TECHNOLOGICAL DOMINATION AND THE FUTURE OF WORKERS IN THE LABOUR MARKET IN THE FACE OF AUTOMATION: A STUDY OF THE AUTOMOBILE SECTOR IN SOUTH AFRICA

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By

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DECLARATION

I, Bianca Ifeoma Chigbu, the undersigned candidate, declare that the content of this thesis is my original work and has not been previously submitted to any other University for an award of a degree either in part or in its entirety.

Signature……..

Date……

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ABSTRACT

This exploratory work investigated the principal aim of this study: the rate of technological domination in South Africa and the future of workers in the labour market in the face of automation. It also explored collaborative experiences between technology and human workers and how employees in the automobile sector compete with technologies in their work environment. The future-readiness of workers in this automation age and union influence with regards to technology adoption in the world of work were also examined. The study utilized a qualitative research method with in-depth interviews of data collection with 30 respondents consisting of two managers and five auto plant workers from Mercedes Benz; two shop stewards from Toyota Motors; two union representatives and nineteen workers working in the auto plant in Volkswagen South Africa (VWSA). A desktop data collection process was also employed in this study. Evolutionary Economics Theory, Labour Process Theory and Corporate Social Responsibility drove the whole analysis to explain the technological outcome in the workplace.

The central argument of this study is that robots and human employees must each efficiently interface where they can best be put to good use. However, in an attempt to minimise product imperfection due to human inconsistencies and to increase productivity, the automobile industry has adopted more technologies to meet the needs of its customers and remained competitive. Nonetheless, the rate at which the technologies are adopted has increased the rate of job automation in the automobile sector and has also led to the deskilling of the auto workforce. Additionally, technology is outcompeting human workers because it has changed and evolved more rapidly than workers. The study argues that despite that automation increases productivity, it is a threat to low skilled workers in the sense that workers might end up underemployed or unemployed although highly skilled workers might be further upskilled. The findings further revealed that the workers are not ready for this change. Another revelation is that there is a unilateral workplace restructuring decision making, which neglects the input of workers and their union with regards to how work should be restructured. The findings call for sustainable corporate responsible management.

The largest adopter of industrial robots in manufacturing processes is the automobile sector since global competition in the labour market commands uninterrupted modernisation and automation of production processes in the automobile industry. Each production process is not imaginable without automation today. In the quest to transform the workplace, improve

productivity, the economy and develop communities with technological adoption, it is imperative to consider the short and long-term sustainable socio-economic development for all. It is argued that almost all sectors and working classes are vulnerable to automation. Kozul-Wright (2016) during the United Nation's Conference on Trade and Development concurs with other scholars that job disruption from automation affect routine tasks and its negative impact is much in the developing countries.

It was recommended that a professional qualification should be incorporated with an academic qualification that aligns with technical and non-technical unautomable skills. Transparency and accountability are a must on the part of all the stakeholders involved in the automobile industry, particularly from management, to make a more sustainable economic decision that will benefit the development of workers. It is equally important for organisations, policymakers, workers, union and societies to develop feasible strategies to manage added concerns of job automation such as polarisation in the societies, the workforce and which may create societal breakdowns and conflicts. At the same time, as these machines will evolve in decades to come, we should expect to see a drastic transformation in workforce development. This study contributes to satisfactory ways to facilitate job automation transition to counteract any negative outcome with reference to those workers who might be affected by the changes in order to achieve a better society.

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LIST OF ABBREVIATIONS

CSR	Corporate Social Responsibility
CEO	Chief Executive Officer
SA	South Africa
OECD	The Organization for Economic Co-operation and Development
EE	Evolutionary Economics theory
AI	Artificial Intelligence
ICT	Information and Communications Technology
STEM	Science, Technology, Engineering and Mathematics
NEDLAC	National Economic Development and Labour Council
SSA	Sub-Sahara African
PwC	Price Waterhouse Coopers
LDCs	Less Developed Countries
LPT	Labour Process Theory
US	United States
4IR	Fourth Industrial Revolution
FMC	Ford Motor Company
GM	General Motors
VW	Volkswagen
VWSA	Volkswagen South Africa
BMW	Bavarian Motor Works
DTI	Department of Trade and Industry
MNC	Multinational Corporation
MAWU	Metal and Allied Workers Union
MICWU	The Motor Industry Combined Workers Union
NAAWU	The National Automobile and Allied Workers Union
UMMAWOSA	The United Metal, Mining and Allied Workers of South Africa
NUMSA	National Union of Metalworkers of South Africa
COSATU	Congress of South African Trade Unions
ANC	African National Congress
UK	United Kingdom
ILA	Individual Learning Account
UBI	Universal Basic Income
OEM	Original Equipment Manufacturer
CA	Companies Act
GDP	Gross Domestic Product
CCMA	Commission for Conciliation, Mediation and Arbitration

THE CHAPTER OUTLINE OF THE THESIS

This section sketched out how each chapter of the study was formed and a synopsis of the findings of each chapter.

Chapter One: An overview of the research problem, aims, and objectives of the study, literature review, theoretical framework and the methodology were provided. The key argument of the study is that the automobile sector has evolved its workplace and labour process with advanced technologies to help boost productivity, however, this workplace evolution has negatively affected the skills and job security of workers. This finding corroborates the view of the Evolutionary Economics Theory (EET), Labour Process Theory (LPT) and the results in the rest of the chapters.

Chapter Two: This chapter covers an in-depth literature review on the experience of human-technology work collaboration and the competition between machines and human workers in the automobile industry. This chapter asserts that the use of technologies in the automobile industry improves working conditions, but some of the tasks executed by autoworkers could be made redundant, leading workers to compete with technologies to remain relevant in the company and, in some cases, to lose their jobs as robots outperform human workers in terms of speed, efficiency, productivity, consistency. This result concurs with that of Chapter one and it is partly supported by EET and LPT theories.

Chapter Three: The chapter reviewed relevant literature on the level of job automation, and the readiness of the workers to adapt to the Fourth Industrial Revolution in the car companies. The main argument of this chapter is that the capabilities and functions of technology have increased resulting in the loss of certain jobs while creating few jobs as well. However, the job destruction is far more than the job creation and it is a concern to note that workers are unprepared to lose their jobs to automation without no hope for a sustainable future in the job market which is a corporate irresponsible behaviour of the motor industry. This view is similar to the observation made in the main thesis of this study and it relates to the perspectives put forward by EET, LPT and Corporate Social Responsibility (CSR).

Chapter Four: This chapter deals with the empirical literature related to the union's influence on technological adoption in the automobile sector. It was revealed in this chapter that trade union with reference to the National Union of Metalworkers of South Africa (NUMSA) lack

decision making power influence workplace reorganization with technologies which jeopardizes the general welfare of auto workers. There is a connection between this result and the core findings in the study. Further, these findings link to the Braverman's conception and execution thesis, as well as managerial control of the labour process theory.

Chapter Five: The chapter covers the conceptual-cum-theoretical framework of the study and how the framework assists in providing the basis for job automation in the world of work, labour market transformation, and corporate responsibility during this process of workplace transformation. The conceptual-cum-theoretical framework implemented to direct this study encompassed EET, LPT, and CSR. The approach of evolutionary economics settles on the link between economic growth and technological change. Whereas, labour process theory maintained that technology is implemented and used in a way to dictate and rule the working class which deskills workers, heighten poverty and degrades labour. CSR emphasizes that the success and existence of an organization focus on their power to produce ample wealth and satisfaction for internal stakeholder including its workers. The application of these varied theories was very helpful for analysing and interpreting the results of this study.

Chapter Six: This chapter detailed the research methodology adopted, which include the unit of analysis, sampling methods, data collection instruments, and data analysis. A phenomenological approach was utilized in this study to focus on the experiences of the auto workers with robotics in the motor sector and to interpret the consistency of their responses on why technologies are adopted in the automobile sector, the collaborative relationship with technologies in the plant, and what the implementation of these robotics means for the car companies. The study interviewed 30 respondents consisting of two managers and five auto plant workers from Mercedes Benz; two shop stewards from Toyota Motors; two union representatives and nineteen workers working in the auto plant in VWSA.

Chapter Seven: presents and discusses the findings that unfold from the experience of human-technology work collaboration in the automobile industry. The findings showed that automation has increased production efficiencies, productivity and safety in the motor sector but still has exposed job security of workers, and in some instances lead to job losses. The result in this chapter is in line with previous chapters, it also aligns with the EET's view of "creative response" which argues that motor companies are developing a creative solution to increase productivity and gains. Nonetheless, LPT's argues that management "creatively

respond" just to control the process of production where the machine produces more products and boost profit for the company but neglects the welfare of workers.

Chapter Eight: The findings derived from the competition between machines and human workers in the automobile industry were presented and discussed. The argument in this chapter revealed that owing to the steady implementation of technology in the automobile sector, workers are forced to upskill and reskill. Nevertheless, workers are constantly deskilled resulting in the redundant workers being relocated to other sections of the company. The deskilling thesis of LPT and the creative destruction theory EET are connected to this finding. This result also concurs with the core argument of the study.

Chapter Nine: This chapter presents the findings on the level of job automation in the automobile industry in South Africa. Discussion of the results was also taken into consideration. This chapter indicates that while some task has been created, the body shop is fully automated, paint shop is about 80% automated, the assembling ward is about 20% automated, the supply for logistics is also making a lot more use of machines and logistics activities are outsourced. These findings relate to the main argument of this study that while productivity increases in the motor industry, the job position of workers is threatened by automation. Connecting these findings to EET, it shows that creative-destruction is more destructive of the side of workers' future career. As indicated in the LPT, the automobile sector chooses a work process that deskills workers and devalues labour. CRS maintains that an organization should make a profit, but activities should not be destructive to its stakeholders and must abide by corporate, socially responsible choice of doing business.

Chapter Ten: The chapter presents and discusses the results of the analysis regarding the readiness of the workers to adapt to industry 4.0 in car companies. The findings in this chapter confirm that notwithstanding the possibilities of reskilling, retraining and upskilling, autoworkers shows little preparedness of technological domination in the workplace. Both the core argument of this study and the findings in this chapter correlate with each other. Specifically, CSR argues against an economic activity the neglects the welfare of some of its stakeholders such as workforce. The indication is that there must be a win-win socio-economic gain for all the people involved in the economy and in the society to close the gap of inequality.

Chapter Eleven: Findings on the union's influence on technological adoption and task automation in the automobile sector were presented and discussed in this chapter. It was indicated in this chapter that trade unions have little or no impact in the decisions that surround the technological reorganization of the plant which is reducing the number of their members in the motor industry. However, trade union have a positive influence on workers' retrenchment, training and retraining. This argument coincides with the main thesis of this study which discovered that while automation comes with a lot of competences, it has destructively affected the job security of the workers through managements' unilateral decision making on the adoption of robots in the auto sector. For LPT, power and control are one of many managerial dominant and authoritarian styles which devalues labour-power. CSR concludes that as an alternative of managerial unilateral decision making, discussing with employees on the adoption of innovative changes may permit employees and their representatives to understand their future with the company and the situation of the workplace CSR practices by taking into reflection the necessity to adopt more technology, other possible changes and the effects these changes may bring.

Chapter Twelve: The logical and critical research debate on South African manufacturing labour market creative destruction theses and occupational structure are addressed. The insight is that it may be hard to ensure that the technical development process creates more jobs than it eliminates when technologies appear to be progressing at a fast rate while job creation is going at a snail's pace.

Chapter Thirteen: The chapter summarizes all the findings as reported in chapter 7, 8,9,10,11 and 12. Further, the chapter presents the policy implications of the findings and the last conclusion and recommendations stemming from the analyses. Future areas of study were also suggested.

Chaper 1

OVERVIEW OF THE STUDY

1.1 INTRODUCTION

While automation would increase productivity, it will nevertheless make the working class vulnerable to both underemployment and unemployment. This dissertation investigated the rate of technological domination of the task and the future of workers in the South African motor sector. The term "technology" "robots/robotics" and "machines" were used interchangeably in this study which refers to as innovations mostly capable of carrying out a sequence of activities independently or semi-autonomously. For ages, technologies have been used in the automobile industry to collaborate with workers to boost productivity, reduce work stress for workers, increase efficiency and generate profit. Of recent, automobile robotics have improved with time adding to their flexibility for a variety of tasks more than before. This has helped car companies to yield higher car units, also saving time and money. In economic terms, this is a perfect development for automotive management as they gain surplus from technology adoption.

Nevertheless, automobile technologies also have the potential to accelerate the automation of tasks once carried out by humans in a significant rate in the car companies leading to reskilling, upskilling, devaluation of work, job anxiety, job insecurity and job loss. Results such as de-skilling, retraining, earning inequality, profitability, unemployment, under-employment, job destruction, workplace evolution, an uprising against machines, economic crises, employment re-allocation, creation of jobs, product innovation, flexible workforce, economic competition, economic development and corporate social irresponsibility have all been contended as the outcome of technological adoption in the manufacturing sector, especially, in the motor industry in South Africa (see: Adler, 1993; Ambe, 2014; Barchiesi, 2010; Black & Hasson, 2012; Braverman, 1974; Calitz, Poisat, & Cullen, 2017; Erten, Leight, & Tregenna, 2019; Hlatshwayo & Buhlungu, 2017; Littler, 1982; Lorentzen & Barnes, 2004; Mashilo, 2010; NAAMSA, 2019; Schumpeter, 1947; Webster, Masondo & Bischoff, 2019).

However, instead of shedding human labour with the aid of robotics and with the hope that technologies will create new jobs in a new sector, the most sustainable opinion would be humans working alongside with robots and intensifying efficiency in the car sector. In this

sense, technology adoption should be driven by the innovation of the workplace, skills, workforce, economy. With this policy, an environment will be created for all the stakeholders involved in the economy to deliver on their full potentials, which makes it responsibly sustainable.

1.2 Core Argument of the Thesis

Automation in the automobile industry results in the increase in unemployment for the low skilled workers despite the fact that elite employees might be further upskilled. Labour process theory (LPT) was the central theoretical framework that energised this study of technological adoption debate, although evolution economics theory (EET) and Corporate Social Responsibility (CSR) supported this study and were consistent with the analysis of this study. Drawing from the theory of labour process, this study posits that labour in the South African automotive sector has been reorganised to the extreme in pursuit of risky speed, competition and surplus-value. This transformation is someway operated by the management to control the more substantial part of auto labour and this capitalist quest for "farthest economic evolution" has resulted to inequality in the society, skill degradation of the autoworkers and destruction of previous human task and has not created jobs at the rate in which it destroys it. Indeed, this is a win-lose situation. Win situation in the sense that the automotive Chief Executive Officer (CEOs) benefits far more from this technological and economic evolution. Lose situation considering the fact that the rate of technological employment stagnation in the South African motor companies is on the increase, which affects the social system in general. This win-lose scenario is "corporate socially irresponsible" on the side of the auto management.

In this regard, from the notion of CSR, the present study settles that notwithstanding that motor corporations want to drive a robust rate of technological innovation and maximise the rate of automobile economic evolution to meet the demands of some of their "relevant" stakeholders such as consumers, management, and owners. However, the other "relevant" stakeholders such as autoworkers and their social welfare should be "equally" met. Consequently, the automobile sector in South Africa must be devoted to an accountable social good and public values while also devoted to their period of evolution, thus maximising fairness for all parties participating in the economy.

In theory, the findings show that the South African (SA) motor industry has evolved and will continue to evolve with technology adoption which has boosted productivity, profit and competition, which also have destroyed a good number of tasks in some departments in the motor sector (body shop, paint shop, press shop) while creating few tasks in another department (assemble line) just as assumed by the evolutionary economics theory.

However, this study argues along with labour process theory by acknowledging workers' welfare by maintaining that the rate of the workplace evolution in South African automobile sector is deskilling workers, degrading labour, polarising the working class, resulting to job loss and might lead to social disorder. From the results of the study and as assumed by CSR, certainly, technological adoption in the auto sector has played a positive role in improving the country's Gross Domestic Product (GDP) and put the country at a competitive advantage through productivity and export, however, this innovation system seems to be driven primarily by markets, profit and the most highly resourced actors whereby employment creation is not adequately met.

No doubt, the study indicates that technology in the workplace is ideal considering numerous economic reasons but not when it is trusted upon to execute or perform all sorts of human activities. As far as South African society is concerned, we are utterly unprepared for changes of that magnitude. The point is that work and concentration on a task are essential for human development. This society will be in turmoil if a significant number of citizens cannot receive earnings or spend. Consequently, it will not be ideal for refitting an organisation with technologies when people queue up to do the work at the minimum wage.

Arguably, human security dwells on public service delivery and individual's expectations from the government at the same time as safeguarding the orthodox concept of security. The threat to human security includes fear of being unemployed, not affording basic subsistence and not contributing to society. If technological adoption causes technological unemployment, destroys more jobs faster and creates fewer jobs at a slow speed and deskills the workforce; it will further steer hardship in South Africa. Failure to create employment or close the pronounced income disparities in the labour market will threaten South Africa's national security but the automobile sector can contribute in reducing joblessness instead of stagnating the number of workers employed in their companies.

It is essential to recognise that crisis can develop from neglecting that work goes beyond waged occupation, but work encompasses important cultural, personal and social implications. In the quest to transform the automobile industry in South Africa, productivity, and the economy; it is imperative to consider the short and long-term sustainable socio-economic development for all. Retraining and reskilling as solutions to job automation is not an obvious answer that will lead to job security. The notion is that only a small percentage of those affected by automation in South Africa can be reemployed in the labour market even after reskilling. Hence, it is somewhat logical to maintain that the economic inequality and unemployment is a menace to long-term peace, and this can be overextended to the security and development of South Africa and any other country.

1.3 Background of the Study

The auto industry for decades has assimilated robotic technology into the workforce to convalesce proficiency, lessen the workload for workers and their stress in the workplace. Early robots have done a lot to remove people from dangerous, repetitive, hard and dirty employment in the production line, and the working conditions around the plant have enhanced as well (Fryman & Matthias, 2012; Vulavala & Ulmer, 2014, p. 24). Human workers and technologies cannot independently perform assembly tasks alone because they are mutually responsible for particular tasks. According to Unhelkar, Siu and Shah (2014, p. 88), one reason for this robot-human teamwork would be to use technology to improve the productivity of people in value-added jobs and to find ways to perform non-value-added jobs.

It has been argued that organisations would rationally prefer to automate the workplace since the present technologies can match the skills of human workers at a lesser cost. Thus, machines would rapidly substitute almost the whole workforce (Brynjolfsson & McAfee, 2014, p. 84). Consequently, new products, businesses, and markets would be created, but organisations would adopt efficient technologies to work in these new markets as a replacement for human workers. In this case, a few years from now half of all employment opportunities may be affected (Frey and Osborne, 2017). Both in the developed and the developing economies, the traditional business methods are being supplanted by the fast-technological emergence.

Automation has been considered to extend the possibility of the formation of new complex tasks for additional computerisation. The innovations may demand the supply of matching

capabilities in the world of work but to develop a labour force with the abilities to utilise modern innovations is a problem faced by computerisation (Bessen, 2015). It is also possible that many industrial workers learned the technical skills on the job. Although not every worker has the knack or opportunity to learn (Ibid).

As an alternative, businesses will automate any complex job that entails additional training and in which labour is consequently costlier (Feng & Graetz, 2015). Those workers with needed new skills will transition to new, well-paying jobs (Bessen, 2015) and the average wages will increase because technology would boost the productivity of labour (Pratt, 2015, p. 58). In this sense, according to (Graetz & Michaels, 2015), some workers will benefit extensively from technological progression. At the same time, the advancement could exacerbate earnings and income disparity among workers (Dorn, 2015; Graetz & Michaels, 2015). Although Haldane et al. (2015) counteract this agreement, arguing that the income gap has not evidently stretched because of job automation. Most recently, Bessen (2015) maintained that low-income workers would lose jobs, whereas high-income workers will gain jobs, and this gap will widen if low pay workforce is unable to move to jobs with higher income.

Aside from income inequality, there is a rising division of workforce among rich and emerging countries as a result of the impact of technologies in the workplace (Dorn, 2015, p. 26). While manufacturing productivity has generally facilitated emerging countries to compete with industrialized countries economically, computerization is seemingly going to influence conflictingly on their capacity to achieve this. In this situation, developing countries risk premature de-industrialization to be economically equal with the advanced nations, in this case, new growth models will be required (Arntz, Gregory & Zierahn, 2016b).

In the production sector, 87% of job losses were as a result of the growing efficiency of factories with automation and enhanced technology while the remaining per cent was trade-related, so, from 2000 to 2010, the number of workers required to make a car in automobile industry reduced year by year (Hicks & Devaraj, 2015). However, manufacturing production growth has been mixed across sectors, as recent history suggests (Hicks and Devaraj, 2015). Also, the rate of technological domination has been overestimated, some of those said high-risk jobs still involve a large portion of the tasks that will be difficult to automate, for example, jobs that require face-to-face and personal association (Arntz, Gregory & Zierahn, 2016b).

Thus, workers within occupations are likely to differ to mechanisation contingent upon the jobs that they execute.

A decision to mechanize work has led to unemployment. The unemployment rate in South Africa as of 2013 was 24%, 27.1% in 2018 but in 2019, it was 29% according to Statistics South Africa. We have seen rapid positive rates of societal and workforce change. Data, however, indicates that the employment market is not steadily growing along with this change; rather, the overall employment rate has been declining in South Africa. Such evidence can be seen in the mining industry in South Africa. Just as Vogt (2016, p. 22) puts forward that within certain commodities, mines have seen a substantial technological change in mining methods. Just about the whole coal sector is mechanised, and several platinum mines have been designed and operated to run as mechanised operations.

Technologies are also threatening assembly line jobs in the manufacturing sector. Investments by automakers on robotics rose from 15% in the period of 1980s to 55% by the year 2010 (Vulavala & Ulmer, 2014, p. 27), 90% of these robots are employed in the assembly lines and half of the machines assist in making automobiles, which means that complex human skills needed for the upsurge of different technologies can easily be mechanised (Ford, 2015).

In South Africa, approximately 10% of present occupations are obliterated yearly, while the number of new employment is around 9% of existing jobs (Kerr, Wittenberg & Arrow, 2014), this destruction is pronounced in the manufacturing sector and which confirms that employment in this sector in South Africa is on the decrease. Also, employment obliteration is higher than work creation in all the two-digit sectors, with the exception of electrical machinery, beverages, and food industries. Technological transformation diminishes the demand for labour. Be that as it may, by cutting costs of goods and services, it frequently leads to upturns in demand for productivity; and more massive request leads to bigger production, which demands extra labour compensating the employment impacts of a decrease in labour conditions originating from automation (Brynjolfsson & McAfee, 2014, p. 81). However, the economists have insisted that it is true that old occupations are destroyed when innovations arrive, but new profitable occupations substitute the lost jobs.

The South African auto sector is still not known for world-class delivery, but it is now exporting locally-manufactured cars to more than 70 nations; it has the challenge of maintaining its

business situation and producing at sustainable prices and of being capable of meeting world requirements rapidly and reliably. It might not be competing favourably on the international level, but the automotive industry is South Africa's biggest productive sector (Ambe and Badenhorst-Wess, 2013, p. 7). The car industry has been deemed among the most successful industrial sub-sectors in South Africa and has drawn significant government support. Generally, South Africa's automotive industry has never been able to become a true leading industry or a significant hub (Barnes, Black and Monaco, 2018, p. 2); this can be attributed to some challenges that the sector is facing.

Challenges related to capacity, capabilities and labour problems have had a bearing on local automakers in South Africa's output (Ambe and Badenhorst-Wess, 2013). With regards to capacity, one of the problems is that the sector is fragile and faces fresh and emerging difficulties such as heavy expenses in replacing obsolete installation or manufacturing instruments. The automotive industry has a role to play in ensuring support for technological innovation [National Association of Automobile Manufacturers of South Africa (NAAMSA), 2019], and it is an imperative to the success and the sustainability of the industry.

On the issue of capabilities as a challenge in the auto sector in South Africa's output (Ambe and Badenhorst-Wess, 2013), the sector needs to seek to increase work productivity as well as concentrations of abilities (Ibid). Nevertheless, this transformation in the automotive industry will significantly lower the expertise and resources shortage of SA (NAAMSA, 2019), and creates more unemployment, since the technologies perform tasks previously executed by employees effectively (National Union of Metalworkers of South Africa [NUMSA], 2016, p. 2). It is evident that the automotive industry is rapidly automating and the rate of loss of jobs is increasing (Hicks & Devaraj, 2015). Notwithstanding that managers generally do not really wish to offer training in South Africa and this has resulted in a shortage of skills and an inadequate development of their employees (Mohlala, Goldman & Goosen, 2012); but definitely in South Africa, regular upskill is the only way to compete with robotics in this period (NEDLAC, 2019, p. 39).

With regards to labour problems, South Africa's position as a trustworthy provider of global export goods has been affected by the strike action and could well adversely impact on potential export agreements for car producers in South Africa (Sitlu, Panday & Karodia, 2014, p. 126). It requires a moment to settle workers' conflicts in South Africa (Ambe and Badenhorst-Wess,

2013, p. 6). The unilateral practices by the auto CEO's to alter the labour process which is favourable to the management and jeopardizes the job of the workers has attracted many criticisms by NUMSA and conflicts between employees and their employers in the factory since the 1990s (Forrest, 2005, p. 203). NUMSA as a trade union has long stressed that the restructure of the automotive labour process must be equally beneficial to all the stakeholders involved in the organisation (NUMSA, 1993) and most recently, the union still maintain their stance that the management must adopt the best possible technology, but only on the basis of maximising benefits to the community as a whole (NUMSA, 2019). Usually, there is a general strike which includes the issues of wages and production but this strike partly includes the issue of technological modifications in the auto companies (Hlatshwayo, 2014, p. 287) .

Barnes, Black and Monaco (2018, p. 2) assert that the state-trading dynamics that accompanied the sector's liberalization adversely affected the growth of the SA automotive industry. Currently, industry-wide governance is significantly tilted in favour of the big Multinational Corporation (MNC) players who control the sector and weigh on policy goal formulation. Seemingly, the South African government support towards technological adoption particularly in this Fourth Industrial Revolution is on the increase and arguably, it is likely that the state will be in favour of the auto CEO's decision to adopt more robots for efficient productivity given the fact that the sector contributes immensely to the economic growth of the country.

To substitute what the auto company managers call an unproductive, incompetent and costly human labour, these companies have been effecting work processes that are labour replacement-capital-intensive. Work productivity surged by less than 1% per year from 1970 to 1994 and improved by 7% between 1994 and 2012 and it is still rising but this higher productivity, however, did not help the automobile workers (NUMSA, 2016b). To be specific, workers are very significant corporate stakeholders, and their welfare ought to be considered in the broader framework for corporate governance and social accountability (Botha, 2015, p. 68). According to the CSR, as the businesses make their profits, the stakeholder's interest such as the certainty of the worker's jobs should not be neglected. The issue is that work provides meaningful benefits to workers and people in general, be it monetary and non-monetary (Freeman, 2008) and for this reason, work can be seen as a human right.

The constant production of technologies that are replacing workers presents both job opportunities and job threats (Marchant, Stevens & Hennessy, 2014). These innovations

demonstrate the possibilities to enhance our lives and rid us of difficult task and threat of labour-intensive and dull work and empower consumers and organisations to realise greater personal satisfaction. It is within reason to imagine that the process of automation could attain such an accelerating pace that, in the coming decades, robots would mostly perform production activities more than before. To counteract this impact lies in ensuring sufficient training and re-training of low qualified workers (Arntz, Gregory & Zierahn, 2016a). Affected workers may be frightened during this economic shift. Notwithstanding that trade unions are struggling to acclimate to the growing effect of the Fourth Industrial Revolution (4IR) on wages and occupations, this transformation will involve public policy to amend the undesirable consequences of job dislocation and it is possible that wages for particular classes in the workforce may necessitate a supplementation of income redistribution (Mokyr, Vickers & Ziebarth, 2015). Hence, it is crucial to consider other policy negotiations, for instance, labour market amendment policies to encourage employees whose profession are changing (Gelb & Khan, 2016).

1.4 Problem Statement

Globalisation has changed South Africa's automotive world of work as a result of new forms of organisations, the advancement of high-tech, and different perspectives of business to keep up with changing market hassles and to keep gain against rivals. In South Africa, a big number of local cars are intended for use in the export industry, affecting the country's equilibrium of payment and jobs. It is, therefore, essential that these cars supply chains remain worldwide competitive. As a result, the automotive industry has adopted technology and leadership methods that have changed the manufacturing atmosphere through the use of the state-of-the-art concept and computation aspects of instruments (Ambe and Badenhorst-Wess, 2013, p. 1). The market and facilities facing the South African automobile sector are threatened, hence the need to enhance delivery standards and discover export fresh in the developing economies (Ibid., 6).

NAAMSA recorded a dramatic annual increase in total domestic vehicle production. This development impacted the GDP level from 0.8% in 2018 to 1.2% in 2019 and is projected to increase to 1.8% in 2020.

Table 1: Yearly Unit of Car Production in South Africa

Year	2016	2017	2018	2019	2020 (projection)
Unit of locally produced cars	600,008	601,178	604,050	657,650	687,200

Source: NAAMSA (2019)

The above table shows that car production and sales have been improving, the workforce does not, however, experience the same positive growth in the car industry. At the end of the fourth quarter of 2015, the total employment of manufacturing as of 31 March 2016 was 31 258, with a decrease of 174 workers relative to the 31 432 heads of industry. As of 30 June 2017, there were 30, 356 industrial overall jobs, reflecting a 159-fold growth from the 30, 197 head of industry as of the end of March 2017. As of 31 December 2018, the industry had 29,484 jobs, which was 781 or 2,6 per cent lower than its 30,265 heads of the industry at the end of September 2018. This represents a drop of 281 jobs. As of 31 March 2019, combined industry employment was 30.030, reflecting a marginal 2-employment decline as against the 30.032 industry lead by the end of December 2018. As at June 30, 2019, the overall number of employees in the industry was 30, 118, reflecting an increase in 86 employees over 30,032 (NAAMSA, 2019) as at the end of March 2019.

Such statistics indicate that from 2016 to 2019 workers have dropped by 1,314 and unable to exceed this percentage in the automotive industry. NAAMSA report indicates that employment in this industry is stagnated while the unit of cars produced is on the increase. Meaning that SA's car industry can certainly count on a more balanced productive system, more optimal innovations and better integration into world markets today and the sector's development also constituted some expenses, but structural problems stick as there was no important job creation (Barnes et al., 2018, p. 2).

The auto industry in SA is changing very fast bringing in hybrids of production and the automation of factories (NAAMSA, 2019). The desire to catch up with the remainder of the globe, to compensate for the lost moment, has led to boost worldwide inclusion since the collapse of apartheid in South African. All of these has influenced the path made by the industrialization method and the state-to-multinational business connection (Barnes et al., 2018, p. 8). During the 2019 NAAMSA Automotive Conference at Kyalami Conference Centre, it was indicated that technology will reshape how cars are produced, with the growth

of intelligent machines and new production automation systems along with advanced materials used in the manufacture of automobiles. So, we are looking at the future of the car as much as we may reimagine the future car.

The South African automotive industry has experienced an incredible transition but new production models and job security have to be balanced (Masondo, 2010, p. 103). It is necessary to take into account that this transition is creating more and more unstable plant workers' jobs (NUMSA, 2016b), redundancies and severance compensation plans in some employees (Hlatshwayo, 2017), as technology efficiently performs tasks previously done by those workers (NUMSA, 2016a). Given the shocking unemployment rate in the country, there is a near-zero chance for discharged workers to find a further job (Ibid). As the CEOs of automotive companies unilaterally acquire and install technology in the assembly plants, employees and their unions do not have the power to change this technical revolution in the South African automotive market (Mashilo, 2010; Masondo, 2010).

In 2011, it was discovered that given the proximity to internal industries in Brazil and South Africa, the manufacturing industry in Brazil and South Africa has been significantly smaller in technology than that of India when it compares manufacturing technological capacities at a firm's level between Brazil, India and South Africa (Rasiah, 2011, p. 203). This will possibly necessitate the car companies in South Africa to adopt more technologies and robotics to compete on the same footing with other BRICS (Brazil, Russia, India China and South Africa) countries. Despite Masondo's recommendation and NUMSA's outcry above, most recently; NAAMSA insists that the market is hungry and is prepared to re-establish to promote more technological innovation, to provide the South African automotive industry with a broader range of products (NAAMSA, 2019). This seems to be a deliberate attempt to attain the rank of one of the leading auto manufacturing with the aid of the best technological capacities amongst the BRICS countries and to the rest of the world, particularly in this Fourth Industrial Revolution.

While technologies are assimilated into the automobile business, both the techno-pessimists and the techno-optimists have coherently argued the adverse outcomes. On the one hand, techno-optimists insist that the constant adoption of technologies in the general context will improve productivity growth and increase the worker's earnings and subsequent well-being. On the other hand, techno-pessimists maintain that the global world of work is on the verge of

employment crisis with the rate of automation since merely a small number of highly trained autoworkers will be needed in the automobile labour market since advanced technologies are built to execute many tasks efficiently and are cost-effective. The problem under investigation thus is technological domination and the future of workers in the labour market in the face of automation: a study of the automobile sector in South Africa. Emphasis on the rate of job automation in the motor sector has been mostly placed in advanced countries and has not been adequately investigated locally. Consequently, the rate of technological adoption in South Africa's automobile industry is an important area of research. The present study also aimed to reconnoitre the readiness of employees concerning this change and identify feasible policy measures to mitigate any possible negative outcome, especially in South Africa. Also, this study expanded the scope of research into the mechanisation of work; contributed to the empirical knowledge of the economics of computerisation and addressed its global social implications.

1.5 Research Aims and Objectives

The present study mainly aimed to investigate the rate of technological domination in the automobile sector and the future of workers in the labour market in the face of automation in South Africa. The sub-objectives of the study were to:

- Explore the experiences of South African workers with regard to the introduction of technology in the workplace.
- Establish how workers compete with rapid technological domination in the workplace.
- Discover the extent to which technology has taken over jobs in South Africa.
- Uncover the readiness of the labour force to embrace the outcome of technological domination.
- Find out about the influence of organised labour and the social movement on technological advancement.

1.6 Research Questions

The main research question of the study was: what is the rate of technological domination and the future of workers in the automobile industry in the face of automation in South Africa? Sub-questions of the study were as follows:

- What are the experiences of South African workers with regard to the introduction of technology in the workplace?
- How do workers compete with rapid technological domination in the workplace?
- What is the extent to which technology has taken over jobs in South Africa?
- How ready is the labour force to embrace the outcome of technological domination?
- What is the influence of organised labour and the social movement in technological advancement?

The research objectives and questions were aligned with each chapter as follows: Chapter two was used as tool to answer research objectives 1 and 2 and questions 1 and 2. Thus this chapter covers an in-depth literature review on the experience of human-technology work collaboration and the competition between machines and human workers in the automobile industry. Chapter three is used as instrument to operationalize research objectives/questions 3 and 4 which gathered relevant documented information on the level of job automation, and the readiness of the workers to adapt to the Fourth Industrial Revolution in the car companies. Chapter Four dealt with the empirical literature related to research objective/question 5 focusing on the trade union's (with reference to NUMSA) influence on technological adoption in the automobile sector.

1.7 Delimitations of the Study

Delimitations entail the feasible limits that were set in this thesis to accomplish the objectives of the study, which are within the study parameter. This considered the study objectives, research questions, motivation to choose this course of study, populations, research methods and design and theoretical insights chosen as targets delimited to study. This section purposely excluded study objectives and research questions as they are already mentioned above.

1.7.1 The motivation of the Study

The motivation of this study was that it is intriguing to understand why enough jobs have not been created at the rate they were destroyed in South Africa. An array of socio-economic issues persists. For instance, job losses and insecurities linger, unemployment fuels further, devaluation of skills grows with no readiness of the uncertain career future. It is understood that these problems to some extent stem from job automation in relation to the rate of the

implementation of technologies. The automobile sector is one of the biggest industry that adopts collaborative robotics to boost productivity.

From a sociological point of view, policymakers are not socially aware enough to recognize the deleterious effect of constant technology adoption and thus, not understanding the current restructuring of the labour process in the motor sector to ask "what if's, why not's," to view the labour market in many aspects rather than one state of mind of economic transformation of partial benefit. As yet, there has not been an eclectic investigation of the experience of robot-worker interface, robot-autoworker competition, rate of job domination, future-readiness and alternative jobs for autoworkers and how union influences these workplace issues. Understanding these issues may lead to the contribution in reducing these social burning problems in South Africa and it was also important to reveal these findings of the state of the current labour process in the motor sector that will necessitate a responsible improvement that will equally benefit workers.

1.7.2 Research Methods and Design

A qualitative research method was uniquely efficient to answer all the research questions. Thus, this research approach was exclusively employed to understand the rate of rapid automation in the labour market. Initially, the researcher planned to interview a higher number of respondents in five motor sectors based on their availability. However, some car companies refused to participate in the study. Consequently, the researcher was able to interview three automobile companies. However, the number of willing participants in each car company were uneven due to time and availability (multiple rescheduling and cancellation of interview). There are some guidelines from the studies addressing sample sizes. Creswell (1998) advises 5-25 for phenomenological study and Morse (1994) recommends at least six. This research is a phenomenological investigation and a total of 30 participants from the three-car companies were interviewed. According to the number of participants from each group, two managers and five Mercedes Benz auto plant employees; two Toyota Motors worker's union representatives; two workers union representatives and nineteen employees at the VWSA auto plant. These numbers of respondents were chosen because of their accessibility, first-hand experience with robotics and with technological expansion in their organisations and were in the best position to answer any question concerning the study at hand.

Given the exploratory nature of this study, the data gathered was thick in quantity and most importantly, rich in quality, detailed and nuanced in labour relations in the motor industry which helped to reach data saturation at a very early stage with 21 interviewees, nonetheless, the interviewer decided to round it up with sample size of 30 respondents. Further, the sample size of thirty participants in qualitative research is sufficient and acceptable in studies of this type, based on empirical evidence from prior research. A point to note is that 30 samples of this study were not based on sample size guidelines as proposed (see: Morse, 1994; Guest, Bunce and Johnson, 2006), or what the researcher felt she can defend or what the advisor required, rather the sample was based on the feeling and certainty that the study was completed with regards to data saturation. This was because no new ideas and revelations was appearing, meaning that the researcher has generated substantive themes and gained enough data that can offer a reliable picture of South Africa's labour process in the motor sector. Therefore, the researcher was definite that the gathered data was sufficient to produce theoretical elements from the study's analysis.

In purposive sampling, a sample is chosen for a particular purpose; gives insight into the area of study and the sample is determined by the availability of the population and the research topic. This study made use of document studies and in-depth interviews to collect primary and secondary data for the study. The idea of adopting in-depth interviews was to allow auto workers and the management to express their experiences, interpret the negative or positive effect of technology and their view on the future of work with technology. The in-depth interviews were conducted with an audio recorder which allowed the researcher to give undivided attention to responses aired from the interviewees rather than the distraction of writing notes and its slow nature of capturing and remembering all that was said.

The study used thematic and content analyses to construct arguments from the data. Quoting the respondents allowed the researcher to grasp details of every word and explain word by word by implying the hidden meanings of quotes from the managers, autoworkers and the union and also considered the emotional state of the interviewee. The researcher in her judgement collapsed most of the similar quotes of the same categories to form one generalised quote to reduce the mass data. However, unique quotes were left untouched. For the thematic angle, with the aid of each research objective, some questions were coded and grouped into units of shared themes and were given suitable names for the category and thematically analysed. As for the content analysis, secondary data in the literature review chapters provided

insights into the discourse of the main and sub-objectives of this study. The goal was to understand more about the constant evolution of the motor industry's labour process and the future career readiness or uncertainty of the autoworkers in the sector through the prior empirical findings and debates of scholars in this area of study. Consequently, it was to systematically determine the rationale, connotation, and conclusion of the foregoing line of arguments in the context of this study to help uncover meanings in the quotation from primary data.

The interview table 1.2 below demonstrates the character and length of each interview that was conducted, it also highlights the researcher's strategy of using the in-depth interview as a well-planned research technique.

Table 1.2: Interview Methods Table

Interviewee	***Status***	***Format***	***Length***	***Recording***
Managers				
Interviewee No 1	Conducted in person/19/Oct/2017	Semi-structured	49 mins	Audio recording and supplementary notes during the factory tour
Interviewee No 2	Conducted in person/19/Oct/2017	Semi-structured	33 mins	Audio recording
Workers Trade Union representative				
Interviewee No 30	Conducted by phone/15/Oct/2019	Semi-structured	21 mins	Audio recording
Interviewee No 29	Conducted by phone/15/Oct/2019	Semi-structured	20 mins	Audio recording
Interviewee No 22	Conducted in person/8/Dec/2018	Semi-structured	24 mins	Audio recording

Interviewee No 16	Conducted in person/21/July//2018	Semi-structured	28 mins	Audio recording	
Automobile Workers					
Interviewee No 8	Conducted in person/31/Oct/2017	Semi-structured	18 mins	Audio recording	
Interviewee No 11	Conducted in person/31/Oct/2017	Semi-structured	31 mins	Audio recording	
Interviewee No 4	Conducted in person/19/Oct/2017	Semi-structured	20 mins	Audio recording	
Interviewee No 23	Conducted in person/21/July//2018	Semi-structured	16 mins	Audio recording	
Interviewee No 18	Conducted in person/22/July//2018	Semi-structured	19 mins	Audio recording	
Interviewee No 15	Conducted in person/21/July//2018	Semi-structured	17 mins	Audio recording	
Interviewee No 5	Conducted in person/19/Oct/2017	Semi-structured	23 mins	Audio recording	
Interviewee No 13	Conducted in person/21/July//2018	Semi-structured	19 mins	Audio recording	
Interviewee No 3	Conducted in person/19/Oct/2017	Semi-structured	20 mins	Audio recording	
Interviewee No 9	Conducted in person/31/Oct/2017	Semi-structured	22 mins	Audio recording	
Interviewee No 12	Conducted in person/22/July//2018	Semi-structured	26 mins	Audio recording	

Interviewee No 20	Conducted in person/22/July//2018	Semi-structured	17 mins	Audio recording
Interviewee No 7	Conducted in person/31/Oct/2017	Semi-structured	30 mins	Audio recording
Interviewee No 10	Conducted in person/31/Oct/2017	Semi-structured	15 mins	Audio recording
Interviewee No 6	Conducted in person/19/Oct/2017	Semi-structured	19 mins	Audio recording
Interviewee No 25	Conducted in person/8/Dec/2018	Semi-structured	21 mins	Audio recording
Interviewee No 19	Conducted in person/22/July//2018	Semi-structured	18 mins	Audio recording
Interviewee No 28	Conducted in person/8/Dec/2018	Semi-structured	16 mins	Audio recording
Interviewee No 14	Conducted in person/21/July//2018	Semi-structured	22 mins	Audio recording
Interviewee No 21	Conducted in person/8/Dec/2018	Semi-structured	19 mins	Audio recording
Interviewee No 17	Conducted in person/22/July//2018	Semi-structured	21 mins	Audio recording
Interviewee No 24	Conducted in person/8/Dec/2018	Semi-structured	17 mins	Audio recording
Interviewee No 27	Conducted in person/8/Dec/2018	Semi-structured	19 mins	Audio recording
Interviewee No 26	Conducted in person/8/Dec/2018	Semi-structured	19 mins	Audio recording

1.7.3 The theoretical framework of the study

Three different but related philosophical frameworks were used to delimit this study from other possible frameworks. This study constructed a satisfactory heterogeneous theoretical model under which manufacturing technologies are implemented to collaborate with human workers, the dynamic nature of technologies, its contribution to the economy, employment, skills and social factors that guilds and impedes technological growth. EET, LPT, and CSR have been used to explain the technological outcome in the workplace. While LPT was adopted as the dominant theoretical framework for this study, these three perspectives commonly have an essential concern in understanding the elements of technology in the workplace and how the outcome differs over time in the labour market and society.

1.7.3.1 The renewed views of evolutionary economics theory

To start with EET, which maintains that technologies and organisations vary from one era to the other and therefore constantly transforming the economy. These technologies can start as simple basic tools accumulating over time, leading to an upsurge in the evolution of the economy and consequent in the high percentage of technological advancement. Dosi (1982) used the term "technological paradigm" embedding it to Thomas Kuhn's scientific paradigm to elucidate the evolution of technological innovation compelled by shifting scientific paradigms. This trajectory involves the action taken in organisations such as the growth rate of technologies in the workplace, which means that organisations function inside the paradigm. However, the main driver in this paradigm is to adopt technology in the workplace with the aim to use it to boost productivity and gain surplus capital.

Put differently, the centrality of the economic evolutionary perspective is in its specification on entrepreneurship, business strategy, innovation, and creative destruction. The insights of EET have dominated the world of work but it has significantly influenced the automobile sector's labour process. When it comes to the growth of the economy, South African governments have dwelled so much on the centrality of entrepreneurialism and innovation like never before in a push to achieve substantial economic growth. Seemingly, EET argued against the theory of labour process which to some extent stresses static perfect competition and equilibrium in the workplace. In its place, the insights of EET are that the economic change, can never be stationary and disequilibrium is the real key to "this evolutionary character of the capitalistic process." Therefore, this capitalistic process in relation to the automotive industry

and the auto CEOs is all about new robotics, new car models, new competition, new market, new skills and new labour routines which forms an entirely new organization (workplace/restructuring/reorganization/revolution). To put it simply, this process of labour exploits the advantage of innovation, try novel possibilities of manufacturing new models of cars and at the same time, manufacture older models of cars in new and easier ways (cutting cost and producing more). Although the theory of economic evolution dominated the debate over 76 years ago by Schumpeterians in 1947. The Neo-evolutionary Schumpeterians such as Moreau (2004), Rahmeyer (2013) and Nooteboom (2014) have represented its predecessor's insights. The perspective commands new attention from the modern scholars and societies to the understanding of the role that entrepreneurs or capitalists play in promoting technological adoption and economic growth. Therefore, this theory is cemented into the foundations of modern economics and spontaneous entrepreneurial activities of the 21st and 22nd century. Correspondingly, companies not only use their allocated resources to pursue their standard behaviour, but they also display a flexible capacity to streamline their capitals deliberately and set up innovative ones (Rahmeyer, 2013, p. 59). The evolutionary theory is a theoretical framework for understanding change mechanisms and the one-sided labour processes that are systematically chosen in the automobile working world of creative destruction.

Nevertheless, creative destruction exclusively reflects on the industrial gainers and avoids the losers and encourages ingenuity while failing to address the associated devastation (Komlos, 2016, p. 11). In other words, EET is useful when it is essential to illuminate the positive result of technological change and techno-economic processes in an organisation, but this theory is not invested in the labour-intensive labour processes and the possible negative outcome of technological domination, and this is where Braverman's position comes in.

1.7.3.2 Labour process theory and its revived perspective

Braverman's Labour and Monopoly Capital and The Degradation of Work in the Twentieth Century in 1974 debates over whether this technological development has been favourable to workers and society. Braverman views management's labour process with regards to job automation as degrading and deskilling. The Post-Braverman of Labour Process Theory such as (Milkman, 1997; Braverman, 1998; Spencer, 2000; Thompson, 2010; Previtali and Fagiani, 2015; Smith, 2015; Butollo, Jürgens and Krzywdzinski, 2019) was adopted to channel this study. Braverman's labour process theory focused primarily on the structure and complexities of the working class as it emerged in the monopoly capitalist era. While the job movement is

key to unlocking class structures, like shifting class structure and growing precariousness within the working class, yet there has also been expanding debates with new themes such as labour embodiment, globalization, increased labour flexibility, work contract heterogeneity and spatial labour differentiation (Smith, 2015, p. 222). Similar principles have rejuvenated the LPT debate that Braverman helped launch. The proliferation of forms of control and the continuing globalization of capitalism creates a demand for analytical writing that participates in a coherent fashion micro-and macro-level analysis (Ibid., 237). This theory is an integral part of humanism, the welfare of the workers and also rooted in the public good that has shaped today's debate on the motor industry's labour market and in society in general.

Braverman's LPT addresses the twenty-first and twenty-second century that differs from the late nineteenth and twentieth century in which he wrote. The link between Braverman's view, technological adoption in the auto sector and the future of workers are that it is instilled with a profound and standing socialism and humanism, around which sociologists ought to be proud in organising research. While evolutionary economics theory sees the organisation as existing to improve efficiency, labour process theory sees them as existing to produce profit and surplus gain for the management using automation as the dominant strategy which negatively affects the welfare of the workers in general. To add to these two theories; CSR was employed to understand the reasons corporations consider stakeholders in under some pressure.

1.7.3.3 Corporate social responsibility insight

The position of CSR is that it is always deemed necessary for organisations to describe their functions in society and observe constitutional, ethical, responsible and social values while making profits. Consumers, retailers, workers, communities, governments, media, investors, trade unions, and activists are ever more insisting on corporate accountability. These bodies individually or in groups compel organisations such as the motor industry to engross in ethical CSR to address and strengthen the socio-economic spectrum of South Africa and globally over the basis of equality and fairness and to avoid corporate lawsuits, protests, and strong international criticism directed at companies that do not pay sufficient attention to all human rights, social contract granted by society and to obtain and maintain their 'social licence to operate' (Bauer, 2014).

Relating job automation and future of employees' aspect of CSR is that organisations are expected to assist in tackling concerns such as economic growth, employment, working

conditions, decent wages, earnings inequality and inequality in general, employment rights violation, training, skills (Komlos, 2016, p. 15) and adhere to labour laws. In other words, an organisation's CSR agenda must reflect you win, and I win position for the society and the organisation for sustainable development (Anadon *et al.*, 2016, p. 9688). The assumption is that innovations are transforming the economy, the process of labour, eradicating specific abilities while creating new ones, creating a safe working environment, shrinking monotonous task, empowering workers through training and involving in social good. It is a point to note that these hypotheses are debatable. In that organisations adopt technologies to maximise profits and neglect workers interest and social issues. It is possible to argue that most corporations that adopt CSR, still, evolve technologically, which cuts down the cost of labour, escalate inequality in the society and may result in class conflict. Nevertheless, the successful, responsible collaboration of workers and technology in the labour market is vital for socio-economic growth. The analysis of EET, LPT and the perspective of CSR are suitable and delimited this study and presented foundation on why all the views cannot be separated in the quest for socio-economic development.

1.8 Significance of the Study

The study should play a positive part in the work process and technological revolution literature in some meaningful ways. Firstly, it should awaken the understanding of workers on how crucial it is to possess generic and core indispensable skills in this robotic age with the outcome of this research given the fact that it has been argued that machines can substitute for brains as well as strength. Secondly, it contributes to the existing studies on technological revolution across the world, Sub-Saharan Africa and the South African labour market. The rate of technological domination and the readiness of employees with regards to this change has not been well explored in South Africa. This study informs policymakers, companies, unions, workers and academic circles to validate what job automation means to the workforce in this new industrial age.

Braverman's perspective on the labour process, evolutionary economics, and Corporate Social Responsibility has not been integrated to explain the technological outcome in the workplace. From a socio-economic perspective, the speed of job automation in South Africa is an area of research worth knowing because it is important to the labour market, economy, communities, and policy-makers. Further, the study draws attention to some important social policy

implications that have lingered and still escalating due to the climbing unemployment that the motor industry contributes to. This study also contributes in theory, as the findings in this study correspond with some of the perspectives of EET in the context of workplace evolution and creative destruction but argue that it is an unequal positive evolution which destroys more than it creates. For the LPT, this study confirms that as a result of efficient robotics in the plant, worker's skills are constantly devalued, workers are outcompeted by the technologies and there is higher fear of job insecurity. Additionally, it will be beneficial to identify strategies for all stakeholders involved in contributing to the economy to commit in responsible ways to achieve a better society.

1.9 Limitations of the Investigation

The topic was regarded as very sensitive for the companies. Some of the questions were left unanswered due to its sensitive nature. Even at that, time on the side of the participants limited the initial number of respondents as their work schedules were always tight.

1.10 Assumptions

- The study assumed that workers and union respondents would be truthful and sincere in their responses without any bias and exaggeration of the implications of their responses.
- It was assumed that the population of this study would be representative of other auto-workers and management that did not take part in this study.

1.11 Definition of terms

The various vocabularies used in the study are clarified in this section.

Robots: Struijk (2011, p. 188) defined a robot as a human-made robotic device that instantly performs certain tasks in accordance with a set of decision-making rules. The operation of a robot can be regulated by a human being, introduced earlier by a program, either by a set of general rules that are converted into action by a robot using artificial intelligence techniques.

Technology: Technology relates to information on how to turn energy into outputs. Yet technology is more than just "technology;" it's an omnipresent, complex system whose economic, financial, political, and analytical dimensions influence every facet of life.

Advanced manufacturing technology is characterized as hard drive-controlled or micro-electronics-based equipment used in product design, produce, or handling.

Technology adoption: Technology adoption is a tool enabling management to take an active part in a world of constant advancement with strategic advantages. This reflects the value and importance of understanding the context of ICT adoption activities, which have the potential to become organizational practices, which eventually shape strategy (Deonarain, 2019). Right technology adoption can contribute significantly to managers' day-to-day activities (Acemoglu, Antràs and Helpman, 2007). Environmental knowledge, the need to address the technology, and the skills required to use the technology are the source of management decision-making.

Labour process: According to Karl Marx, the labour approach refers to the way by which labour is materialized or measured in use-values. Labour is an association between the worker and the natural world that deliberately changes the latter's components. Therefore, the components of labour-process are summarized as follows: first, the task itself, a purposeful efficient activity; second, the object(s) upon which the task is conducted; and third, objects that enhance the work process. It points to the production process: human labour-power is converted to raw materials and equipment to manufacture goods (1976).

Job automation: According to International Society of Automation (www.ISA.org) "the creation and application of technology to monitor and control the production and delivery of products and services." Thus, job automation is the activity of substituting technological innovations for human workers, which usually refers to cases where the technology is deployed instead of simply replacing manual work or tasks based on knowledge.

Job insecurity: Job insecurity is between jobs and layoffs, because it applies to workers who are at risk of unemployment (Hartley *et al.*, 1991). Therefore, job insecurity is the probability that an employee will not be performing his/her task; work with a significant level of job insecurity would be that a person with the job will have a high chance to lose it. It is known to be the general fear about the potential continued existence of the career in the near future.

Job loss: This is the loss of jobs due to profound structural economic shifts, as distinguished from extreme changes in production. Such structural changes involve technological

advancement, changes in the flow of global trade, changes in the place of operations, and improvements in the system of work and organization within businesses (OECD, 1990).

Upskilling/reskilling/deskilling: To upskill is to provide training that enhances an employee's existing skillset, allowing them to grow in their current role and bring added value to an organisation. To reskill is essentially to retrain an employee for a new position. This process is commonly used when an employee's post has become redundant and the employer looks to retain the worker by training them in a new discipline. Deskilling:Braverman (1974) described deskilling as a process by which the owners of the means of production may regulate employees to increase profits by growing labour costs. Deskilling is the system by which skilled labour within the corporation or environment is replaced with the implementation of technology powered by semi-skilled or unskilled workers.

Management and autoworkers: Management is a set of guidelines pertaining to the roles of preparing, coordinating, managing, regulating, and applying those guidelines to the efficient and effective use of physical, social, human and intellectual capital to accomplish organizational objectives.Whereas, auto-worker is a person employed in the automobile manufacturing industry.

Trade Union: This is a group of workers in a particular business, sector or organization formed to increase wages, salaries, working conditions or social and political standing by collective bargaining (Morris, 2002).

Shop steward: The shop steward is an individual chosen by the members of the trade union working at the workplace (Webster, 2001). This is the regular employee selected by his / her workmates to serve them in their management interactions. Shop stewards are part of leaders of the labour unions (Buhlungu, 2006). Unlike other union representatives, shop stewards work on the shop floor, binding workers to union officials. Their job is to be the first contact when an employee is faced with work-related problems or conflicts.

Automobile, automotive, motor, car, auto sector/industry: This is a business of producing and selling cars. The automotive industry includes a broad range of companies and organizations involved in the design, production, production, promotion and selling of motor vehicles. The industry or sector is a common term used to describe a community of institutions

engaged in similar forms of economic activity. A sector can be a subgroup of economic activity-as in the automotive sector which is the same as the automobile, auto or motor sector.

1.12 Conclusion

This study aimed to investigate the rate of adoption of technologies and task automation and the future of autoworkers in the South African motor industry. Studying this burning topic was important in the sense to understand in general socio-economic relation of job automation. With some steps further, the study draws attention to some important social policy implications that have continued owing to the soaring unemployment in part attributed to job automation that the motor industry participated to due to the rate of implementation of advanced manufacturing technologies in the car plants. This study employed a qualitative research approach. In addition, a heterogeneous theoretical framework was adopted in this study which includes evolution economics theory, labour process theory and corporate social responsibility.

The core argument of the thesis is that automobile industry in South Africa has boosted their productivity and export which points them closer to the core of the global car market and the government of South Africa share from this positive economic move. This progress has been made possible as a result of employing the best robotics on the plant floor. Nevertheless, this study put forward that autoworkers in this sector are receiving the negative effect of this progress in terms of job insecurity, job loss and skill devaluation as technologies take on the jobs previously allocated to the workers. It argues further that instead of trampling on worker's welfare while making business progress, the best workplace evolution will be a corporate responsible one that considers all the welfares of the entire stakeholders in the automobile industry in the country.

The chapter gave a synopsis of the methodological and theoretical delimitations that bounded the study. The study's rationale, limitations to the study, assumptions, terminologies used in the study and study format were also explained. Moving forward, the next chapter concentrates on the review of literature in the area of autoworker-robot collaborative experiences.

Chaper 2

EXPERIENCES OF WORKERS WITH TECHNOLOGY IN THE AUTOMOBILE INDUSTRY

2.1 INTRODUCTION

The use of technologies in the automobile industry improves the conditions of work, however, some of the task performed by human might be rendered redundant, thus, leading to workers competing with the technologies to stay relevant in the company and in some cases, losing their jobs as robots outcompetes the human workers in terms of speed, efficiency, productivity, consistency and reliability. This key argument of this chapter correlates with the central thesis of this study in Chapter one, which asserts that though automation would intensify productivity in the automobile sector, on the other hand, it will expose the autoworkers to job insecurity and joblessness. Both the core argument of this study and the assertion of this chapter connect to the evolutionary economics theory that the process of labour in the motor industry takes the advantage of innovation to manufacture new and old models of automobiles to display a flexible measure to reorganize their resources intentionally (Rahmeyer, 2013, p. 59), and to increase productivity and economic growth (Schumpeter, 1947; Freeman, 1982) but might lead to the destruction of some tasks. Consequently, technological adoption degrades labour and de-skills workers according to Bravermans' labour process theory.

This chapter focuses on exploring the dynamic experiences between today's technology and the human workers in the automobile industry. The chapter also investigates the different ways the human workforce competes with technology in the workplace. By investigating these themes, an understanding of how human workers and manufacturing technology as a total system are integrated into different situations was ascertained. Including human worker and robot, worker interfaces about their collaboration, the level of training involved to utilise the machine successfully; the benefits and its social, physical and emotional strain faced on the process of this teamwork. In the quest to expand productivity and encourage workers to carry out their work best, most manufacturing industries inspire to cleverly incorporate innovative automation into the labour-intensive practices. The support of robots is very useful in many situations in the car manufacturing industry, and different functional capacities are evolving where automatons will be needed to support humans.

Although the lack of effective implementation process and management neglect on production workers experience with these technologies can influence the operators very negatively. Findings by Calitz, Poisat and Cullen (2017, p. 1) highlights that South African industries have been aware of the international production developments, regarding the implementation of robot-human worker collaboration and the potential outcome of this collaboration on the African workforce. However, impacts such as fear of retrenchment, trust between robot-human worker collaboration and the African culture have been stressed. This collaboration has necessitated the human workers to put more effort to remain relevant in the labour market by continually competing with the smart robot-co-workers.

2.2 The Core Argument of this Chapter

Having robots that perform some work in the assembly line increases precision, productivity and safety in the automobile industry and as the auto industry expands, the technology-human interface becomes the best attributes of successful implementation in the sector. The quality of skills, new skill discoveries and competition of skill acquisition will also grow in order to compete with the capabilities of these novel technologies. Nonetheless, workers' job security and employment are at stake, they experience a lack of job satisfaction as workers are constantly in competition with smarter technologies.

2.3 Brief Origin of Industrial Robots in the Automobile Industry

Industrial robots were first deployed in the General Motors company in the year 1961. Soon after that, the Ford company adopted these technologies, which mostly carried out spot welding. Later in 1969, a technology that was capable of performing added tasks were developed called 'Stanford Arm'. Another type of robot 'Silver Arm' was adopted in 1974, which was multipurpose. More of these sophisticated technologies were deployed in the automotive industry in the 1990s to automate many processes, such as assembly, welding, painting, moving large parts and die casting. Looking at the history of industrial robots in auto-industry, according to Vulavala and Ulmer (2014, p. 22-24): "It was initially hard for car companies to make the robot work or perform like humans. Shortly, engineers developed controllers like the human hand, and the robots were able to complete different tasks, some of the robots were developed to pick and spot castings over and again but lacked intelligence as it proceeded with its work even if it had no casts.

As of then, the robots had strong specialisation and performed a set of several operations but could not fulfil the choice of the customer. In this manner, in developing modern industrial robots, a significant role in the deficiencies of such machines was considered and removed. The developed industrial robots had obtained qualitatively new attributes. The first generation of robots could not independently work without human interference. The second era robots were versatile whose unique feature was the ability to change their movements relying upon the working environment. The 3rd generation (intelligent robotics) of industrial robots had the ability to modify the working conditions due to the additional machine learning embedded in it. When industrial robots began to discover more extensive application in assembling and manufacturing, it got to be clear that the robot is capable not just to facilitate the action of humans in the industry but additionally to perform the operations outside of the scope of human abilities.

2.4 Reasons Behind Technological Adoption

Karabegović (2016, p. 92) averred that the automotive industry is the world's leading installer of robotics, provided that international competition in the job market requires continuous development and transformation of manufacturing processes in the motor industry, and every manufacturing process could not be conceived without robotics today. The automobile production globally was estimated at 90 million units as of 2014, and this number is presumed to expand in the future. Senior managers interviewed by Calitz, Poisat and Cullen (2017, p. 8) revealed that it is highly crucial to identify what the consumers are searching for and take this knowledge and advantage to outcompete counterparts. The numerous productive contributions of technologies to any manufacturing organisation are what forces its adoption (Rasiah, 2011; Barnes, Black & Monaco, 2018).

This contribution can be seen in its steady accessibility, predictableness, consistency, exactitude and unreceptiveness to the unreceptive environment. Although, these machines, for now, do not have many abilities that are vital which come intuitively to human workers. For instance, the capacity to respond to unanticipated work environments or situations and the capability to improve performance based on past knowledge. The recent technologies are conveniently adopted in highly organised automobile environments where essentially all of the decision making and inconsistency can be planned out of the workstation (NAAMSA, 2019), that is supposed to lead to informed decisions (Deonarain, 2019, p.7).

Robots enhance the productivity of these costly production lines by ensuring that production activities move with minimal machine idle moment at a steady speed. The main aim is to increase productivity and improve service delivery in the most cost-efficient and sustainable manner (Vidal, 2004; Deonarain, 2019; Monaco, Bell and Nyamwena, 2019)**.** A robot is a pure component of any factory floor; however, it is incredibly versatile and efficient. Technology can perform a special purpose, but it comes with a high additional expense: the mixture of various tubes, pipes, monitors, motors and controls is not even near to a robot's reliability, with 99.99 per cent uptime, thus, with technologies, higher quality can be achieved (Fredriksson *et al.*, 2001; Jones, 1987; Karabegović, 2016). Thus, in terms of productivity, technologies are detailed and produce high valued products. due to more controllable, predictable and repeatable process consistencies; articulated robots provide a greater yield (Struijk, 2011, p. 191). With constant speed and repeatability, these machines are capable of manufacturing countless quantity within a short timeframe than human workers and scraps will be significantly reduced (Vulavala & Ulmer, 2014, p. 29).

With regards to safety, machines can carry out the dangerous task in some hazardous conditions, lift heavy loads without wound and prevent accidents for human workers (Haddadin, Albu-Schäffer & Hirzinger, 2008; Calitz, Poisat & Cullen, 2017; Monaco, Bell & Nyamwena, 2019). In the aspect of savings, technologies lessen the total wasted material, make an unlimited number of products, save money for the firm in the long run and considering the low cost of these machines (Brynjolfsson & McAfee, 2014; Naudé, 2017; Deonarain, 2019; NEDLAC, 2019). New forms of these technologies adopted each year are far more advanced than their prototypes (Arntz, Gregory & Zierahn, 2016a, p. 25). Modern industrial technologies offer multiple advantages, and their capability is only increasing with time (Singh & Sellappan, 2013, p. 767), at extraordinary speed, driven by technologies developing at an exponential rate (Deloitte, 2018, p. 2) and the automotive industry in South Africa "cannot stand still" (Department of Trade and Industry[DTI], 2018, p. 5). Factors that propel technology adoption include technology-push mechanisms and market-pull mechanisms (consumer behaviour playing a pivotal role in technology adoption and automotive manufacturers developing new vehicle technologies and governments incentivising technology adoption and adaptation) (Deonarain, 2019, p. 6-7).

Considering the time taken to paint a vehicle by a human being, the use of automated robots is economical and extremely effective. The quantity of paint dispersed is spread equally on the

vehicle with robots fitted with a flowmeter, which reduces waste material (Vulavala & Ulmer, 2014, p. 29). Over the years, millions of dollars have been saved by the usage of robotics in the car manufacturing industry. These companies have increased their production lines in twofold by setting up different robots in place of humans in the factory. The motivation is that since robots do not go on sick leaves or vacations, using robots in this sense saves money for the adopter. Organisations also save more money as technology do not need insurance or health benefits. The robot can perform jobs without a break and perform the same task continuously without breaks (Ibid., 30).

The aim behind why robots are conquering automakers worldwide alongside painting, assembly, welding and sealing departments is that robots perform tasks at faster and less expensive than manual applications making them more appealing, and potentially much better option for the industry. Presently automated robots can likewise be equipped with vision technology, permitting robots to see, the decision of manual or robotic assembly is certain. The robots nowadays can also investigate their work along with assembling a car, eliminating labourer interference (Vulavala & Ulmer, 2014, p. 26). Some time ago the sales of technologies were decreasing but recently increased because the automobile companies are reinvesting in newer technologies, advanced facilities and refurbishing the production sites and this investment will continue (Struijk, 2011, p. 194). One of the reasons behind these technological adoptions in the car industry is to establish human-machine collaboration in order to boost productivity.

2.5 Human-Robot Interface

The manufacturing industries for decades has assimilated robotic technology into the workforce to convalesce proficiency, lessen the workload for workers and their stress in the workplace. In South Africa, a study conducted by Calitz, Poisat and Cullen (2017, p. 7) found that some workers indicated that the robot-human collaboration for South African and African businesses is a feasible choice. They implied that South Africa is a developing nation, and any innovation progressions must be favourable to drive financial development, improve work accuracy, enable labourers to work more astute and upgrade human work execution. Furthermore, they expressed that the human-robot teamwork, by and large, does not supplant human skills. However, this collaboration helps workers in ordinary and routine activities. Although some of the workers in their study noted that the technology adoption is not a

practical decision for the South African and African organizations in light of the fact that the expense of the innovation being seen as high; work expenses are moderately reasonable in comparison with other nations; a largely technically low skilled labour, half-informed and heavily unionized labour force.

The South African car industry is by far the most evolved in the deployment of robotic machinery, which has enabled a major intensification of production in multi-product processes (Barchiesi, 1998, p. 64). This makes it more likely that workers are capable of performing at the same time a set of basic tasks on multiple lines, without this implying a real improvement in the skills and control of their work. For Deonarain (2019, p. 26) collaboration between human and machines is vital to ensure that the benefits of digitisation and to increase skills development and capacity building. To be able to exploit the humans' adaptability and the capability of the accuracy of robots deeply, Unhelkar, Siu and Shah (2014, p. 88) indicates that one methodology is to apply autonomy to improve the efficiency of individuals in performing esteem work and search for circumstances where robots can generally effectively perform non-esteem work. The robotic assistant can offer an important boost in the productivity of human workers while maintaining operational adaptability. This makes the assembly line the rightful work setting to apply the assistance of robots given the fact that it is characterised by multipart and unpredictable market demands. This application and support would improve consistent quality during the process and lessen the nervous tension in human workers triggered by ergonomics (Gleeson *et al.*, 2013, p. 350). The facilitation of combining humans and robots to be involved in the execution of work in the factories is essential for the successful realisation of mix assembly structures (Consiglio, Seliger & Weinert, 2007, p. 40).

For Struijk (2011, p. 190-191) up to 1000 articulated robotics can be used in modern car factories, with only 5000 workers, a percentage of 1 to 5! In the car factories, spot welding, arc welding and handling of the car body and parts are the main techniques for these types of robots. Earlier, increasingly sophisticated applications such as underbody sealing and laser welding have been developed using articulated robots and, more often than not, vision systems. Corporations with < 500 workers now have the highest percentage of adoption of robots. Therefore, firms have become more competitive (Black & Hasson, 2012, p. 6)**,** but South Africa is falling behind leaders in technology (World Bank, 2017, p. vii). based on this, South Africa's Department of Trade and Industry has recognised the importance of human-robot interface in the auto industry and calls for more incorporation and adaptation to technological

change as the global market requires constant innovation and creativity to flow with the trend of the 4IR (DTI, 2018, p. 5). One of the reasons behind this is for the workers and the robots to effectively execute different tasks assigned to each of them for faster productivity.

2.6 Human-Robots Division of Labour

Newer technologies appear to spring a new division of labour in which employees carry out duties that aide technologies of additional complex and different tasks (Autor, 2013; Acemoglu & Restrepo, 2017). To appropriately locate, select, procure, conveying parts to the work area and correctly remember combinations of parts is challenging for human workers. The parts acquisition and its conveyance involve some amount of employee time and are possibly a trigger of ergonomic strain. As a matter of fact, part acquisition is one of the main aims of automatons' intervention (Gleeson *et al.*, 2013, p. 350) . Though, the operation of these tasks often requires qualities that only human worker can offer, for now, qualities such as high degree of physical handiness, detailed visual and concrete observation, and with the capability to reach into spaces that are tightly confined. In this case, the handling of parts is best completed by human workers. Gleeson *et al.* further explicated that in terms of the operation of parts, robots execute the task of tightening bolts properly, guaranteeing firm rotation and preventing physical stress on the human worker. Whereas human worker ability is best suitable for task such as connecting electrical manoeuvres (2013). In welding and painting, robots can complete such tasks in isolation and without the guidance from human workers. Cars are usually sealed by robots; still, some car parts need manual sealing to establish quality around doors and inside the automobiles (Fredriksson *et al.*, 2001, p. 33).

In the task performed in the assembly line, machines in orderly form provide right parts to a human worker to heighten the performance of the worker, while the human worker executes all the assemblage (Gleeson *et al.*, 2013, p. 351). Also, the actual welding assembly consists mainly of handling and fastening the components, and the actual welding is just one of many tasks. The ability and adaptability required by the treatment of various parts are, to a great extent more noteworthy than for the welding procedure. Therefore, a cooperative welding cell in which human and robot interaction is the most suitable solution. The person will be responsible for managing the welded components and will direct the robot employee to fulfil the welding job (Antonelli, Astanin, Galetto & Mastrogiacomo, 2013). These technologies have altered the division of responsibilities in industries (Saborowski & Kollak, 2015, p. 133).

Despite that, the human-robot teamwork in the automobile assembly can be very successful sometimes; inadequate or appropriate training of workers to effectively utilise and collaborate with these advanced robots can lower or increase productivity meaningfully.

2.7 Enhancing Abilities to Use New Adopted Technology

To be able to adapt and incorporate new techniques within the firm effectively, organisations have to acquire new abilities to enhance the level of skills in their workers since the features of newly adopted technology might be distinct from previous ones (Boothby, Dufour & Tang, 2010, p. 651). The intentional combination of new techniques and training results in increased productivity compared to the implementation of new techniques alone. Thus, employees who are unable to work with robotic teammates may not realise how best to use these innovations (Gombolay *et al.*, 2015, p. 312). The argument is that providing essential training to workers in the result of implementing new equipment leads to high productivity performance. Thus, it is anticipated that adopters of technologies with associated training will have increased productivity efficiency than others (Ibid., 652).

Both high and medium-tech industries are providing a variety of education to its workers than less technological dominated industries (Boothby *et al*., 2010, p. 652). These industries that offer strategic training influenced by the technology are seeking after the correct business systems to utilise the embraced innovations to best impact, at any rate, regarding efficiency execution. Such preparation expands the utilisation of innovations that empower specialists to perform more prominent duties, but not those that routinize job duties (Riddell & Song, 2012, p. 3). For instance, scratches, dents, and other flaws are fixed on the manufacturing line by trained body personnel. Moreover, the task of sealing cars requires a high level of craftsmanship, which entails the operator to be trained for six months to be completely skilled. But this lengthy learning period seems like a hindrance for management to engage with new workers because managements prefer to quickly engage the new workers (Fredriksson *et al.*, 2001,p. 33), and use the money for training to invest on materials (StatSA, 2018). Nonetheless, management is confident that the workers can be trained towards the needed skills (Deloitte, 2018, p. 6).

With the pace of changes in technology and its adoption, worker's training on the use of industrial technologies has to be continually upgraded and be up-to-date regardless of the time

and resources. This is particularly true since employers adopting new technology is one progress and employees comprehending the full potential of that technology by having a better understanding of its functions and effective ways to use it is another progress. Training brings an advantage to the economy, and it prepares the workforce, especially those utilising advanced technologies for greater global effectiveness and competitiveness in South Africa (World Bank, 2017). Indeed, workers having the knack to learn fast in this technological age is valuable than years of experience. Consequently, systematic, holistic, unrestricted education and unremitting training are what is required in industries such as automobile sector to avoid injuries considering that car industry needs exceptional repeatability at high precision and high speeds because of the complexities included.

2.8 Reduction of Repetitive Tasks for Human Workers

Technologies guarantee higher repeatability than manual execution (Antonelli *et al.*, 2013, p. 145). It is proven that the combination of workers and robots is favourable to manage the growing challenge of meeting the shifting demands of the quantity as well as diverse products to be manufactured. Such challenges and procedures must be met with high precision and repeatability, which is hard to achieve at a consistent level for human workers. The reality is that workers tend to spend more than 50% of their working day repeating the same movements which increase the musculoskeletal disorders on different parts of worker's body (Fredriksson *et al.*, 2001, p. 38-40).

For this reason, according to Landau *et al.* (2008, p. 561), some tasks are allotted to a particular group of workers contingent to the quantity of work involved and age appear to impact on the type of task to be allocated to the selected workers in the assembly line. Even at that, aged employees despite low job demand from them, indicate signs of the lumbar spine. This condition is as a result of accumulated effects of repetitive tasks (Ibid), and they become less keen to situational changes as they age (Jeon & Jeong, 2016, p. 458). The point is that those mature workers who have grown with the company tend to struggle with adjusting to new techniques of job execution. In general, it is crucial to steer clear from assigning strenuous tasks to older workers (Landau *et al.*, 2008, p. 561). Placing older employees on early retirement schemes and recruiting younger workers on the one hand and identifying dangers in the assembly line and modification of the work model, regardless the age of the workers, on the other hand, are the solutions to this problem (Ibid).

To perform complex operations in the manufacturing process makes robots evident choice for the automotive industry (Vulavala & Ulmer, 2014, p. 30). Automated industrial robots have the ability to increase the quality of tasks and products radically. Robots can continuously achieve quality products than a human with little inspection. Industrial robots are commonly implemented in manufacturing industries because of their capabilities (Unhelkar *et al.*, 2014, p. 88). Complex and repetitive jobs could be performed by machines to avoid muscular pressure on human workers and maintain other human work-related safety issues.

2.9 Technological Adoption and Human Job Safety

As the usages of automation increase as they continuously get sophisticated, one of the core inspirations is a social issue such as to increase safety and better working environments for workers. Vulavala and Ulmer (2014, p. 30) asserted that due to the high efficiency of robots, human errors and self-afflicted harms and accidents could be eliminated. Furthermore, it upturns the safety of workers by allowing the robot to complete the precarious tasks, specifically the welding because welding poses many security harms to workers (Antonelli *et al.*, 2013). Decisions to adopt industrial technologies is to protect workers from the execution of unsafe duties because these machines can carry out the task in environments that are dangerous such as poor lighting, poisonous substances, or tight areas. Also, robots are efficient in lifting heavy loads without injury or tiring; thereby, it prevents accidents for human workers involved in the hazardous task and creating a safe working environment (Singh & Sellappan, 2013, p. 766).

Robots, unlike humans, do not hold back while accomplishing unsafe jobs associated with welding, fitting and painting. Robots can move hefty items or issues of fatigue without limitations. For instance, painting a car is very complex and is also hazardous due to the toxins present. This restriction of workers from operating risky jobs is one of the main advantages of robotic adoption in the auto industry. Moreover, these technologies can work with heat and contaminated composites. Showing that there is various work with great dangers to humans in the labour market, which makes it logical to adopt robots in the auto manufacturing industry. Again, crash-test tasks using robots are among the jobs which under no circumstances be completed by humans. By doing such tasks, machines have made the work environment safer (Vulavala & Ulmer, 2014, p. 30).

In a hazardous environment such as assembly line that could be too fast for human workers to perform tasks that are monotonous and unsafe; robots are adapted to perform such tasks and thereby decreasing risk on a production and assembly line by performing on parts or environments too unsafe for humans. In manufacturing, robots complement human capabilities in the process of teamwork and aid strenuous tasks and work next to humans safely without injuring them (Weistroffer *et al.*, 2014). No doubt machines are utilized as a part of the car industry to help labourers in manufacturing lines, and work with the hazardous radioactive and chemical substances in painting stations, giving accident-free and sound workspaces for humans. Although, extreme close vicinity between robots and humans could lead to other safety concerns for the employees (Vulavala & Ulmer, 2014, p. 24).

For instance, brain injury, chest impacts, facial bone fractures can occur if robots and workers collide with speeds (Haddadin *et al.*, 2008). For a safe human-robot interface to be guaranteed in the assembly floor; constant and clever monitoring activity that will offer the arrangement with necessary information regarding workers and machine localization, as well as hazardous areas, must be well considered (Moniz, 2013). Remote robots fitted with tires are far less harmful due to the limited impact they can inflict on the infected human being. For a fact, sometimes they can be pushed away completely Mobile robots may, however, create new dangers when they move towards people, increase the total pace and transparent inertia. There is a need to create guidelines to avoid technical accidents while using service robots and managing their workshop with people (Echávarri *et al.*, 2013). The design of the latest manufacturing robots complies with such requirements (Weistroffer *et al.*, 2014). Nevertheless, it is apparent that it is compulsory to reflect on the qualitative variables in the description and design of computerised systems (Moniz, 2013). With the aim of overcoming conceivable workplace impediments, there has been continual advancement of technologies to impact on the safety of workers.

Specialised robots have proven effective in unsafe environments. The early robots did a lot to relieve people from risky, extreme and hard occupations in the production line. The labourers' working life was tremendously improved, and the working conditions around the processing plant improved as well (Fryman & Matthias, 2012). System failures may, however, result in injury, loss of containment of toxic, flammable materials resulting in significant harm to the work environment. Serious accidents in the plant are within the stand-alone automated machinery scenario, followed by flexible production systems.

These accidents are mostly experienced by automated equipment operators, maintenance or repair staffs. This occurs when operators are attempting to rectify blockages in the machines, discovering faults and adjusting the portion or machine which happens while the manufacturing robots are in the automatic operating mode. This is particularly true because workers in one assembly plant felt unsafe with their experience with robot assistant due to the sudden functional changes in the robots while in the operating mode (Unhelkar *et al.*, 2014, p. 89). Thus, working with autonomous agents is increasing the safety challenges and leading to a shift in the structure of the relation of workers with their work atmospheres (Moniz, 2013).

Trust and safety in the introduction of collaborative robots at the operative level are important according to (Calitz, Poisat & Cullen, 2017, p. 8). The task may be executed improperly if the operator has doubts about the design and function of the machine (Mokyr, Vickers & Ziebarth, 2015). For this trust to be established, the technology must function to standard specification and perform 100% as expected (Joe *et al.*, 2015), this trust will increase in the event that the operator feels the robot relies upon his information, as opposed to him on the robot, the worker will feel very valuable and in charge. It was suggested that a design with more efficient safety mechanisms that would not interfere with the job of the human operator would be preferable, and it is possible that this will reduce some stress that the workers go through which impact on how efficient they are with their different tasks.

2.10 Overcoming Human Inconsistency in the Automobile Industry

Understanding issues of stress that comes with working in automated environments and different steps to control the stress and human limitations for optimal collaboration is very important. The primary sources of stress and human limitations are lack of job control, no management support, redundancy and job insecurity. Despite that Mital and Pennathur (2004, p. 304) revealed that increasing workers control in the execution of the job and improving training will be the solution to these problems in technological environments. At the same time, Vidal (2007, p. 265) emphasised that employee engagement in some significant challenging activities, work reorganisation and additional new assignments in the workplace results to stress, tension, frustration, strain, dissatisfaction and psychological distress.

However, in an inconsistent setting, human errors are the consequence of human variability. This variability may be due to external phenomena such as interferences, excessive job

requirements, users inability, psycho-social variables, task and organisational features, human-machine malfunctions or poor system adaptation (Mital & Pennathur, 2004). Automated instruments do not experience anxiety, time pressure and are not influenced by these factors that greatly impinge on human performance in the same way humans do. Because humans have beliefs, motivations, emotions, sense of responsibility and need to be socially accepted; these factors affect their performance, according to Joe *et al.* (2015, p. 1232).

The use of error monitoring can be one of the ways to decrease human errors. It maintains control of the operator but offers extra assistance to help the operator detect its own mistakes (Mital & Pennathur, 2004, p. 307). Also, the interface between the two must be effective for the human operator to communicate most efficiently with the machinery. An effective interface reduces or lessens human mistakes, prevents uncertainty and expensive inefficiency (Ibid., 309). No doubt that social factors can affect human team efficiency and human-robot cooperation. Thus, to optimise team efficiency, people's individual behavioural, computational capacities, and social variables affecting teamwork need to be considered thoroughly (Joe *et al.*, 2015, p. 1232).

2.11 Technologies Associated with High and Low Job Satisfaction

Shifting the idea from human inconsistency to job satisfaction, Cummings, Gao & Thornburg (2016), indicated that the existence of automation in the workplace would only increase, bringing with it a multitude of issues related to boredom. Boredom has been linked to task performance, and with the ongoing task automation, work-related boredom will grow into more pressing matters for workers motivation (Cummings, Gao & Thornburg, 2016). This growing work automation, however, is yet to tackle boredom related to some industrial tasks. For Calitz, Poisat and Cullen (2017, p. 7), the main problem for South African and African organizations that adopt sophisticated technologies at the lower level in the labour market are concerns of idleness, redundancy, and joblessness. Furthermore, these scholars noted that it was indicated by their respondents that the effect of technology on employee's motivation could be a huge challenge.

Effective communication, for instance, was recognised as a significant factor in how well people and automation work together (Joe *et al.*, 2015, p. 1229). Communication between humans and machines does not flow naturally as it does between individuals, as the human-

computer interface is comparatively slow and often disruptive. These scholars further stated that when the amount of automation is high, communication and other interactions between human and automated agents may be very restricted. Evidence mounts that whatever the level of industrialisation and whatever their past exposure to the industry, workers' responses to the work situation are strongly conditioned by technology (Form, 1973, p. 737).

With a worldwide push for greater automation and autonomy in many safety-critical job settings; boredom in the workplace is likely to be an increasing issue (Cummings, Gao & Thornburg, 2016, p. 279). These scholars revealed that monotonous and cyclical tasks in job settings such as assembly line tasks are perceived as boring. The reason is that assembly workers are confined to a restricted station with robots, their work requiring only superficial attention and almost no communication. Although communication tends to be frequent but brief and shallow because of noise. Workers hardly interact with one another while working except outside of scheduled breaks (Lewchuk & Robertson, 1997). This means that workers can only converse with each other during their break time.

The frequency of communication depends on the type of automobile company. The difference between each company from the other can be surprising. While workers from one company may likely have the freedom to communicate, the other workers from other auto company may likely have the least freedom to do so. Thus, workers from a specific car plant are prone to be guarded by workload and might have the slightest flexibility in interacting with their colleagues and the capacity to make judgments which might advance the quality of worker's working life (Lewchuk & Robertson, 1997, p. 56-57) Such a lack of flexibility and communication makes it difficult for workers to influence decision making in their work environment. These workers find it difficult to leave a workstation to deal with private issues such as going to the toilet or attending to family issues. Despite that this may differ depending on the company, all auto workers find it relatively hard to take time off from their workstation or find a relief worker (Ibid).

It was revealed by Form (1973, p. 10) that the quantity of interaction in the car factory has little impact on the skilled person's job satisfaction, but it has some impact on the less skilled person’s job satisfaction. The low skilled workers tend to enjoy their job more when they have a high chance to communicate with their co-workers. Form further contended that machine administrators, who work in a boisterous and uncrowded quarter because their machines

occupy so much room, increase their job satisfaction when friendship made at work continue into the outside network. Workers who work in swarmed; however, calm quarters can interact effectively, and this condition boosts their work fulfilment (Form, 1973). However, workers who test motors and make minor repairs have more opportunity to move about and have some conversations (Ibid., 737). Form found that three-quarter or more in the four-car plants he studied were satisfied with their daily contacts and the same proportion were satisfied with their physical working conditions, half or more had at least two good friends in their workgroup, and an even larger percentage had at least one friend.

The quantity and quality of worker's interaction are conditioned by the complexity of the plant's technology and the degree of technological constraint imposed by work operations (Form, 1973, p. 737). In general, the more workers controlled their technology and the greater the density of their workplaces, the greater their chance for social interaction, and the more they took advantage of that chance. Differences in interaction rates among workers who performed different operations were the largest in plants with the most complex and highly developed technologies. Form (1973) specified that the higher the skills of the employees and the more they control the work, the more fulfilled they were with their occupations. Thus, the desire of an employee to work in a group would be most noteworthy when that individual had some authority over his or her job in the group (Gombolay *et al.*, 2015, p. 295).

Consequently, work fulfilment is more profoundly connected with work activities than skill level. Gombolay *et al.* (2015, p. 295) affirmed that a significant number of workers would establish that the higher the authority over activities and the more mind-boggling the innovation, the higher the job fulfilment. For this reason, an employee may feel that his or her skill is being undervalued when controlled by an automated system. In spite that the automated system efficiently increases activity, removing control from human specialists may alienate them and harm profitability.

Even though that auto workers would prefer control over operations which contributes to job satisfaction, Form stressed that most workers work because their work assimilates their lives and would instead continue working in the car company for the reason that their jobs fulfil them. Another motive is that assembly line workers would prefer the monotonous nature of the job as long as they get paid (Form, 1973, p. 9). Thus, car assembly employees do not intend to flee from their jobs more than other employees from any other industry. Most of the workers

working in the auto company would prefer to maintain their job status for the reason that being employed provides an organizational bond to their lives (Ibid). Indeed, for certain employees, job satisfaction is more attached to a personalized concept of' good day's work for a reasonable day's salary' than to any chance of increasing one's position in problem-solving and decision-making (Vidal, 2007, p. 261).

In terms of leadership, Gombolay *et al.* (2015) averred that human co-leader was a better team player than his virtual counterpart. The automated leader is unlikely to efficiently transmit soft leadership abilities that would enhance human values and trust of the human subordinate because there are situations in which team leadership may influence the effective fulfilment of a human assignment (Joe *et al.*, 2015, p. 1230). Notwithstanding that human worker noted that their human counterparts' value and understood them and that they value human workmate than a robotic one, but more robot authority over task allotment is more valued than human teammate's authority (Gombolay *et al.*, 2015). These scholars concluded that robot teammates with the capacity to allocate and plan assignments autonomously could enhance both the completion time of the assignment and the willingness of human employees to work with their robotic teammates.

As a result, providing employees with a position in assigning duties to their robotic counterparts may not be an efficient way to improve the satisfaction of employees. Team fluidity can have a more significant impact on employee satisfaction than the level of decision-making power of the individual (Ibid., 311). It is possible that some automobile workers would report that their work has little motivation while the remaining group would describe their job as challenging (Fredriksson *et al.*, 2001; Vidal, 2007). In the same manner, individual work instructions play an important role around mediating the impact of concrete career design features, such as participatory work structures on job satisfaction (Vidal, 2007). This means that workers have individual differences or interpretations based on job motivation, satisfaction and or stimulation.

Job satisfaction also depends on the negative or positive attitude to current technology and the introduction of new types of workplace technology. Age certainly has been found to moderate the connection involving the attitude about the adoption of technology and the consequences it may bring (Elias, Smith & Barney, 2012). Younger employees are better equipped to adapt to new technologies as a result of their exposure to different types of technologies. The older

employees tend to exhibit the least motivation levels and job satisfaction on the whole when their mindset on technology is low (Elias *et al*., 2012). The indication here is that age is an important factor to take into account when discussing the implementation of technology in the organisation. These scholars, in addition, noted that a greater lack of familiarity with technology leads to greater anxiety. Perhaps management can address both anxieties and negative attitudes towards technology through technical training as well as the development of a supportive work setting thereby taking into account the moderating overall impact of employees' maturity level. Bearing in mind that attitude towards technology is important, the employers have a duty to make every effort to guarantee that workers have an encouraging attitude towards technology in the place of work (Ibid). The suggestion according to Vidal (2007, p. 265) is that workers can change, modify their expectations, values and evaluations in such a way that they are reasonably happy when working at the factory.

The collaborative experience between human workers and robot-co-workers draws attention to the collective efforts of technology and workers in the automobile sector. The following section discussed how human workers compete with technologies in the workplace.

2.12 Workers Competing with the Rapid Technological Domination in the Workplace

A study by Saborowski and Kollak (2015) found that robots were viewed by experts to compete with significant aspects of the job. Respondents in a study by Calitz *et al*. (2017, p. 9) specified that with enhanced competitiveness, "the individual will want to compete with the robot or behave totally wrong, leading in types of sabotage" and therefore, the individual may find it hard to meet the speed with the robot. Naudé, Szirmai, and Haraguchi (2015, p. 259) echoed the constant decline in employment rate in the manufacturing companies in South Africa.

The exceptionally high rate of unemployment in South Africa is evidence of a shortage–demand for jobs exceeding supply, indicating the structural failure to provide employment opportunities for rapidly increasing working population (NEDLAC, 2019, p. 29). Partly, this is structural unemployment that exists once there is a substantial gap among the schooling, abilities, knowledge, and many more; which are needed for a job and the accessibility of adequately skilled employees to fill those positions (Ibid., 32). Active labour market policies, including skill upgrade and educational opportunities, are needed to guarantee that other employment possibilities compensate for work losses resulting from technological

advancement and the globalisation of supply chains (International Labour Office, 2016). Nevertheless, the Fourth Industrial Revolution is the worse time to be in competition with technologies (Brynjolfsson & Mcafee, 2012).

2.13 Skilling Up for the Automation Age

To favourably compete with technology means constant skill upgrade in South Africa, as, without it, more attention will be given to labour-saving machines in the world of work (NEDLAC, 2019, p. 39). 73% of executives in South Africa see the society where automated systems would replace human employment rather than raise them (Deloitte, 2018). Thus, both the worker leaders (NUMSA) and the car companies' leadership should accept that the workers must be re-skilled in order to save their employment (NAAMSA, 2019). That means that the implementation of fresh techniques may involve additional abilities in the labour market (Acemoglu, 1998). Workers had shifted to higher earnings through skilling up during earlier stages of technological development, thus moving ahead of the machine (Haldane *et al.*, 2015, p. 13). When different employees have distinct abilities, both automation and the development of new assignments can lead to higher inequality in that machines compete more effectively against less qualified labour, and the more qualified employees have a higher sustainable benefit than the less skilled in new, intricate assignments (Acemoğlu and Restrepo, 2016). Those with a high level of competence can be transferred somewhere, whereas mid-qualified assembly line workers could be at higher risk except if re-qualified (Deonarain, 2019, p. 14).

Technological innovation is changing production capabilities and could potentially have devastating impacts on sectors such as the automotive industry in South Africa (Deonarain, 2019). This raises the odds of substantial-scale of unemployment or underemployment if the skill-up choice is no longer accessible. When skilling-up declines, workers may be hollowed-out (Haldane *et al.*, 2015b). The set of abilities that were formerly attractive to employers as well as regarded as advanced skills are being seen as common abilities as the industry changes. In specific, the pressures and tasks put on workers engaging with robotics are mostly cognitive improvements, more difficult tasks and innovative activities (Calitz, Poisat and Cullen, 2017, p. 9).

As robots overtook people in the performance of basic activities, people stayed one step ahead of the system by constantly training to satisfy the new requirements of new sectors for new

product development (Haldane *et al.*, 2015, p. 8). It is also possible that many industrial workers learned the technical skills on the job (Acemoglu, 1998). The skills that South African managers require from their workforce are indeed going to evolve even quicker than they do now (Deloitte, 2018, p. 9). Workers reclaiming the competitive lead over technologies by means of upskilling might be challenging to accomplish, mainly because the pace of contemporary technological change seems to go beyond the speed of its predecessors (Arntz et al., 2016a, p, 25).

Now that all the OECD countries are facing an age-old population and workforce and fast technological change, it is essential to boost investment in human resources for mid-career employees, particularly those that are rare such as ICT skills. Motivating elderly employees is more difficult, and it is also hard for employers to invest in skill upgrade for aged workers, though that may change since elderly employees stay longer in the industry (Martin, 2017). A point to note is that the age of automation commands upskills but this is mostly set for new market entrants into the world of work. Thus, the opportunity for the workforce full of adults might be difficult because some of these less educated and adult workers lack lifelong learning foundation skills that are effective.

Arguably, it is possible to say that with all effort to upskill the adult workforce now or in the future, the skill gaps will not be bridged adequately in this automation age. Such capabilities will include a wide range of intellectual and non-cognitive skill, and our education and training programs will need thorough adaptation to guarantee that these skills are adequately supplied (Martin, 2017). The development of skills is extremely important, particularly for multinational companies such as automobile companies in South Africa (NAAMSA, 2019). For instance, in SA the availability of qualified technical staff to technicians is small and the dependence of qualified machinists and engineers was reduced by the use of auto-controlled devices (Rasiah, 2011, p. 224).

In the meantime, the government should promote imports of skills, which is important since SA does not possess the competencies needed in the automotive industry (NAAMSA, 2019). This reveals that the machine age has resulted in significant changes in the labour market and skills supply, and one cannot deny the importance of high-quality skills that focus on key cognitive and non-cognitive skills development (Martin, 2017). This could be the reason why there is an increased demand for particular skill groups such as Science, Technology,

Engineering and Mathematics (STEM) in the labour market. Professionals with these skills are enjoying high development. More employers are searching for innovation alongside technical abilities. Successful digital businesses are now fusing their employees' technical and creative abilities (Committee for Economic Development of Australia, 2015). The subject of skill shortages has created conflicting views as to whether skill shortages are a real problem in the industry or whether they result from a lack of training (Mohlala, Goldman & Goosen, 2012).

2.14 Training to Compete with the Labour Market Automation

Skills gap problem, according to Mohlala, Goldman and Goosen (2012), can be related to the manager's unwillingness to offer training to their employees in South Africa. It seems that organisations are good at attracting outside skills but not good at retaining current skills. They tend to maintain more managerial abilities than technical abilities, particularly where technical abilities are the key. This is a cause for concern because it is one of the reasons causing to skill shortage and lack of employee development (Mohlala, Goldman, & Goosen, 2012). Major training demands for workers are fundamental computer abilities and excellent hand-eye coordination, greater technical training, and understanding robotic functionality (Calitz, Poisat and Cullen, 2017). To retrain employees according to their comparative advantage could be the answer to this challenge and to counteract this challenge depends on ensuring sufficient training and retraining of low qualified workers (Arntz, Gregory and Zierahn, 2016b). The importance of employee's training in this era can never be overemphasised (Talukder, 2012).

Another important point is that how automobile companies train their workers to do their jobs differs based on the type of company. For instance, while it may take seven days to train a person to do their job in one company, it may take more than a week to train workers to do their jobs in another company, and the training needs of men and women differ as well (Lewchuk & Robertson, 1997, p. 57-58). Training seems to be the only method that knowledge workers can use to keep up with the constant work shifts to automation (Mital and Pennathur, 2004). Workers by themselves are also expected to invest in their training. On this note, according to the (Committee for Economic Development of Australia [CEDA], 2015), in order to ensure that their careers are resilient in a quickly evolving technological setting, employees may need to manage their professions as a business, assume greater accountability for their

training and invest in abilities and professional development to continue to adapt their abilities to the needs of the sector.

The problem at hand is that workers do not have the knack to be trained even when the training is made available to them by management (Webster, Masondo & Bischoff, 2019, p. 15), and this is reducing worker's capacity to compete with job automation. Naturally, learners are now expected to be much more self-directed to learn how and when to adapt to the changing world in ways that are still uncertain the (CEDA, 2015). For instance, we need to maintain literacy and numeracy and guarantee that outstanding STEM abilities equip individuals to stay competitive in the knowledge economy and create science and innovative thinking. This constant training will enable human employees to compete for the employment generated by this machine age. Although, the nature of this 4IR might inhibit the effort to competently train workers to work favourably with the technologies (Arntz, Gregory and Zierahn, 2016b). In this regard, the International Labour Office (2015) stress that training, coupled with education in the face of work automation, might be successful in curbing job loss and compete with technology.

2.15 Education for the 4th Industrial Revolution

The deficiencies of the South African education system, which are well established, obviously impede the country's ability to generate a critical mass of experts capable of bringing the nation into the information and innovation generation (NEDLAC, 2019, p. 28). For workers to compete expertly with recent technologies, one of the important steps is education (Haldane *et al.*, 2015, p.15). School education has continued to concentrate on creating key cognitive skills such as reading and arithmetic that smart technologies have obsoleted humans so far in these skills and machines are fast catching-up on writing (Ibid). For example, experience in the use of assistive technology and the transmission of this knowledge and expertise to other consumers should be encouraged by education (Saborowski & Kollak, 2015). That is why organisations are encouraged to develop educational employee's programs so that they can make more effective use of innovation (Talukder, 2012). Technology challenges traditional techniques of providing education, implying that academic organisations and teachers will need to evolve as technology destabilises and generates new approaches to learning. Meaning that new learning models such as enhanced internet learning and brief courses designed by employers need to maintain pace with changing trends.

Workers with higher education tend to compete more favourably with technologies compared to those with limited education. The commonality amongst all the countries, according to Arntz, Gregory and Zierahn (2016b) is that the level of education of workers affect automatability. As a result, countries with a strong focus on highly qualified workers typically have a lower share of workers at high automation risk, as these workers usually perform fewer automated tasks than low skilled workers. Education systems have been slow to respond to the fast-moving skills needed in today's economy (World Bank, 2016), but many nations are beginning to re-evaluate their education strategy in which teachers are no longer merely a source of knowledge but must educate learners on how to discover and apply data in a fresh and unexpected context. This approach of preparing learners for a new unpredictable work environment such as this present technological evolution is particularly important considering the fact that businesses like auto companies are hugely investing in efficient technologies (Vulavala and Ulmer, 2014, p. 27).

2.16 Investing in Human Workers or Investing in Technologies

Financially, technologies compete with human workers. Interviewees in Saborowski and Kollak (2015, p. 136) analysis perceived that "investing money in technology means less money to hire workers." While human workers are becoming more expensive, technologies are becoming inexpensive. A significant number of firms that contemplate of hiring new workers are considering the uncertain future costs of health care and other employment benefits. However, these firms are grabbing the opportunity to purchase affordable/discounted and efficient technologies. The aim is to make a bigger financial decision in equipment than in workers (StatsSA, 2018). Additional decision with this corporate move is that it takes even the talented workers months to train new workers. Moreover, these technologies are mostly imported, which signifies that the money is also invested abroad instead of investing in domestic human workers. Seemingly, technology is outcompeting human workers because it has changed and evolved more rapidly than workers. Ultimately, as this equipment evolves in decades to come, we should expect to see the drastic transformation in workforce development if workers want to remain valuable and efficiently participate in the world of work.

2.17 Future-proof scarcest skills in demand for Industrial 4.0 globally and locally

In their Future of Jobs Survey 2018, World Economic Forum (2018b) suggested that technical and non-technical roles are needed in jobs. While some of the roles will remain stable, others

will grow in the future. Below are the list of jobs that will remain stable and those roles that will continue to develop in the labour market.

2.17.1 Technical Future Scarcest Skills

Competencies that relates to Information Technology (IT) is more in demand and will grow extremely in demand in the labour market – employees already in the job market who wants to remain in their jobs and those job seekers who wants to enter the job market all need to have at least a basic level knowledge of below listed future technical skills.

Software Developer, Statistical Analysis, Data Mining, Web Developers, Java Development, Mobile/Android Developers, Robotics Specialists and Engineers, Network and Information Security, UX Designers, Python and PHP developers, Process Automation Specialists, User Interface Design, Middleware and Integration Software, Web Architecture and Development Framework, Network Administrators, Systems Administrators, Data Security Administrators, Mac, Linux and Unix Systems, Database Developers, Business Intelligence Analysts (analytics and Reporting Tools, Database Technology, Data Scientists) Electro-technology Engineers, Energy and Petroleum Engineers, User Experience and Human-Machine Interaction Designers.

2.17.2 Non-Technical Future-Proof Scarce Skills

Non-technical skills for Kruger (2006) applies to basic skills that are beyond the traditional education curriculum and are not unique to any single career role or work setting, but may be commonly included in all assigned jobs and activities. In other terms, no matter the sort of work, it is necessary to have non-technical skills for a successful career.

Public Policy, Financial and Investment Advisers, Organizational Development Specialists, Petroleum and Natural Gas Refining Plant Operators, International Relations, Risk Management Specialists, Chemical Processing Plant Operators, Compliance Officers, Sales and Marketing Professionals, Supply Chain and Logistics Specialists, General and Operation Managers, People and Culture Specialists, Innovation professionals, E-commerce and Social Media Specialists, Sales Representatives, Organisational Development Specialists, Customer Service Workers, Managing Directors and Chief Executives, Human Resource Specialists, Management and Organization Analysts, University and Higher Education Teachers, Training and Development Specialists, Digital Marketing and Strategy Specialists.

The exponential growth in technology has led to increased demands on qualified staff, who rely not just on technological skills but also on non-technical skills (Nasir *et al.*, 2011), but compared to technological knowledge, non-technical skills are overlooked. Non-technical abilities are required to complement the technical skills of a professional workers. Non-technical knowledge can only be learned through training and daily usage at the office (Ibid). While technological skills are important to a career, we cannot ignore that non-technical skills are a great compliment to technical skilled employees in any industry. Professional employees are under-equipped if they rely solely on technological skills without non-technical skills (Nasir *et al.*, 2011). Again, as the world of work transforms with the rate of technological adoption, the technical and non-technical skills evolves with the transformation.

2.18 Gender and Workplace Transformation

South Africa has fewer women receiving training on computer skills and considering that the World Economic Forum (2017b) indicates that Rwanda and Namibia are the top Sub-Saharan African countries that are gender-equal. Therefore, South Africa is not on the top list of the gender-equal country to date; although it is performing better than other African countries such as Zimbabwe, Ghana, Kenya, Nigeria, and so on. Gender issues should be considered as we transform the workplace and education. We also need to consider the particular impacts on different organisations. Due to how the labour market is presently segmented, the burden of work displacement and abilities gap trends are likely to drop disproportionately on females. This is particularly true because as World Economic Forum (2018a) report indicates, a substantial proportion of the 75 million positions likely to be affected by automation are roles presently executed by females and that only 22% of those operating in robotics are females. The least number is found in the manufacturing sector, with barely 15% of women (World Economic Forum, 2019). Furthermore, females are most probably going to be underrepresented in work development in the future. World Economic Forum (2018a) points out that gender gaps in AI skills can exacerbate gender gaps in economic participation and future opportunities as AI encompasses an increasingly demanding skillset.

New sources of job creation, according to Faith (2017) also provide a distinctive chance for the future of job to achieve gender parity. Job losses from automation will not be experienced equally by men and women. Because men will be less affected than women and given the gender gaps in the world of work. However, considering that women are going to be hardest

hit, they are almost invisible in the debates about job automation. The debate about the impact of automation is concentrating on how these technologies are going to impact men. This relates partly to inequalities in women's access to and use of technology (Ibid).

Closing the gap to gender parity needs constructive measures and government action to guarantee that women are fairly represented in the fastest-growth professions and most in-demand set of skills. At a period where human resources become increasingly valuable and supplementary to technology, society will not continue to deny itself of women's expertise in industries where knowledge is already limited. These and other attempts to invest in improving talent and skill could be the platform that is needed to progress towards comprehensive, viable development that optimises technology to generate opportunities for everyone. Investments in humans can turn them from passive observers to engaged agents of radical change in their local, domestic and international societies (World Economic Forum, 2019). In this regard, the World Economic Forum is urging all companies and most importantly, the manufacturing companies to establish the five fastest-growing employment and committing to recruiting the same number of males and females. Aside that job automation will affect more women; older workers will be mostly at risk of job automation.

2.19 Age and the Fourth Industrial Revolution

Younger people have more to benefit from this 4IR. One of the reasons is that from a very young age, these learners start to use websites effectively, Google, code and develop Apps. The reason is that young individuals are curious, willing to learn; meaning that they are passionate about technology and they self-taught themselves at a very young age. This makes it easier for them to excel in technological-related qualifications that the present labour market and the world need. Seemingly, the older population will benefit less from these technological opportunities. As National Economic Development and Labour Council (NEDLAC) (2019) notes, older employees might experience growing insecurity on the labour market, and pressure for access to high-quality retraining and skills opportunities. While some of these professional qualifications require both school leavers and school drop-out to be qualified and the duration of the programmes ranges from one month to six years, some specifically need academic qualification and work experience to start the certificate. Over the years, organisations and even small business have continued to specifically demand experienced workers. Employers mostly sought for senior professionals, with the above-hunted skills and therefore neglecting

fresh young graduates. Consequently, President Cyril Ramaphosa urged employers in South Africa to "employ young people - even if they lack work experience. They are courageous, innovative and creative."

As far as race is concerned, it was noted that a good number of black African and coloured population groups in South Africa has the lowest skills in this technology era (NEDLAC, 2019, p. 46) and thus, this limits the chances of these population groups to emigrate to other countries to search for better job security.

2.20 Professional Versus Academic Qualifications Versus the Fourth Industrial Revolution

Both professional and academic approaches do not collectively work in collaboration in turning out a competent labour force that possesses real-world competence to execute needed duties (professional qualification/certification/courses) and at the same time, execute academic knowledge of the required job (academic qualification). When it comes to the training that the university provides, the focus is on learner's specialisation on knowledge of academic discipline consisting of different subjects, and at times, a partial or fulltime focus on research. However, the application of this knowledge in the real world is what the learners are lacking. To instil knowledge, to offer practical experience and assist to apply the knowledge professionally and practically is what professional qualification offers to its learner. Usually, what to expect from professional qualification holder is higher compared to the expectation from an academic qualification holder.

The skill demands that accompanied the Fourth Industrial Revolution are predominantly sophisticated and technically intense skills. In preparation to be ready and to adapt to this technological evolution, almost everyone in the society must be technically inclined and not just the fundamentals but also on a certified professional level on these scarce skills. Decades back, the best option to participate in the labour market and in a well-paying career was to obtain a degree in any field. Of recent, the system has taken a new turn. A good number of people without a degree now have equal and sometimes even higher positions in the labour market. This has been successful through professional certification and qualification. Therefore, even though all types of education are essential in boosting growth in the economy, the need for vocational (professional) training and specialised technical education increases with the industry's level of technical sophistication. Increased productivity and hence

development and profits involve a fast advancement in the present and future workforce of this type of education and training in South Africa (NEDLAC, 2019, p. 43).

While corporations prioritize the reskilling of employees, one of the important issues is the rethinking of educational institutions and pedagogy by shifting education from ‘degree' development to 'skills and employability' education. One of the driving forces behind this kind of reasoning is a sense of urgency–technology change is increasing in speed, and new skills are bubbling to the surface. This, in effect, suggests that knowledge reserves are limited because these new skills are rare, so it makes perfect sense to invest in the continuous learning of younger workers than to try to find new workers who may not have all the necessary skills. The potential of current employees should be the data maintained by the HR systems to inform which persons are perfectly suited to upskilling or reskilling programmes. Experienced employees can continue to observe what positions are in high demand, and then prepare to prioritize them. These steps should be bolstered by a structural analysis of how employment is controlled and which fields of job creation may strengthen social benefits.

2.21 Conclusion

Along with an increase in productivity and efficiency, we will see an increase in the quality of skills, new skill discoveries and competition of skill acquisition but the rate of technological adoption in the labour market will upsurge with time leading to workers being outcompeted and thus workers’ jobs will be threatened. This chapter aimed to focus on discussing the collaborative experiences and the competition between technology and human workers in the automobile sector. The central arguments are that having robots that perform some work in the assembly line increases productivity in the automobile industry and allows workers to concentrate on more important and challenging tasks. As auto industries expand, unified integration becomes the best attributes of successful implementation of technology and human workers. To put it simply, robots and human employees must each efficiently interface where they can best be put to good use. Consequently, each cannot independently perform alone because they are mutually responsible for exclusive tasks. However, human workers’ safety, satisfaction, reskilling, training and gender parity in the face of job automation must be well

taken into consideration. The next chapter explored the appropriate literature on the level of job automation and the readiness of workers to adjust to this technological change.

Chaper 3

THE RATE OF TECHNOLOGICAL ADOPTION IN THE FACE OF JOB AUTOMATION IN SOUTH AFRICA

3.1 INTRODUCTION

This chapter argues that technology adoption will boost the output of production in the manufacturing sector and increase the country's GDP. It will also result in the creation and destruction of some task. But the destructive effect will be more pronounced leading to the higher number of unemployment rate and polarization in the labour market and society at large as it destroys more than it creates coupled with its nature of deskilling due to its increased efficiency. Both the argument in this chapter and the key thesis of this study are in line with each other that job losses are caused by manufacturing job automation notwithstanding its precision in manufacturing gains. In theory, these theses relate to the EET's creative destruction perspective as well as the deskilling thesis of LPT. Further, it parallels the notion of recent CSR by Komlos (2016, p. 11) that creative destruction centre of attention is on the financial gainers and pays no attention to the losers and supports creativity while disregarding its associated destruction.

While the previous chapter discussed the human-robot interface and human-robot competition in the world of the automotive sector. It was noted in the previous chapter that the new features in automobiles, the escalation in the number of parts that goes into each car and higher assembly had necessitated human-machine teamwork and job automation in the automobile sector. This industry will continue to adopt more technologies to meet the needs of its customers to minimise product imperfections due to human inconsistencies. The chapter also indicated that auto-human-workers are in constant competition with technologies through up-skilling, retraining and education.

On this basis, this chapter builds on the preceding chapter by exploring the rate of job automation in the workplace and the readiness of the workforce to adapt to this technological change in the South African car companies. The chapter delved into the global empirical studies coupled with South African literature on work automation. It also presented literature on wage structure and job reallocation in this Fourth Industrial Revolution. The economic and social implications of technological domination were also examined.

3.2 The Core Argument of this Chapter

The functions of technology have enormously increased and range from their previously impossible reliability, the pace of operation, accuracy and low energy depreciation. Some employments are lost and some jobs are created during the process of work automation. But, the speed at which jobs are lost, however, is not the same as that at which jobs are generated. However, existing technologies are closing in on human intelligence. That is, robots can still handle employees' remaining jobs. A point to note is that workers are not prepared or ready for such a level of structural change in the labour market.

3.3 Workplace Automation and the Level in the Reduction of the Workforce and Creation of New Job Opportunities

It has been argued that technologies are certain to affect different kinds of businesses (Frey & Osborne, 2013), and across all skills and levels. The structure of the South African population has shifted from largely blue-collar and unskilled to one controlled by semi-skilled and skilled workers working in a highly automated production environment (Hlatshwayo & Buhlungu, 2017, p. 128). A substantial number of jobs have begun to rely heavily on machines (Economist, 2012; Mokyr et al., 2015). For instance, the automobile sector in South Africa is using capital intensive diversification in relation to their technological capability portfolio to meet market needs both locally and abroad (Lorentzen & Barnes, 2004, p. 493). Meaning that the sector is restructuring to trim down and become extra competitive (Black & Hasson, 2012, p. 6). This restructuring trend has resulted in the worker's loss of tasks in the entire plant and frustration and job uncertainty dominates the minds and lives of the workers (Barchiesi, 2000).

Technological innovation and its introduction present opportunities and threats (Marchant, Stevens & Hennessy, 2014). We have experienced its prospects in productivity and economic growth (Riddell & Song, 2012), revenue growth, employment and investment (Rüßmann *et al.*, 2015), and market expansion (Bessen, 2016). These opportunities have been made possible due to the capabilities that the technologies possess. However, when technological capacities develop very quickly, a much larger percentage of the workers may be displaced in a much shorter moment than in the past waves of technology. These capacities will reduce the value of skilled labour in many industries; given that human capacity as providers evolves slowly, even in an extremely trained society. In other words, there may be such a fast rise in robot capacities and technological adoption that many human employees may find themselves with almost

nothing to offer (Pratt, 2015). The truth is that many jobs are prone to automation owing to the fast evolution of the Fourth Industrial Revolution (Frey & Osborne, 2013), the labour market is polarized (World Bank, 2016), there are job fragmentation and destruction (Brynjolfsson & McAfee, 2011; Jaimovich & Siu, 2012), and unemployment is at its peak (Smith & Anderson, 2014).

A close percentage of jobs that are susceptible to automation in different countries has been projected by scholars such as (Bowles, 2014; Arntz, Gregory & Zierahn, 2016b; Frey & Osborne, 2015; World Bank, 2016). Prediction indicates that the average of 9% of jobs across the 21 OECD countries is automatable. This differs across these countries; evidence indicates that the rate of job automation in Estonia and Korea is 6 % while Austria and Germany are 12 % (Arntz et al., 2016a, p. 8). Their report also indicated that 55% of jobs in Uzbekistan and 85% in Ethiopia are at risk of automation, while in countries such as India and China are estimated to be 69% and 77% respectively to job automation. A similar study by (Bowles, 2014) reported corresponding data ranging from about 47 per cent in Sweden and the United Kingdom, respectively to 62 per cent in Romania. Frey and Osborne (2013) estimate that roughly 47% of the total United States occupation is at the peril of automation. In close relation, the percentage of jobs threatened by automation in India is 69%, 77 % in China and 85% in Ethiopia (World Bank data, 2016). In the threat of automation, the United States seems much less pronounced with 9% of jobs compared to 47%, as projected by Frey and Osborne (Arntz *et al.*, 2016). The view from Smith and Anderson (2014) is that many jobs presently carried out by humans will be taken over significantly by robots by 2025.

In the automobile sector over the decades, the application of robots in the auto industry has increased drastically. Automotive investments on robots climbed from 15% in the 1980s to 55% by 2010 (Vulavala and Ulmer, 2014, p. 27). The advancement of robots in the last 50 years is astonishing. While robotics proposes an entirely new concept of automation, the auto industry plant-floor is the place today's robots do the majority of their work. In addition, 90% of today's robots in the world are engaged in manufacturing lines, and 50% of them have been engaged in automobile production (Ibid., 26). Furthermore, 87 per cent of job cuts in the industrial sector was due to the increasing efficiency of automation and enhanced technology factories, while the remaining per cent was related to trade. Thus, from 2000 to 2010, the number of people required to produce a car in the automotive industry decreased year after year (Hicks & Devaraj, 2015).

The rate of technological domination in the labour market is alarming (Martin, 2017), and that is why Acemoglu and Restrepo (2016) stated that if the expansion of automation progresses as anticipated by analysts over the next two decades, the possible estimated effects of the spread of robots could be much greater. Moreover, the main groups experiencing significant decrease are daily manual jobs, blue-collar workers, technicians and manufacturing employees, machine operators and transport staff. Arntz et al. (2016a, p. 4). summed up that it is unlikely that this automation will destroy good numbers of employment. However, low-skilled employees are likely to suffer as a result of the cost of improvement as their job automation is greater than extremely skilled employees. For Smith and Anderson (2014), we should be concerned that only a few highly skilled employees will be successful in this innovative work setting, but much more can be displaced, at best, into lower-paid service employment or, at worst, into permanent joblessness. The estimation made by Acemoğlu and Restrepo (2016) is that additional technology decreases the workforce-to-population ratio by 0.18 to 0.34 per cent on average for every 1,000 employees, while also lowering salaries by 0.25 to 0.5 per cent on average.

The automation heterogeneities across skills, occupation, sectors and countries may reveal overall disparities in the workforce, prior investments in automation techniques and similarities in workers' schooling across nations (Arntz et al., 2016a, p. 8). For instance, the risk of jobs that are likely to be automated can be found in different cities based on the how skilled the city is and gaining comparative advantage in new job creation that will persist them. However, this has contributed to increased income disproportions between cities. Again, the degree of automation of one country might be higher than in another country for the reason that investment in sophisticated technologies in one country is stronger than the other country (Ibid., 19). The results differ greatly as the observations in these fields are highly sensitive to the particular approach used to evaluate the automatability of different jobs or industries. Further study is therefore required to eventually evaluate the automatic vulnerability in different countries across the continuum of economic development (Heimerl & Raza, 2018, p.14).

3.4 Parliament of the Republic of South on The Fourth Industrial Revolution

During the 2019 SALSA Development seminar on "The Fourth Industrial Revolution – the Impact on South Africa and the Legislative Sector" in South African, it was noted that the

implication of the 4IR is going to be massive for all industries. It further revealed that the South African Legislative Sector was majorly concerned about the technological threat to jobs and job redundancy despite that this revolution will come with great enhancement to the nation.

The concern also is that a significant number of South African citizens are still not at all ready for the destructive change that came with the 3rd Industrial Revolution years ago, let alone to show readiness to adapt in the new economic change where major jobs in all sectors are at risk to automation (Parliament of the Republic of South Africa, 2019). To ensure a peaceful revolution, we have to be certain that this present technology is beneficial to a good number of people and make these people up-to-date with technology and be valuable in the economy. The solution brought forward is to advocate for a policy framework that will oversee the 4IR and make it less disruptive in the labour market in a developing world such as South Africa. We will need new skills for new fields as the existing skills have been considered irrelevant and outdated. Thus, we need to re-educate the workforce based on the new fields (Parliament of the Republic of South Africa, 2019). This problem is extended to the rest of Africa. For Agola (2016) countries in sub-Saharan Africa (SSA) have the largest technological gap relative to many other developing countries.

3.5 Developing Countries and Productive Technologies in Manufacturing Industries

Africa continues as a continent with the lowest rate of deployment of technology across all forms of human production, according to Agola (2016). Poverty bedevilling SSA nations are strongly linked to the low use of productive techniques in the continent's multiple financial operations. Pervasive poverty, low productivity and related low salaries, and absence of employment are all related to the issues of Africa's technological innovation gap. It is reasonable to contend that African financial systems cannot encounter equitable economic development without solving the issue of the technology gap (Ibid).

The capacity to import technologies developed somewhere else and to implement imported technology efficiently in financial operations distinguishes leading players from emerging economies in economic growth and development (Agola, 2016, p. 10). The robotics potential to be embraced in Africa is becoming increasingly viable as robots' costs and flexibility continue to decrease (Naudé, 2017). For Naudé, the Fourth Industrial Revolution certainly retains possibilities for African reindustrialisation. New company models to bring products and

services to customers are among the possibilities. These include services-as-services, the economy of sharing (cooperative) and electronic services and exports. All of these are markets presently underdeveloped in Africa, but with significant potential considering the geography, demographics and continuing urbanisation of Africa.

African (re) industrialisation is also threatened by the 4IR. The major threats are job losses, the redundancy of the industrialisation model by attracting low-cost Foreign Direct Investment (FDI) labour in assembly-type production and manufacturing re-shortening to developed countries (Naudé, 2017). African nations are one of the least prepared for the Fourth Industrial Revolution since the infrastructure of Africa is the least developed and most of the workers in Africa is not qualified (Gumede, 2017). The challenges of automation will potentially hit hard in the developing countries and impact on the humans in a negative way despite that technologies will free people from unexciting, monotonous labour (Faith, 2017).

The latest study on the effect of the 4IR demonstrates that it will be worse off since Africa is so unprepared (Gumede, 2017). The poorer the nation, the more likely it is to be automated (World Bank, 2016). As shown by Rodrik (2016), peak manufacturing employment among emerging countries has decreased steadily over the course of the 20th century, a worldwide trend that must be ascribed to workforce automation, posing major difficulties for future job creation in developing countries. There is an actual risk that technology's effect on the worldwide labour market may present disparities between African nations and emerging markets. Developing nations have encountered declining labour, and real value-added manufacturing stocks, particularly since the 1980s (Riddell & Song, 2012, p. 1).

3.6 Technological Unemployment and Technological Adoption

Most analysts and scholars seem much more positive about the future implications, stressing that the past technical revolutions have generated the same fears of high unemployment that have never actually come to fruition (Martin, 2017, p.12). Improvement in labour productivity by around a third each generation has not triggered any reduction in employment because as of 2015, the jobs rate of the United Kingdom as a percentage of the total population was about 50% comparable to that of the early 19th century and this was even to other countries (Haldane *et al.*, 2015, p. 7). Graetz and Michaels (2015) revealed that utilising industrial robots did not impact destructively on the overall working hours. Consequently, there is no reduction in the

demand for labour due to the adoption of technologies. Actually, competitiveness expanded with monotonous and highly automatable tasks and with positive indirect product demand compensating the effect of computerization and technological replacement (Bamber *et al.*, 2015). 11.6 Million employments on the net throughout 27 countries in Europe were created between 1999 and 2010 resulting from this compensation (Ibid). Autor (2015) is much more optimistic about the machine age job opportunities. He emphasises the fact that technological unemployment fears are nothing fresh because a long time ago, Keynes (1930) invented the word "technological unemployment", but the fears never became a reality, despite the enormous changes in requirements and supplications in the multiple technological eras of labour across sectors, occupations and countries. Instead, over time, employment rates have increased. As a consequence of the machine age, there is no reason to assume wide-scale unemployment (Mokyr *et al*., 2015).

It is doubtful that the modern concern of permanent unemployment as a result of automation will come to reality rather, the advancement of technology will continue to improve the usual way of living in several unanticipated and vivid ways as we have seen for over two centuries ago (Mokyr *et al*., 2015). Arntz *et al*. (2016, p. 4) maintained that the estimated share of "at-risk jobs" should not be related to actual or anticipated job losses due to technological expansion for three reasons:

I. Because of financial, constitutional and social obstacles, the use of current technologies is a slow method, so technological replacement is often not as expected.
II. Even when innovations are implemented, by switching duties, employees can adapt to altering technological endowments, thereby preventing structural unemployment and
III. Additional jobs are also created by technological change through the demand for new technologies and increased competitive nature.

The point still remains that South African industrial jobs have been steadily declining since 1989-1990 and based on the pattern that this past performance has depicted, the employment growth in the manufacturing sector will persist in declining or may sluggishly increase (Naudé, Szirmai & Haraguchi, 2015, p. 259). Even if there will be employment growth, the growth will only increase 1% per year. It is estimated that by 2030, employment in this sector will decline further (Ibid). Apart from a slight increase in 2006-08, employment growth in the manufacturing sector in South Africa had declined steadily yearly since 1995 (Black, Craig &

Dunne, 2017; Masondo, 2018), despite an increase in manufacturing output and the sector has seen further significant declines after 2008 with 25% below its peak in 1998-99 (Naudé et al., 2015).

In terms of productivity, there has been an increase, and it is continuous as a result of capital-intensive (Lorentzen & Barnes, 2004, p. 493; Naudé, Szirmai & Haraguchi, 2015, p. 258), at an unusually rate (Black *et al.*, 2016, p. 13), advancing at extraordinary and exponential rate (Deloitte, 2018, p. 2), with technologies now doing the jobs that humans would have done in the past (Gumede, 2017). From a development point of view, economic growth relies on the supply and efficiency (expertise) of services. This implies that the economy will grow if there are enough workers with highly needed skills in the labour market. However, if human workers fail short of these factors, then the economy will rely on labour-saving machines which tend to be available at low cost and highly labour efficient in quality (NEDLAC, 2019, p. 39). This is possible as the motor companies require constant innovation and creativity (DTI, 2018, p. 5), which will impact on how work is done, meaning that the current technologies are smarter and are constantly adopted in the workplace in comparison to those that come before it (Deloitte, 2018, p. 2).

3.7 Differentiting the Fourth Industrial Revolution Era from the Previous Technological Revolution

Given its deification, the magnitude of these latest technologies is likely to exceed that of previous technologies, as the intensity of a phenomenon's effect is strongly correlated with its presence (Bürgi & Pradeep, 2006, p. 648). More jobs have been created in the past than destroyed, but in the future, it does not have to be that way (Walsh, 2017). These machines are smarter and are combined with artificial intelligence and connected information technologies which have made it possible to utilize automated machinery and equipment in factories, resulting in cost and time savings while increasing productivity outputs given rise to efficient digitised and automated systems that are able to displace conventional labour (Deonarain, 2019, p. 10). As pointed out by Walsh (2017), machines took over many of the physical tasks that we used to do in the Industrial Revolution but all the cognitive duties were still left to us humans. However, this time, as machines also begin to perform several cognitive duties (Haldane *et al.*, 2015, p.15), that is where to worry if there will be any job left for us humans (Walsh, 2017). A point to note is that new jobs must be done where either people excel, or where we choose not to have machines. But the contradiction is that the computers that will be

available in 50 to 100 years will be super-human, according to Walsh (2017). Consequently, any work in which humans continue working better than machines is difficult to imagine. This implies that the only jobs remaining are those we prefer people to do.

Surely, the recent technologies imitate human intelligence and learning, but it also at the verge of surpassing the knowledge of human workers. Meaning that the human mental capability can be easily replaced and not only human physical capabilities which the old technologies possessed in the previous labour process and the industrial revolution. Intelligence as the primary most quality that singled out humans from technologies now exists in these designed systems. Theoretically, all sectors in the economy can be impacted in this face of automation. The previous technology revolutions replaced humans in manual work, then in repetitive work, allowing us to take jobs in intelligence-based work. Now, these white-collar intelligence-based jobs are under threat. There is no job that technologies finally will not be able to do better, faster and cheaper than man, including the smartest amongst us. Evidence shows that Algorithms are gaining knowledge to perceive and not only to process and solve problems (Pratt, 2015). For example, the idea of a self-driving car was science fiction over a decade ago, but it is a scientific fact today. Maybe peak human could be reached in this period just exactly the way peak horse was reached in the early twentieth century.

3.8 Wage Structure and Production Technologies

In view of the fact that South Africa has more of the unskilled workforce in this era of work automation according to Fourie (2016), the disparity between the earnings of the small number of skilful workforce and a large number of employed but low-wage workers will upsurge. Extensive imbalance in the economy increases if low wage workers cannot easily move to high wage jobs, despite that management is always increasing productivity with only minimal increases in wages (Burawoy, 1979). Though, it has been indicated that there will be an increase in wages as a result of productivity boost because of technology (Pratt, 2015, p. 58) but the needed skills and opportunity to perform the task with technologies might not be accessible to low-wage workers.

Those workers that constantly acquire fresh skills will receive better and higher wages in technological occupations (Bessen, 2016). Contrary to the above agreement by Burawoy (1979), Bessen, (2015) and Fourie (2016), Haldane *et al.* (2015, p. 8) argued that obviously,

technological advancement had not expanded revenue inequalities. Indeed, they stressed that since the advent of the Industrial Revolution, technology has boosted wages, lengthened, thickened and enriched labour workers through the fruits of technology, typically in the form of greater salaries. The providers of labour and capital have therefore shared in the fruits of greater incomes in approximately set ratios. Historically, technological impacts have been felt, to some extent, in hours of work but not drastically (Ibid., 8-9). However, to counteract Haldane et al.'s argument, some scholars maintain the agreement that the advancement in technology could exacerbate earnings and income disparity in the labour market (Dorn, 2015; Graetz & Michaels, 2015) and low-payed workers will lose jobs whereas high-payed workers will gain jobs. This gap will widen if the low paid workforce is unable to move to jobs with higher income (Bessen, 2016). Consequently, the income gap will evidently stretch because of job automation.

However, comparing South African manufacturing labour costs to those of the other BRICS (Brazil, Russia, India, China and South Africa) countries. When it comes to South African labour costs and wages, as indicated by Naudé *et al*. (2015, p. 257), the cost of labour in the South African manufacturing sector are significantly higher than those comparable to Lithuania, Malaysia and Poland. South African manufacturing workers earn almost 50% higher than their counterparts in Malaysia and Poland, but almost 80% higher than those manufacturing workers in China and Lithuania. While below those of Brazil, South African labour costs are relatively high compared to those of Russia, India and China. Naudé *et al*. (2015) corroborate the findings by ILO (2010) and World Bank (2011) that the minimum salary in South Africa is substantially higher than that of any other country of the BRICS. As reported by the World Bank, wage levels are high in South Africa because:

- Skilled, creative labour has a high wage because of the lack of skills in the world;
- Collective bargaining structures offer higher wages to union workers; and
- The cost of living in South Africa is large, and needs salaries above a certain level in order to attract workers.

Reducing living costs would allow for more competitive wages without hurting worker's welfare. The average skilled worker earns nearly 7.5 times more than the average low-skilled worker. The boost to wages for some workers may be offset by job losses for others – the net effect remains unclear and these high wage levels make it difficult for South Africa to compete

in low and medium-tech goods or markets where cost is the deciding factor (World Bank, 2017, p. 14-26). The average wage in South Africa masks the country's high wage inequality and polarisation in the manufacturing sector.

3.9 Automation a Cause for Job Polarization

Aside from the income inequality, there is growing polarization of labour market outcomes between rich and emerging countries as a result of the impact of technologies in the workplace (Dorn, 2015; Agola, 2016). Polarisation in the labour market is a structure of employment whereby the share of low-skill jobs is rising, the share of middle-skill jobs are falling, and the share of high-skill jobs are increasing. This usually happens where jobs that are routinized are positioned in the middle of the skill allocation. Job polarisation also comes as a result of automation of complex tasks be it in the middle, high and low wage jobs (Feng & Graetz, 2015). Automation of jobs could be a poison to the economy or a remedy in a developing country like South Africa. In that, the mechanization of jobs which leads to labour market polarization could transform into a further polarisation of South African society. It is a point to note that this job automation if well implemented could benefit a good number of people in South Africa and thereby to some extent shrink the economic gap between the haves and the have not. For Autor (2015) with time, polarisation will not continue due to strong complementarities between automation and labour, which boost productivity, boost income and boost labour demand.

3.10 Automating the World of Work for Better Economy

Riddell and Song (2012) maintain that new and more developed techniques have long been acknowledged as a significant contributor to productivity and financial development. This is why countries around the world are moving towards knowledge-based financial operations, technology coupled with learning which would play ever more significant roles in their economies. A substantial aspect of the process of technological diffusion and development is the introduction of technologies by companies and employees. The adoption of technology can also be seen as a choice to reallocate in reaction to changing financial conditions, enabling customers and manufacturers to take advantage of the possibilities offered by the implementation of innovative inputs (Riddell & Song, 2012, p. 1).

As for Rüßmann *et al.* (2015, p. 9), the fourth wave of technological advancement will bring benefits in four areas: (1) Productivity: There will be productivity improvements and which will vary by industry but specifically, automotive companies can expect increases of 10-20%. (2) Revenue Growth: 4IR also will improve revenue increase. Companies' need for upgraded facilities, as well as consumer demand for a wider range of increasingly personalized goods, would fuel additional revenue growth. (3) Employment: The development that the 4IR would generate will contribute to a 6 per cent employment growth over the next 10 years and the need for more employees in the mechanical engineering industry, the growing use of tech, communication and analytics would fuel the market for professionals with software development and Information Technology (IT) abilities, such as software-skilled mechatronics professionals. (4) Investment: evolving production methods to incorporate 4IR will permit further investment.

South Africa displays strong capabilities in automotive manufacturing, with the sector deemed an industrialisation success story. It means that South Africa boasts a strong automotive sector with multiple leading Original Equipment Manufacturers (OEM) locally manufacturing vehicles for domestic and international markets (Deonarain, 2019, p. 21). Barnes, Black and Monaco (2018, p. 8) pointed out that the automobile industry can boast of a balanced production and export system which also has boosted the country's economy through technological innovation, a meaningful annual increase in total domestic vehicle production which has also positively impacted on export and on the country's GDP level (NAAMSA, 2019). The introduction of new product innovations in South Africa is designed to ensure that South Africa does not lag further behind the automotive technology boundaries and with other countries, and that domestic production strives to be ready for export to developed market (DTI, 2018).

According to Export.gov (2019), the automotive sector in South Africa is the mainstay of the national industrial base and accounts for 6.8% of GDP (4.3% manufacturing and 2.5% retail). South Africa improved its global ranking to 22nd in the world with a production market share of 0.68%. The automotive industry, therefore, represents an increasingly important strategic and catalytic role in the overall South African economy by impacting directly on many important economic policy goals, such as contribution to GDP, employment, skills development, economic linkages, technology and innovation, and making significant

contributions through taxes, and substantial FDI (Export.gov, 2019). This is a sustainable decision for the South African economy (Calitz, Poisat & Cullen, 2017, p. 7).

Gross automobile sales in the vehicle business sector in South Africa rose to $38.1 billion in 2018 compared to $37.57 in 2017. Exports of automobile goods contributed to $13.52 billion in 2018, equal to 14.3 per cent of gross South African exports. As the country's largest manufacturing sector, automotive and part growth accounted for 29.9 per cent of South Africa's manufacturing output in 2018. In addition, the investments of the seven main OEMs in the country amounted to another significant $545 million in 2018, along with an expenditure of $265 million in the automotive component (export.gov, 2019). Evidence indicates that both globalisation and labour-saving manufacturing technological progress have been behind these economic improvements (Rodrik, 2015, p.1-2).

3.11 Possible Future of Work

According to Price Waterhouse Coopers (PwC, 2017), significant gains should be made from these technologies in terms of (1), the creation of entirely new kinds of employment linked to these new technologies; and (2), more substantially in terms of quantity, the recycling of capital from these innovations into extra expenditure. This creates demand for additional employment in less automated industries where people can maintain a competitive advantage over intelligent computers. There may be more jobs in the fields of modern technology which do not exist today. It is really hard to understand what these new kinds of employment are going to be in advance, but previous experience indicates that there will be some work gains from this source, though likely considerably less than the automation possible work losses of around 30 per cent. More importantly, these new automated techniques will significantly increase output over time (PwC, 2017, p. 12). Doing so will produce additional revenue, initially behind the new techniques for the shareholders of intellectual and financial capital, but transmitting into the rest of the economy as this profit is invested or spent in several other fields. This extra spending will produce enhanced employment and profits in less automated industries, including healthcare and other private facilities, where robots might not be able to completely substitute employees with a human touch in the foreseeable future, as opposed to complementing and enhancing them (Ibid., 13).

According to historical evidence, this will inevitably lead to widely comparable general employment rates for human employees, although with distinct sector distributions and kinds of jobs than now; higher average actual revenue levels worldwide owing to greater general productivity; but perhaps also a more skewed distribution of revenue, with a higher percentage going to those with the ability to flourish in an increasing knowledge economy. This would, however, place a high value not only on the level of education when entering the workforce but also on the capacity to evolve over time and retrain throughout a professional life (PwC, 2015).

3.12 Challenges for a Pro-active Industrial Policy in Developing Countries

Emerging nations may not be able to cope with constructive industrial policies. As Heimerl and Raza (2018) extensively explained, One of the substantive policy problems of introducing new technology is handling the eventual reshuffling of employment from old and new sectors and industries. This includes policy capability in the areas of education and training as well as active labour market policy. Another task is to promote the development and growth of new economic sectors that use and build on new technologies in a manner that provides a net social benefit to society. This task calls for ambitious economic policies with an emphasis on research and innovation, tax and fiscal policies, transportation policies as well as social and regulatory policies that protect core public goals such as social inclusion.

While such policy capacity is better established in OECD countries than in the least developed countries (LDCs) (Ibid). The reason for this is that the operation of network technology depends on the cheap and effective supply of energy, as well as on state-of-the-art telecommunications innovations, which are largely absent in the LDCs. Massive infrastructure expenditure will, therefore, be expected. The funding of such projects would rely on a well-designed combination of public and private monies and, in the case of many LDCs, would call for the creation of new financing mechanisms, such as infrastructure development banks. Prudent financial management can reduce unnecessary external debt and focus on the production of secure long-term funds. Similarly, connections to infrastructure facilities should be offered at reasonable rates (Heimerl & Raza, 2018, p. 20). Another argument is that the market for jobs will change to higher qualifications, albeit fewer workers, and the emergence of new job-generating economic activities will, therefore, depend, in turn, on the creative and innovative potential of the future workforce (Ibid).

3.13 The Unautomable Sectors are Automable

Data has shown that there are many jobs, primarily in the service sector, which do not require a high degree of technology usage and are at low risk of automation at the same time (e.g. hairdresser) (Heimerl & Raza, 2018, p. 12). Another projection is that the opening of job in the years to come is estimated to be in the health sector, which is likely to add over 4 million new jobs from 2012 to 2022 in the United State (Citi and Oxford Martin School, 2016). Contrary to the above points, research shows that even the health sector is not left behind because data shows that many governments invest much public money in developing assistive technology in this sector; that is why professionals in this sector believe that more and more technology will enter the nursing sector and care practice will radically change (Saborowski & Kollak, 2015). For instance, Smith and Anderson (2014) carried out a study on AI, Robotics, and the future of jobs. They found that the large majority of their participants anticipate that by 2025, robotics and artificial intelligence will pervade broad sections of their daily routines, and respondents were mainly consistent in their projections of technology advancement itself.

3.14 The Changing Structure of Labour in the Labour Market of South Africa

The creation of the economy of South Africa points towards the pressure of the economic and demographic years ago and the reactions to those pressures by investors, organisations, employees, production, government and people. In the economic base, South Africa's economy has shifted in a progressive form. We have seen meaningful transformative effect of technology at every sphere in South Africa (Ambe & Badenhorst-Wess, 2013; NAAMSA, 2019), be it in commerce, consumer interface, communications, production, retailing and robotics (DTI, 2018; Deonarain, 2019; Barnes, Black & Monaco, 2018). Globally, technology has immensely fostered labour mobility, the flow of information, market connectedness and lowered trade barriers. This structural change will shape South Africa's economic future. The development of the economy of South Africa will be contingent on the emergent of new markets, opportunities, product and services developed by technologies (DTI, 2018). Despite that the structural change will undoubtedly remain part of the economy, outside this box, it is not certain how the economy will develop.

3.15 The Digitalisation of the South African Economy

The study of Futures of work in South Africa by NEDLAC (2019, p. 40) highlights the depreciation in the number of workers in South Africa. The study analysed that from the mid-1970s to 2000 between 6 and 7 workers were employed in sectors which manufacturing is one of them; but recently in 2017, the number needed is just 4 to 2 workers. According to Phillips, Seedat and van der Westhuizen (2018), one in three jobs in South Africa (5.7 million jobs) is at risk of total automation. South Africa has advanced in terms of implementing technology, the increasing development of its economy has, however, not translated into meaningful growth, particularly for labour (Ibid., 6).

The threat of sophisticated automation grows as it will reduce many jobs across the economy, aggravating the risk of unemployment, creating more job displacement in a distressing picture (Ibid., 7-9); this will add significant stress on an already pressured South African economy. Indeed, South African workers are afraid that technology will reduce their jobs and aggravate income disparity, just like many workers beyond the borders South Africa.

Most recently, as estimated by Nomfanelo *et al.* (2019, p. 2-9), more than 500,000 manufacturing jobs alone could be disrupted by technology across South Africa by 2030, and job cuts are projected to outpace job gains in the industry. With 4.5 million future jobs being created in total, it is projected that these developments will displace 3.3 million current jobs by 2030 in South Africa. In global terms, a Forrester research report referenced the McKinsey Global Institute study's findings, stating that while automation will obliterate 24.7 million employments worldwide by 2027, new technology will also generate 14.9 million fresh employments in the next century, with automation generating employment equivalent to 10% of the population by 2027.

The view that technology is at its infancy and yet to "take off" in South Africa is not totally factual because the usefulness and adoption of technology by African leaders have dramatically increased, meaning that they are well aware of the digital age. For instance, according to World Economic Forum (2017a), high rate of jobs in countries such as South Africa, Kenya, Nigeria and Ethiopia are liable to automation, and the capacity of these countries to adapt to further job disruption is a concern. The main constraint to businesses in these regions has been inadequately competent workforces, and this pattern may get worse in the future. In fact, by

2020 alone in South Africa, 39% of key professional abilities will be completely different because of automation (World Economic Forum, 2017). This instability of skills at times stems from the fact that many occupations in these regions are adopting more technologies in their organisations. To create a channel of future abilities, African academics must develop future-ready curricula that foster critical thinking, creativity, and emotional intelligence and also speed the development of digital and STEM abilities to suit people's job and collaboration in the Fourth Industrial Revolution. The Forum's Africa Skills Initiative offers appropriate fresh perspectives and brings companies together to tackle the growth in future-oriented abilities and promoting strong public-private discussion on the immediate and profound overhaul of education and labour practices to train employees for the prospect of jobs (World Economic Forum, 2017a).

Volkswagen Group South Africa has recently adopted 320 new robots in its body shop as the maker of the latest Polo and other unconfirmed versions at its Uitenhage factory in the Eastern Cape. The new robotics supports the plant to assemble other models like Skoda and Audi, consequently improving health and safety at the plant and saving on the cost of production and to increase volumes of products. Calitz, Poisat and Cullen (2017, p. 10) findings revealed that South African industries could not refuse to follow 4IR, global trends and cooperative job methods. Moreover, these scholars noted that automotive providers and manufacturers of components had introduced cooperative workspaces and comprehensive use of collaborative technologies (Calitz *et al.*, 2017, p. 10). It is indeed a matter of reality that if the developing world does not comply with the industrialised world's scientific progress, the potential risk of further marginalisation becomes real and it would fuel the public's fear of a fresh divide between the haves and the have-nots. To avoid this, it seems vital for the newly emerging and developing economies to compete from the beginning and not to wait for these to be transplanted at a subsequent point from the industrialised world (Bürgi & Pradeep, 2006, p. 650).

For Fourie (2016), automation is unlikely to result in much broader joblessness in South Africa. Productivity will increase, boosting the income to complement machines for those with abilities. Higher earnings are likely to be spent on facilities where intensive use of unskilled labour is dominant. Due to the large availability of unskilled workers in South Africa, this increased demand will reduce unemployment, but it is unlikely to affect incomes. The disparity

between the wages of a limited pool of skilled workers and a large supply of working yet minimal-wage workers would grow (Fourie, 2016).

In South Africa, thousands of jobs have already been lost as the mining industry has applied technological innovation over the years, with technologies now doing the jobs people could have done previously (Gumede, 2017). Automation is indeed a threat to many jobs, especially unskilled ones more easily replaced by machines. South Africa already has an enormous skills gap, and this will tend to widen the gap, which means that the 4th Industrial Revolution is a daunting prospect for many South Africa's adult population (Hanusch, 2017). Economic growth has been slow in the country since 2013, with small rebound each year, which is below the rate of population growth. Consequently, South Africans are becoming poorer on average. South Africa thus risks lagging behind with growth below that of its peers; this fall in productivity has therefore been an impediment to job creation (Hanusch, 2017).

South Africa is among the developing countries which have designed and adopted neo-liberal macro-economic policies in the quest for foreign direct investments from multinational corporations. The role of multinational corporations in developing countries are normally viewed to be that of spilling-off technological innovations and increased performance (Masondo, 2010, p. 123). The South African high-tech sectors are those that tend to perform better with respect to generating employment. This means that, on average, innovation is good for South Africa and its jobs (Hanusch, 2017). The country has tools to fuel economic growth and lessen the number of jobs at risk. Nonetheless, to be effective, the key intervention is to increase the pace at which the workforce acquires the skills essential to maximize the benefits of human-machine collaboration and this intervention must start now (Phillips, et al., 2018, p. 9), and through this, South Africa could potentially double the size of its economy in five years' time.

3.16 South Africa's Structural – Hindrances to Growth and Employment in the 4IR

To maintain the infrastructure associated with automation, affordable and reliable supply of electricity and fast, reliable and open internet are needed; developing countries are lacking these, thus access to these services should be offered at an affordable price (Heimerl & Raza, 2018: 20). In the case of South Africa, there is a partial electricity supply (the recent load-

shedding) and telecommunication services. However, the issue of load-shedding might be temporary.

Similarly, according to NEDLAC (2019, p. 18-24) in some instances, SA has built itself in a box with respect to its socio-economic lethargy and the explanations are as follows: 1) “greed” (there is a rising debt servicing burden as the nation and its stakeholders live beyond their means, and these are structural barriers to sustainability, growth and work creation), 2) “ignorance” (SA is not aware of a variety of facts that affect the existence and success of the country and its place in the global economy), 3) “misconceptions” (The illusion that South Africa is the gateway to Africa. South Africa's growth is now only the third-largest.in Africa, after Nigeria and Egypt), 4) “productivity constraints” (advancement, the supply of skilled workers, the value of R&D, the accessibility of technology and the capacity of leadership to mix together the available inputs harmoniously and effectively); 5) “mediocrity and entitlement” (South Africa has been in the lower-middle-income trap for at least four decades and it is expected to be in it for another two decades without graduating to upper-middle-income status. If their income per capita growth rate record is not improved, and conditions for entitlement are at least partially responsible for low educational performance, which also legitimize mediocrity).

In 2017, on a similar note, Gumede, a South African scholar, highlights that in Africa as a whole, one of the issues is if African higher education institutions are not failing, they are trapped in pre-digital age teaching methods or are over-focused on obsolete humanities instead of on technical, engineering and science qualifications (Gumede, 2017). The rulers of Africa are among the least cognizant of the drastic modifications in technology and their prospective effect on countries of the world. In the instant post-colonial political, economic and ideological paradigms, most of their attitudes, views and commitments with the globe are static (Gumede, 2017). Some African governments have continued to build their dreams on the eventually delusion that the former imperial forces will always be compassionate towards Africa after their previous territory exploitation, which would then automatically parachute African markets into Fourth Industrial Revolution. Some are hoping for growing forces to lift Africa from underdevelopment (Ibid). They naively think that perhaps the West or emerging countries like China are wholly "dependent" on African assets and could, therefore, be induced to promote Africa's growth because they need the resources of Africa (ibid).

3.17 Social Issues Conducive for Robots Domination

Technology, science, and society are inherently interconnected and interdependent, and because technology is strongly integrated, they cannot be viewed in isolation (Bürgi & Pradeep, 2006, p. 647). Taking into account the time factor, technological and social changes may not happen at the same moment as the social system needs its own time to react to change and discover its new equilibrium. The coexistence of many types of cultures today and the similar coexistence of techniques, from pre-industrial to state-of-the-art technologies worldwide, demonstrate the facts mentioned above. Radical technological and social modifications may not simply exterminate past forms, and all types of cultures have historically used science and technology regardless of their point of growth and faith.

As far as technological and social changes are concerned, their prospective effects are likely to be more significant because they have the incomparable strength to penetrate all societies and economies, from pre-industrial to modern societies, from ancient to extremely industrialised economies (Bürgi & Pradeep, 2006, p. 647). The respondents in Smith and Anderson (2014) study stated that technology will remove us from daily humdrum and enable us to identify a more positive and socially useful connection with the job. However, they conclude that through the decisions we make, we as a community regulate our destiny. The benefit of past technological expansions has not flooded in any sort of equitable way to workers or the poor, but have benefited those in charge of the adoption. Arguably, there is a doubt as to whether technology will create better jobs for average people as it provides massive profits for firms.

The participation of the public and civil society due to the significance is one of the most urgent problems in science. The public must be engaged from the outset, as news and technology information will influence the public's perception and determine the understanding, attitude and behaviour of people towards new technology for their social recognition or resentment (Bürgi & Pradeep, 2006, p. 652). Excluding civilian society in a dialogue on future technology's beneficial and detrimental implications will have disturbing consequences and trigger a backlash of public opinion. In addition, social acceptance is possible if individuals are prepared to embrace the danger of modern technologies and usually have a favourable perspective of science (Bürgi & Pradeep, 2006, p. 653).

Investment in technologies and most especially production ones, heighten economic output nonetheless this investment at the same time inflicts a negative externality whereby the marginal social development and benefit is lesser than the marginal private benefit. Companies benefit more through the adoption of industrial technologies while neglecting or ignoring if it will be socially beneficial. Unemployment will persist if automation rapidly or slowly dislocates workers from preceding sectors while the newer sectors struggle to engross the displaced workers. Still, channelling the human workforce to education, teaching, health care sectors and other fields means that costs associated with these areas will swiftly increase. In this sense, it will be a winning game but a defeated one. In other words, workers will pay so much to get these services with their incomes, although it is a possible strategy to avoid instability in the society.

Scientific knowledge application and related developments are two of the main variables that determine social progress and prosperity. Social change is as vibrant and complicated as it is in social systems, and it is both the vital component and the driving force concerning social evolution. A multitude of variables determines the evolutionary processes of culture in technology. Advances in any discipline inevitably lead to social relationships, meanings and social patterns changing (Bürgi & Pradeep, 2006, p. 647). Society and the process of scientific and technological development: the protection, improvement and preservation of lives through recent results is inherent to scientific and technological studies because science's very purpose is to serve humanity (Ibid., 648). With new types of organisations, society responds to technological change and develops its reactions to technological innovation. Changes in one system will result in changes in the other because numerous feedback loops connect these complicated organic structures and the sociocultural context, therefore always reacts to technological developments. The method of development forms the evolution of culture, and it is therefore vital to understand the social consequences of technology in order to know and comprehend the direction in which society is moving forward (Ibid).

While our social fascination with technology often focuses on what it can do in technical terms- how many millions of instructions per second, or what an individual could do with it, technology's true significance lies in the choices that it provides within society and to whom it provides them (Charley, 2016, p.169). This huge rise in people's productive ability should not lead the vast majority to a decline in quality of life. People can decide what kind of technology to create and when and how to use it. Ultimately, we must turn our attention to the social aspects

of technological change and, in specific, its effect on energy relations in society (Ibid). New workplace technologies emerge from a system that is generally unresponsive to the needs of the broad populace and over which the broad populace exerts little or no control (Charley, 2016: 170). The net impacts of technologies in terms of how many jobs it destroys or creates are not the issue, but the core point is who has the jobs and skills, what kinds of leverage they provide, and what they mean in a social context (Ibid).

3.18 African Values and the Evolution of Labour

Important environmental characteristic such as culture can hinder the promotion of human-robot collaboration and affect the way these new technologies can be embraced to their fullest potential (Calitz *et al*., 2017, p. 8). Africans do not resist conforming to new technologies and using them, see their reliance on mobile devices, although they would find it more difficult to work with a robot rather than a colleague because African culture focuses more on human relationships (Calitz *et al*., 2017, p. 9-10). The sort of communication needed for technology implementation differs across societies. Therefore, African workforce executives must recognise the fact that in the human-robot cooperative job setting, the manufacturing industry that is implementing technology globally could explore automation differently. Despite that, these technologies are increasingly viewed as co-workers; nevertheless, new human resource management practices will be required to reduce the fear of unemployment in the South African workforce. This will eventually determine the success of human-robot collaboration in a modern work sustainable environment of the future (Ibid., 10-11).

New forms of legislation and global norms are needed to direct technology research, growth, production and marketing. However, the mere establishment of a legal framework or norms is not enough, as it is necessary to enforce the legislation and regulations. A better knowledge of technology's legal consequences would assist policymakers set up a legislative structure and norms that are compatible with their society's dominant value system. This is particularly true and significant for developing nations, where fresh legislation and institutions were implemented during the period of colonial and post-independence. Nevertheless, none of the laws should delay or prevent the development of knowledge directed at improving humanity (Bürgi & Pradeep, 2006, p. 651). Since many of the consequences of technological change cannot be anticipated readily or precisely, this does not imply that employees should not take

measures to prepare for possible modifications as any outcome arises. A point to note is that worker's readiness for the future of work is highly under-researched to date.

3.19 Workers Readiness for the 4IR

Workers who will benefit from the next wave of structural change will be flexible and innovative workers who have made smart future decisions. Similarly, it will be the most flexible employees who will be able to leverage their elevated level of skills, who will find it easier to adapt to modifications in the labour market (CEDA, 2015). Even if technology enters the manufacturing cycle, the jobs effect relies on whether the workplace can adapt to new requirements (Arntz *et al*., 2016, P. 23).

In one automotive industry, operators disclosed that working side-by-side with robot imposed more restrictions on the operators and required them to accept and adjust to the robot (Weistroffer *et al.*, 2014). Employees' individual acceptance of innovation is also affected by co-workers, social networks, socio-economic factors, education, benefits, personal development, identity, past experience and love of technology (Talukder, 2012). In general, people must be convinced of the personal use of any change before they can accept it. In a similar vein, Gates argued that automation cannot advance if the public opposes it (Quartz, 2017). It is possible that Gates is indicating that if all the members of the society are not benefitting from technological domination, it is likely to spawn anti-technology movement (neo-Luddite movement) to contain this automation strictly.

Overall, Smith and Anderson (2014) predict technologies dominating many human jobs in 26 years from now. Nevertheless, ways of living will be created by human ingenuity, just as it has been since the dawn of the Industrial age; even if the system of education does not properly prepare people for the work of the coming years (Smith & Anderson, 2014). Qualities needed by the desired worker to work with these technologies and thrive in the job setting are readiness to learn, support training and upgrade, accepting change, being technologically inclined and adapting to new techniques (Calitz *et al*., 2017, p. 9). Many emerging markets with a youthful, technology-savvy workforce could also develop completely fresh production ideas (Rüßmann *et al*., 2015, p. 11).

3.20 Creativity Skill as Readiness for a Future in the World of Work

Creativity is one of the highest admirable attributes in many sectors of the economy. Most technologies find it hard to create, only to reproduce. However, there is also conflicting evidence. In the future of jobs survey, World Economic Forum (2018) depicted a projection of the ratio of human-machine working hours 2018 versus 2022. It showed that machines are rapidly closing in on the complex task previously regarded as some jobs strictly for human capability, to prepare workforces for the future of jobs, creative-future-ready and emotional intelligence individuals are needed (CEDA, 2015; World Economic Forum, 2017a). What is happening today is that young people are taking their future into their own hands and developing entire new small businesses and industries that did not exist in the past. The belief is that not only the government can solve the problem of technological unemployment but individuals as well. Furthermore, corporations are not in the business of finding better jobs for people; it is equally the role of individuals to find better jobs for themselves. Unfortunately, there will always be a sub-group of individuals who will be unable to catch up with all the technologies. Nevertheless, it is important to understand what to do to prepare our future workforce for this reality to adapt to it and to try to produce ready-people to effortlessly transfer into this new paradigm, since it seems that the idea of automation slowing down is not likely to happen soon.

3.21 Entrepreneurship and the 4IR

This period of work automation is the best time to become an entrepreneur (Brynjolfsson & McAfee, 2012). African nations need to enhance entrepreneurship and education in order to counteract threats posed by this technological age and seize chances that come with it (Naudé, 2017, p. 1). If African entrepreneurs are eventually unable to take advantage of the opportunity to produce at least some robots in Africa, the advantages of creating a product on the continent will be comparatively restricted (Naudé, 2017, p. 7). African companies can, of course, import robots, and they will have to do so more and more as the norms in worldwide value chains will require compliance, but this will come at the expense of job creation. Moreover, as in the past, African manufacturing will have to deal with a small portion in the value chain. The argument is that nations producing and exporting robots will have a competitive manufacturing advantage.

On an individual level, autoworkers can set-up a small-scale business that can yield a minimum profit as an alternative career for subsistence. For instance, in the South African context, Barchiesi's (2010, p. 75) study indicated that plant workers had an unregistered, self-employed second job in which the average income was R588 per month, compared to an average net monthly wage of R2202 as of 2010. This means that businesses can start small. In fact, many workers would not mind being laid off, if that allowed them to collect severance packages and retirement contributions to fund some new self-employed enterprise (Barchiesi, 2010, p. 76). Barchiesi (2010, p. 76) report that lack of funding and challenges in obtaining more schooling are the factors most frequently cited as a barrier to self-employment. Nonetheless, the financial plan for those workers who have lost their jobs is to collect their retirement benefits and pool them with retired colleagues or neighbors to start small, unregistered businesses. Therefore, economic necessity pushes insecure employees into all sorts of alternative employment, which may well be more exploitative than their own official positions (Ibid).

In terms of South Africa, it is important to rigorously evaluate and improve the performance of entrepreneurship programs (World Bank, 2017, p. 13) Arguably, this era of industry 4.0 creates an opportunity for those with an entrepreneurial spirit to thrive in the economy believing that this period of work automation is the best time to become an entrepreneur (Brynjolfsson & McAfee, 2012). Hence, African nations need to enhance entrepreneurship and education in order to counteract threats posed by this technological age and seize chances that come with it (Naudé, 2017, p.1). Arguably, this era of industry 4.0 creates an opportunity for those with an entrepreneurial spirit to thrive in the economy.

3.22 Multi-Faceted Human Capital Development in South Africa - Government/Workers/People Readiness for the Fourth Industrial Revolution (4IR)

Various positive decisions are being made, and numerous changes are taking off and are about to take off in the quest for skill revolution in South Africa that will benefit learners, educators, labour market and the government. Considering the shifting world of work and the transformation in general in our society, a framework for highly relevant skills are being enhanced in order to counter this Fourth Industrial Revolution. To counteract the negative effect of technological domination and to maximise 4IR's positive outcome, the following agendas will be put in place according to the Parliament of the Republic of South Africa (2019):

- A good number of public schools will be transformed into technical high schools;
- Introduce maritime sciences, aquaponics, technical mathematics, aviation studies, technical sciences, aquaculture, hydroponics and mining sciences which are diverse new subjects that technology brings;
- Increase investment in the needed learning infrastructure and ICT tools to train leaners for the present technologies and the ones yet to come;
- To provide digital workbooks and textbooks on a tablet device for all school child in the next six years;
- Fully invest in the training of Master's students and PhD candidates in the varieties of the Fourth Industrial Revolution related discipline and programmes such as Cybersecurity, block-chain, biotechnology and nanotechnology, Robotics, Artificial Intelligence, next-generation telecommunications, Internet of Things and additive manufacturing;
- To form a Ministerial Task Team in charge of the Industrial 4.0 in conjunction with the Departments of Trade and Industry, Basic Education, innovation and research, industry, Science and Technology and academia who are skilful and knowledgeable to participate;
- The historically disadvantaged school will most benefit from these agendas, especially from the digital workbooks and textbooks on a tablet device; and
- To train and upskill lecturers to deliver Life skills curriculum needed in this fundamental transformation.

On the one hand, South African society is majorly aiming to establish an amalgamated knowledge-base and a skill-intensive economy that the transforming labour market requires at present, and in the near future. On the other hand, the rate of the already exacerbating structural unemployment will widen. Notwithstanding that the aim is not to prohibit technological growth but, in this regard, in the pursuit to develop the innovation capabilities, to reskill and upskill at all level, these frameworks and agendas must be revisited continuously, rechecked and weighed to be convinced that the satisfactory inclusive-sustainable policy decisions are effected.

3.23 Human Rights to Work

The 4th Industrial Revolution is changing not only nature but also challenging the very essence of what makes us human (NEDLAC, 2019, p.17). Work provides tangible benefits to people,

whether they are economic or un-monetary (Freeman, 2008). The reports of McAfee (2015) confirmed that money is not all workers gain from working. This indicates that a sense of social attachment and personal worth are derived through having a job and losing such positions harm society, the individual and aggravates public health. People value other people's social interactions at work. Our technological future should be about our humanity, not about technology (Walsh, 2017). Averagely, we like to work, and we like to get paid for work. We believe that we deserve to work and get paid for our work to survive. Thus, if people start to lose their belief in work, they might start to question all kinds of related beliefs. Sustainable livelihood and decent work are what both those in the labour market and even those citizens outside the world of work are thriving for. The government of South Africa has promised to commit to the realisation of both decent work and a livelihood that is sustainable to workers which include fair labour practices, good earnings, employment creation, equality, and rights to work to mention a few.

3.24 Conclusion

This chapter presented the literature on the rate of technology adoption in the workplace. The argument is that automation has been established to be a compulsory change that a thriving and profit-driven organisation must adopt. In the process of work automation, many jobs will be destroyed, and many jobs will be created. However, again, the speed at which jobs are destroyed is not the same speed at which jobs are created or will be created. Moreover, existing technologies are closing in on previously unautomable human intelligence, meaning that machines can still perform the jobs that are currently regarded as scarcest skills, be it technical or/and non-technical skills. The indication is that its practical functions have increased tremendously and range from its dependability, compactness, accurateness, cheapness, low energy depletion and rapidity of operation, which were not possible previously. Having examined the impact of technology on work, the question is: how have trade unions responded to work automation? The following chapter addresses the influence of trade union on technological domination in the workplace.

Chaper 4

THE INFLUENCE OF UNIONS ON TECHNOLOGICAL ADOPTION IN THE AUTOMOBILE INDUSTRY

4.1 INTRODUCTION

Trade union does not have power to effect decision making in the automobile sector, especially with regards to workplace restructuring and task automation which threatens the jobs and welfare of the workers considering that the rate of technology adoption is creating more unemployment as technologies are efficiently performing tasks that were previously performed by workers who are union members. This argument concurs with the general thesis of this study which posits that although the introduction of technologies multiplies the number of cars manufactured per day, in spite of this, job insecurity and resulting job losses are provided for mostly low skilled workers. Such claims are related to the insight into the philosophy of the labour process, which suggests that the administration of subcontracting employees through the trade union to carry out labour (Braverman, 1974, p. 61), nevertheless, the labour cycle is solely the responsibility of the employer and his representative.

Therefore, the power to restructure the workplace is based on the decisions of management (Charley, 2016); in fact, the systems of the labour process are often designed and created with disrespect for the workplace, regulation and elimination of worker participation (Charley, 2016, p.170). Further, LPT maintains that technology is used to regulate and govern the working class, which can exacerbate deprivation, separate culture, reduce skill workers, decrease jobs, polarize the workplace and allow class conflict.

The previous chapter presented the various discussions, controversies, agreements and recommendations within the Fourth Industrial Revolution discourse and some observations were made in the process. The discourse revealed that in the quest to boost productivity, remain competitive, cut cost and maximise profit; auto companies are adopting labour-saving technologies. Therefore, the rate of car factory automation is increasing. Another observation is that while organisations are ready to exploit the full potential of 4IR, workers are not prepared for the negative outcome. Caught in between, the South African government is struggling to identify and implement the appropriate policy that will wheel 4IR for the betterment of auto workers, automotive sector, their representatives, the economy and its

populace. This chapter looked at the influence of union on technological adoption in the automobile industry.

4.2 The Core Argument of this Chapter

The analysis of the literature in this chapter illustrates the reality that the labour union lacks control and power on workplace reorganisation. The indication is that the union's decision-making contribution and involvement do not count in the organisation, mostly on the adoption of advanced technology. The management's unilateral decision, which alienates the role of employer and employee in decision-making on the restructuring of the workplace negatively affects the preparedness of trade union for the introduction of shop floor robotics and their impact on their members. Thus, workers and their representatives have little influence on how many robots should be employed in the car plant. The central position of the thesis of this study corroborates the contention in this chapter that though the implementation of robotics ensures efficiency in the automobile sector it neglects the welfare of the workers in terms of the organisational decision that affects their job security and future in the company.

4.3 Brief Synopsis of Automobile Companies in South Africa

Fully imported as Completely Built Units were sold in South Africa before 1920s, meaning that there was no automobile assembly in SA before then. In order to support the need to purchase locally produced cars, halt the dependence on importation and develop the local industry, the South African government implemented high tariffs to discourage imported vehicles (Hartzenberg & Muradzikwa, 2002). For this reason, different car manufacturing companies set up car plants in South Africa in 1920s. However, in 1970s/80s, due to the sanctions imposed against South Africa as a result of the global intolerance of the apartheid government, Ford Motor Company (FMC) and General Motors (GM) pulled their investment (Duncan & Payne; 1993); other car companies such as Volkswagen (VW) and BMW (Bavarian Motor Works) continued their operations (Ibid., 14).

Transformation in South Africa in the 1990s necessitated the sanctions to be lifted. Since then, the South African auto industry has been competitively trying to race in the global automobile market equally. Automobile companies such as Mercedes Benz (Daimler-Benz), VW and BMW are headquartered in Germany; FMC and GM (GM is no longer in South Africa) both are headquartered in the United States while Nissan Motor Company and Toyota Motor

Corporation are headquartered in Japan. This means that they are foreign-owned companies with production facilities in South Africa.

In order to support businesses to compete in global and domestic markets, automobile assembly firms, with the support of the state elite, encouraged domestic automotive companies to sell shares to transnational businesses (Masondo, 2018, p. 209). This was to guarantee that once these companies were acquired by transnational companies, they would increase investment in development, including technology improvements and creativity, to make South African companies competitive internationally. The state elite claimed that domestic vehicle manufacturers alone could not invest in advanced technological production methods to reach global economic expectations (Barnes & Black, 2013). Export levels were to be used as an indicator of the degree to which corporations were globally competitive. In line with the general trend of merger and acquisition of an investment in the 1990s, in 2003 automakers, now renamed Nissan South Africa, took over their Japanese parent company, which increased their stocks from 98% in 2003 to 100% in 2010.

In 2010, Delta became wholly owned by the American company General Motors, while Mercedes-Benz, after its merger of Chrysler in 2007, became wholly owned by the German company, Daimler AG. By 2010, Samcor and Toyota South Africa were also wholly owned by their parent companies. As a result, South African car manufacturing businesses have been fully integrated into the strategic plans of their parent companies. It ensures that investment decisions and quality standards are decided outside the countries where these branches are based, even though the South African Bureau of Requirements has a role to play in quality control (Masondo, 2018, p. 214).

There have been no national attempts to control investment decisions of different companies except using the MIDP to encourage automotive firms to produce for export under domestic terms agreed with the automotive industry, which required state aid to be globally competitive (Barnes & Black; 2013). The state could have extended more regulation to vehicle manufacturers in order to increase production and rising vehicle models in order to achieve economies of scale. Establishing and extending a domestic automotive manufacturing plant includes funding and leveraging on a macro scale, as well as technology and new inventions.

Nevertheless, South African transnational car companies have already developed local and international business networks and technological capabilities, as well as the capital, and do not need a state regulatory mechanism close to that of South Korea (Masondo, 2018, p. 215). Looking at market trends, global automotive demand fell by 1.1 per cent in 2018 to 95.6 million cars, down from 96.7 million production units in 2017 (Export.gov, 2019). The lower output may mostly be related to the 2.04 million or 2.8 per cent drop in passenger car production from the 72.72 million delivered in 2017 to the 70.68 million recorded in 2018. South African automotive production increased by 1.6 per cent to 610 854 units in 2018 from 601 338 units in 2017, mainly supported by record vehicle exports. In terms of global light commercial vehicle production, South Africa ranked 15th with a market share of 1.24 per cent, while the country ranked 26th with a market share of 0.46 per cent in 2018 for global passenger car production. South Africa was the leading market on the African continent, accounting for 54.3 per cent of overall production capacity in Africa (Export.gov, 2019).

4.4 Overview of National Union of Metalworkers of South Africa (NUMSA)

In 1987, Metal and Allied Workers Union (MAWU), the Motor Industry Combined Workers Union (MICWU), the National Automobile and Allied Workers Union (NAAWU), and the United Metal, Mining and Allied Workers of South Africa (UMMAWOSA) were merged to form NUMSA. NUMSA was the biggest metalworkers' trade union in South Africa affiliated to Congress of South African Trade Unions (COSATU), the largest trade union federation in South Africa. NUMSA was ousted from COSATU in 2014. This removal was as a result of NUMSA's decision to stop supporting the ANC (African National Congress) in the 2014 general elections. ANC is the Republic of South Africa's governing political party. NUMSA maintained that the party had failed workers. Presently, NUMSA is the largest trade union in the South African automotive industry. This is an industrial union structurally located and organising in the metal and related industries such as the automobile sector (Mashilo, 2010).

4.5 Global Union's Influence on Technological Adoption.

Technology adoption according to (Jones, 1987) has proven to be problematic and a source of frustration for trade unions. This is for the reason that the adoption of technology with its associated interference in the workplace creates doubts about job security. Such dissatisfaction intensifies since there are few instances where unions successfully control automation, and

frustration deepens with the understanding that technology could be employed in a way that the skills of the workers could be replaced. The IndustriALL Global Union which represents workers across the supply chains in manufacturing sectors in more than 140 countries at the global level stated in Union (2016, p.1) that "technological changes in the workplace have deep social implications, as temporary and casual work risks to spread further, unemployment runs high, wages are low and workers' rights attacked." These vulnerable workers are aware that these new machines could certainly be designed around their unique skills, employing their knowledge and creativeness to improve the quality of products and services provided to the public in a significant way (Jones, 1987).

There is lack of easily accessible technical alternatives that could be used to fulfil the ambitions of the union to provide more job security (Jones, 1987, p. 144). Restricting their bargaining ability has often compelled trade union officials to rely on traditional threat and coercion tactics to force the employer to deliver the required service (Ibid). Lack of effective options and limited discourse of technological implication have eroded the ideas of unions on what they can reasonably accomplish. Unions were, therefore, compelled into reactive responses instead of proactive reactions to problems that affect workers in the workplace. Ultimately, unions embraced the implementation of technology because they were unable to prevent it and also because they recognised its potential advantages for employees of the union and society as a whole, such as replacing boring, repetitive and meaningless tasks, even though, union demands for socially responsible implementation of different technologies are often theoretical, abstract, and utopian (Jones, 1987: 144).

4.6 NUMSA and its Influence on Technological Adoption.

With specific reference to the National Union of Metalworkers of South Africa, in the 1980s, NUMSA did not have a coherent strategy to influence, respond and engage with work restructure in the manufacturing sector; its agenda was dedicated basically on fighting for freedom of association, organizational rights and against the apartheid regime as a system of political domination (Masondo, 2010, p. 48). Management's unilateral work reorganisation, the changing work practices without negotiations and its unfavourable outcome on workers forced NUMSA to voice out in 1989 criticising the approach and resolute in committing in taking part in the decisions around work reorganisation at all levels (Forrest, 2005: 203). The union exerted power to participate in reorganising the workplace and on other wide-ranging

economic issues in the manufacturing sector. In the 1990s, some shop stewards of NUMSA were indomitable to engage with management and the government on issues around restructuring of the sector, workplace and the economy with a constructed purpose to ensure living wage, job security and, to meet the basic needs of the citizens and create additional jobs (Forrest, 2005, p. 253). In 1993, one of the NUMSA's National Congress emphasized that any changes in the labour process must aim to empower the working class through the creation of new job opportunities and security, skill upgrade, sustainable environment, and technological adoption that accommodates the needs of the society as a whole (NUMSA, 1993, p. 14). The policy of NUMSA specified that union must demand that the installation of new technology, new labour process, reorganisation of the workplace and other work-related concerns must be discussed and negotiated with the unions (1997, p. 30).

4.6.1 Unilateral Decision by the Management

Management or their unions does not consult the union before adopting technologies in the workplace, which makes it difficult for the union to deal with the effects of technical changes in the work environment (Hlatshwayo, 2017). The assertion by Masondo's study noted that when assembling new car models, any other automotive assembly plant massively transforms their work production systems and processes (2010, p. 100-101). However, the decision regarding this transformation is single-handedly made by the management and imposed on the workers and the unions. Most shop stewards sensed that the company is not interested in their strategic leadership, inputs and strategic decisions on how work should be restructured and organized given that they are foreign companies in South Africa and for this reason, unions and workers do not have real influence to make decision in a foreign-owned company (Masondo, 2010, p. 116). Often proposals about reorganization and new structures are taken by supervisors and managers and enforced as such, and the front-line workers have not been included in restructuring, and that is why plant workers have always argued that managers "hold us in the dark" regarding improvements, poor communication and lack of trust between employees and management (Vidal, 2004, p. 12-17).

This unilateral decision at auto-plant headquarters like Germany, which neglects the union and worker's decision and influence on work reorganisation is what Masondo (2010) referred to as "imperial restructuring". This signifies the power of Multinational Corporations (MNCs) to unilaterally rearrange work in plants owned by them in developing countries. For instance, the

320 new Kuka robots are energy-efficient and faster in producing higher volume quality cars than human workers, but allow humans to concentrate on human-related tasks, as installed at the Uitenhage Volkswagen South Africa (VWSA) body shop in 2016. This decision was not discussed with union or workers beforehand (Masondo, 2010; Hlatshwayo, 2017). This move neglects NUMSA's policy with regard to consultation about introduction of new technology, which states that "a company must give six months' notice of the introduction of new technology. This notice period must be before the decision to purchase the machinery" (NUMSA, 2012, p, 16). The reason why VWSA neglected the unions and their workers' influence on technological adoption is because of their power of imperial restructuring (Masondo, 2010).

Management seems to violate union's six months' notice policy, yet, unions had never been able to engage with employers before the technology is introduced. It is always difficult for unions to ask a company to return machines to their manufacturers when they have already been purchased (Hlatshwayo, 2017, p. 107-108).

4.6.2 Workplace restructuring, worker's participation and unilateral decision making

Aside from the fact that the unions are not consulted in the process of technological introduction, workers also are not consulted and are unable to influence work reorganisation and its process. This means that management has the power to unilaterally purchase and install technologies on the assembly plants without workers' involvement in the decision (Masondo, 2010, p. 3). Furthermore, he stressed that because car plant-like VWSA is controlled from the VW headquarters in Germany, the power of VWSA workers to influence reorganisation of work is almost none. In the current age of neoliberal globalisation, worker participation should not necessarily be seen as a process initiated and driven by employers alone because workers sometimes seek participation, especially when confronted by possible job losses and insecurity. Masondo argues that despite workers in auto-plants in Germany being actively involved in and influencing work restructuring processes, compared to their counterparts in South African auto-plant, worker participation takes different forms and characters. This implies that not all forms of worker participation give workers the power to influence decision making in workplaces (2010, p. 3-40).

Vidal (2004) identified two forms of worker's participation: substantive empowerment or nominal empowerment. Substantial empowerment includes amongst all, clear participation in

deliberation and decision-making and the ability to change corporate procedures, while nominal empowerment includes the aggressive quest for feedback from and/or the transfer of new responsibilities to staff, but without real authority or daily, direct involvement in policy-making and problem-solving. Despite these empowerments, workers have no power to make decisions to alter the work reorganisation (Vidal, 2004, p. 6). In other words, irrespective of both empowerments, there are no indicators of enhanced democracy, control or power-sharing (Ibid., 11). These two forms of workers' participation can be regarded as an illusion of choice, according to Burawoy (1979). With the "illusion of choice", workers prefer to consent and participate in the labour process and treat the labour process as a game and "make out" as long as they get their monthly wages, incentives and remain employed (1979, p. 27). To put it simply, workers are happier when they feel that they have some sort of free will and control to effect changes in the car plant.

So far as the interests of workers (satisfactory salary and job security) and the interest of management (surplus value) align, the game will all work out (Burawoy, 1979). This can justify why NUMSA is more interested in the wage increase. However, this game to some extent is not all working out. The reason is that on the one hand, the management of motor companies are increasingly becoming competitive like never before and therefore sourcing for labour-intensive technologies that can boost productivity and efficiency. On the other hand, the South African autoworkers and their representatives are increasingly becoming aware of the deleterious effect that these labour-intensive technologies have on their future in the labour market.

Friedman (1977, p. 116) acknowledged that workers could be susceptible to managements "direct control" of the work process. Most recently, Hlatshwayo (2017) and Masondo (2010) confirm this control by maintaining that the CEOs of the auto companies in South Africa noticeably evolved their work production systems, processes and routines unilaterally. The evolution of such is only the decision of the management without the input of NUMSA or auto workers.

Over the past three decades, the number of mobilized employees in South Africa have preferred to negotiate with employers on the basis of a cooperative mandate and workforce freedom in order to reform and democratize the workplace, and yet the development of new production processes still does not require significant involvement of workers (Webster, Masondo &

Bischoff, 2019, p. 13). This was why Barchiesi (1998, p. 60) echoed that generally, the labour process is led by administrators, with very restricted prerogatives in the field of co-decision taking and tendency against top-down contact.

However, Vidal (2007, p. 262) uncovered that participation in decision making, with regards to work reorganization of all sorts, is not on the agenda of some factory workers though others have always wanted to give their input on the labour process in their workplace. Although employees can be pleased in comparatively conventional Fordist systems, a relatively small percentage of workers are eager to take part in practical decision-making and problem-solving, a relatively small proportion are staunchly opposed and the rest are in the centre. Vidal also states that, for most employees, predictability at work, strong interpersonal relationships, effective management contract, equal pay and job protection tend to be more critical in creating a positive work atmosphere than opportunities for active involvement in decision-making and problem-solving in the organizations (Vidal, 2007, p. 272).

Whereas employee feedback is actively sought and worker proposals are often sought, this mechanism works within the context of the conventional authority structure, where management issues and goals are established, employee discretion is severely restricted and deliberation and decision-making are minimal (Vidal, 2004: 10). Shop stewards in the factories are to some point alienated and prevented from meaningfully engaging in changes in the workplace driven by management. Considering the pressures on the companies by neo-liberal globalisation and trade liberalisation, many shop stewards are unwilling to impede the work reorganisation (Masondo, 2010, p. 100-101). Nevertheless, workers should be involved in the restructuring decision making, since many scholars according to (Ibid., 2010, p. 33) regard workers participation on work restructuring processes “as institutional capitalist machinery set to quell industrial unrest”.

4.6.3 Union and its Reactive Nature

Union react slowly to technological modifications in the factory (Hlatshwayo, 2014, p. 287); manufacturing problems only arise when it begins to affect workers ' positions in the plant. The problem is that unions tends to bargain with companies after technology had already been introduced and that negotiations with management focused on the redeployment of workers who had been replaced by machines. The union’s statement often indicates that they have no plan to engage proactively with technological changes at plants in order to mitigate the effects

of these changes on workers. Instead, the union complains and put media pressure on the company as part of what can be considered a "rearguard strategy", since it entailed responding after the technology had been implemented (Hlatshwayo, 2017, p. 107-108). Unlike wages, managers of manufacturing plants view technology as their preserve, although technological change affects the nature of work, skills and numbers of jobs. This is then worsened by the fact that unions tend to put the technological change on the back burner when it comes to collective bargaining, allowing managers to operate uncontested in the terrain of technology (Hlatshwayo, 2017).

South African trade unions, according to Hlatshwayo (2017, p. 114), did not formulate strategies for dealing with a management that is not willing to discuss production issues. The unions could have tabled production and technology issues during negotiations, but instead, collective bargaining was dominated by wage negotiations and was engaged in politics for personal gains. It is just recently that unions like NUMSA are starting to adopt a more worker- and community-oriented type of politics and promised to table technology concerns as one of the key bargaining issues. Since the unions and workers do not think that management wants to engage with them on production issues genuinely.

Consequently, the best form of response by the unions should be to combine production and wage issues in every round of bargaining. Strikes, therefore, must not be just about wages, but also about production issues. However, this can only happen when unions demand access to production plans and devise research-based responses that seek to protect workers' interests (Hlatshwayo, 2017, p. 114-115). It was in 2017 that NUMSA included technology and production issues as part of their agenda for collective bargaining (Hlatshwayo, 2017), as there was a realization that employers wanted to use restructuring to deal with their problems of profitability. Unions should demand production and technology plans so that they formulate informed positions to save jobs. Management at the plant is using its authority and control of the plant to initiate and enforce technological modifications, with unions only reacting afterwards (Hlatshwayo, 2014, p. 292).

4.6.4 Automating Union Members

NUMSA acknowledged that the Fourth Industrial Revolution is creating more unemployment as technologies are efficiently performing tasks that were previously performed by workers (NUMSA, 2016b). The post-Fordist labour process in the automotive industry is progressively

becoming deep-rooted (Masondo, 2010, p. 39). Jobs are becoming increasingly precarious, particularly in the manufacturing sector, as job losses are announced almost daily and employees are suffering from short-term work and compelled to negotiate arrangements for training layoffs (NUMSA, 2016). In some instances, workers were made redundant and took severance packages (Hlatshwayo, 2017). Considering the shocking level of unemployment, the likelihood of discharged employees finding another job is near zero (NUMSA, 2016). For instance, a report by NUMSA in 2004 indicated that Tiger Wheel and Tyre retrenched more than 400 workers since 1999 as a result of the adoption of different technologies.

Companies have been effecting work processes that are labour replacement capital-intensive to substitute what they call an unproductive, incompetent and costly human labour since the Second Industrial Revolution. "Contrary to all the rhetoric about workers being unproductive, labour productivity has increased substantially over the recent period. For about 24 years – from 1970 to 1994 – labour productivity increased by less than 1% a year. Between 1994 and 2012, it increased by more than 3% a year, rising by as much as 7% between 1994 and 2012! However, this increased productivity did not help workers, whose share of the national income went down at the very same time, workers were more productive" (NUMSA, 2016). Certainly, technological modifications that eliminated traditional abilities, automated union jobs have made it easy to move jobs to non-union factories, non-union regions and even other nations (Charley, 2016). Different CEOs of the automobile manufacturers have to share with NUMSA some of the challenges they are having and talk to them about the need to re-skill workers in order to save their jobs (NAAMSA, 2019).

4.6.5 Reasons Behind the Union's 'Rearguard Approach'

Numerous challenges have been encountered by NUMSA which include the gradual decline of the union's Research and Development Groups, failure to transmit information about workplace restructuring to members, opposition from within and lack of trust between employers and unions (Masondo, 2010, p. 59). Explanation as to why the union has been unable to respond proactively to automation is that they focus on 'palace politics' and politics of 'upward social mobility' at the expense of attending to issues of production and technological transformations and even NUMSA acknowledges this reason (Hlatshwayo, 2014, p. 297). Thus, the union spend their resources and time mostly on wages and alliance

politics instead of engaging work reorganisation and technology, creating labour systems on the shop floor and undertaking factory-based technology research and education.

According to Hlatshwayo, seemingly, the union structures and leadership in South Africa do not help the union or their members even to begin to respond adequately to technological and production changes. The explanation to this can be divided into two: (1) "politics from above", which entails using political space to advance the individual interests of union leaders, and conventional union issues. (2) splits within the unions, which make the task of building the capacity to engage with technology even more difficult. This is why a comprehensive dialogue on how to respond systematically to technological innovation have not been provided by congress (2017, p. 111).

There is an acceleration in the use of new technologies such as robotics. The implications of divisions within unions, and of weakened labour, could indicate that trade unions are currently unlikely to mount a formidable response to pervasive automation (Hlatshwayo, 2017, p. 113). The current division inside the trade unions has amounted to their reluctance to improve their delivery to members, much less coordinate unstable workforce and partake in innovation issues (ibid., 100). That is why the unions respond to technological developments just after they have already been enforced by management in the automotive industry. South Africa's position in the global division of labour and the current neoliberal global development trajectory makes it easy for multinational corporations to use their power to embark on imperial restructuring of work (Masondo, 2010, p. 79).

4.6.6 Power and the Management

The reorganisation of the workplace has vastly increased the power of management in relation to the workforce, and this seems to be a move toward workerless factories and expert systems (Charley, 2016, p. 169). Management can generate a product or provide a service without depending on the workforce's traditional abilities or human effort, which adversely affects and undermines the workforce's bargaining power. Power arises primarily from the dependence of management on a certain set of employees to create a product, to provide a service, and eventually to make a profit. "Now, when their system, which is always a crisis for the working class, is not working well, they hire fewer workers, pay low wages, become more brutal in the workplace, and generally do not care about the safety of workers as they struggle to squeeze as many profits as possible from the workers" (NUMSA, 2016). The power of management arises

from owning or controlling the organisation, the labour process, technology, and from the reality that the workforce depends on the workplace to make ends meet. This means that sources of power are concentrated on management's decisions (Charley, 2016), which is unilateral and can sometimes be termed "imperial restructuring" (Masondo, 2010).

It is vital not to neglect job loss and changes in skills, as effects of technological adoption; however, the most significant impact of technological change is its impact on power relations for both employees and management in the industry (Charley, 2016). Many of the traditional sources of union or employee authority or leverage are undermined by the design, development and implementation of new techniques. "We are the slaves," "without them buying our labour we are as good as dead". Capitalism is a system that enslaves the majority of people to work to enrich a small minority of individuals. They own the labour, so they own workers as workers need the salaries to survive (NUMSA, 2016). With this point, it can be argued that the unions are fighting for survival. Unions are powerless to react to technological transformations effectively and they see technological change as an imposition from management (Hlatshwayo, 2014, p. 288-294).

Trade union leaders and shop stewards are responsible for putting innovation and productivity matters on the membership map, as the economic and labour transitions of the economy play a role in pushing the boundaries of jobs and layoffs, which inevitably threaten the trade union and members (Hlatshwayo, 2014, p. 296). Furthermore, technologies are often intended and created with contempt for the workforce, control and reduction of worker involvement (Charley, 2016, p.170). Effective technology policy must go over and above addressing the side effects of technological innovation to address the core issue of power loss (lack of union influence) that the workforce experiences (Ibid., 167). Technologies are enforced without any regard for the workforce's requirements. Hlatshwayo (2014, p. 299) concludes that incorporating dual approach for both mainstream labour interests and innovation and development will serve to save some employment and play a major role in the life of employees at the workplaces.

4.7 The Importance of the State in Shaping Work and Technology

This present transition will involve public policy to amend the adverse outcomes of dislocation, unlike the Industrial Revolution transition, where the support of the government was not in

play. Workers in SA does not enjoy any real support from their governments to secure participation in decision making on issues related to the restructuring of work. The truth is that any resistance to the introduction of new production systems or methods on the part of labour is likely to be viewed as an obstruction to development and modernisation (Masondo, 2010, p. 123). Governments should embrace a wide variety of strategies to support the implementation of technology, fund academic organisations to provide training of different kinds and provide a broad variety of programs and incentives to encourage companies to provide training (Boothby, Dufour & Tang, 2010). The state can also be called upon to intervene practically in a manner that saves jobs, as jobs are part of the state's development agenda (Hlatshwayo, 2017, p. 115). In this case, the South African government must function to assist the transition through the provision of support to affected persons or non-affected persons to adjust to the technological changes. The government requires to be at the forefront of providing its people with possibilities to access technologies across fields such as infrastructure, connectivity, abilities, incentives, policy frameworks and regulation. It must also establish policies for regulating action in fields where the technological revolution is likely to have the most significant effect (Phillips, et al., 2018, p. 24).

Government investment in the African knowledge base is much required, as it can be asserted that the most severe constraint for African entrepreneurs to exploit the possibilities of the Fourth Industrial Revolution, exposing employees to automation, is the absence of abilities and training. The need for African labour force training and re-tooling to find jobs less vulnerable to automation requires more recognition (Naudé, 2017, p. 13-14). To be able to adopt technologies and participate in this era, the African government needs to focus on improving education and significantly upgrade its investments in the performance of its workers, reflected in the sort of abilities required to absorb and use modern technology, produce and adapt technologies and market less prone to future work automation (Ibid., 17).

For PwC, working with employers and educational providers, the government should invest more in the kinds of education and training that will help individuals in this increasingly automated globe to remain one step ahead of the robots. Employees need to be better matched to fresh possibilities. Furthermore, central and local authorities also need to assist industries that can create fresh jobs (PwC, 2017). Below are some possible policies that could assist affected workers.

4.7.1 Training Layoff Scheme

For instance, workers in Denmark have the ability and responsibility to embark on a training or retraining program to upskill their existing skills or to develop an entirely new set of skills soon after they lose their jobs. South Africa has a similar program, which is a training layoff scheme that was established in 2009 as a retrenchment substitute to upskill and retain workers in employment, which runs from three to six months of training. However, workers stay in employment during the training period but forego their regular salary for a training bonus, and they can also combine short-term job agreements throughout the training phase.

4.7.2 Individual Learning/Training Accounts

Another possible policy tool is individual learning/training accounts connected to employees. Workers can use this account to acquire training/computer qualifications if they are laid off or need to upgrade their current abilities (Martin, 2017). In several OECD countries, such systems exist. To give an example, the 1999 budget set up an Individual Learning Account (ILA) in the UK. However, after two years of operation, the system was abolished when it was disclosed that educational providers were committing fraud using the scheme (Martin, 2017).

4.7.3 Robot/Technology Paying Taxes

Bill Gates, in his interview with (Quartz, 2017) proposed that robots who took jobs from human workers should deserve to pay taxes matching that worker's income taxes. Meaning that "robot paying taxes" is a metaphor because it is the company that will pay the taxes. Gates maintains that the retraining of the labour force to transition to health services, caring for the old and sick, education, teaching or other fields where human workers will remain vital and hard-to-automate. Also, government-funded resources will be supported by these taxes. Intentionally, this strategy would slightly reduce the rate of that technological adoption, providing sufficient time to transition to another service. To decipher this idea, Gate is putting this scenario in a box. Since companies no longer have to pay the wages of those countless replaced workers, they should still pay the tax for the income generated by their robotic substitutes. Gates asserted that the government should raise the level of tax of adopters of technologies and even slow down the speed of robotics to be able to manage this displacement. Governments have a part to play in managing such impacts and programs rather than relying on companies to redirect employment to assist individuals with reduced incomes.

This idea has, however, been criticised by PwC (2017), arguing that it might not be economically efficient to tax only the robots because it is singling out robots and neglecting other labour-saving technologies. Boothby *et al*. (2010) noted that public policies promoting the implementation of technology sometimes come in the form of tax incentives for expenditure in machinery and equipment, for example, by allowing for quicker depreciation.in these techniques, the adoption of particular types of new technology can be promoted. Investment in associated infrastructure is another type of public policy to encourage technology. Government assistance in the implementation and training of technology is often given at the same level as the public by several levels of government and distinct agencies. In principle, each set of these policies seeks to improve the quality of labour or capital

4.7.4 Voluntary Severance Packages

It seems extremely likely that the 4IR will result in important changes in demand and skills supply, creating winners and losers in this process. In turn, this raises the inevitable question if 4IR gainers may compensate and improve the loser. Whether the technological shock leads to a potential improvement in Pareto (where a decision leads to a social benefit for other people in a society which leads to a win-win choice) or not. Even if that is the case, the question arises inevitably as to whether or not the pay-out takes effect and in what manner. Nonetheless, the winners are often not paid or the pay-out is typically not complete or can contribute to further reductions in performance. Compensation is now typically defined in financial terms (e.g. severance compensation or unemployment benefits), but it can also take the form of resources provided to people to encourage them to improve their skills and employment opportunities in accordance with emerging labour market requirements. Relevant facilities include a range of jobs, education and training programs that could allow employees to improve their skills at this age, such as technical skills (Martin, 2017).

4.7.5 Universal Basic Income

The view that technological change has caused significant unemployment has triggered calls for new measures such as minimum basic income (Ford, 2015). It may be necessary to supplement salaries for particular groups of employees by some redistribution of income (Mokyr, Vickers & Ziebarth, 2015, p. 47), through Universal Basic Income (UBI). Countries such as India, Netherlands, Brazil, Finland, several states in Canada and the US are practising UBI schemes. With regards to the economic future of South Africa, one of Africa's richest man

Johann Rupert notified that he is in favour of UBI as one of the solutions to the growing inequality and threat of job losses due to automation. He stated that such social and economic transformations would excavate "political extremism and hatred in society" and to mitigate layoffs by globalization, we would have to think of ways for an economy that works. Rupert states that people have to be given time to re-skill for a new economy in South Africa. COSATU has called on the government of South Africa to implement a basic income guarantee. The idea of a UBI has gained traction as a potential way to maintain the wages of those who are losing out of globalization and whose demand is crucial to keep the country moving (PwC, 2017). Nonetheless, UBI must be put into practice in a way that it will not disrupt the present economic structure. This wealth redistribution should be seen as a means to invest in and support the common good.

4.8 The Existence of the Social Movement: Luddite and Neo-Luddite Movement

There have been some movements against the rate of technological application since the Industrial Revolution. In a nutshell, a Luddite uprising took off between 1811 to 1812. The group burned factories and exchanged gunfire with the securities of some companies and soldiers. The unrest was defeated between 1812-1813. Luddites condemns both the cutting of wages and the imposition of machines. The tussle was to put down machines that negatively affect the workers. The Luddite movements were against technologies that epitomise control over society and nature. It is vital to note that Luddism was not resisted to technology. Nevertheless, they revolted against the societal problems triggered by the application of technologies that was fading occupational values which were central to many societies and related to the issues of the adoption of robotics in the auto sector.

Since the 19th century, anyone or group who directly challenges any technical system that seems to reduce or eliminate human workers (focusing on employment/job context but this also can include any type of modern technology and the defence of nature), is referred to as a neo-Luddite. They argue that the extent and complexity of technological change in modern society threaten the essence of humanity. Limited intellectuals are involved in the neo-Luddite movement. For instance, in the later 1980s and early 1990s, a group of activists and writers named themselves "neo-Luddites", canvassed against the negative impact of technologies. Recently, a group of drivers in New York are moved against technological progress. These groups include the Upstate Transportation Association (UTA) and the Independent Drivers

Guild (IDG), requesting for 50 years ban and the prohibition on self-driving cars. They argue that driverless vehicles will not yield a profit to the economy and most importantly, these significant groups of human drivers strongly contend that saving their jobs is the major reason they push to stop the technology to operate. In the past, social panic over the disappearance of the need for a human job has often been connected with the development of industrial technology, the best-known example being the Luddite movement in England in the nineteenth century, which resorted to smashing equipment in a futile attempt to prevent factory owners from installing it. However, the Luddites were craftsmen, highly qualified employees, and feared being substituted by less qualified workers.

Nevertheless, so far, there has not been such major movement in the car companies in South Africa but there is a reaction by the union to technological modifications in the factory; however, this reaction is slow (Hlatshwayo, 2014, p. 287). The decision of multinational companies to assign car manufacturing in South Africa was made in terms of labour stabilization. South Africa has been depicted as an unstable basis for the production of cars and parts for the global economy in a number of extended industrial activities (Sitlu, Panday & Karodia, 2014, p. 126). Industrial affairs stabilization and near co-operation among workers and associations to enhance efficiency and general efficiencies are crucial in an attempt to attain the current annual car manufacturing targets in South Africa (Sitlu, Panday & Karodia, 2014; NAAMSA, 2019). Without this teamwork, the effect of the union strike will reflect GDP growth and the balance of payments of South Africa, and for a long time, the industry will be aware of the consequences of prolonged industrial action.

4.9 Conclusion

This chapter examined how trade union, with specific reference to NUMSA influence the adoption of technology in the automobile sector. The review observed the dearth of research on the influence of trade union regarding task automation in the manufacturing sector as a whole. Even NEDLAC (2019, p. 110) is aiming to consider further research on topics such as the futures of worker's representation and the role of trade unions regarding 4IR in South Africa. Albeit, the review of literature in this chapter highlights the fact that the unions are at present, fear the rate of adoption of new technologies in the automobile industry and NUMSA is seemingly underprepared or ill-equipped for the adoption of shop-floor robots and its influence on worker's job. Another highlight from this chapter is the unilateral decision by

management, which alienate union and worker's participation in the workplace transformation decision making. Hence, workers and their representatives have no control regarding how many and when technology should be adopted. The next chapter examined the three varied theoretical frameworks of the study.

Chaper 5

Conceptual-Cum-Theoretical Framework

5.1 INTRODUCTION

For the study of this nature should have various elements and those elements would include the development of the economy, knowledge about the evolutionary economics of labour process and adaptable employer and employee relationship. For these reasons, the conceptual-cum-theoretical framework adopted to channel this study included Labour Process Theory (LPT), Evolutionary Economics Theory (EET) and Corporate Social Responsibility (CSR). While LPT is the core theoretical framework of this study, EET and CSR discussions are demoted to the background of this study and are consistent with the study analysis. LPT itself cannot be the driver of the resurrected labour sociology. However, with its focus towards the complexities of neoliberal political economy, it is well-positioned to be at the core to participate in the new perspectives of economic history, job relations and to extend its conceptualization of labour-power (Thompson and Smith, 2009, p. 926).

The utilization of these eclectic theories has been very useful for arriving at the following findings:

(i) It is very necessary to align workers with the technical change to achieve faster and more accurate efficiency and to remain competitive internationally in the automobile industry. But with increasing efficiencies, such innovations lower the amount of worker's workload that affects the worker's role in the organization, thereby threatening their job security.

(ii) Employees are learning new skills and retraining to conquer or exceed the rivalry with robots as automation has deskilled autoworkers. However, employees claim that it is a losing fight for the autoworkers and a winning battle for the machines as technology becomes smarter yearly and management always adopts more of these innovations yearly.

(iii) Some activities are technology-dominated but at the same time, some activities are created for higher-skilled employees. Results show that technology adoption is on the rise, resulting in about 100% body shop automation, 80% paint shop automation and 20% assembly ward automation.

(iv) During this automation era, employees could never be prepared for such structural change that threatens their welfare considering that the power which affects the whole process of labour and work is not in their hands, but can reluctantly embrace it without much alternative to other career paths which is not in the grasp of susceptible to automation.

(v) Although the management does not display flexibility in the training of workers in general, certain skills such as design and implementation of technologies are reserved for management's discretion. Employees and their trade union are not entitled to make a response to the workforce reform agreement, which has now reduced the number of workers from 10,000 to 4,000 in a specific motor company - to take one example. As a consequence, in the car industry; job insecurity, workers' vulnerability and unemployment remain.

The main purpose of this chapter was to construct a satisfactory heterogeneous theoretical model under which manufacturing technologies are implemented to collaborate with human workers, the dynamic nature of technologies, its contribution to the economy, employment, skills and social factors that guild and impede technological growth. The models are explored in detail and partly criticised. Further, it examined elements of technology in the workplace and how the outcome differs over time in the world of work and society.

The study has a primary objective to investigate the level of technological domination and the future of workers in the motor industry in South Africa. Therefore, the study was divided into five secondary objectives to grasp the complete knowledge of the study. To be able to explore and understand each of this study's objectives and the issues around it, one or more theoretical framework was applied to view each objective of the thesis.

Therefore, all three theories (LPT, EET, and CSR) were utilized on research objective one: to explore the experiences of South African workers concerning the introduction of technology in the workplace. EET and LPT were adapted in study objective two: to establish how workers compete with rapid technological domination in the workplace. Objective three and four sought to discover the extent to which technology has taken over jobs in South Africa and uncover readiness of the labour force to embrace the outcome of technological domination was driven by the three theories in this study. Lastly, objective five employed mostly LPT and CSR: to find out about the influence of organised labour and social movement on technological advancement.

These theories thoroughly explained the nature of work with different benefits or loss to those involved in the process of work, nevertheless, this study picked and concentrated on the most vital characteristics of each theory and its connection and compatibility to each study objective and also considered its pitfalls and aligned it to the relevant literature review, analysis, findings and interpretation of this study. However, this was done as an inclusive analysis in this chapter rather than a separate discourse of each study objective.

5.2 The Core Argument of this Chapter

In this chapter, not one of these theories would be able to explain the findings of this study, thus, the application of these varied theories has been very beneficial in this study. Every aspect of this study is in some way connected to the theoretical frameworks of this study. It initiated a deep understanding of the research problem, questions and significance of the study that rightly connected all the labour process and technology implementation issues to the best foundation for this study and steered the choice of secondary data, research design and data analysis of this thesis by selecting the best central features in the theories to deliver a comprehensive study of work reorganisation and job automation with the consideration of the future of workers in the world of work. Each theory filled in a noticeable gap in the complementary theories. These mixed theories served an important purpose in summarizing the study in the section of the core argument of the thesis and chapters and a well-supported rationale perspective in a conceptualized nature throughout the study.

5.3 Evolutionary Economics Theory

The approach of evolutionary economics dwells on the connection between economic growth and technological change. Capitalism interfaces with domains such as technology, institutions, science and economy in which it transmutes. It is a radical structural transformation that unlocks economic activities (new sectors/industries or extremely invigorate present businesses) and opportunities that are unique. For the most part, technological change is gradual and cumulative (Freeman, 1994). The main influence on economic growth and rate is the continual adoption of technology. Schumpeter (1939) considered an invention to be the maker and killer of industries and society as a whole, recognizing the transformative aspect of technological change that could contribute to waves of creative destruction. He saw the value of businessmen in taking advantage of discontinuous growth possibilities and saw technology as a new combination of producers and manufacturing methods, including new products, new

production techniques, opening up new markets, utilizing new raw materials, or even reorganizing the sector of the economy. Evolutionary (incremental) technological change is usually an improvement of expertise and, in order to see change as an evolutionary process, the decision-maker must have adequate technological scanning and tracking systems in place that will make it possible to understand what is happening and enable prompt action to be taken.

Organisations need to pre-empt or at least react efficiently to structural modifications in their settings in order to stay competitive, either at the forefront or as a follower. There is fundamentally a structural change in the technological setting. Dealing with structural change involves the use of appropriate environmental screening processes and methods, completely appropriate organisational evolutionary computation that are supported for strategic reasons by a well-developed range of knowledge. The implementation of retraining programs and a shift in the present methods and procedures could include quick and efficient action to prevent or respond to technological change (NEDLAC, 2019, p. 12).

There is always a roll-over of technological knowledge from one organisation, one occupation and country to another but the difference in adoption differs between adopters who may result to unequal economic growth (Agola, 2016; Arntz, Gregory & Zierahn, 2016b; Bessen, 2016). The word "technological paradigm" was used by Dosi (1982) entrenching it to Thomas Kuhn's scientific paradigm to illuminate the progression of technological advancement induced by variable scientific paradigms. Industries function within the paradigm. Technologies evolve from simple basic tools to sophisticated advanced machines. Indicating that the boundaries of manufacturing are being annihilated, and fresh paradigms are evolving for all business. This technological paradigm will not occur at the same time across all industries and nations or with the parallel rate. Nonetheless, it will attain a similar rate with time with corporations vying for, location to quickly manufacture the services that will permit them to stake their position in the highly competitive capitalist system fittingly.

The truth is that our economy is a complicated ecosystem that continues to evolve which grows larger yearly and we must realise that we are dealing with an evolutionary economy rather than a static one (Atkinson, 2014, p. 1). Hence, this modernisation does not need interruption (Karabegović, 2016). Freeman (1982) stress that this innovative trajectory will not slow down the rate of its adoption by countries and industries so that the economic growth will not

decrease. In addition to shaping geographical possibilities, technology also drives more extensive evolution (Bürgi and Pradeep, 2006). This is because societies are structured more or less to promote sustainable development. How we work, learn, interact and live are guided by the principle of attaining the most outputs with the slightest input (Atkinson, 2014, p. 22); thus, evolution is what societies seek.

The global industrial reorganisation, depending on reforms and corporate procedures, can be evolutionary or devolutionary for some parts of the world. For technical innovation as a whole, it could also be evolutionary or devolutionary. Devolution is a change that leads to decreases in productivity or setbacks in competitiveness and innovations that do not benefit the general economy but benefiting a specific group of people in the economy. Atkinson concludes that economies are best described not just as markets or machines, but also as complex evolutionary mechanisms that evolve annually, every month, and even every day. These modifications usually constitute scientific progress (evolution), but they sometimes constitute degeneration (devolution). Accelerating the rate of evolution is the most important thing policymakers can do when it comes to economic policy (Atkinson, 2014, p. 63). Rather than slowing down the rate of automation, we should create new, quicker evolutionary change by promoting the fast development of new business operations and technologies. Put differently, the speed of the adoption of technology and its birth must be increased with commercialisation of technology breakthroughs (Ibid., 41).

Simply put, countries such as China and India seem to have taken-off long ago from their counterpart's countries. Although the emerging nations are, to some extent converging to the active growth pattern. EET posits that collections of alteration of labour shares and competition in the world of work in the process of technological trajectory are vital in that it forms the growth in the sector and the economy. As technology advancement progresses, new knowledge is found, and existing methods are being tested, and this technological progress does not only reconfigure particular regions it affects, but it also affects bigger economic and social elements (Atkinson, 2014, p. 22). Merging with the world economy through the evolutionary development exemplary has to come from the transformation in the domain of technological economy. Arrays of achievements, including productivity improvements, revenue growth, increase in employment, more investment can be attributed to technological advancement and adoption (Rüßmann *et al*., 2015). So, for each organisation to competitively and profitably "take-off" (Rostow's economic growth), it must cumulatively assimilate

advanced technologies in its workplace. Economies with devolution forces lose out to those with greater capacity to organise manufacturing systems around the best available technologies, which means that technology determines and shapes the production system of a nation (Atkinson, 2014, p. 22). For example, automobile sectors in countries such as japan have long taken off and reach the stage of high mass consumption compared to countries like South Africa.

There is a gap between a society's technological growth and its moral and legal institutions, according to the theory of technological evolutionism. It is a social fact that while science and technological advancement in manufacturing are springing forward, legal regulations are lagging and opening up a gulf of confidence between individuals and government. The current scenario can create social tensions and issues, as the misuse of technology for destructive reasons is not yet explicitly excluded (Bürgi & Pradeep, 2006, p. 651). The uniqueness of technology, particularly in terms of its ubiquity in virtually all spheres of human life, describes why the severity of possible effects will outweigh that of all other traditional innovation of the past. The development of the increasingly evolving 21st-century technologies seems to have the capacity to revolutionise the economic and social development and can provide creative and sustainable approaches to the world community's most urgent issues and their habitat (Bürgi & Pradeep, 2006, p. 657).

This evolvement upsurges its economic status in the labour market, according to EET. Organisations learn and sensibly calculate conceivable transformations and make profitable decisions knowing that labour environment changes, but businesses that do not embrace these dynamics declines and are left behind. This change has been accompanied by the constant productive rate of employees and the skills to manufacture better-quality products. Historically, economic growth varies with collections of innovations in each era, and its supports and utilisation also noticeably vary in the institutional structures. Rapid and slow development periods take over each other, but the precise length of the various stages depends on a particular historical and institutional variable. Evolutionary economists play a key role in the dynamics of markets (Freeman, 1994). This evolution in the automotive sector is reconsidering the routines of automakers, refurbishing methods of productions and allowing novel services.

5.3.1 Evolutionary Routine

The evolutionary theory considers economic players as bound by their restricted spectrum of routines at any moment. Organisations usually construct the ways things ought to be done, what to be accomplished, actions, tactics, targets and procedures to be adopted, and this is called "routine". It further includes characteristics of organizations ranging from periodic adoption of new technologies, procedures for appointing or sacking workers, purchasing new inventories or increasing the production of high demand items, branding, expenditure reforms, research and development, strategies regarding product diversification, foreign investment and to the business environment determine input and output levels with time. Put differently, the overall behaviour of the firm is driven by the organisational routine.

Organisations with better strategies than other companies tend to develop, while companies with worse approaches tend to lose share of the market, considering that Agola (2016, p. 10) pinpoints that how these technologies are deployed and utilised in economic activities is what distinguishes winners and losers in the economy. Nevertheless, these routines can be reorganised and altered at any time by the management if proven unprofitable. Thus it is altered by the constant changing environment (Nelson & Winter, 1982). The situation prompts highly competitive companies to broaden their horizons and to learn from the mistakes of other businesses. This empowers such corporation with awareness to established innovative approaches to snatch the foreseeable opportunities. In this regard, firms will not be losing economic activity to other nations unnecessarily (Atkinson, 2014, p. 22).

5.3.2 Evolutionary Search and Selection

“Search” is used by organisations to evaluate the current routines. Engaging in search may lead to the modification, drastic transformation or complete routine change. The process of search spawns’ transformations. Evolutionary theory also consists of the "selection environment" in the technological evolution process. The selection procedure is externally influenced by conditions such as the quantity and demand of products, how other competitors perform, which controls the speed of the organisation to expand its competition and opportunities. Evolutionary economists are of the view that the main drivers of development are productive output, the capacity of organisations to organize manufacturing in ways that lead to the most productivity with the lowest costs, including labour inputs, and the capacity of businesses and

establishments to change over time in order to react to new circumstances, in part by creating and adopting technology innovations (Atkinson, 2014, p. 9).

The "selection environment" evolutionary viewpoint provide understanding into what the economic system must be doing. “Search and selection” inspire and directs each other and are interdependent co-existing characteristics of the evolutionary process. Organisations transform over a period of time through the combined action of search and selection (Nelson & Winter 1982). Thus, it describes that society should be engage in research and testing and the feedback from the research guilds the development of the economic system. It can be argued that evolutionary theory is essentially a dynamic theory, in which the diversity of organisations is a key feature. The economy is an organism that continually develops new sectors, techniques, organisations, professions and capacities while purging older ones that are made redundant by newer technologies and many other evolutionary modifications. This pace of evolutionary transition varies over space and time, based on a number of variables including technological development, entrepreneurial commitment, national policies and the competitive global environment (Atkinson, 2014, p. 6). The emergence of new developments and advances is contributing to the advancement of robotic technology, which has been primarily used in the automation of production processes. In exchange, this will lead to the development and implementation in the future of efficient manufacturing or smart factories which, in addition to cars, will also manufacture many high-quality products in a short time and with wide variations (Karabegović, 2016).

The notion of the evolutionary theory is that companies observe simple rules, make and choose the best decision, expand when profitable and pursue profits. Scholar Freeman (1994) states that capitalism can only be seen as a process of evolution of constant innovation and creative destruction. This creative innovation destruction forces people, organisations, and even entire areas and countries to adapt or otherwise suffer the implications of failing to do so. It shrinks occupations, and it undermines the old system of labour, the forms of organisation of labour and the procedures of manufacturing. For those corporations who want to advance abundantly from innovation, brings novel value to clients and nation while those capitalised in the old labour process often fail. It is a blunder to want evolution without extinction or loss of jobs, and certain countries make this mistake when it comes to supporting economic evolution, so going slowly means growing slowly (Atkinson, 2014, p. 42).

Creative destruction is driving economic development. This implies that government should actively remove obstacles to development. The indication is to decrease the regulatory and other protection confronted by more industrious innovators (Atkinson, 2014, p. 48). New technology manufacturing and dissemination involve new methods of doing tasks, fresh modes of action and collaboration. For Nelson and Winter (1982), organisations are shaped by specific capabilities and decision rules, which are modified as time goes on through measured problem-solving efforts and random events. During this process, most lucrative organisations push the less lucrative ones out of the industry. Evidently, the labour market has witnessed the radical transformation of work with the level of workplace automation, which varies in industries, and countries. Constantly, management is searching and selecting economic decisions that will boost its competitive edge in the labour market.

Indeed, evolutionary economists agree that technology is the major driver of evolutionary extinction and creation (Acemoğlu & Restrepo, 2016; Bessen, 2016; Gelb & Khan, 2016; Martin, 2017; Heimerl & Raza, 2018) because it leads to more effective, greater quality and more creative activities being replaced by less effective, reduced quality and less creative activities. Nevertheless, the Leftists are disturbed by this extinction because they place greater focus on the welfare of the workforce who may suffer from such a developmental situation. Still, in actuality, economic progress is impossible without job destruction from automation. While policymakers can assist those affected by competition to move to different operations, they should do their utmost to foster and adopt the developmental force of creative destruction (Atkinson, 2014, p. 42). Again, notwithstanding increasing income inequality is no more significant financial issue than maximising economic development, since this is the key to improving standards of living and well-being (Ibid., 9). Helping the affected employees to shift to different employment and sectors is a suitable policy reaction. So, the function of government is to foster evolution while assisting those who are threatened by this change. Moreover, the worst thing the government can do is try to slow the loss or reverse it (Ibid: 39).

The government will not only remove constraints to evolution but also efficiently and effectively promote evolution; it will also need to take measures to assist employees and communities adjust to technological evolution. If we are to adopt a vision of much faster evolution, not only is it reasonable to set up a scheme to help those affected by "creative destruction," it also makes political sense to decrease resistance to evolution. It would be wise to embrace a flexicurity scheme based on the concept that job security is not based on

restricting layoffs, but on increasing the capacity of employees to move to new jobs, partly by supporting the development of sustainable qualifications (Atkinson, 2014, p. 61).

To decrease the vulnerability of organisations lagging behind profits and competition in the work mechanisation process, EE seems to be pointing that adopting new technology forces added dynamic efforts such as retraining and upskilling.

One of the factors shaping evolution is culture. Evolution needs a supportive culture, but some cultures have not adopted evolution and continued to do so. Indeed, stability over evolution has been appreciated for much of human history. It is critical for society and culture to embrace evolution and allow corporations to innovate actively and cultures must also have a teleological goal for evolution. With this regard, societies and cultures must accept destruction and the loss of jobs that often go with innovation (Atkinson, 2014, p. 51-54). Governments can promote evolution by ensuring that most or all of what they do supports evolution. Economies are, in fact, complicated evolutionary structures, which implies allowing and maintaining stable evolutionary patterns involving much more than defending the livelihood of the workforce. Innovation is not something that falls out of the sky, but rather comes from intentional human action (Ibid., 58). Steady technological development will assist in maximising economic development to significantly enhance future generations ' living standards, quality of life and society (Atkinson, 2014, p. 63).

As a continuous phase, technological progress will be a cumulative developmental (incremental) method that changes civilization over the long term. As a specific process, technological developments can be highly detrimental to those organizations and individuals who are ignorant of longer-term trends. Technological innovation, which is not properly planned, is often regarded as revolutionary. Capacity expansion can be accomplished if the company profits from change often because new technology blends with existing policies, but it can also be disruptive if it significantly evolves process innovations or product developments at a period when the enterprise is deeply dedicated (organizationally and financially) to old models, frameworks and marketing strategies (NEDLAC, 2019, p.12).

The central task of economic policy is not managing the business cycle or maximising fairness but to drive a robust rate of economic evolution and maximise the rate of evolution (Atkinson, 2014, p. 1). To increase evolution, policymakers should (1) promote global inclusion (2) tone

down the rate of loss in the traded industry (3) promote a culture that accepts evolution, which includes natural evolutionary loss (4) implement measures to promote development (5) facilitate strategies to stimulate economic development, particularly through technological innovation (6) avoid natural evolutionary profit and loss (7) reduce public obstacles to development (8) and develop a broader understanding of economic development (ibid).

Seemingly, corporations are focusing and vying to contribute to the growth of the economy and building efficient services and products that benefit clienteles by stirring to "Industry 4.0" while maximising profits by taking advantage of automating the workplace through restructuring (evolution). However, while this evolution will increase safety management, product differentiation and other considerable beneficial in many ways to the economy, its unremitting disruption on the workers has not been well managed or are neglected.

The usefulness of EET is that it elucidates the necessity to transform the workplace for the economic growth of the company and the economy as a whole. However, it neglects some of the undeserving aftermaths of which this competitive transformation may have on the workforce, and this is where Braverman's position comes in.

5.4 Labour Process- Labour and Monopoly Capital by Braverman

Is this rate of technological and economic evolution in the workplace not disrupting the workforce in many ways? Is the technological evolution not going to outcompete the human worker in the labour market? How is the labour market going to adapt to such change? These are important economic and social questions that the technological and economic evolutionists neglect to take into proper consideration. Labour and Monopoly Capital written by Braverman (1974) centred on de-skilling and strategies of management control. De-skilling may require a decrease in work discretion and judgement, a decrease in the range of duties performed and a decrease in supervisory autonomy; it can also mean the loss of a privileged social position (Littler, 1982, p. 133). Braverman (1974) was fiercely critical of the sociologists of work and other observers who assert that while technological progress destroys some occupations, it will certainly create new and better jobs and that the advancement of automation unavoidably leads to an upgrade of indispensable skills of the workforce. He stressed that technology is employed and utilised in a way to dictate and rule the working class which can heighten poverty, create division in the society, de-skill workers, degrade work, polarise the workforce and enable class

violence. He delved into how de-skilling occurs through the management's adoption of machine and automation in the modern industry.

According to Braverman, the typical procedure of managerialism was the structure of scientific management, originated in the work of Fredrick Winslow Taylor, with its emphasis in achieving maximum productivity and profit from technologies and workers. Thus, Taylorism (virtualization, task simplification, high productivity, red tape, managerial discipline, de-skilling and systematic oppression of employees working) was not simply one managerial approach among many, but an essential feature of the capitalist labour process, the apparent decision-making consequence to industrialisation (Braverman, 1974).

5.4.1 Taylorism and LPT

Braverman summarized that the foundations of Taylorism are the collection and growth of understanding of the labour process, the accumulation of this understanding as exclusive preservation of executives and its conversation, lack of such information among the employees and use of this monopoly of understanding to regulate each stage of the labour process and its mode of execution. As summarized from Taylor's (2004) book, the principles of Scientific management; Taylorism is characterised as follows:

- The knowledge must be held by the management. In other words, power and control are detached from the workers;
- Every part of problem solving and knowledge must be owned by the management, skills and capabilities that formally belonged to workers; and
- Management must strategize and pre-determine all jobs that are to be done.

Before the present capitalism according to Braverman, the labour process was the duty of the craftsperson. The capitalist sub-contracted a skilled craftsperson through the crafts guild to carry out labour (Braverman, 1974, p. 61). However, currently, the labour process is solely the responsibility of the capitalist and his representative, the manager. Only managers think about work while workers execute the job. In this case, the worker is expected nothing much more than being a good robot. Hence, “the separation of conception and execution” is the heart of Taylorism. Workers become nothing but an animated managements instrument through this concept of the separation of conception from execution (1974, p. 136).

Braverman argues that scientific management (also known as Taylorism) is a process whereby knowledge was robbed from workers and enhanced to be management's knowledge. The capitalist accumulates more capital through acquiring workers and surplus value extracted from the labour process using divided tasks, technological adoption, employing knowledge of craft into the system, minute control, and substitutions of low-priced labour for pricey labour. Companies amass more wealth through gaining workers and surplus value extorted from the labour process using job automation. Organisations are highly automated, and task that previously needed human input is being performed by technologies (Braverman, 1974). The machine is seen as an independent participant in human social arrangements, the mere product of human labour and ingenuity, intended and built by humans and alterable at will. It gives life, enters into relationships with the employees, establishes relationships of its nature, is equipped with the strength to shape human life, and is sometimes even endowed with models for human beings (Braverman, 1974, p. 229). This technology is used by companies to control work procedures and the process of assembling products, weaken the rights of workers' and during the nineteenth century, the process of labour control and exploitation at the point of production had developed and matured through labour de-skilling (Braverman, 1998).

There was the emergence of new skills in each previous era, but every unique ability was subjected to the management control and undermined as the investment needed the biggest profit. Hence, management was compelled continuously to routinize and make work uninteresting by transforming the workplace tasks with technology. Although constant revolutionization of production continues to give rise to new skills, it shortly becomes susceptible to that same process that releases skills (Braverman, 1998, p. 176); So, under capitalism, there is a natural tendency to degrade work. The degradation of labour through the constant adoption of technology is a method developed continuously and recreated by capitalist leadership. The qualified employees who dominated capitalism's early years were substituted by unqualified employees, subjected to humiliating and unfriendly labour. Not only are they robbed of the means of manufacturing, but they are also subordinated to a process that draws knowledge and abilities (designs embedded in technology) that belonged to workers and makes it part of the knowledge of management that utilizes it for planning in such a manner that the performance for the employees is deskilled and dehumanized. Which means that organizational growth under capitalism tends to "de-skill" the workforce and mask the true value of work (Braverman, 1974). Technologies are the tool of automation of the workplace by the capitalist which is capable of creating poverty amid plenty, while at the same moment contributing to

the manufacturing of a surplus labour army and thus to poverty on a quite large scale due to these burgeoning sectors in one industry.

5.4.2 The New Wave of LPT

The recent contributors of labour process literature concur with Braverman that the main focus for management is on job reorganization and profitability through the mechanisation of the workplace to stay ahead of the competition (Vidal, 2004, p. 9), a process in which have resulted to many workers to lose their jobs and many will experience unemployment (Thompson, 1983, 2010; Adler, 1990; Milkman, 1997). Despite that Braverman stressed that management robbed and extracted the skills of workers and embedded it into machines to automate the task of autoworkers using the designed machines, the new wave of labour process theorist have pushed this argument further. Some time ago, Thompson (1983, p. 2-3) echoed that technologies have been designed and configured with human intelligence and expertise that introduce efficiency, standardization and large-scale integration of activities to the motor industry. Recently, Pratt (2015) argued that the latest technologies are capable to perceive, display, understand on their own with the initiation of the deep learning techniques, solve real-world problems to mimic the intelligent decision-making skills of the human workforce and this period, a good number of mental activities are embedded in technologies. In view of the fact that these machines have built-in employees' intellectual and physical labour, it is not simply an "abstract" innovation (Thompson, 1983, p. 4-5) but also like all computers, industrial robotics is built for social purposes in such a way as to maximize operational efficiency (Thompson, 1983), and the automotive industry had modernized the workforce with these industrial robotics and which have fundamentally restructured the economy (Milkman, 1997).

The perception is that the use of technology strengthens the movement of regulation and management of lean production work (Butollo, Jürgens and Krzywdzinski, 2019, p. 17). Systemic process management and predictive process control principles were among the core ideas for automation. In line with this, several companies have developed predictive maintenance systems. Though, it is unlikely that this technology-fixed strategy will work as it takes away the knowledge and learning opportunities that workers will obtain from information-based process control, review and efficiency and this can contribute to a lack of human problem-solving skills (Butollo, Jürgens and Krzywdzinski, 2019, p. 15). Stewart *et al.* (2009) argue that with lean manufacturing (idea and equipment such as robotic technologies to

prevent mistakes, minimize waste in the production process and maximize production) in the workforce, employees are always unhappy with task intensification, added workload and management strategies that have a significant negative impact on workers and are sometimes counterproductive to their job satisfaction. The contention of Stewart et al. is that lean is a form of class conflict from above (Ibid., 206) and an assault on labour and a new means by which capital attempts to subordinate labour. Whereas, these same 'high-performance' activities produce exhaustion, time constraints and ‘poor work-to-home spillover’ (Thompson, 2010, p. 11). Also, employees seldom challenge the external influence of the operational methods themselves, and the main reason would be that the systems often offer benefits including cuts in internal workloads due to increasing pressure to avoid mistakes in a highly complicated business environment (Butollo, Jürgens and Krzywdzinski, 2019, p. 13).

In response, the technology-fixed approach of labour process could diminish the significance of experiential expertise of employees and make their contributions more duplicatable, they could also reduce the workers’ bargaining power (Butollo, Jürgens and Krzywdzinski, 2019, p. 19). Other scholars have argued that job automation approach degrades the value of human labour and deskill workers (Adler, 1990; Milkman, 1997; Thompson, 2010; Smith, 2015). However, Adler explained deskilling and degradation of labour a bit differently from Marxs’ labour-process view.

5.4.3 Marx on the Degradation of Labour and Deskilling

Admittedly, de-skilling is of immense theoretical importance, even though it is simply a symptom of the power politics of the domination of the capitalist structures (Adler, 1990, p.787) but deskilling occurs occasionally. Adler clarified thoroughly that Marx saw the degradation of skills or deskilling as having a liberatory meaning. This indicates that industrial growth changes the work experience of employees and promotes the growth of their skills which then results to an extension of the education scheme and the mental knowledge base of workers (Ibid., 787). Also, he stressed that only a handful of workers undergo deskilling. Adler agrees with Marx's theory that the depletion of labour-power is only in terms of money, whereas actual ability (education, skill-making) tends to increase. As a result, de-skilling effects are only a small proportion of all outcomes and the general trend is the enhancement of skills (Ibid., 791). In Adler 's view, Marx 's thesis is not that capitalism sees little progression towards a more properly developed individual; instead, because of its propensity to produce

these people, industry picks up speed the transition from the old to the new form of society and a change from one mode to another (Ibid). Indeed, the strong case against Braverman's deskilling reading can be rendered by pointing out the challenge of reconciling this reading with Marx's recurrent statement that capitalism is building the infrastructure of the productive forces for the revolutionary mode of production that will supplant it. Deskilling, on the opposite, implies that a socialist society will inherit a workforce mainly composed of unskilled labour (Adler, 1990, p. 791).

5.4.4 Deskilling and Unemployment: The New Bravermanian

5.4.4.1 Deskilling of Workers

The organisation of labour has been revolutionized by the emergence of new technology and workplace automation, which has contributed to a change in behaviour and attitudes, as revolutionary robotics reveals the opportunity for less-skilled jobs and the loss of manufacturing expertise (Thompson, 1983, p. 2-3). The adoption of assistive technologies does not increase flexibility, individual responsibility and actualization-development (Butollo, Jürgens and Krzywdzinski, 2019, p. 12). The ability of the novel robotics assembly line to change the labour market and replace human workers has created a further backdrop for claims about the diminishing value of employment (Thompson, 1983, p. 4). In the capitalist labour process, there is no imperative to deskilling but to cheapen the costs of labour, which in specific conditions results in deskilling, while in others it may be imperative to move into new divisions of production with more skilled labour-power and create surplus (Thompson, 2010, p. 10). This is not conventional upskilling or deskilling, but a broader range of skills and reserves of labour-power that the worker requires from labour. Thus, workers spend more on their skills, in reciprocity with the evolving labour-power, in exchange for innovation in human capital (Ibid) as an effort for self-protection (Milkman, 1997), but this skill upgrade has either not came to fruition or has vaporized (Thompson, 2010, p. 11). This is a new form of work-related instability which have emerged, with employees being informed that they no longer have a place for life or even a future with a business and that they have to render themselves employable even without employment, whilst benefits are being reduced or withdrawn (Ibid).

Thompson and Smith (2009, p. 920) concluded that strong flexibility knowledge workers may not occur in the workforce. However, high-performance workplaces can be accomplished, but the concept of skills generally rewards capital rather than labour. One of the explanations for this is that the mobility capacity (where and to which the employer markets his or her labour

resources) is undetermined in the sense that the choice on which the employer wants to position his or her labour-power is left to the worker and therefore remains a source of confusion for the employer to decide whether or not the workers should stay with them. There is also confusion for the worker as to whether or not the contractor company would continue to need its labour services (Ibid., 924). Although employers or the education system are responsible for the development of skills and the preservation of employability, however, companies need to step beyond the boundaries of Taylorism and Fordism (large-scale high-tech industrial production) to create organizational structures and processes that promote ambition and creativity in the context of innovation and continuous improvement on the part of the workforce (Ibid., 920).

5.4.4.2 Labour Process of Unemployment

For Adler (1990, p. 785), there is a contradiction between the innovative aspect of the technical basis and the entrenched existence of its social manner. This paradox has a bright side: the nature of the industrial need for versatility, which inevitably leads towards a fully developed adult. It also has an ugly side: the skewed form in which capitalism communicates the significant need of industry namely labour instability and structural unemployment. Any worker faces unemployment-in the seasonal wide-scale unemployment arising from the recurrent economic crises of capitalism and in the ongoing smaller-scale unemployment created by the failure of capitalism to prepare for the impact of economic and technological transition on the labour force (Adler, 1990, p.787). For instance, most factory workers have been driven into long-term unemployment or fragile underpaid occupations and have experienced a drastic deterioration in their living conditions (Milkman, 1997, p. 11). Such workers are dismissed as redundant robots by their managers and face a grim future of economic poverty and societal loss of dignity (Ibid., 11). Good salary alone does not boost the self-fulfilment in workers, employment profoundly forms their identity and practice within and outside the workforce, and most people's lives stay governed by job (Thompson, 1983, p. 2-4).

Under certain conditions, certain employees will accept a buyout as a consequence of job insecurity in the sector rather than maintain their positions in the auto industry, and the staff impacted will go into business with buyout capital (Milkman, 1997, p. 4-6). Although very few displaced workers can make a clean career switch to other sorts of jobs as a result of industrial transformation, those employees who remain in the vehicle industry be that as it may realize that their future with the sector is not guaranteed with the ongoing comprehensive internal

reconstruction and shake-up (Ibid., 12), the truth is that displaced automobile workers are a tragic situation and unjustifiable flop of social policy (Milkman, 1997, p.11). Whilst this job loss and buy-out highlights the prospects and problems faced by employees in the post-industrial economy, the condition of employees that stay in the business shows the dynamics of the process of work rearrangement that is about to decline (Ibid., 12).

The argument is that the outlook of the future remains highly ambiguous for both former and current car employees and that they are aware of possible long-term unemployment and are susceptible to problems such as downward mobility and socioeconomic deprivation (Ibid., 12). This economic move has contributed to generated instability and eventually made less powerful groups weak, undermining whatever mechanisms of self-protection millions of workers already established (Milkman, 1997, p. 2-11). This is a brazen assault on labour organizations and sadly, industrial jobs will not be around any longer (Ibid., 11).

In Braverman's analysis, workers were not relinquished of skills in a straightforward and inexorable fashion (Spencer, 2000, p. 239). The process is complex, involving frequent work shifts, setbacks, periodic changes, losses, transitions and transformations. Thus, deskilling would only be realized if the circumstances permitted it to evolve (Ibid., 239). These circumstances include the higher quality (Fredriksson et al., 2001; Jones, 1987; Karabegović, 2016), repeatability and greater yield (Struijk, 2011, p. 191), better service delivery and productivity (Vidal, 2004; Deonarain, 2019; Monaco, Bell & Nyamwena, 2019), international competition in the automobile market and transformation of production processes (Karabegović, 2016, p. 92), consumers need (Calitz, Poisat & Cullen, 2017, p. 8), the various manufacturing gains of technologies (Rasiah, 2011; Barnes, Black & Monaco, 2018) but the major interests under these circumstances are to cheapen the costs of labour (Thompson, 2010, p. 10) for surplus wealth and value for the sole benefit to the management (Braverman, 1998; Berberoglu, 2011; Burawoy, 1979; Previtali & Fagiani, 2015; Smith, 2015). Conditions such as the above mentioned: capital and market-driven capitalism (Thompson and Smith, 2009, p. 925) and severe competitive pressures in the motor sector (Vidal, 2004, p. 9) have made manufacturing job automation as one of the dominant strategies adopted by management to meet its business needs (Adler, 1990; Smith, 1989; Milkman, 1997; Stewart et al. 2009; Spencer, 2000; Previtali & Fagiani, 2015; Butollo, Jürgens & Krzywdzinski 2019). These are external circumstances that offer different results in the internal labour process, owing to the distinctiveness and peculiarities of particular points of output that pick and form labour-power,

assess labour activity and differentiate competitiveness between capitals and between employees as socially and culturally disparate owners and sellers of labour-power (Thompson and Smith, 2009, p. 918).

5.4.5 Burawoy's Notion on Labour Process

Rather than interpreting capitalist authority as tyrannical or "de-skilling", Burawoy (1979) recognises a more hegemonic strategy of co-optation and mild manipulation in the capitalist labour process. For Burawoy, workers are not "coerced" by the management; instead, workers contribute in the system and consent in that same system which constrains them. Consent comes from participation in choosing (Burawoy, 1979, p. 27). Workers consent to the uneven social relations in various ways rather than actual oppression. Burawoy concludes that management regulates employees in an extremely restrictive setting by offering labour the "illusion of choice." Thus, workers involved in this way generates approval and reduces the possibilities for conflicts between class consciousness and labour management while optimising productivity. These workers are well aware of this "illusion of choice", and they participate and treat the labour process as a game.

In the modern labour process workers play the game of "making out". In the making out, workers work to inventive-rate levels of productivity and, in doing so, are rewarded with pride, social status, and playing this game also reduces their boredom. So far as the interests of workers (satisfactory salary) and the interest of management (surplus value) align, Burawoy argues that the game will all work out. The game itself is the link between individual rationality and the rationality of the capitalist system (Burawoy, 1979, p. 92). Instead of a simplistic perspective of employees as being fully independent and rational or completely coerced and lacking in agency, Burawoy claims that employees are neither entirely rational nor irrational: they consent to their position. Thus, it is necessary for the game to walk out to establish lasting cooperation. Although, management persuades workers to cooperate in the interest of profit by dismissing any worker incapable of meeting its portion of work.

In and of itself, the game becomes an end. Workers engage in it and focus on their connection with the mode of manufacturing (the machine), and in this phase, they are subordinated. The "making out" game isolated the worker's desires and overshadowed the reality that management was increasing profitability with just a marginal increase in wages. Although, it does not follow that this somehow fools people into accepting the system or that their

underlying consciousness is affected. Burawoy suggests that if control is internalised and thereby the workforce consents to capitalist relations of production then deskilling is no longer a necessity for control, for too much deskilling would threaten the securing of the surplus since it would accentuate class struggles (Burawoy, 1978, p. 288) and potential labour conflicts. Increasing work mobility (promotion) within the corporation has enabled management to decrease conflict and increase the illusion that workers had choices. Instead of alienating employees, therefore, modern capitalism has been able to co-opt employees into adopting capitalism as the preferred ideology (Burawoy, 1979). Similar to the position of Burawoy that workers "making out" with the management's preferred labour process in return for social status, satisfactory wage and to keep busy; and by doing so, these workers consent to exploitation through participating in such labour process. However, Friedman (1977) explains that management adopts "responsible control strategy" to obtain the consent of workers. This responsible control strategy allows workers some degree of control of tasks and a partial piece of conception and execution in the process of labour.

5.4.6 Friedman's View of Labour Process

As for Friedman (1977, p. 116), managers have efficiently embraced two separate approaches to guarantee that they continue to dominate labour. These approaches have been well defined and tyrannical. It involved 'direct control' on the one hand and managers have used tactics of encouragement and consensus, which is referred to as 'responsible autonomy' on the other hand. Organisations implement 'responsible control strategy' that is to ensure the consent of workers to the benefits of management by allowing workers limited degrees of job control and a limited unit of conception and execution. This approach is adopted when management encounters strong worker resistance (Friedman, 1977, p. 77-85). "Worker resistance must be seen as a force which affects capitalist development, rather than simply as a force which may eventually destroy the capitalist mode of production (Ibid., 49)."

Friedman acknowledged that workers could be susceptible to "direct control" such as Taylorism but noted that there were boundaries to direct control that could be partly counterbalanced by adopting "responsible autonomy" measures for the workforce. Managers do employ consent, but not always. Thus, Friedman averred that workers are active collaborators in their very own exploitation and not in the suppression of subjectivity.

Neither Burawoy nor Friedman refutes the related argument of Braverman that capitalism is a method that has increasingly deprived employees' actual control over their job. For the twentieth century, the growth of capitalism and the capitalist production process led in command over labour to ensure its ongoing exploitation and formation of ever-higher surplus gains, which is the very foundation of the capitalist system's accumulation. In contrast to the competitive capitalism stage of the nineteenth century, Braverman asserted that the shift to monopoly capitalism and the monopoly power of big, organised corporations contributed to the actual subjugation of labour through much more systematic labour control. He argued that managers had isolated the conception of a job from its execution to obtain deeper control over the labour process. The combined impacts of mechanisation, scientific management, and many other control methods enabled management to seize control from employees and impose regulations on employees across all sectors, including office and service employment, under ever-changing conditions.

As capitalism evolved from its competitive stage to its monopoly stage, it underwent a significant transformation that raised it from domestic level to a worldwide level. This was followed by a global process of economic imperialism, as the export of wealth substituted the export of products characterised by the previous phase of capitalist development (Berberoglu, 2011, p. 34). This has had genuine implications for peripheral areas and world nations, often with disastrous outcomes. The scenario in the advanced capitalist centres was also serious, but the growth of a powerful labour movement in Europe and North America counteracted the adverse effect of the globalisation process in the 20th century (Berberoglu, 2011, p. 38).

Our societies' occupational structure has indeed been transformed (Castells, 2010). However, the methods and structures of such a reconstruction are the product of interaction in each specific social context between technological change, the institutional environment, and the evolution of relationships between capital and labour. Braverman (1974) predicted that enormous bureaucratic organisations and monopoly capital would dominate the world. The technology used during the manufacturing phase is not the enemy, but the class differences that governed the use of the equipment. In this sense, it is the organisations that reduce employment and not technologies. Capitalism is a structure of property relations, whereby a vast majority laboured; whereas an insignificant minority possesses and control the capital, and this is the reason management exist. Machine designs in the previous era of capitalism were mainly consistent with rigid, standardised work systems that gave employees little accountability and

required a few abilities from them. Throughout the developed capitalist countries, drastic changes in process technology and consumer markets have been combined to create a large-scale production.

While technology has developed a small class of software analyst and software engineers, it has decreased much-qualified employment. Other results can be reached, including mass automation and utilisation without cultural enrichment or an economy in which technology degrades skills (Brynjolfsson & McAfee, 2012). The issue is that this will lead to significant rises in wealth disparity, masses of individuals who seem to be unemployed, and social order breakdowns. Even if jobs are accessible, there is still concern that technology is on the rise and that skills, institutions and organisations need to be updated more quickly (Brynjolfsson & McAfee, 2014). These scholars complained of deficient domestic demand in the economy as a consequence of elevated unemployment, certain to further increase existing inequalities and acknowledged the fact that work also has significant social objectives beyond merely earning a living. Work is not only a major source of income but also a source of satisfaction, self-esteem and a significant part of our everyday social interactions.

A process of polarisation (Autor & Dorn, 2013) of the workforce has been taking place in most industrialised countries for the past several decades. This process is leading to a hollowing out of the middle class: jobs that fall in the middle part of the job hierarchy, jobs that provided middle-class pay, are now increasingly being handled by technologies. Brynjolfsson and McAfee (2011) stressed that with more advanced software systems disrupting labour markets by making employees redundant, the pace of technological innovation continues to rise. This represents the fact that there is no 'iron law' that technological progress must always go hand in hand with the development of diverse jobs (Brynjolfsson & Mcafee, 2014). As stressed by (Zimmermann, 2015, p. 1), in advanced or developing countries, university graduates around the globe discover that their academic degree alone is hardly any assurance of having a job. At this point, the best guess that the labour economists can make is that there is going to be less work. Rather, work will take on distinct forms from those that many individuals in the developed world have been used for about a century (Zimmermann, 2015, p. 4).

The usefulness of the argument of Braverman's work is that it takes into consideration the workplace issues that might affect society as a whole. Thus, his work is embedded with deep

humanism and societal issues, which is vital to the global good and development that is sustainable for all citizens. Braverman knew how modern technology and the new workplace leadership methods would be, but he was not against or opposing the development of technology. The fact is that deskilling is on the increase yearly and that is why scholars such as (Acemoglu, 1998; CEDA, 2015; Haldane *et al.*, 2015; Acemoğlu & Restrepo, 2016; Calitz, Poisat & Cullen, 2017; Martin, 2017; NEDLAC, 2019) have chorused the importance of workers skilling-up in this era in order not to be hollowed-out. As without skill upgrade, more attention will be given to labour-saving machines in the world of work and considering that workers and technologies are competing. The certainty that these innovations are adopted to yield profit for management, to control the execution of activities, in an attempt to degrade the rights of the employees, points to the fact that technology in this context is neither equitable nor practical. Nonetheless, if only economic stakeholders such as management, can be socially responsible while maximising profits, the world as a whole and the world of work will sustainably develop.

5.5 Corporate Social Responsibility (CSR)

To supplement the above theories; corporate social responsibility (CSR) is employed for a better explanation to fathom grounds and pressures under which corporations consider stakeholders.

In the words of World Bank (2013), "CSR is often defined as corporate responsibility, corporate citizenship, social enterprise, sustainable development, triple-bottom-line, corporate ethics, and in some cases, corporate governance. What binds these terms together is the expectation that corporates (private and public enterprises alike) behave ethically vis-à-vis a broad group of stakeholders - workers and their families, communities and the wider society". Interested parties can be classified into two categories: internal and external stakeholders. 1) Internal/primary stakeholders are creditors, executives, owners and employees. These are the most significant partners in a business because they are part-owners or shareholders of the organization. (2) The external/secondary stakeholder shall consist of vendors, investors, administration, culture, associations, customers, rivals, the community and trade unions. Accordingly, stakeholders are groups and individuals who may or may be influenced by the completion of the purpose of the organisation (Freeman, 1984).

5.5.1 Old CSR Perspective: Shareholder Profit Maximization

In 1962, economist Milton Friedman first introduced the economic model of CSR. He concluded that the only social responsibility of a business organization is to foster and secure the interests of its shareholders, investors or owners by generating profits and optimizing productivity by complying to the local laws in which it works. For Friedman, as managers indulge in corporate social responsibility, they disregard private property rights and the contractual essence of contracts that destroy the true nature and structure of capitalist society and place it on the path to the socialist state (Friedman, 1962, p. 136). Managers must aim to do what is right for shareholders who make profits, most of all, and resist any facade of corporate social responsibility. In his words, "there is one and only one social responsibility of business –to use its resources and engage in activities designed to increase its profits" (Friedman, 2007). This stand of Friedman was known as "shareholder theory". Under this principle, among the numerous business-associated actors' shareholders have an unparalleled centrality, companies should be operated to increase their interest on their own. For Friedman "the corporation is an instrument of the stockholders who own it" (Friedman 1962,135). However, the focus of CSR has been moved from shareholder perspective to stakeholder attention.

5.5.2 New CSR Perspective: Stakeholder Value Maximization

From the socio-economic model of CSR, R. Edward Freeman in 1984 disputes that the ancient idea of managerial capitalism introduced by Friedman is no longer effective and it is unethical. By reconceptualized stakeholder concept, he concluded that there is a need for a company to be accountable not only to its shareholders or investors but also to its contractors, staff, consumers and the society which he narrowly defined as "stakeholder theory". Such stakeholders are directly related to the company and each other for the existence of the organization, and vice versa (Freeman, 1984). Capitalism works when businessmen and executives figure out how to get the needs of many on the same path. The stakeholder strategy aims to create a new paradigm for the company— a new scenario— that allows big companies to make our economies and our lives better by generating stakeholder interest rather than merely profiting to shareholders (Freeman and Elms, 2018). The story contains a realization that if we want the result of business to become more responsible capitalism, it needs stakeholders to respect corporate responsibility (Ibid., 2018).

The danger of both the old story (shareholder profit maximization) and the new story (stakeholder value maximization) is that there are some activities in which business should not engage. If for example, customers accept only the lowest product or service and are allowed only by depriving workers of any benefit (and perhaps much worse), instead entrepreneurs will indulge in their creativity and innovation (Freeman and Elms, 2018). They need to be motivated to develop innovative products and services that create value across the board — for staff as well as customers and other stakeholders. Let us aim for these kinds of businesses, and others that create value through stakeholders, rather than settle for profit only for shareholders. Let us take advantage of the consequences of a new way of thinking about companies. The best way to make a profit is to provide the great goods and services that customers want, as those deals make their lives better. Profits benefit from getting vendors who are committed to improving the business and staff who are motivated to work together to build something of value (Ibid., 2018). And if a company is not a good citizen in its culture, at least in a free society, citizens will use the political process to control the business tightly and even prohibit it from functioning within the boundaries of the state. The owners are interdependent, and everyone who operates a big business understands that.

The modern company tale is about generating as much money as possible for all of these stakeholders, including, of course, increasing gains for shareholders. Leading market models of the 21st century illustrate how to keep all priorities going in the same direction, with as little trade-offs as possible (Ibid., 2018). Today's corporate world according to (Freeman and Elms, 2018) brings "continuous creation," not the outdated story of "creative destruction." Many resources might be limited, but human creativity and innovation are not, particularly when motivated by a sense of purpose. Organizations who cross the needs of one stakeholder with the interests of another quickly find that there is clearly no hiding place in today's world (Ibid., 2018). As a consequence, companies are forced to engage in stakeholder-oriented CSR.

5.5.3 The Compelling Forces of CSR

There are influences and enforcers of CSR that pushes or motivates firms to engage in ethical CSR to address racial imbalances and to strengthen the socio-economic spectrum of South Africa and globally over the basis of equality and fairness and to avoid corporate lawsuits, protests, and strong international criticism directed at companies that do not pay sufficient

attention to all human rights, social contract granted by society and to obtain and maintain their 'social licence to operate' (Bauer, 2014). Below are some of the compelling factor of CSR:

5.5.3.1 BEE, BBBEE, King Report and Affirmative Action

In South Africa, the private sector has been forced to implement socially responsible strategies that are more mature than in many of the developed economies (Mueller-Hirth, 2016). This was implemented through the adoption of Black Economic Empowerment (BEE) legislation and later Broad-Based Black Economic Empowerment (BBBEE) legislation embraced by the post-apartheid government to provide historically disadvantaged groups with socio-economic opportunities through jobs, logistics, ownership and management and to recognize all stakeholders when conducting their internal and external activities. Today, the success of any South African business is measured on a range of BEE scorecards, with businesses earning corporate social responsibility points. Owing to the violent and oppressive history of the SA, the key definitions of CSR are corporate citizenship and social investment in community development (Mueller-Hirth, 2016, p. 65). Notwithstanding this obvious anxiety about the building of the future in South Africa, CSR has not been expanded to include core business activities and deal with the issue of the worsening of inequality (Ibid). The corporate sector is under pressure by different groups to promote social reform and environmental protection. In fact, the King reports encouraged companies to adopt the 'triple bottom line' implying economic, environmental and social dimensions of a company's operations as the desired way of doing business (www.sustainabilitysa.org., no date; Mueller-Hirth, 2016). It sets out guidelines on how businesses should disclose and report their annual triple bottom line performance together with their financial performance (Kabir, Mukuddem-Petersen and Petersen, 2015). However, the King Reporting Clauses are not obligatory, but they adopt a "ensure compliance / apply or clarify" approach that forces corporations to apply CSR initiatives or to justify why they have not fostered them (www.sustainabilitysa.org).

According to studies, not all CSR initiatives in South Africa are the product of voluntary or conditional business decisions; some of them are the consequence of corporate enforcement with BEE regulations (www.sustainabilitysa.org; Mueller-Hirth, 2016, p. 53). Adding that businesses will not be eligible for contracts successfully until they adopt BBBEE policies. For starters, in the mining sector, the charter system means that businesses have to adhere to change legislation if they want to obtain a license to practice. This indicates that the South African state has a central role to play in identifying and empowering CSR (Mueller-Hirth, 2016).

However, given the presence of affirmative action laws and a charter system, CSR in South Africa has a heavy focus on economic growth and poverty alleviation; it is related to corporate citizenship and strategic philanthropy (Ibid., 53).

The situation in South Africa is way more complex: several industries are dominant actors, but the policy still forms CSR by affirmative action and charter law, and civil society is relatively strong and well-organized to support labour (Ibid., 53). Although corporate engagement in development is commonly portrayed as opposed to the involvement of the state. The International Institute for Sustainable Development (IISD) (2013) has reported that in the past, policymakers have focused on legislation and regulation to meet social and environmental goals in the business sector. Instead, declining government resources, along with a lack of confidence in legislation, contributed to the creation of voluntary and non-regulatory programs.

5.5.3.2 Johannesburg Stock Exchange (JSE)

A key driver of CSR is the JSE that has introduced Socially Responsible Investment (SRI) with the main objectives of distinguishing between companies that attempt to perform on the triple bottom line, and offering a framework for measuring socially responsible companies around sustainability globally and in South African context (www.jse.co.za). The SRI Index tests corporate policies, management systems and efficiency and reporting concerning the three foundations of the triple bottom line as well as corporate governance activities.

5.5.3.3 Trade Union as CSR Enforcer

Trade Unions in South Africa are also a powerful driving force of the CSR. Trade unions are both legal and successful participants in CSR deliberation because they are of a democratic nature, which means that decisions are taken by agreement between members; they are sensitive to broader societal issues affecting their members as part of that community and their incentives; and that of management in the context that trade unions are economically reactive (Harvey, Hodder and Brammer, 2017). They have the legal authority to hold the company to account in deliberative processes (Ibid., 43) and are easily able to disseminate and monitor compliance by the firm and also to enforce compliance where necessary as "warriors of social justice". This is a significant incentive for firms to stay focused on employment legislation, service terms, workforce delivery, and overall employee benefits (Kabir, Mukuddem-Petersen and Petersen, 2015; Harvey, Hodder and Brammer, 2017). Trade Unions have indicated that

the automobile sector in South Africa lacks consideration on worker's future when it comes to workplace automation. These corporations are neglecting some rules in union and worker's consultation and also neglect the accepted standards of how things are to be done in the labour market. CSR could hypothetically realise much wider issues, which means it can be effective in making workers feel much more certain with their future, increase employee determination, motivation and encouraged about the firm and boost productivity. Which is a good employment practice and as such sustainable (Porter & Kramer, 2006, p. 4).

5.5.3.4 Customers, Suppliers, Employees, Communities, Investors, and Activist Organizations

There is proof that company ethical conduct is profoundly affecting customers purchasing decisions that customers will either praise or condemn companies on the grounds of their perceived social results (IISD, 2013; Kabir, Mukuddem-Petersen, and Petersen, 2015, p. 285). Again, investors change the way they judge the performance of firms and make decisions based on considerations that include ethical issues (IISD, 2013). Stakeholders, including consumers, retailers, workers, governments, investors and activist organizations are increasingly demanding corporate accountability (Ibid). Since customers are becoming increasingly interested in business, more organizations are taking steps to ensure their members are socially responsible. Some create behavioural guidelines for their suppliers to ensure their brand is not compromised by other companies' practices (Ibid). As stated by Alibaba CEO Jack Ma, "customers are number one; employees are number two and shareholders are number three." Workers are looking increasingly beyond pay-checks and incentives, to search for employers whose philosophies and company's practices are in line with their convictions. Accordingly, Freeman and Elms (2018) recaptured that companies are obligated to implement CSR as they realize consumers buy responsible products and services, workers choose to work with responsible employers, manufacturers have responsible clients, creditors fund responsible incentives and societies accept responsible newcomers and retain responsible incumbents. Overall, ethical capitalism relies on ethical behaviour by both corporations and consumers and is not a catalyst, but rather part of approaches to societal problems (Ibid., 2018).

Further, governments and the media have become capable of holding businesses accountable for the social effects of their operations and putting public pressure on corporations. Many businesses have indeed achieved a great deal to enhance the social impact of their operations, but these efforts have not been as successful as they could be (Porter & Kramer, 2006, p. 1). The debates about CSR have moved to corporate boardrooms to resolve issues related to labour

conditions. The company's most popular reaction to these problems has been neither managerial nor functional, but superficial (Porter & Kramer, 2006).

According to Kabir, Mukuddem-Petersen, and Petersen (2015) numerous international rules, principles and conventions still affect businesses in South Africa: Basic Declaration of Human Rights, International Labor Organization norms, ISO 9000, ISO 14000, Global Sustainability Transparency Framework Guidance, Sigma Guidelines, Sustainability Index of Dow Jones (Ibid).

5.5.4 Companies Act in South Africa and CSR

The Companies Act (CA) introduced substantial modifications to South Africa's corporate law landscape. Workers in corporate law are now more noticeable, and problems such as human rights are now recognised as significant (Botha, 2015: 51) and for this reason, work can be seen as a human right. This act encourages workers as the company's stakeholders to access information within certain conditions and to give them access to legislative derivative intervention. The duties imposed on businesses and managers are intended, among other things, to favour the workers of the company (Botha, 2015). For example, in the formulation of a business rescue plan, CA addresses the problem of worker participation, but it does not involve employees in the plan's approval, as employees cannot vote on this issue. It is argued that the provision would have been more significant if the CA had effectively given trade unions substantial privileges of involvement in the approval of the rescue scheme.

Since the decision regarding this transformation and plan is single-handedly made by the management and imposed on the workers and the unions (Mashilo, 2010; Masondo, 2010; Hlatshwayo, 2017). The same issue applies to the Social and Ethics Committee: the inability to grant employee representation privileges on the Social and Ethics Committee represents a lost opportunity on the part of the Companies Act drafters to allow feedback on problems such as health and security, labour and jobs, as well as other problems concerning workers (Botha, 2015, p. 51). These matters affect employees directly (Mashilo, 2010; Masondo, 2010; Hlatshwayo, 2017). If such matters had been attended to, they could have given workers the chance to have a higher voice in corporate governance by extending their right to participate in corporate decision-making processes (Botha, 2015, p. 51).

The fact that not only financial but also social benefits are to be taken into account by businesses shows the significance of CSR in corporate governance. However, CA gives workers fresh freedoms that are to their advantage. Employees were previously not recognised as stakeholders under company law, and they had to use the protection granted by labour law to implement any rights against businesses. These advances are good and staffs are now involved in multiple respects through the exercise of distinct freedoms and the enforcement of distinct responsibilities imposed on the business. However, staff management involves employee share ownership schemes, the selection of employee members to the board of directors and the participation of employees, whereas the focus is only on the economic aspect and provides only a short-term monetary alternative for employee issues (Botha, 2015, p. 51). Employees are almost solely dependent on labour law to exercise their right to participate and make their voices heard. So collective bargaining, an adversarial system, remains the main and possibly default means for staffs to have a say in the business. Effective insolvency processes should be given, and workers should be recognised as stakeholders because they are still susceptible and last in the stakeholder spectrum. These mechanisms could provide protection (Ibid., 53).

5.5.5 CSR and Decision Making

Employees have become very significant corporate stakeholders, and their needs should be considered in the broader framework for corporate governance and social accountability (Botha, 2015, p. 68). By considering the legitimate interests and aspirations of its stakeholders in its decision-making, the Board will create an appropriate balance between the desires of its various stakeholders, such as employees and shareholders. If the company is in a state of financial distress, the release of the necessary information to the labour unions could result in a negotiation process that could help support the board in finding a solution to its problems. Instead, if the corporation decides to reduce the size of its workers owing to its non-profitability or to expand its business activities, consulting with its employees ' representatives may be of key importance in making policy decisions (Ibid., 50). CSR can also involve consulting unions and workers and be transparent in their decision making with regards to workplace reorganisation.

MNCs are not concerned at all about informing and consulting workers about their plans to restructure work; they often do this without carefully assessing the impact such a decision

will have on workers and society in general (Masondo, 2010, p. 109). These organizations are convinced that they have a divine right to restructure work as they wish irrespective of the obvious social consequences (Ibid.). Unfortunately, the Companies Act does not provide workers with a real voice in making such decisions (Botha, 2015, p. 50). It is a point to note that economic system that would reduce civil strife, civil discontent and huge polarisation in the society would create a better stable global peace and global environment. Any corporate behaviour contrary to this will be considered as an irresponsible organisational practice and not observing the moral responsibility towards its stakeholder (Freeman, 1984).

Consulting employees of the application of innovative changes may empower employees to understand the situation of the workplace CSR practices by taking into consideration the necessity to adopt more technology, other possible changes and the effects these transformations may bring. Such knowledge will enable employees to realise how the transformation may influence them. When it comes to workplace transformation, industries are always enthusiastic about transforming to remain on top of the competition, but this has to include the needs of the workers and the surrounding society. This is particularly true because as Porter and Kramer (2006) suggest, corporations should function in ways that ensure long-term financial efficiency by avoiding socially detrimental short-term behaviour if not, it will discover itself on a destructive route and undermine long-term prosperity for both parties (Porter & Kramer, 2006, p. 1-5).

Employees will have a valuable voice if they have a seat on the commission on social and ethics. Thus, the Companies Act in South Africa has failed employees according to Botha, by imposing a direct duty on the board to take account of staff. South African companies can and should be more liable and accountable to their staff, particularly if they want to introduce strategic adjustments that influence workers directly and indirectly, as well as the effect on society within which they operate. Retrenching staff suggest that a company does not act responsibly, as does the payment of enormous bonuses to managers in moments of economic distress and post-retrenchment (Botha, 2015, p. 52).

According to CSR, it is expected of industries to aid in contributing to working conditions, economic development, decent wages, occupation, general equality, education, skills, adhere to labour laws and avoid employment rights violations. Put differently, the CSR agenda of any organisation must reflect a win-win position for the community where it operates and the

company. In this case, technological advancement is changing the economy, the process of labour, eliminating some skills while forming new ones, designing a safer working environment, endowing the workforce through training and involving in social good. The point is not that governments and other civil society participants should weaken businesses' capacity to function productively, as this will stagnate salaries, employment will disappear, and the wealth that pays taxes and promotes non-profit activities evaporates (2006, p. 5).

The responsibility of the automotive sector is not just to ensure the safety of its employees by adopting technology that can prevent accidents for human workers and reduce ergonomics-related issues (Gleeson *et al.*, 2013), but also to create more and more employment and encourage upskilling. The point is that organizations are neglecting part of the CSR agenda if they directly or indirectly facilitate job fragmentation (Jaimovich & Siu, 2012), job destruction (Brynjolfsson & McAfee, 2011), higher automatable occupations (Frey & Osborne, 2013), labour market polarization (World Bank, 2016) and de-skilling (Braverman, 1974). The implementation of technologies in the workplace has positively impacted on the growth of the economy (Riddell & Song, 2012). In order to maintain this growth, the rate of adoption of capable, productive technologies increases, and therefore reducing the rate of human workers in the automobile sector yearly (Hicks & Devaraj, 2015). However, it will not be rational if the capabilities of machines surpass most capabilities of the workers (Pratt, 2015).

The major corporate stakeholder: the employee and trade union as the most influential and lawful internal stakeholders of a corporation and how CSR influences worker's future have been neglected. Since the CSR essential idea is that management should deliberate the effect of continuing corporate actions on all who are affected by the activities. In this regard, those affected are the workers. Moreover, corporations must take workers into account, including the sense of responsibility that companies have toward workers as they conduct their activities — the nature of the automobile industry of recent needs lesser human workers. However, instead of shedding human labour with the hope that technologies will generate new employment in another new sector, the most sustainable opinion would be humans working alongside with robots and intensifying efficiency in the car sector. In this sense, the technological adoption will be driven by the innovation of the workplace, skills, workforce and the economy and not focused on the fear of deskilling and unemployment. With this policy, an environment will be created for all the stakeholders involved in the economy to deliver on their full potentials, which makes it sustainable. Technology can find applications in societies and economies,

irrespective of their development or status. Corporation, workers and unions can bargain their way to optimal outcomes that meet the need of the workers while respecting the needs of the organisation. This informs us that everyone could profit from technological evolution and its applications, at least theoretically (Bürgi & Pradeep, 2006).

5.5.6 Repercussions of Non-compliance

Companies who fail to meet the BEE scorecard and earn unfavourable reviews are therefore finding their ability to operate in the country more difficult (Mueller-Hirth, 2016, p. 66). As part of Corporate Social Responsibility Strategies, socio-economic growth must be addressed with BEE codes and the other sector-specific charters being a major engine of CSR activities, and socio-economic development success is necessary for corporate and social licenses to meet society's demands (Ibid). Compliance and progress of the results of any South African business are determined with a scorecard for some areas: ownership (20 points), management control (10 points), equity (5 points), production of talents (15 points) and preferential recruiting (from black firms; 15 points). This CSR enforcer bodies, such as BEE, BBBEE, UDHR, trade union, state, ISO, media, JSE, does not aim solely to address ethnic imbalances; it also tries, on the grounds of fairness and equality, to boost the socio-economic spectrum of the country. As various corporate litigations, marches and global criticisms directed toward firms that fail to take adequate care of all human rights show, a robust approach leaves businesses vulnerable to considerable risk (Bauer, 2014). Compliance with this agreement includes businesses not only to reply to their creditors but also to civil society in general. The CSR concept is based on the idea that businesses that do not act responsibly in civil society under a social contract run the risk of losing their 'operating licenses' (Ibid., 2014).

5.5.7 CSR: Positive Gains

There are many positive outcomes for companies who implement a strategy of social responsibility, including business benefits. improved brand identity and credibility; increasing sales and client loyalty; better efficiency and profitability; improved employee capability; social advantages (community education, housing and welfare programs) company engagement; environmental benefits (greater use of renewable energy sources; improved content recyclability; incorporation of environmental management techniques into business plans) (IISD, 2013).

5.5.8 Some Shortfall of CSR

The problem of both old and new corporate social responsibility is that CSR is what companies want it to be with their judgment, and often it is what is most convenient. This 'company judgment' approach to organizational responsibility is troublesome. Such definitional confusion presents problems not only to investors trying to hold companies responsible but also to firms themselves (Bauer, 2014). The CSR campaign has two fundamental problems: lack of guidelines describing what constitutes as corporate responsibility, leaving it up to business managers to determine, and over-reliance on public control–often referred to as 'political regulation' to make CSR effective. Such glitches are closely associated: because there are no specific guidelines for corporate responsibility and civil law cannot work properly (Ibid). Given the human rights consequences of not "doing well" today, CSR appears persistently entrenched in the image of a virtuous businessman (Bauer, 2014). Rather than changing the statute, the supporters of CSR attempt to change the company from within, thus increasing the level of corporate behaviour beyond what is legally required for the good of factory workers. Too often, corporations include CSR frameworks in their main business processes to distract attention from socially irresponsible conduct (Ibid., 2014).

5.5.9 Possible Improvement on CSR

Practical and workable implementation of CSR can be achieved with some positive approach. In 2014, US Labour Minister Robert Reich was concerned about people's readiness to regulate corporate behaviour, arguing that consumers benefit from inexpensive products made with cheaper labour, or from cost reductions that hurt, in addition to their own, the atmosphere and communities. Therefore, Reich stressed that peoples' needs are too contradictory to count on as impartial arbitrators of the responsible enterprise. The only way to ensure companies are responsible according to (Bauer, 2014), is by encouraging stronger governmental regulation instead. Furthermore, human rights activists stated that the role of CSR is not to protect people but the business and human rights movement (BHR) emerged as a consequence of this dissatisfaction (Ibid). It has tried to shift the emphasis from the needs of the vulnerable group to the rights of the organization and from corporate welfare to full international transparency. The BHR campaign argues that international human rights law provides a strong legal foundation for the appraisal of companies and for their enforcement, irrespective of whether the company's reputation is favourable, profitable or enhanced. The BHR movement argues that universal human rights will form the basis of the professional norm, and that some kind of

leverage is required to address corporate irregularities. The issue is also that these CSR schemes are expensive for businesses as it is not feasible to make cheap products for customers without the cut in wages and workers' employment (Ibid., 2014). Some of the CSR programs should, therefore, be reviewed.

5.5.10 The Connection Between Evolution Economics, Labour Process and Corporate Social Responsibility

The views of evolution economics, labour process and corporate social responsibility could be incorporated into a better background for understanding changes in the labour market accompanied by technological change and what is expected of corporations and its management. While, in many instances, LPT centered on the nuances of internal and external working relations with a broader macro context, in comparison to EET that did not take into account the welfare of workers (Thompson and Smith, 2009, p. 925). Nevertheless, these three approaches are preferred for this analysis for the reason that they all seem to interpret the evolution of technology, the process it brings to the workplace and how to balance technological change for wholesome social good. Thus, it can be intuited with complementary approaches. We can study technological advancement and how it shapes the social forces. Concisely, these perspectives affect the social, individual, economic and political sphere. All these factors prompted an evolution in the way the organization observes its production and social setting. This thesis was based on the analysis of the labour process, EET and the CSR perspectives and on the explanation of why all viewpoints cannot be split in the quest for balanced socio-economic development.

5.5.11 The Relevance of LPT

For Thompson and Smith (2009, p. 925) some people will think that the LPT is out of touch with the new economy edition, but we are still in market-driven capitalism which makes LPT relevant. Further, even though LPT has been less effective in systemic theory-building based on information and feedback (although there is a promising prospect of confronting and overcoming theoretical and practical challenges) (Thompson, 2010, p. 13). LPT had the potential to integrate the multiple dimensions of labour, work and industrial relations and the destruction of labour under the control of new forms of modern capitalism and management– consistent with a revolutionary decade and focused on Marxist narratives of labour and capital inside capitalism (Thompson and Smith, 2009, p. 916). Accordingly, LPT reiterated certain

developments in a study at the workplace that aimed to transcend hierarchical, structured norms and to uncover and investigate the secret or informal domains of industrial relations and confrontation at the workplace (Ibid., 916). Moreover, LPT is relevant to our times due to workplace dynamism, and their multifaceted inclusion in the broader political economy (Ibid., 925).

LPT has understood and clarified how the trend of most industries focuses on the growth of financialization in the economy, lean manufacturing, lean services, agile capitalism and constant consolidation, while companies pursue ways to reduce expenses and control assets to satisfy capital market demands, culminating in the management being unable to protect even core employees from the impacts and being essentially unable to manage collective negotiations with the workers (Thompson, 2010, p. 11). According to Spencer (2000, p. 225), Braverman provided a clearer view of the specific characteristics of modern capitalism through the mobilization of employees and showed the crucial role of social conflict in deciding corporate outcomes. Braverman turned his focus to the development of surplus-value, which he claimed, relies on the radical reduction of workers' power over the labour process. To fulfil their managerial role in the workplace, capitalists will seek to minimize the cognitive and technological input of their labour force into the production process (Ibid., 225). The real concept of exploited labour seeks its explicit manifestation in the particular patterns of impoverished and unskilled labour (Spencer, 2000). Such patterns show the dominance of capital over jobs and, in reality, indicate the contradiction at the heart of the relationship between capital and labour (Ibid., 226). Quite relevant LPT ideas are that "there's an accumulation logic that arises from the rivalry between capitalists and between capital and labour that induces capital to regularly revolutionize goods and services development (Ibid., 10).

5.6 Conclusion

In order to deal with the issues of technology adoption, job automation and the future of workers in the labour market, not one of the theories was enough to understand the objectives of the study, consequently, LPT, EET and CSR were able to relate to one or more research objectives. This chapter positioned that as corporations maximise economic evolution and profits through continual adoption of technology, these innovations must be employed in a fair means to avoid deskilling of workers and polarization in society. Therefore, organisations must

be socially accountable and take consideration of all the stakeholders involved in the economy and their business venture.

The chapter presented the main issues reviewed in the literature, which is nuanced in the theoretical framework of job automation. Thus, this chapter offered a theoretical background supporting this study. At first, this chapter explained the approach of evolutionary economics relating it to technological advancement. Also, the labour process traced to Braverman was discussed as the main dominant theory of this study. Furthermore, the discourse of CSR was presented. This chapter also briefly explained the linkage between the three theories. The next chapter centres on the methodology adopted in this study for the investigation of the rate of adoption of technologies and task automation and the future of autoworkers in the South African automobile industry.

Chaper 6

RESEARCH METHOD AND RESEARCH DESIGN OF THE STUDY

6.1 INTRODUCTION

For the study of job automation and the future of workers in the face of automation, it would be necessary (of primary importance) to get in-depth narratives and views of all role players in the automobile sector. Hence, a phenomenological methodology was adopted for the study to tease out the experiences and challenges of these role players.

This chapter offers an overview of research strategies that were used in the study. Mohammad (2013) explicates research methodology as an outline of steps on how, where and when information is to be collected and evaluated whereas Babbie (2010), states that it is a measure taken in developing rational understandings or getting information or confirmation as a fraction of a study scheme. Research methods are plans and strategies that describe steps from explicit expectations to explicit and comprehensive approaches for data collection, analysis, and interpretation (Creswell, 2014). Creswell and Creswell (2018) further state that the choice of research methods is based on research questions, addressed in the project, and the personal experiences of researchers and research participants.

In order to investigate the rate at which automobile management adopts advanced manufacturing technologies in the motor factories and plants in South Africa, a qualitative method of research was employed in the study. This study applied open-ended semi-structured interviews, which, in an in-depth manner, sought to explore the positive and negative aspect of technology adoption in the motor industry and answer the question related to this adoption such as the experiences of auto-workers in collaborating with robot workers, work and skill competition between these workers and their technology counterparts, worker's readiness for the change that accompanies the implementation of these technologies and worker's union response to the rate of the adoption of technologies and its impact on workers' jobs. This study purposefully included three foreign-owned car companies in South Africa, namely, Volkswagen Group, Toyota Motors and Mercedes Benz plants as the population for the study.

This chapter is important because it provides a deeper understanding of the different techniques and concepts used in the study. It also offers an assurance that the study has been carried out

without a doubt and that the findings are true rather than fabricated. Such issues have an impact on the overall reputation of the study as well as on the potential use and implementation of its findings.

This chapter deliberates on various philosophical discussions and research design on which this research approach is built on. The study instrument utilised for gathering data is also explained, and methods that were followed to carry out this study are incorporated. Information was also gathered through the use of secondary data composed of published literature and, empirical studies, books, and research journals. The researcher also discusses and justifies the choice of approaches used in this study. Lastly, ethical considerations that were followed are also discussed.

6.2 The Core Argument of this Chapter

A phenomenological approach was utilized in this study to focus on the experiences of auto workers with robotics in the motor sector. This was also utilized to interpret the consistency of their responses on why technologies are adopted in the automobile sector, the collaborative relationship with technologies in the plant, and implication of the implementation of these robotics for the car companies and the workers.

Empirical studies on workplace reorganization, evolution and work process have shown that the most leading methodologies used by scholars are qualitative research and document study. These research approaches are exploratory in nature since the scope of this study requires an in-depth understanding of worker-robot work relationship, 4IR compulsory skills, job automation, alternative jobs for workers and labour and management relationship. The desire by scholars to understand the lived experiences of workers in the automobile sector and their robotic counterparts and the labour process in the motor industry have guided their choice of research method.

For example, Barchiesi (1998b) used intensive semi-structured interviews with 30 automobile employees, corporate managers, as well as union officials and focused on employees' perceptions of the organization of output, organization of work and restructuring. He found that restructuring leads to unfair market liberalization, which encourages the company to outsource production phases, thereby threatening the stability of union membership and, at the same time, in combination with job intensification, increased job insecurity and job anxieties.

Hlatshwayo (2017) also examined how South African trade unions in the steel, automotive and chemical sectors have reacted to technological change through qualitative analysis. His results showed that the union responds gradually to technological changes in the factory and production problems often occur when it begins to affect workers' employment in the field.

Further, with an exploratory and descriptive qualitative research design, Ambe (2014) explored challenges faced by vehicle manufacturers in South Africa and found that labour issues, excessive port charges and lack of skills continue to be difficult challenges for the auto industry to tackle. Also, Hlatshwayo and Buhlungu (2017) used a methodological in-depth interview to examine the limitation of the trade unionism approach in the era of global labour restructuring and technological change. These researchers have shown that NUMSA has implemented a negotiating strategy that routinely avoids production issues at the plant and limits the union's ability to respond efficiently and effectively to technological innovation and job reorganization. Again, through qualitative interviews, Barchiesi (1998a) analyzed workplace co-determination thesis in the South African automotive workplace which revealed that the South African automobile companies have combined highly authoritarian technological innovation with a unilateral restructuring of work and production organization, embedded in an enduring corporate paternalism which points that the union is fighting a largely defensive battle, where the power of worker organizations is undermined by a sense of precariousness, instability, generalized loss of identity and fragmentation of solidarity (1998, p. 70).

Webster et al. (2019) performed a qualitative case study of the Volkswagen factory in the Eastern Cape Region of South Africa with an emphasis on staff-management interactions at the factory. It was noticed that the implementation of new production structures did not involve significant worker engagement, which democratizes the workforce. Similarly, Masondo (2010) used a qualitative research approach to analyze the involvement of employees in the transformation of the automotive industry in the workplace. He believed that when new car models were manufactured, any other automobile assembly plant would dramatically change their job production systems and processes. Nonetheless, the judgment on this transition is reached by the managers alone and is forced on the workers and the trade unions.

While the above scholars made use of a qualitative method as the primary data source, they also supplemented the approach with document studies as their secondary source of data.

Nevertheless, some scholars employed only document study (secondary data sources) in their study.

For example, Black and Hasson (2012) implemented a document study to explain the competitive benefit of capital-intensive industrialization versus labour-intensive manufacturing. Their result has shown that, while faster economic growth is an important objective, at any given level of growth, the economy needs to become more labour-intensive, because while exports have grown, they have not led to the expected bonanza of jobs. Likewise, through the use of secondary data analysis with the case of the automotive sector in South Africa, Masondo (2018, p. 203) found that efforts of the post-apartheid state to attract and retain investment in the automotive industry were not similar to those of a developing state. These efforts are similar to those of a business nanny state that simply provides a handout to transnational firms that have not increased employment; rather, they have increased profits for the automotive industry (ibid., 205). In the same vein, Barnes, Black and Monaco (2018) critically assessed the collection of documentary data available in the formulation of previous and current automotive policy, including the 2035 Masterplan and field research conducted with NAAMSA and the National Association of Automotive Components and Allied Manufacturers (NAACAM). Barnes, Black and Monaco (2018: 2) argued that the SA car industry can certainly count on a more balanced production system, better innovations and better integration into world markets today, and that the development of the sector also represented some costs, but structural problems remain because there was no significant job creation in the industry. In addition, Black, Craig and Dunne (2016) looked at the nexus of poor manufacturing performance capital intensification and declining employment in the manufacturing sector in South Africa through a secondary data collection. They argue that, in spite of the exceptionally high unemployment rate in South Africa, the manufacturing sector is highly capital intensive compared to similar countries. The intensification of wealth has been catastrophic for employment, increasing inequality and poverty (ibid., 13). These researchers noted that the majority of South Africa's unemployed labour force is unskilled or semi-skilled and can most readily be incorporated into labour-intensive operations.

The approach of this analysis was inspired by the preference of the research method of these prior studies. Document study was used in this study to:

- gain valuable insight into the phenomenon under investigation;

- acknowledge researchers who have been involved in the investigation of the same phenomenon; and
- provide the researcher with an opportunity to identify other researchers who supported or opposed the results of this thesis.

A phenomenological technique was adopted in this study to describe and interpret the nature of labour process and economic evolution phenomenon with group auto workers who have first-hand experience with robotic co-workers and to understand the situation that has influenced (personal or group) experiences of the phenomenon through interviews of data collection. Both qualitative in-depth interviews and document data germinated group of themes that formulated sections of indications and central argument of this study thereby attained a more theoretical conception of the phenomena (robot-human interface, job automation and the future of workers).

Hence, phenomenology is the study of phenomena and this study conducted a phenomenology of the technology adoption and the future of workers in the face of job automation in the South African automobile sector. For that reason, this study as indicated in the preceding chapters revealed that while the South African auto sector has restructured the labour process and technologically advanced which has positively impacted on the rate of the quality unit of cars, increased export and global competition with good financial turnover, creating some new demanding roles and skills for some workers and helped establish a safer work setting.

The negative impact has many bears on the autoworkers because the rate at which the auto management implements this robotics in the car plants have destroyed a good number task as the technologies are now doing the jobs that the workers used to do and it is threatening the job security of the workers in the companies. Many of the good skills possessed by these workers are no longer needed and they are upskilling and reskilling to be to some extent relevant in the industry. These workers are completely unprepared for changes this job automation will bring to their career and life. This study posits that it will not be corporate socially responsible if auto-management refits their plants with advanced technologies that dominate most of the workers' jobs and when their workers in the car companies are uncertain of their existing jobs and the unemployed are outside the companies queuing up to do some tedious work at a minimum wage.

6.3 Research Philosophies

Research philosophy is concerned about how the information ought to be gathered, investigated and deciphered (Antwi & Hamza, 2015). The underlying foundations of qualitative and quantitative approaches outspread into various philosophical research paradigms. According to Somekh and Lewin (2005), the notion of philosophies may depict the thinking patterns of people in regards to explicit situations. These authors indicate two significant research philosophies, namely the Positivist and Phenomenological philosophies.

The Positivist paradigm entails the application of systematic practices to explore social issues or occurrences (Zou, Sunindijo & Dainty, 2014). Creswell (2014) describes positivism as a scientific technique of conducting research, which generally involves realistic scientific features to determine the underlying effect of explicit concerns. Positivism is linked with quantitative research and involves hypothesis testing to achieve objective truth.

In contrast, the phenomenological paradigm mainly focuses on providing a substantial understanding of the life experiences of individuals (Collis & Hussey, 2013). Phenomenology normally focuses on discerning and understanding how people live and conduct themselves in diverse settings (Lopez & Willis, 2004). Therefore, the main difference between the two is that the positivist paradigm is quantitative, experimentalist, traditionalist and scientific while phenomenology paradigm is more qualitative, subjective, humanistic and interpretivist.

This study adopted the interpretivism paradigm, which is also termed the phenomenological approach. This approach was deemed suitable for this study as comprehends the experiences of South African workers in the automobile sector concerning the introduction of technology in the workplace. Interpretivism focuses on studying the multidimensional nature of social phenomena to increase knowledge. The Interpretivism paradigm was deemed appropriate for this study since it resolved to comprehend and decipher everyday endeavours such as autoworker and robot daily teamwork experiences, constant competition between these work team and social realism of employees – as well the values and meaning of work to the autoworkers (Rubin & Babbie, 2010; Collis & Hussey, 2013).

Interpretivists view social reality as personal since it is moulded by the opinions of the participants, as well as the standards and goals of the researcher. The interpretivist paradigm aims to offer extensive comprehension of peoples' life encounters (Collis & Hussey, 2009). It

is connected with qualitative research and is utilised to get a comprehension of the world from an individual's point of view. This paradigm which deals with small in-depth, investigations and qualitative. Interpretivists are of the view that it can only be through the subjective analysis of an intervention, in reality, can that reality be completely comprehended. They acknowledge that there might be numerous justifications of reality, but affirm that these explanations are in themselves is a piece of the logical information they are seeking after. The interpretivist paradigm was adopted because the researcher needed to acquire a comprehension of the word from an individual point of view about how workers compete with the rapid technological domination in the workplace. The researcher made use of this paradigm to interpret the actions that result in how individuals comprehend their emotional reality.

6.4 Research Approach

Research approaches are divided into two groups, namely, qualitative and quantitative research approaches (Walter, 2006). The qualitative approach to collecting data centres on defining a phenomenon in a profound inclusive way. This is usually done through interviews, open-ended questions or focus groups. In most cases, a small number of participants participate in this type of research, as it involves numerous resources and more time. The quantitative approach is mainly focused on describing a phenomenon over a larger number of participants, thus offering the opportunity to summarise characteristics across groups or relationships. This method investigates a large number of participants and uses statistical techniques to define general trends in process relationships. As stated by Creswell (2014), the difference between qualitative studies and quantitative research is framed in terms of using words (qualitative) as opposed to figures (quantitative) or using closed-ended questions (quantitative hypotheses) as opposed to open-ended issues (qualitative interview questions). Rather than generating numerical data that supports or discredits apparent qualitative research theory, it seeks to provide real factual descriptions based on individuals' face-to-face knowledge and social gathering in their shared environments (Stake, 2010).

The study from the research paradigm adopted the qualitative approach. Qualitative research is an approach used investigating and understanding the importance of a social or human issue. Qualitative research is a form of social inquiry that interrogates how individuals decipher and comprehend their encounters and the environment they live in (Elmusharaf, 2013). Qualitative research is the technique of selection when, in the context of the social and cultural scenario,

the research question needs knowledge of process activities and relationships (Creswell, 2014). Qualitative research offers detailed insight and understanding of real-world problems and, unlike than quantitative research, it does not use numerical data to describe the phenomenon (Korstjens & Moser, 2017). For this reason, the researcher used qualitative research to establish the perceptions and experiences of South African workers to the introduction of technology in the workplace. Qualitative research permits the researcher to provide rich information and comprehend the issues that are disregarded regarding the matter under scrutiny (Antwi & Hamza, 2015).

Qualitative research is valuable in getting a comprehension on circumstances and issue when one has little knowledge of the concept. It is essential in the original early phase of concept formation with the ultimate objective of understanding social and cultural phenomena in the natural environment in terms of all participants' experiences, significance and opinions. Qualitative research is suitable for this study because its goal is to discover and provide a thorough understanding of the experiences participants have regarding the introduction of technology in the workplace. It also helped the researcher to investigate problems that needed more clarity. Qualitative research additionally has the benefit of giving profundity and detail, encourage discussions and allows for more flexibility. Subsequently, the study used qualitative research that is responsible for its quality and claims, meaning that it does not try to place itself beyond judgment and provide information to its public on which to judge it. This strategy also strengthens the comprehension and clarification of connotation as well as the fundamental human interaction intentions. The investigator had a chance with the previous appointment to engage with respondents on a one-on-one basis.

6.5 Research Design

According to Kurumbi (2018), the research design is a collection of methods used to collect and analyse the variables indicated in the research problem. It is a guide that the researcher pursues to accomplish remarkable rations of the study and achieve the ultimate study objective (Woodley & Lockard, 2016). There are different research methods for both qualitative and quantitative strategies. There are four main types of quantitative research projects that are analytical, correlational, quasi-experimental and scientific. A descriptive design attempts to describe the current status of a variable; a correlational design examines the relationship between variables by way of statistical analysis; a quasi-experimental design seeks to establish

a cause and effect relationship between two or more measurements, and experimental designs use the scientific method to determine a causal relationship between a number of variables.

In terms of the qualitative research design, they are divided into five groups, which are the ethnography, narrative, phenomenological, grounded theory, and case study designs. Grounded theory is a logical technique of data analysis, normally associated with qualitative research that enables the researchers to build up a hypothesis that clarifies a particular phenomenon. Ethnographic studies are qualitative methods used to describe, explore and deduce the features of a culture. Phenomenology is used to define phenomena and to focus on individual experiences and understand their composition. A case study includes a profound knowledge of many sources of information and may be explanatory. The narrative strategy weaves a series of occurrences together, generally to create a cohesive story from just one or two people. The table below explains in detail the qualitative research designs.

Table 6-1: Qualitative Research Design

Method	Focus	Sample Size	Data collection	Data Analysis	Written report form
Ethnography	Describes and interprets an ethnic, cultural or social group	—	Observation & interviews, and immersion into cultural as active participants	Describe and interpret findings by analysing data and developing themes	Description of the cultural behaviour of a group
Narrative	Individual experience & sequence	1 to 2	Stories from individuals & documents	Stories, review of historical content, development of themes	A detailed picture of a person's life; often a chronology or biography
Phenomenological	People who have experienced a phenomenon	5 to 25	Interviews	Study and describe experiences, examine meaning and context, look for themes, classify	Report of "essence" of the experience, description of the context of the experience or phenomena
Grounded Theory	Develop a theory from grounded in field data	20 to 60	Interviews, then open and axial coding	Open, axial, and selective coding used to categorise the data and describe the implications of the categories	Results in a theory, theoretical model, or figure that represents the phenomena
Case Study	Organisation, entity, individual, or event	—	Interviews, documents, reports, observations.	Develop a detailed analysis; identify themes; make assertions	In-depth study of a case that describes the case, its themes and possible lessons learned

Adapted from Sauro (2015)

This study adopted the phenomenological design, which concerns itself with uniqueness for every individual. It is the best design for this study since the researcher was looking at the rate of the adoption of technology in the auto sector, workers experience with the technologies and their readiness for the uncertain future. Leedy and Ormrod (2010) show that phenomenological research tries to comprehend the attitudes, views and opinions of a particular position of the individual. By looking at numerous perspectives on autoworkers and auto management on the same situation, the researcher would then be able to generalise job automation situation from an individual about what the level of robotics, job creation or job loss and possible alternative career.

The use of a phenomenological method helped to aim at understanding and interpreting the meaning these workers and their management offer to their working lives and business venture. Phenomenology is concerned with individual people's experiences. It typically includes lengthy, in-depth interviews with participants, and on occasion, the researcher interviews several times with the same respondents to get a complete image of their phenomenon experiences. Bryman (2008) adds that qualitative research is a phenomenological method that examines actions of subjects through analyzing their way of thinking and perception, as well as their perspectives on a topic that is relevant to a study.

6.6 Sampling Technique

The two main sampling techniques used in studies are probability and non-probability approaches. The approach to probability sampling considers the sample chosen from a population to be representative of the population (Maree, 2010). The benefits of probability sampling are that there is a high likelihood that each population participant will have a higher opportunity of being included in the sample and their capacity to allow statistical inferences about the target population from which the sample is extracted (Malhotra and Birks, 2007). Simple random, systematic, clustered, stratified and multistage sampling methods are standard likelihood sampling methods (Sekaran & Bougie, 2010). On the other hand, a non-probability-sampling method is when the sample is chosen on the basis of the subjective judgement of the researcher rather than random selection, which is the basis of the probability sampling methods. It is not dependent on randomisation, and the ability of the researcher to select components for a sample is more dependent. The result of sampling may be prejudiced and makes it difficult for all population components to be equally part of the sample. Babbie (2013) indicated that

the techniques of non-probability sampling include: purposive or judgemental sampling; snowball sampling, convenience, and quota sampling. Convenience sampling may be the simplest sampling technique, as respondents are chosen based on accessibility and readiness to participate in the research. Quota sampling is repeatedly used by market researchers where interviewers are provided with a quota of subjects of a specified type to attempt to recruit. Purpose also is known as selective or subjective sampling depends on the researcher's judgment in choosing whom to request to participate. Snowballing is when present respondents are asked to advise extra recognised respondents, so the sample increases in size like a rolling snowball.

In this study, the purposive sampling and snowball sampling method were used based on automotive employees, management and worker's representatives who deal more with machinery in the motor industry. According to Leedy and Ormrod (2010), purposive sampling is when the researcher deliberately chooses respondents to include the survey, based on their capacity to provide the needed information. In this case, the selected group of automobile stakeholders in this study possesses the information that is relevant to all the objectives of this study. The purposeful sampling is appropriate for this study because it focuses on the particular trait by selecting a representative sample to fit their requirements, or specifically approaching individuals with particular characteristics that will help answer research questions. Snowball sampling was used because of the sensitivity of the study topic specifically to the auto-workers and management, availability and time as well. This necessitated one identified and willing participant to refer the researcher to other unbiased respondents who had the courage to be part of the interview, who also were willing to be available to devote 10 to 15 minutes from their busy activities to be part of the study. Hence the researcher by using these methods was able to focus on the automobile sector where workers collaborate with robots daily.

6.7 Study Area and Population of the Study

The research was carried out in three study areas: East London (Mercedes Benz plant); Port Elizabeth (Volkswagen Group South Africa) and Kwazulu-Natal (Toyota Motor Co. Ltd). Mercedes Benz plant is situated in Settlers Way in East London Eastern Cape. It is located on the shore of the Indian Ocean, mostly between the Buffalo River and the Nahoon River, and is the only river port in the country. The Volkswagen Group South Africa (VWSA) plant which is situated in Uitenhage, an industrial town which lies approximately some 35 km from Port Elizabeth in the Eastern Cape, 750 kilometres east of Cape Town and 1 000kms south of

Johannesburg. Just over half (294,713 m²) of the plant's 520 963 m² area consists of production facilities. Toyota Motor plant is situated in Prospect on Road South of Durban Kwazulu-Natal in South Africa. Zikmund and Babin (2010) described the population as a topic of research that could be persons, groups or organisations. Hair, Wolfinbarger, Ortinau, and Bush (2008) say a population is a comprehensive group of individuals from whom issues can be examined or observed for data purposes. The study population comprised three automobile companies in South Africa, namely, Mercedes Benz, VWSA and Toyota Motors. Participants consisted of automobile management, auto-plant workers and trade union representatives (Shop Stewards).

6.7.1 Sampling Size

Zamboni (2017) defined sample size as the number of units or individual data pieces collected in a survey that is imperative in determining the accuracy and reliability of the results of a survey. Determination of sample size is the selection of the number of observations or components to be included in a sample. There are some recommendations put forward from literature in terms of sample sizes. For an ethnography study and grounded theory study, Morse (1994) suggested roughly 30-50 participants respectively, while Creswell (1998) suggested only 20-30. Creswell (1998) recommends 5-25 for phenomenological research and Morse (1994) suggests at least six. This study is phenomenological, and a total of 30 participants from the three car companies were interviewed. The sample size of thirty participants within qualitative research is adequate and appropriate in studies of this nature moreover the researcher based the sample size on empirical evidence from prior research. As per the numbers of respondents from each company, two managers and five auto plant workers from Mercedes Benz; two shop stewards from Toyota Motors; two union representatives and nineteen workers working in the auto plant in VWSA.

6.7.2 Data Collection Instrument

Creswell (1998, p. 110) sees data collection as part of a collection of interdependent tasks aimed at obtaining information to address research questions. Given the degree and motivation behind this research, secondary data collection (literature reviews) and primary data collection through in-depth interviews were utilised to gather the information for this study.

6.8 In-depth interviews

In-depth interviews were conducted with all the participants to collect data. Although, a questionnaire is another way of collecting data which is a set of fixed-format self-report items that are completed by respondents at their own pace, often without supervision (Stangor, 2011). It is a quantitative form of gathering a large amount of data to topics and answers that are sensitive, so a questionnaire guarantees the respondents anonymity, encouraged frankness of respondents' opinions and cost-effective as well. However, in-depth interviews were chosen ahead of the questionnaires mainly for their advantages in this study because: with in-depth interviews, the researcher got: (1), in-depth understanding of each autoworker, manager and shop steward, (2), more personal answers, more tailored to each respondent's situation, (3) more suitable responses for such sensitive questions in this study, (4) deeper reasons to why the number of advanced robotics are increasing in SA's motor companies yearly and (5), more researcher's and participant's flexibility considering the busy schedules of these stakeholders in the automobile environment and place for the interviews irrespective of its time-consuming nature. Therefore, the in-depth interviews offered a coherent, exploratory, flexible approach to determine the rate of technology implementation, job automation, experiences of South African workers with regard to the introduction of technology in the workplace.

There are three recognised kinds of interviews used in education and social studies: open-ended, semi-structured and structured, based on the nature of the case as determined by the initiating interview investigator (Greeff, 2011). Semi-structured interviews are interviews that use an interview protocol to help guide the researcher through the interview process. While this may include elements of discussion, it is mostly a guided discussion between the researcher and the participant. Structured interviews are interviews that conform strictly to the researcher's guidance using an interview protocol. It is a stricter style of interview, as only the questions on the interview protocol are studied.

This study utilised semi-structured interviews to acquire more insights on the phenomenon under study, thus enabling respondents to elaborate and provide more flexibility, scope and obtaining more data from them. Semi-structured interviews maintain some structure and afford the researcher the ability to source more additional data from the participants. The semi-structured interviews were the foundation for the development of contextual data that primarily meet the research goals and research issues being measured as the study's primary theme.

Semi-structured interviews are pre-determined questions, but the order can be changed depending on the interviewer's view of what seems most appropriate. Semi-structured interviews with open-ended questions integrated into the interview guide facilitated the study. The duration of these interviews differed and depended on the respondents' wealth of data. However, the interview sessions took time to conduct, so it was important to be clear about what the researcher would get out of this information-gathering approach. The researcher made use of an interview guide containing questions and themes that are essential to the research.

For example, for the workers, some of the questions in the interview guide for this study were:

- Has there been an increase in the number of technologies in your workplace? If yes, please mention the type of machines and what their functions are.
- What experiences (in terms of collaboration, safety, repetition, job satisfaction, etc.) have you had and are currently experiencing with technology in the workplace?

For management, some of the questions in the interview guide for this study were:

- Kindly explain the main reason why your organisation adopts sophisticated technologies.
- Would you say that management prefers more technologies than human workers? Why do you say so?
- Would you say that machines are replacing the number of current workers in your workplace? Kindly explain your answer.

The questions for union read:

- Do plant employees receive any training pertaining to the adoption of advanced technology? If yes, do union facilitate these training?
- Would you say that the union are always consulted prior to the introduction of new technologies in this organization? If not, why not?
- Would you say that the union engages in negotiating to ascertain that no dismissal will result from the introduction of new robots?

Which department in the company is mostly dominated by robots? What happened to the workers affected?

6.8.1 The Interview procedure

First, the investigator notified the participants on their first session about the research. Participants were provided with the option of either participating in the research or not. The clearance certificate acquired from the University of Fort Hare Ethics Committee was provided to the employees who agreed to engage in the research. Respondents were familiar with the content of the Ethics Research Confidentiality and Informed Consent Form, which required the participants to endorse signatures in recognition of their participation in the study.

The interview was scheduled when the participant was free, and the venue was pre-arranged. The two respondents from Toyota car company were interviewed telephonically due to time and distance constraints. However, the researcher interviewed participants from VW and Mercedes Benz companies face-to-face with an audio recorder. All Volkswagen respondents were accessed through NUMSA trade union and interviewed during their VWSA NUMSA worker's Indaba at Uitenhage Port Elizabeth. The interview with Mercedes Benz participants took place at their factory in East London.

The investigator used semi-structured interviews with arranged composed questions for the interviewees. The questions were ready, organised and arranged according to the goals of the research. This procedure urged the participants to respond to the questions as precisely as they can and probed for more information where it was not clear. To ensure that answers were recorded, participants' answers were registered using a digital voice recorder and back-up recorder. All interviews were held at the workplace of the participant. Each interviewee was provided with a duplicate of the interview schedule and the researcher's contact details for possible future inquiries.

6.8.2 Challenges faced during data collection

At the end of 2017, the Mercedes Benz Company permitted the investigator to gather information from them; the research was able to interview seven respondents in total; however, in 2018, the researcher failed to get any responses from them, resulting in few participants. Other automobile companies refused to take part in the study. For instance, General Motors was leaving SA and others believed that the topic was very sensitive and would have a negative impact on their companies. In an attempt to rectify these issues and to move forward in gathering the data, the researcher decided to obtain data through NUMSA. This was done by

approaching one union representative and asking if the researcher could interview some of the members who are also working in the car plants. This request was successful. However, data was collected from Volkswagen through NUMSA trade unions while they were having Workers Indaba. The researcher contacted NUMSA and was directed to one shop steward of VW who later on introduced me to other workers. However, most of them cited that they were busy hence did not participate in the study, therefore, the researcher only conducted a few interviews as some workers did not want to be recorded. Nevertheless, a saturation of data was reached with the numbers that participated. Therefore, more participants were not needed after all.

6.9 Secondary Data Collection

The desktop study, secondary data or literature reviews are used interchangeably. Using secondary information, the variables used in this research are commonly recognised and defined especially in associated literature where sources such as books, publications, websites, empirical research, and other associated materials served as major factors. Secondary research was important as it consolidates findings and can help surface patterns of discourses and arguments related to the automobile sector has evolved and the labour process. Secondary data was used in this study to locate the existing research on the adoption of advanced manufacturing technologies and its relationship to productivity, efficiency, market competition, job automation, skills, reskilling, deskilling and job security. Further, it was utilized to look for linkages that permitted new insights to be revealed. Desktop research provided the basis for channelling further primary research for this study.

6.10 Trustworthiness and Credibility

Credibility is said to be a trust placed on the truth to determine whether the results of the studies represent reliable information and initial views from the initial data of the respondents. The researcher ensured credible data by recording all interviews and transcribe verbatim within a short period. Reflexivity was conducted to guard against researcher biases and guaranteeing objectivity. The following was performed to boost the research instrument's reliability and validity:

- Credibility: Data engagement (recordings, notes and transcripts) was performed seriously to demonstrate clear links between the interpretations information. There

were regular debates and changes were made in accordance with the suggestions and recommendations.

- Dependability: According to (Riege, 2003), reliability in quantitative studies strongly resembles the concept of dependability. The motive behind this experiment is to show in the investigation process signs of stability and consistency. Through a comprehensive description of the research process, care was taken to ensure that the research process was logical, traceable and documented in a reflexive way.
- Authenticity: The design of the question items was based on the comprehensive theoretical basis as outlined in the study's Chapters Two, Three, Four and Five.
- Confirmation: Working forward, as well as backward through the study phase, carried out an audit process to guarantee that the findings ' information and interpretations were sound and verified. The aim of the interpretation method was not to generalize results to a population but to recognize recognized values and trends related to the subject of studies.

By implementing the following requirements, the trustworthiness of this study was assured: credibility, reliability, authenticity and confirmation. The description of what was accomplished in the qualitative research phase; how it was achieved; and why it was done; as well as adherence to the criteria defined for qualitative research, this research study ensured authenticity and confidence.

6.11 Transcription of Interviews

It is particularly essential to prepare a transcript from an audio-taped interview to ensure that the information is not lost. Data was shortly transcribed while it was still fresh in the researcher’s mind and the researcher used headphones with an on and off the pedal to comprehend the verbal cues of the respondent.

6.12 Data Analysis

Qualitative data analysis is the organisation and interpretation of linguistic (or visual) materials to create statements on the material's implicit and explicit aspects and meaning-making structures and what is depicted therein. In routines and procedures, qualitative information analysis is also performed to uncover and describe field problems or structures and procedures.

Therefore “data analysis refers to a process of meaning-making related to the data collected, which is an ongoing process of analytical reflection on the assembled data” (Creswell 2009).

Data analysis provides the mass of information gathered with order, structure and significance (Creswell, 2014). It is a method of information review, transformation, modelling with the goal of discerning models and data analysis method. The researcher transcribed, analysed, interpreted and checked data collected from the respondents. The transcription of the interviews helped the investigator achieve a better knowledge of the topic through constant listening and reading of the transcribed interviews. De Vos, Strydom, Fouché, and Delport (2012) defines data analysis as a method of inductive reasoning, thinking, theorising that is far from organised, mechanical and technical processes for making inferences from empirical social life information. According to Zhang and Wildemuth (2009), there are two methods to analysing data, namely; inductive and deductive approaches. Inductive reasoning is the use of current information or observations to create projections about fresh instances, according to Hayes, Heit and Swendsen (2010). The deductive strategy is the development of an assumption based on current theories and the development of a study plan to test the hypothesis (Wilson, 2010). The deductive method can be explained using the theory-driven hypothesis, meaning that deduction of the outcomes from the premises is included. When using a deductive method for a research study, the researcher creates hypotheses that need to be tested using appropriate methodology. Qualitative research is usually connected with inductive methods, while quantitative research is more frequently associated with deductive methods.

In this study, the researcher made use of the inductive approach to analyse the data. Thus, the researcher identifies the specific themes and themes from raw data and then develop a theory. The researcher employed thematic, content, and quotation analyses to structure arguments from the gathered information. For the thematic analysis, certain questions were embedded, clustered into units of recurring themes with the support of each research objective and were given an appropriate label for the category and analysed conceptually. With regards to the content analysis, Secondary information in the chapters of the literature review gave insight into the discussion of the primary objectives and secondary objectives of this thesis. The aim was to learn more about the ongoing development of the labour process in the auto industry and the future career preparation or insecurity of workers in the companies through the existing empirical studies and observations of experts in this field of study. Quoting the respondents gave the researcher the ability to gain information on each phrase and to clarify sentences,

revealing the hidden meanings of quotations. The researcher broke down most related quotes of the same types into one common quote to minimize them from massive amounts of data. Interesting quotes, however, remained intact. Accordingly, the reasoning, undertone and inference of the prior series of contentions were systematically established in the scope of this study to help discover the significance of the quote from primary data.

The method of defining patterns or topics within qualitative information was used to analyse thematic data. There are many different ways to approach thematic analysis. However, this study followed Braun and Clarke (2006) 6-step framework. It may be the most important strategy, at least in the social sciences, likely because it provides such a clear and usable structure for thematic analysis. The following are the 6 steps involved in the thematic analysis according to Braun and Clarke (2006) which were followed in the study:

- Step 1: Become familiar with the data- Reading and re-reading transcripts is the first step in any qualitative analysis. Making notes and jotting early impressions is helpful at this point.
- Step 2: Generate initial codes- data is organised in a meaningful and systematic manner in this stage. Coding lowers a great deal of information into tiny pieces of significance. The information will code each data segment that was applicable to our research question or captured something interesting.
- Step 3: Search for themes- a theme is a pattern capturing something important or interesting about the research questions. A theme is characterised by its meaning.
- Step 4: Review themes- The investigator reviews, modifies and develops the topics we identified in step 3. The investigator will read the information related to each theme and consider whether the information supported it. The next step is to consider whether the topics function in the context of the whole collection of information.
- Step 5: Define themes- This is the final refinement of the topics, and the objective is to 'define the ' essence' of each theme ' (Braun & Clarke, 2006, p. 92). What is the theme saying? If subthemes exist, how do they communicate with the primary theme and connect to it? How are the topics related to each other?
- Step 6: Write-up- Usually, the research endpoint is some document, often a journal article or dissertation, which in this case is this study.

6.13 Ethical Considerations

According to McMillanand Schumacher (2010), there are various ethical considerations that the researcher used when the study was being conducted. The permission was granted from one of the car companies to undertake the research. The investigator from the University of Fort Hare Research Ethics Committee received an ethical clearance certificate. The following ethics were considered when conducting this study:

- Confidentiality and Anonymity: The anonymity and confidentiality of the information obtained through semi-structured interviews were emphasised to the participants. Information supplied by participants was kept private, and the identity of the participants remained anonymous.
- Informed Consent: Participants in this study were informed of their right to participate in the research or to withdraw from it. Furthermore, participants were notified that only for scholarly reasons was the data requested.
- Honesty: Study findings were honestly reported, and data findings were not manipulated in any way.
- Respect for Autonomy and Dignity of People: Regardless of their era, ethnicity, gender or status, the respondents were treated with regard and dignity. Nicholson (2011) recommended that when dealing with ethical problems, priority should be given to respect for the dignity of individuals and concentrate on moral freedoms. Therefore, the focus should not be on the researcher's comfort.

6.14 Conclusion

An interpretative phenomenological approach was used in this study and it was useful in this study for expounding a richer understanding of the labour process and the implications of work reorganisation in the motor industry on the side of the organisation and as well as on the workers.

Taken into consideration the eclectic theoretical framework of this study, the phenomenological technique offered a suitable methodology for the exploration of evolutionary economic theory, labour process theory and corporate social responsibility insights which emerged a list of important social-economic concepts such as job creation, productivity, market competition, economic expansion, GDP, profitability, labour market

evolution, product innovation, training/retraining, upskilling, de-skilling, polarisation, underemployment, job destruction, unemployment, job insecurity, employment reallocation, workers welfare and corporate social good.

Thus, the purpose of this chapter was to outline the research methodology used in the present study and to motivate the use of each strategy taken in the study. The section addressed the most significant research methodology issues. Examples include the research philosophy, research approach, research design, sampling design, instrumentation, data collection procedures and ethical considerations, among others. A qualitative research method was adopted for the study with in-depth interviews and secondary data collection as the data gathering techniques. The study employed a purposive sampling method and supplemented with snowball sampling approach. The population for the study consisted of Toyota motors in KwaZulu-Natal, Volkswagen Group in Port Elizabeth and Mercedes Benz plant in East London; all in South Africa. A total of thirty respondents from all the three car companies participated in the study. Inductive approach, quotes, content and thematic method of data analyses were utilized to analyse the data. This study observed all the responsible ethical considerations. In the subsequent chapters (Chapters 7, 8, 9, 10 and 11); data were interpreted, findings were presented, discussions were engaged and conclusions were made based on each of the study objectives.

Chaper 7

EXPLORING THE EXPERIENCES OF SOUTH AFRICAN WORKERS WITH REGARD TO THE INTRODUCTION OF TECHNOLOGY IN THE WORKPLACE

7.1 INTRODUCTION

From the experience of workers in the automobile sector, it can be concluded that while automation and the use of technology have resulted in productive efficiency and or increase in productivity, however in the process, workers have become more vulnerable to job losses and thus those remaining in the sector experience less job satisfaction and insecurity. The use of technology is underpinned by the evolutionary economics framework, which is based on the link between economic expansion and technological innovation. It is a revolutionary systemic transition that unlocks unique economic activities and opportunities, and technological changes are, for the most part, gradual and cumulative (Freeman, 1994). In the automobile industry, the use of new technology or robotics is high and therefore, it was critical to understand the experiences employees have had with an introduction to technology in their organisation. The participants noted that technology has helped in increasing their work performance; however, it also comes with a downside of job loss. This may be partially due to more advanced technologies that make jobs easier and faster than human beings. Technology also increases cost-effectiveness, ensures higher quality, lower scrap automobiles, increases productivity, reduces repetitive tasks for human workers, lessens the nervous tension in human workers triggered by ergonomics and establish a safe working environment for workers.

This chapter details the experiences of South African automobile workers with regard to the introduction of technology in the workplace. It also outlines the reasons why organisations adopt sophisticated technologies. The chapter likewise looked at how individual duties have been affected due to the introduction of some machines in the workplace. A thematic method was developed in analyzing and presenting the results. This chapter first presented a synopsis of the central argument of this chapter which is also in line with the core argument of this study.

7.2 The Core Argument of the Chapter

Automation has increased productivity, production efficiencies and safety in the car companies nevertheless has threatened job security of workers, and in some case resulted in job losses. In line with previous chapters, driving and maintaining innovation progress is a central issue for

automobiles managers in general. The complexity of the car industry, especially when combined with different vehicle models, assumes this sector utilizes innovation to react strongly to the ever-changing business climate and remain viable in the international motor world. This part of the core argument corresponds to the view of evolutionary economic perspective. Meaning that the continued development of robotics and its allocation of further roles is a selected effort to make sure that the positive competitiveness of South African auto companies in the worldwide automotive sector. This strategic move is what the evolutionary philosopher labelled as “creative response” which suggests that SA's motor businesses are developing a creative solution to shape the entire series of future events and their maximum long-term payoff capabilities.

An additional argument is that the use of these robotics is also intended to improve the safe operation and high volume of vehicles in the plant. Moreover, automation in the auto sector has made things easier for employees by relieving the need for manufacturing workers to execute mundane tasks manually that risk their well-being. Employees, nevertheless, confirmed that programming errors and being too close to operating systems may lead to injury.

Another argument is that workers saw their robot co-workers as stronger rivals and opponents challenging their employment. Consequently, while employees were relieved of the burden of repetitive work, they argued that the sense of meaningful work had been drained and reduced their job satisfaction. Therefore, they yearn for more obligations to build cars to improve their self-confidence.

On the other hand, labour process sees this “creative response” as a capitalist control in the process of production where there is still minimal worker responsibility, limited level of job influences and a highly restricted unit of conception and execution (Smith, 2015, p. 225). For LPT, such technologies are implemented to generate a capital gain for managers to undermine workers’ welfare, which points out that technological progress is far from being fair and equal nor pragmatic in this sense.

7.3 Why Automobiles Organizations Understudy Adopt Sophisticated Technologies

Most companies adopt technology because it offers more advantages in terms of delivering quality goods effectively as opposed to human workers. For instance, technology is free from drama, do not need wages, disciplinary action, leave, retirement considerations, lunch breaks,

medical aid, injury-free, does not grumble about the workload, perform more dangerous tasks and works round the clock at a faster pace and reduces production costs. This shows that the capabilities of technologies are alluring and necessitate their adoption, but these values of technology, as opposed to human, are detrimental to human existence and human functions in society. To gain a better understanding of the reason behind technology adoption in the motor sector, it was important to grasp it from management's perspective. The following is an interview excerpt which illustrates the reason why the motor industry in South Africa adopt technologies:

> *"The reason is quite simple, is to be globally competitive, if we did not adopt these technologies, we would basically close the plant, and it will be 3,000 jobs lost to be quite honest with you. The rest of the world is moving towards these technologies. You can produce faster, quicker, more accurate, greater safety issues going on for the workers and bigger volume and the plants set are able to join bigger volume at the right quantity cost and quality, and all the ones will be more successfully, so if you are sitting with a low volume plant and not just embracing technology, you cannot compete on a global platform, so it is actually a business imperative for us to do that." (Interviewee No 1, manager, October 2017).*

The findings show that technology is being used every day and will continue to be used in the future as it produces cars in a faster and safer manner. Robots enhance the output of these costly assembly lines by ensuring that production activities move with minimal machine idle moment at a steady speed. In terms of productivity, technologies are more accurate, detailed and produce high-quality work. With constant speed and repeatability, these machines can produce a greater quantity within a short timeframe than human workers and robots are adopted to be globally competitive.

From the view of economic evolution, management is searching and selecting economic decisions that will boost its competitive edge in the labour market. The selection procedure is externally influenced by conditions such as the quantity and demand of products, how other competitors perform, which controls the speed of the organisation to expand its competition and opportunities. The position of EET is that competition in the labour market in the process of the technological path is central, given that it structures the company's growth. This study also revealed that management emphasised that these machines provide safety for the workers

as old methods of doing things were harmful to people. Therefore, from the above accounts, technology is a necessity when it comes to performing certain complex tasks in the organisation which make work easier for workers.

Technology is being implemented continuously, hence, it is necessary to explore experiences of South African workers with regard to the introduction of technology in the workplace.

7.4 South African Worker's Experiences with the Introduction of Technology in the Workplace

The following section looks at the experiences of employees as a result of the introduction of technology. This section was challenging for some employees to answer truthfully given the sensitive nature of the research problem. However, the researcher managed to get some information from other participants, which gave a clear picture of their experiences. The following discussion is based on the interview questions regarding the experiences of workers while working with robotics.

7.4.1 Experiences Workers had in Terms of Collaboration, Safety, Repetition and Job Satisfaction with The Introduction of Technology

The aim of the question was for the researcher to understand how the workers experienced the introduction of technology in terms of collaboration, safety, repetition of work and job satisfaction.

In terms of collaboration, the researcher wanted to understand if the employees are working well with machines. It must be recognised that as much as these machines are being introduced, they cannot work alone. The following are interview excerpts which illustrate the experiences workers have had with technology in terms of collaboration and safety:

> *The answer is yes; it makes things a little bit easier. We and the robots must work together for safety reasons. We do a lot of tasks repeatedly, so the robots help when it comes to that. but you do not want to be too close to them because they can injure you and it can be very unsafe if the procedures are not followed but you do not want to compete with them because we see them as strong rivals, we just have to work along and with them (Interviewee 8, October 2017).*

It can be observed from the participants that they worked well with the robots as the machines do most of the repetitive jobs, which make their job easier and more work is done. Therefore, there is a need for the facilitation of combining humans and robots to be involved in the execution of work in the factories which is essential for the successful realisation of mix assembly structures. On the other hand, as much as workers enjoy working with robots, there is still fear of the robots taking over jobs as technologies will always stay with the organisation. Hence, these workers work well in collaboration with machines; however, they feel that they are in competition with robots.

Further, the findings show that machines can be dangerous and unsafe to workers as they are not easily predictable. The majority of the participants felt that these machines are not very safe and sometimes they are not comfortable working with it due to injury concerns. Most importantly: *"machines are usually unsafe if you do not follow procedures"*. Hence, there is a need for trust to be established between the machines and the workers so that technology can function to standard specification and perform 100% as expected. When it comes to job satisfaction, autoworkers revealed that:

> *Robots take away the physical work on the workers because the robot does not get tired. This reduces the work of humans but this affect worker's satisfaction because it makes them feel lazy in the shop. Since all they do in the press shop is parking. Is just that we are threatened that almost the task that we are performing at present can be done by robots. I can say that this affects my job satisfaction. There are things as a worker you wished you did in or on the car that will boost my confidence in my skills and smile at what and what I did to make the car. This feeling boosts my job satisfaction as a hard worker. Sometimes, it occurs to me that it is my competitor and rival and possibly have more chances of staying in the company more than me (Interviewee No 11; October 2017).*

Findings in this chapter pointed out that workers are experiencing a lack of job satisfaction when it comes to working with technology as they felt that one day, they would be replaced by these machines which are performing most of the tasks. They feel that their skills are not being utilised fully, and sometimes, they are left with less challenging work. Workers also expressed that they do not use most of their skills as machines do it for them because technologies are programmed to work in perfection.

7.5 Conclusion

Technology is adopted for better safety consideration as well as to yield high car volume in the plant. From the worker's view, it has been confirmed that this technology has made the life of employees a little simpler and has had a significant impact on a safer and more efficient automobile workspace for workers. Another insight from the viewpoint of employees is that collaborating with technology helps to reduce the need for autoworkers to execute routine tasks that affect their health. Nevertheless, employees also imply that programming inaccuracy and working too close to machines will cause a personal accident to workers.

Even though the workers are relieved of tiresome job roles, they complained that their job satisfaction has been affected and also the value of meaningful work. They desired more responsibility in building cars to enhance their confidence. Another point made was that workers saw their robotic counterparts as better competitors and rivals and thus, a threat to their jobs.

This chapter gave a clear picture of the experiences that the workers have been facing due to the introduction of technologies. It pointed out from the management point of view that due to the nature of the automotive industry, car companies must respond to a rapidly changing business environment and to stay competitive in the global motor changing marketplace.

According to evolutionary economists, by creating and adopting technological innovations, production efficiency will increase and managements must seize the predictable opportunities in order not to lag behind its competitors. In summary, the adoption of technology should benefit the company but at the same time should ensure that people have access to meaningful work. The question which now arises is if there is any competition between machines and workers which is covered in the following chapter.

Chaper 8

WORKERS' COMPETITION WITH RAPID TECHNOLOGICAL DOMINATION IN THE WORKPLACE

8.1 INTRODUCTION

Due to rapid technological adoption in the motor sector, workers are compelled to upskill. Nevertheless, in most industries, management would prefer to utilize technology instead of retraining the workers; resulting in the redundant workers being transferred to other sections of the company. Hence, the job satisfaction of the workers is affected as they no longer be doing meaningful work. It is clear that machines and workers are doing the same job, which means one can replace the other, but the chances are that machines will dominate most tasks to establish efficiency and consistency. Efficiency in the workplace has risen exponentially because of technological updates that drive vehicle businesses to the next level. The question that arises is, are workers competing with the machine in their work to remain relevant? It has been observed that many people lose their jobs due to job automation, which is usually called technological unemployment. As technological features have increased, their ability to replace employees has also increased. Technology has a significant impact on the automobile sector because where motor companies used to need five people to accomplish a task, now only one or two workers are needed for such a task.

This chapter focuses on the second objective of the study, which sought to clarify how workers compete with technology in the workplace. To answer this research objective, the researcher conducted interviews with management and workers. The management provided information on the training received by employees for the adoption of advanced technology, while workers provided information on different ways they compete with the robots to ensure their job security. The findings are illustrated in a thematic presentation.

8.2 Core Argument of this Chapter

Innovation has developed a new form of the automotive workforce in South Africa with various levels of expertise, while companies carefully select the most skilled workers and who are able to compete with technology and respond to their modern, creative world to maximize profit.

Thus, there is always a shift in the automotive industry that requires higher dynamics to guide the change in lower-level capabilities, as well as a deliberate combination of skills between technology and workers. With regard to the evolutionary economic literature, on which the part of this analysis is focused, as the motor industry progresses with widespread technological possibilities, high abilities and skills to learn and incorporate new knowledge into its production process also grows to achieve above-average profitability and earnings, respectively. And during this phase, certain abilities will be lost while others will be developed.

On another perspective, the labour process as the main theory guiding this study notes that this creative destruction of skills continually deskills employees, degrades work and renders labour obsolete in automobile plants as car companies maximize profits by implementing labour and skills replacing technologies. Ultimately, the CSR as a harmonizing theoretical approach of this study, suggests that evolutionary labour process is important for business, economic and social growth. This labour mechanism cannot, however, be more disruptive on the part of the workers, contributing to unemployment and some sort of socio-economic division which is an unethical corporate decision impacting the broader society.

Results from the study showed that the automotive industry is continuously asking for labour to improve human capital resources as the only way to retain their jobs. For some reasons, however, workers view competition with technology as a lost effort. First, technology is increasingly efficient and works with velocity. Second, these machines are built to conduct several activities of human nature and are constantly improving. Third, training and skilling-up are not sustainable considering that new technologies will be designed and adopted to deskill workers from the newly acquired skills within a short time. Fourth, the task and space left for autoworkers are shrinking and might not absorb all the workers remaining in the motor sector. Consequently, autoworkers are having difficulty competing with their machine colleagues. Nonetheless, these workers will continue to reskill with the hope that it will secure their current job. The implication is that it is highly important to encourage the training and multiskilling of workers but it is equally important to ascertain that reskilling will guarantee job security and continued employment for workers.

8.3 Training Relating to the Adoption of Cutting-Edge Technology

This section focuses mainly on management and their views in connection to workers training. The study seeks to understand if training is being provided to workers when an organisation adopts new technology. Usually, when a new technology is being introduced people are trained on how to use the new equipment to avoid mishaps. Specifically, in the automobile industry, they need to understand how the machines operate to avoid producing faulty cars, which could lead to accidents, thereby putting the life of the consumers and workers at risk. With the pace of changes in technology and its adoption, workers training on the use of industrial technologies has to be continually upgraded and be up-to-date regardless of the time and resources. It is a point to note that employers adopting new technology is one progress and, employees comprehending the full potential of that technology by having a better understanding of its functions and effective ways to use it; is another progress. Training brings an advantage to the economy, and it prepares the workforce, especially those utilising advanced technologies for greater global effectiveness and competitiveness. If the skill-up alternative is no longer accessible, the risk of large-scale unemployment or underemployment will be increased.

The point is that training shifts uneducated workers into educated staffs and training also take unqualified or semi-qualified employees into qualified workers status who can do their allocated duties in the best possible manner. The following is an interview excerpt from management regarding training;

> *Yes, absolutely, so let me give you an example, last year we introduced the manufacture of hardware cars in the plants, that is a car without battery, so there was massive training in hardware technology, and how to manufacture the hardware cars. All of our employees in the body shop heavily received advanced training and started operating the machines in the assembling shop. I do not know if you know other manufacturing companies in South Africa, you get paid according to the skills you have acquired, you do not get paid according to the job you do, so, the more skills you have acquired even though you do not work much, you will get paid more. So, there is a lot of investment in training, and most important especially now we are more dependent on robot and automation, we need our people to acquire more skills and be able to work in many different places. Whether people train themselves on their own, I have no idea. But*

maybe labour can give you an overview of what people are doing on their own or what type of education is being provided to them (Interviewee No 2, October 2017).

Workers are being trained every time a new technology is being introduced in the organisation. Therefore, having more advanced skills is a necessity in the car manufacturing business as employees are valued based on the skills they possess. Hence training is of high priority in these companies as they make use of vast technologies and cannot afford to have turnouts of faulty vehicles. In this industry, one faulty car causes a lot of ripple effect on the company - as all consumers might return their product, and the whole batch of that model will have to be re-checked and rectified. The company's image can also be affected. Therefore, the expenses caused by one mistake because of lack of training can be detrimental to the organisation. Another management representative also stated that:

Huge yes, we have invested a massive amount of money in training. We have technical training centres which are fully accredited. And we have had an increase in the number of apprentices we bring in every year, and there are huge training and retraining of existing artisans. We send people to Germany for technology training as well. Furthermore, having a training facility here, we are able to train our local suppliers. Therefore, we do not have to send them overseas for training because it is very expensive to do that. (Interviewee No 1, October 2017).

The revelation here is that workers have to always keep abreast with new technologies if they are not up to date with the skills required, it might affect their job security. The success of any corporation in a dynamic system falls in its capacity to prepare its human resources to be productive, innovative, creative, constantly improving efficiency and enhancing economic advantages. Nevertheless, there is a competition between employees and machines as workers should always stay abreast with the skills required by these machines. The following section explores this from the workers' perspective.

8.4 Competition Between Workers and Robots

This section focuses on how employees see themselves as competing or will compete with machines in the future in terms of their skills. From the employee's perspective, it appears that workers are always competing with the machines to keep up with technology. Adopting innovations will intensify the difficulty of development in terms of technology implementation,

and this will involve the expertise and abilities of the country's population, as well as the examination of new manufacturing opportunities, to ensure an effective economic transition as robots are competing with workers on significant job elements.

Additionally, technology is outcompeting human workers because it has changed and evolved more rapidly than workers. Nonetheless, as these machines evolve in decades to come, one should expect to see a drastic transformation in workforce development. It has been stated that employees are suffering from job dissatisfaction as they are unsure of their job security as most machines are replacing them and doing the same task as human workers. The point remains that robot implementation will reduce the importance of human labour. Competition between robots and autoworkers is a losing battle for the workers. As one shop steward put it:

No worker can compete with the present robots. All the worker can do is to reskill and upskilling and the hope they are retained within the company or hopefully find another job outside the organisation (Interviewee No 30, October 2019)

This explains why many workers believe that their jobs in the motor sector are not at all safe. This was indicated by all the worker's understudy, who complained that:

I think it is a losing battle for us because if they can get a robot to fetch the bolts for them, they can do that but we are still here because there are little things that robots cannot do. Even after re-skilling and upskilling, we are not safe (Interviewee No 4, October 2017)

and

We cannot compete with robots. The only thing that will make us relevant is multiskilling to upgrade our skills required to maintain those robots (Interviewee No 9, July 2018)

and

You know it is a lot easier to compete with your fellow workers because if you push harder, you will gather knowledge, skills and specialities that the other workers do not possess and will take them time to acquire, but when it comes to robots, they are very fast, and they are programmed to do a whole lot of tasks perfectly. I do not think there

is any way I can compete with the robots. I do not think any skill I get will help. Do you know why? The machines are improving faster and are always with many steps ahead of you and more robots keep coming into the workplace (Interviewee No 18, July 2018)

However, some of the workers pondered on what would happen after all the workers are reskilled. One responded by saying that:

We are reskilling hoping that that is all it will take to be in this company. Personally, I think the space for workers in this company is shrinking and that makes me wonder where we will go next. Am just saying it because almost everyone is reskilling for a limited task, for instance, engineers and electricians and that make me wonder again what are all these people going to repair? So, definitely, this company will not be needing such a number of engineers and electricians doing one thing. Looking at it, only the best few will be selected (Interviewee No 15, July 2018)

The observation in this study revealed that workers are always competing with their robot counterparts. This competition with technologies is a deliberate move to gather more relevant knowledge, skills and specialities to perform as perfect as the robots, to increase their chances in retaining their job security. Besides, this is a strategy to reskill for their current job with the company and possibly for its relevance in another company or sector, should they get retrenched from their present job position and for the fear of being deskilled and redundant. The finding further indicates that workers believe that they will be unable to compete on the same footing with technology, regardless of training, reskilling and upskilling considering that technologies are smarter, faster, more efficient and can be programmed to accomplish any type of human task. Hence, autoworkers see this competition between them and robots as a lost battle already.

It must be argued that robots cannot replace all workers, as these machines need to be reprogramed and guided on what to do. This is where the human factor cannot be replaced because they determine the limitations of what robots can or cannot do. For instance, the current resurrected maintenance department needs more workers considering that more robots are installed, more maintenance needs to be done as management cannot afford any breakdown of machines. Therefore, workers are still needed but must have the skills to maintain the machines. However, not all trained and reskilled workers will be absorbed in the maintenance

department or other departments, this has attracted some policy connotations in relation to skills-upgrade in the motor sector.

8.5 Policy Implications and Recommendations for Constant Upskilling in SA's Motor Industry

The results of this chapter of the study lead to some policy recommendations for human-robot competition. Since the auto company's process of work deskills workers and degrades labour due to regular evolution of the labour process with innovation, workers need to continually update their skills to compete with robots, to be able to retain their existing job and receive a better earning. Aside skilling-up, workers also have to be trained, retrained and get more education to be able to operate in this labour market that is dominated by technology.

This study shares the view that "excessive educational and skill specification is a serious mistake and potential hazard to our economic and social system. We will hurt individuals, raise labour costs improperly, create disillusion and resentment, and destroy valid job standards by setting standards that are not truly needed for a given task" (Braverman, 1998, p. 147). Upskilling might be a way to compete with robots, but it will not be a long-term sustainable approach as robots keep getting smarter and more effective every day. Thus, despite that constant upskilling will be profitable for workers to remain relevant in the labour market and contribute to the South African economy; this rate of skill specification and upgrade will polarise our society in the long run, and its traces can be seen presently.

It is worth stressing that indeed, management, union and the government should smartly invest in the "reskilling, upskilling, training and retraining" of the workforce to possess the appropriate competencies required for the 4IR. Most importantly, autoworkers have to treat their career as a business and therefore, invest in their training, reskilling and upskilling to remain relevant in the labour market and these skills and training should be under the umbrella of unautomable technical and non-technical job families. Conversely, while specifying the acquisition of the required higher-order skills, we should also relook at the disadvantages of these skill specifications and its detrimental effects it might have on our society in the long run.

8.6 Conclusion

Currently, job automation has taken 80% of tasks in the automobile industry in South Africa, and issue which would be fully discussed in the next chapter (Chapter 9). With thematic analysis, the results of the objective of the study which looked at the competition between workers' and technology adoption in the automobile workplace show that workers and machines are in competition but it is not a fair competition as machines are more advanced, efficient and work continuously. Companies need machines for efficiency, but they also need workers for jobs that the machines cannot do and to maintain and operate machines. In order to ensure that workers' careers are resilient in an evolving technological setting, employees are reskilled to suit industry needs. This need to reskill arises when workers' current skills are no longer needed (deskilled), or technology is performing most of the task.

Theoretically, deskilling arises when the management adopts technologies that compete and to some extent, outcompete shop floor workers. This happens when the task that workers are supposed to do are reduced, narrowed and are being performed by the robots. The emphasis on increasing productivity to remain to maintain competitive status in the economy through the utilisation of technology (economic evolution) is deskilling automobile workers and requiring workers to compete with technologies through substantial re-and up-skilling. Workers today more than ever are taught to think of their success in relation to their cleverness which is what will ensure their employability.

Hence workers should always stay abreast with technology to remain valuable to the organisation, given that workers are constantly "deskilled and to upskill" in the face of auto work automation. The following chapter focused on the extent to which technology has taken over jobs in South Africa as it appears from the above discussions that new technology keeps entering the labour market, and only those workers with relevant skills will survive in this new world of work.

Chaper 9

The Extent of Job Automation in the Automobile Sector in South Africa

9.1 INTRODUCTION

This chapter indicates that the automobile sector workplace is dominated by technology utilization at the level of 80 per cent with workers constituting the remaining percentage. This percentage is an indicator of how workers lost the competition with technology in the industry as it also accounts for the extent of job losses in the sector. From the previous chapters and the central argument of this study, it has become clear that car companies are adopting technologies because of its efficiencies to remain competitive in the global car market. Also, workers are experiencing a safer working environment with the introduction of robots but sometimes feel unsafe as a result of possible machine malfunction and fear of job security. At the same time, workers are competing with these robots to be valuable to the company and maintain their employment status. In general, whenever a new technology is introduced in the automobile sector, production increases, profit grows, the workplace is made safer, we see an economic boost, skilling-up becomes imperative, few new tasks are discovered, workers work overload (due to fewer workers), workload reduces (tasks allocated to machines), workers become deskilled and automated, retrenchment occurs, unemployment increases and different forms of polarization surfaces in the society

From the perspective of technological evolutionary economic theory, Rüßmann *et al*. (2015, p. 9) affirmed that the fourth wave of technological advancement would evolve the economy and industries in different ways. They are ranging from high productivity to revenue growth and also a slice of 6% employment in ten years ahead. However, from the stance of the labour process, although not against technological advancement, Braverman (1974) posits that technology is adopted and utilised in ways unfavourable to the working class which deskills the workforce, degrades labour, divides social classes and possibly, will enable class violence. Technology is used by companies to control work procedures and the process of assembling products hence weakening the rights of workers and taking over the jobs. In the middle of these arguments is Corporate Social Responsibility which position that the purpose of any establishment that runs in a society have to be dedicated to legitimate, upright, sensible and public values while devoted in their period of profit-making. World Bank (2013) maintained that CSR has often been described as corporate governance, corporate citizenship, economic

entrepreneurship, sustainability, business ethics, and corporate strategy in some instances. What unites these terms is the anticipation that organisations will act ethically towards a diverse group of stakeholders-employees and their representatives, communities and society in general.

This chapter focused on the extent to which technology has taken over jobs in the South African automobile industry. According to evolutionary economics theory, technologies evolve from simple basic tools to sophisticated advanced machines. Indicating that the boundaries of manufacturing are being annihilated, and fresh paradigms are evolving for all business.

To get a clear picture of the extent to which technology has taken over jobs of the South African workforce, the researcher interviewed the trade union representing auto workers, management and workers. Management had to explain if they preferred machines more than workers and if the technology is dominating jobs. The workers provided information on how technology is replacing workers and which departments are mostly affected. The chapter first looked at the management perspective, followed by workers' view.

9.2 The Core Argument of the Chapter

Some workers have been replaced by the robots and many workers have been relocated from a number of departments to the assembly line. Technology remains a key element in determining the size of workers in the manufacturing sector and has led to a drastic reduction of workers and their jobs in the South African motor sector. Those transferred workers were retrained to work in the assembly line as technology is performing the task that workers used to do and in a faster, efficient way and thus, higher turnover of car units but with less human hands. This indicates that there is currently little reliant for physical human labour in the SA's automobile industry.

Given the above, management would rather choose to automate their car plants if the resources to afford and maintain more robot is there. The most important concern for auto management is to increase the output without necessarily getting more people and improve the economic standards in the workplace. Equally, it is about competition, safety, profit and precision in the motor work environment. The observation is that machines are not drastically replacing the current workers because when technology is being introduced, it also creates few other jobs, but it will require people with higher skills. Meaning that workers skills are constantly

devalued, deskilled and reskilled. Another meaning is that autoworkers already in the system are being reshuffled to very few departments.

Of course, there are still jobs that require a human touch, but the point is that any task in the car sector can be automated and it is just a matter of time and choice. Debatably, if machines can be programmed to mimic the human intelligence coupled that it has been imitating human power for years, then it can also be programmed to do far more than it is doing at present. Only if the robot inventors and adopter choose not to go to that extreme. One can argue that technological change would not greatly strengthen job opportunities by itself and, to the extent that it would create more jobs, it would likely create jobs for most of newer technologies and few workers affected in the existing system who are reskilled. This means that workers would not benefit from the job creation or at most benefit disproportionately little in the first instance.

In theory, EET assumes that creative destruction and profit maximization with the constant adoption of innovation is the ultimate concern for the auto CEOs which benefits the company and the state in terms of productivity, output and GDP.

Nonetheless, in this process of deliberate selective economic evolution, the negative part of the creative destruction neglects to consider if what is created for example during the new labour process and work restructuring is essentially better compared to what is destroyed and if this labour transformation worth the risk of neglecting the welfare of workers and the public interest which might lead to poverty and social disorder. Thus, the automobile sector should select an organizational practice and routine that represents both the company's economic and social good for every stakeholder involved in the country's economy as this is the wholesome sustainable business practice.

9.3 Management Perspective on Technological Domination: preference between workers and machines

This section of the study sought to understand if management prefers more technologies in the plant than human workers. One can argue that technology is faster, stable, accurate, and reliable and does not require salaries or leave as workers do. Therefore, management might prefer to have more machines than employees. Management agreed that they do not necessarily prefer machines to workers; however, the machines are required as some jobs cannot be done with human efforts alone. Hence, it is not about preferences but about productivity, quality, and

making profits. Management from companies under study interview excerpts are below showing their views on this point:

> *I do not think we prefer machines over human, but certainly, we prefer more automation for number the reasons; one it improves the economic standards in the workplace. For example, it is easier to turn a car on the side and work on the body than to get two people to lift the car and work underneath it, and we will likely increase the output without necessarily getting more people. If we have the resources, we prefer robots to do that, so it's definitely not a case of choosing a robot over human but there is a lot of pressure on every workplace to produce more with less, and one way to produce more with less is to invest on automation including robot not just in the manufacturing world, but also in the other sectors in the world who also uses more robot technology than other official intelligent technology (Interviewee No 2, October 2017).*

It has been made apparent that management does not necessarily prefer machines than human workers, but in this competitive world, they need to deliberately think about production and quality and improve their workplace economic standard. Again, the other manager also had a similar view on the issue of preferences between human workers and machines.

> *There is nobody in the management team that will prefer to get rid of people and then replace everybody with robots; that's not the motivation behind why we bring technology. The technologies are there for business imperative only in those areas where it actually makes sense, where safety is an issue, where accuracy and repeatability are critical. So, the answer there definitely is no (Interviewee No 1, October 2017).*

The study shows that management does not introduce machines to take over the jobs of the workers but because some tasks require the use of machines. One of the examples which have been given previously by one of the participants is that one cannot expect workers to lift a car while another worker is working underneath it, but a machine can do that without harming the workers. It has been shown that machines are needed as well as the workers, but looking at the type of industry under study, it makes use of more machines than human workers. It is now imperative to understand if there has been an increase in the number of technologies used at work, which will be discussed below.

9.3.1 An increase in the number of technologies in the workplace

The question was posed to management to indicate if there has been an increase in the number of technologies in their workplace. In the car industry, one expects them to introduce new technologies frequently as they always produce better cars every year from the previous ones.

The results from the management interviews show that technology has been increasing in their companies yearly. It shows that more technology has been introduced to ensure that the company produce the best cars with good quality in the market. One manager responded by saying this:

> *Yes, there has been a massive increase in technology, the first phase increase was in 2003 when we replaced all of the welding stations in the body shop with robots, and we replaced some of the activities in logistics, supply chain, warehousing with robots and then the next machine increase happened in 2014, where the body shop was made fully robotic, paint shop is about 80% robotic, and about 20% robot in the assembling ward, and we outsourced the logistics activities, and the supply for logistics is making a lot more use of machines as well. So, the machines are being used in the welding shop, body shop, painting machines, assembling machines, and machines to move parts from one plant to the other. The new model introduced 50 to 240 robots, and now there are 550 robots. If you go to our assembling line, you can see one of the machines that are very dominant, the moving line machine, which moves the cars along, and up and down. (Interviewee No 2, October 2017).*

The above participant has pointed out an increase in technology from 2003 until now. In some of the car assembly line, work areas such as the paint shop make use of robotics in over 80% of their work, which shows the use of technology is dominating in the car industry. Results in this section have confirmed that car companies aim to work best with existing technologies, new opportunities and new market demands and have a role to play in ensuring support for technological innovation which necessitates asking: are machines replacing current workers in the automotive workplace?

9.3.2 Machines Substituting Workers in the Auto World

An organisation that uses machines can generate a lot of products or services in a short time but this might affect the number of workers needed. Management were asked if machines are replacing the number of current workers in their workforce, and the following was stated:

They are replacing in some shops, and they are also recreating other job and tasks for artisan and workers with much higher skills. (Interviewee No 1, October 2017).

The participant stated that machines are not replacing the current workers because when technology is being introduced, it also creates other jobs, but it will require people with higher skills. Though one can argue that to some extent, they are replacing some workers, especially if they are found lacking in terms of skills. Those with a high level of skill can be incorporated somewhere else, whereas mid-qualified auto workers might be at high risk except if retrained. Arguably, the automobile economic growth at present and at the pace at which it operates requires that fewer jobs are created for human workers. On the other hand, another management pointed out that:

We recognize definitely those jobs where the human factor is actually critical, and you can't really expect a robot to be able to identify the quality of fitment of parts, the things that are seen by human eyes and even the quality of paintwork must be inspected and checked absolutely by the eye and the human hand. Furthermore, if your factory was entirely an automated machine and all factories became like that, it would be very difficult to distinguish one from the next in terms of its output and competitive edge. We believe that our people in the workplace will give us a competitive edge. All car plants around the world got robots building in their factories. We are proud of our plants here, and they can compete very favourably with plants overseas even against our sister plants in Germany that exports the same products as we do in America. We are getting higher awards than they are. The difference is the people, and we work on that advantage. (Interviewee No 2, October 2017).

The participant further extensively explained that:

We use many machines, especially in the body shop, where the cars are welded together before they are painted, which is both done by robots. However, the company still needs employees who are robot technologist even though the welding and polishing of the cars are done by robots. In assembling line bolting pieces, tyres and seats are still

done massively by people, because it is not very easy for robots to get in and out of the car. Using the robots in such a task is not practical and at the same time assembling and buying of robots is very expensive. Therefore, their entire employees will not be replaced by the robot as robots cannot inspect the quality of cars. Mercedes Benz is pretty much at the peak of robot technology, any further robot technology would require massive investment, and they have to produce a lot of cars to justify that investment. The management does not believe that any time soon there will be a massive replacement of employee. However, there are other areas which are not automated adequately, such as administration, financial system, financial management, HR Management, IT, and control departments. However, in this case, most work is done by workers than robots as they cannot interview applicants, place adverts, calculate salaries and other company procedures. Complete automation takeover is not possible as the majority of automation is partial, so only certain duties are automated.

It can be concluded that the motor industry uses more technology than workers. Nevertheless, machines will be almost impossible to replace all employees as human workers are still needed in certain jobs and also to maintain the equipment and making it work. However, arguably, even if other jobs are said to be created, it does not happen at the pace it destroys in this industry.

It is important to note that automation would not boost employment enormously by itself and, to the extent that it would create jobs, it would possibly be creating jobs for mostly technology and few jobs for workers affected in the existing system who are reskilled. This means that employment in this industry will stay stagnated and workers would benefit from the creation disproportionately little in the first instance. As a result, the number of people that will remain unemployed will be higher than the numbers employed. Hence, it is clear that technology does dominate task in the motor industry, and it will be discussed below.

9.3.3 Technology Dominating Jobs

Management had to explain if technologies are dominating the jobs in their workplace. It can be pointed out from the discussion above that there has been an increase of machines since years back, and many of the task done now requires robots. A recent study estimates that automation could destroy as much as 800 million human labour globally by 2030. The

following excerpts show the responses from management participants on whether technology is dominating jobs or not:

Yes, for sure and why is because robots can work faster, they can produce the right level of quality every time. It is also because of cost, and fast time delivery. When you have an automated robot, it does require humans to be the operators and to be much more skilled. So we have fewer employees that are definitely more highly paid with more enhanced skilled. (Interviewee No 2, October 2017).

And

They are dominating some jobs but not all, so as I mentioned in assembling, the car plants are made up of body shop, paint shop and the assembling. The body shop used to be manual but is now highly automated. The assembling line where we fit the cars remains manual operation. So technically, changes depending on the area of work. However, technologies in the body shop can clearly be said to be dominating jobs. However, as they are dominating one type of job, they are also creating another job such as artisans and technician jobs. So the number of artisans are increasing massively. So I see the positive in that we are upskilling the workforce of South Africa. I think that is a good thing for South Africa, definitely not a bad thing. (Interviewee No 1, October 2017).

Technology is, therefore, dominating jobs in the motor industry. This may be because of the advantages associated with using robots. Many human tasks have been reduced as a result of work automation. Few workers are experiencing an increase in their workload and those few were technicians and artisans. Hence, the study shows that technology increases or decreases employees' duties, depending on the department. However, it should also be taken as an opportunity for growth and upskilling on the part of the employees working at the plants. For workers to remain competitive in this industry, they have to possess a certain quality of skills as new technologies are introduced. If one does not possess these skills, it means that they might lose their jobs as one of the managers indicated that they have few employees and they earn higher salaries because of the higher skills they possess. After discussing the management's view on the extent of technology in their organisation, the next section looked at the issue from the worker's point of view. The workers answered the same question as the management to get the opinions of the workers as they deal with the issues first hand.

9.3.4 Technology Increase at the Workplace

Management of the companies under study stated that technology has been increasing in their workplace. Similarly, the workers also support their account that there has been an increase in technology in their workplaces. The following are some of the interviews that represent the excerpts from all participating employees:

"Just recently about a month or two ago, they introduced new Automatic Guiding Vehicles. The parts that were being delivered by people are now delivered by technology, they have automated it" (Interviewee No 5, October 2017).

And

"With every new model, the company buys a new robot. Robots used to be minimal before in the line, and we had a more human workforce. I will admit that we are manufacturing faster these days compared to before as a result of many robots producing. There is something called "takt-time" which usually lasted for 5 minutes before, but now the cycle is 2 minutes because of the robots and the production volume has increased. We used to produce about 20 units per hour, but now we are producing about 100 units per hour with the same workforce, which means more units and more cars than before with the same number of workers plus new technologies" (Interviewee No 13, July 2018).

And

"We have got KUKA robots in different versions, for example, in the press shop, we normally used to have what we call manual labour to move your press parts from one operation to the next. But now we have installed robots to move press parts from one press to the next press. So now, instead of having manual labour, we have got robots doing the transfer of press parts" (Interviewee No 3, October 2017).

From the above quotations, it is inferred that most of the work has been automated which makes manufacturing easier, faster and more unit of cars daily. Another revelation in this study is that while work moves at faster speed with the help of more intelligent technologies, the number of workers remains the same. They all agreed that new technologies are adopted every time a new model of vehicles are introduced and some revealed that new technologies are being renewed

yearly. Therefore, management is always looking for a way to maximise profit and hasten work; hence, there are more robots each year in the company.

Theoretically, EET recognized that some people will gain in this process while some will lose and emphasised that companies like automobile sector must find "new ways of doing things". Notwithstanding that these robots have eased the process of labour, one can argue that the evolutionary economic theory refuses to accept the clear negative side of innovation and evolution with regards to dislocation and deskilling of workers that they deemed "not deliberate and unplanned." As the number of robots increases in the auto industry, it concurrently reduces the population of shop floor workers, paint floor workers, body shop workers and assembly line workers.

The decision that resulted in these changes and the reallocation of a significant number of autoworkers from different departments (body shop, paint shop) to a particular department (assembly line) is almost irreversible. As indicated above, some tasks are affected hence the need to know which departments or tasks that can be easily replaced by machines which were examined in the next section.

9.3.5 Departments or Tasks that Can Simply Be Further Substituted by Machines

Some departments or tasks are not affected when a new technology is introduced in the auto sector. However, others can easily be replaced by machines. More of these sophisticated technologies were deployed in the automotive industry in the 1990s to automate many processes, such as assembly, welding, painting, and moving large parts of the car. In welding and painting, robots can complete such tasks in isolation and without the guidance from human workers.

The management interviewees pointed out the following departments or task that may be easily replaced by machines:

- Where the task is repetitive, safety-critical components are involved and where accuracy is of importance. For example, there are hundreds of studs inside the body shell of a car, a bolt that the components get bolted into to make the seats or the engine which makes part of the body shop. These parts are made from factories all over the

world, and the accuracy of placing those studs is critical and humans are not just capable of that accuracy consistently.

- The assembly ward and administration. It will not be easy to put the robotics in these departments though it can be done. These people are at risk in terms of job security.

From the workers' perspectives on whether to adopt extra robots to assist in tasks, workers had this to say:

"In the absence of enough workforce, for example, we were 5 in this station, now two hands have been removed and now we are 3 and we are expected to perform the same performance, then we will need the assistance of the robots in order to produce the same capacity of units. This is only because the number of workers is not increasing, so we need assistance" (Interviewee 9; October 2017)

And

"Not to my knowledge. Management can answer that but do not go asking so that you do not start giving them ideas to bring more robots which can further reduce workers and their tasks. "I will say not at all. We workers can be trained to do anything if they want us to do that job. Those robots are good, but because that it threatens our job security then we are ready to do any job without most of the machines" (Interviewee 12; July 2018)

This statement was substantiated by some workers who specified that:

"If I say yes, then that means I want some workers to go home. If workers can be trained to do even the most complex jobs, then we can do it. Besides, people were doing those tasks before the machines came in, we can be trained to do better" (Interviewee 20; July 2018)

It can be concluded that few workers need more robots as they have too much workload and it is almost impossible to meet this current market need without these robots if there are fewer hands. Findings show that the number of workers in the body shop, press shop, paint shop has dramatically shrunk with more robot, for this reason, the workers in that department needs extra assistance in the area of their task. The automobile industry has doubled its production

lines by the introduction of robots in place of humans. As a consequence, businesses can use one flexible production line to create various car models with distinct body styles and designs.

On the other hand, most workers fear for their jobs if the companies keep on introducing new technologies. However, some believe that workers can be trained to carry out any task and are ready to do any job without most of the machines if only they could be trained for such tasks since more robots would mean more workers without jobs. Management, however, noted that more robots are not needed at the moment because their car plant is sufficiently automated as they can ever likely to be.

As the findings indicate, irrespective that there are still jobs that require the human touch, the point is that any task in car sector can be automated and it is just a matter of time and choice. Ever cheaper automated machines, in many respects have superior senses to humans and simultaneously run in almost every aspect. Debatably, if machines can be programmed to mimic the human intelligence coupled that it has been imitating human power for years, then it can also be programmed to do far more than it is doing at present, only if robot inventors and adopters choose not to go to that extreme.

9.3.6 Technology and Human Workers

According to management, they do not necessarily prefer technology more than human workers as both have roles in the plant which needs both to work together, although they have more machines because of the type of work they do. Workers, on the other hand, believes that management prefers machines than workers. But some participants also pointed out that as much as the employers prefer machines over them, management still need workers for certain jobs such as human resources management and maintenance, although; it was noted above by one of the managers that administrative work can also be automated. The following are some of the interview quotations which represents the view of all workers:

> *Yes, they do, forgetting that even though the robots are efficient, if there is a break down they lose more production with robots than they do with us workers. Because, if there is a production that will take like 1 or 2 hours, they take more time with robots, whereas, us workers, we never have a breakdown, only when we go on strike or tea break. At times, production stops while waiting for new technology to be delivered from outside countries. (Interviewee No 7, October 2017).*

And

I think so if I were to look at it from their perceptive, they think technology is more productive, more efficient, there is less absenteeism, no sick leave, no complains, the payslip is always the same but people get tired, but with robot and technology, it moves fast. You see with the introduction of new technologies each year there is something new. Also, technology cut cost and avoids the labour issue of the workers and their unions. If it breaks down, it can be fixed on the spot; hence, they are more reliable, so they prefer technology. (Interviewee No 10, October 2017).

And

These days, the term restructuring is a way of management showing their preference and need for more machines than human workers as their main goal of profit is above everything else. They sometimes indirectly say it and point out how these machines generate more profit and compete ahead of other car companies. One could see it in their faces and tone that the employer wish they have more of robots (Interviewee No 6, October 2017).

From the accounts above, workers agreed that management prefers robots than workers, which might be because robots produce more on a limited time and work consistently. However, an important factor to note is that robots sometimes malfunction or breakdown and the costs involved are colossal. However, the main argument is that the employer has more to gain with robots than with workers. Robots would not go on sick leave or vacation, which saves a lot of money. Organisations also save much money as robots do not need insurance or health benefits. Thus, if given a chance, they would replace workers with machines as they perform more tasks and do not need negotiations to boost productivity.

The view of workers resonates with the complaint made in March 2019 by the chief executive of Atlantis Foundries, Mervin Moodley, in the automotive sector in South Africa that "*sick leave was constantly abused. We are competing against the best in the world. For us to compete we need excellence as well,*" employees must become accountable in this situation. Therefore, one can say machines in some instances performs more tasks than workers, which will be discussed below.

9.3.7 Machines Performance Against Human Workers

A person using a machine can complete more job, which would require several individuals to conduct. Machines perform human tasks at a comparatively greater velocity than humans. All participant except for two agreed that machines perform more tasks than human workers. The two respondents who did not agree with the statement argue that the machines cannot work without them. Workers responded by stating that:

Somehow the robots replicate what human worker does. On average, when humans are transferring press parts to the other, you normally get four parts per minute, but robots can transfer ten parts per minute. (Interviewee No 13, July 2018).

And

No, they do not, because today there is no machine that is not being operated or supervised by a human being. (Interviewee No 19, July 2018).

And

I do more work. A machine is a machine, but if you look very well, you will know that considering that I am using human power that I do a good job. (Interviewee No 28, December 2018).

The revelation here is that machines perform more tasks than workers as robots do not rest and perform faster. That means technologies are programmed to do things faster and consistently. With the more advantages associated with technology in car plants, workers feel insecure in their jobs as they believe technology is replacing their jobs.

9.3.8 Technology Replacing Workers

Technology has been praised for its efficiency and precision, which cannot be comparable to the workers, which makes workers more fearful of technology replacing them. Management pointed out that they value the contribution brought forward by the workers, and the company cannot run without humans. However, in some work areas; humans may be affected. The employees, on the other hand, believe that technology is replacing jobs in their companies. Workers had this to say when asked if technologies are now replacing the number of workers:

Yes, I do believe that because previously in the body shop there were more operators but now, there are more robots than human beings. All the people were working with us, doing welding, are gone as the whole process is being done by the robots. So the few people who are there are now loading the equipment on the robot. Other operators were transferred to the other shop because the body shop is the most technological advance shop, and then in assembling, we have many human operators and few robots. So, those operators were transferred from the body shop to assembling. But as time goes on those departments will be full, and the only choice would be to retrench those workers. We see it coming. (Interviewee No 14, July 2018).

And

If you have to look at the traditional press line, you would have an average of 20 operators. Now you only need 4 operators just to pack the parts. So 16 workers are reduced by introducing 5 robots. The affected workers are moved to other departments within the industry for now. (Interviewee No 21, December 2018).

And

Robots will still come to the departments that the workers have moved to and then what will become of those workers. The company would have employed more than a thousand if there were no robots. So the number of workers are not increasing, but the number of robots are increasing. (Interviewee No 17, July 2018).

I believe that in the near future, the number of people in the company would be reduced to 20 per cent and the remaining space will be filled with robots. This can be seen already as the employers are removing workers from three departments (press shop, painting shop and body shop) and stuffing them in almost one which he called the "reserved to be flushed shop". (Interviewee No 24, December 2018).

The number of workers has been replaced by the robots and many workers have been relocated to the assembly line from the body shop, press shop and paint shop.

It is also important to note that as much as technology is replacing other jobs, some areas are not severely affected, such as the assembly area as most of the operations that are done in this area can be perfectly done by humans such as the trimmings of the inside of vehicles, however,

it was noted that the assembly line will soon be affected and will not be able to absorb mass transferred workers, considering that no new employment of that capacity is created for exiting workers or new entrants. The result of this study does seem to indicate that the welfare of the workers is not much of a concern to management.

9.4 Policy Implications and Recommendations

The results of this chapter of the study lead to some policy recommendations for the government of South Africa and the automotive sector. For the state, understanding of technology adoption in the face of job automation is a lot less developed if the implications that it has for the future of existing autoworkers and additional job creation for the human worker has been almost neglected in pursuit of one-sided development.

Indeed, the state should effectively negotiate with motor companies and labour in paper and actual practice to successfully implement policies that are aimed at the development of the automobile sector to equally establish productivity and employment. For the motor sector, there is a large, unskilled, skilled and jobless energetic group in South Africa who are possibly ready to offer their labour power for at least monthly minimum wage. Instead of deskilling them and adding to the number of unemployed, these pool of unemployed can be skilled or reskilled and be re/employed in areas in the auto sector that requires at least human labour and strictly use technology in areas where it is highly needed.

9.5 Conclusion

It is inferred that most of the work has been automated which makes manufacturing easier, faster, efficient and with more unit of cars. Another revelation is that while work moves at a speedy rate with the help of more intelligent technologies, the number of workers remains the same. So, the number of workers is not increasing, rather decreasing when people are fired, resigned, or someone dies, but no replacement is done as robots take their space hence no continuation of job creation. As reflected also in this chapter, most of the work is being performed by robots. Meaning that the rate of job automation in the motor sector is high and counting.

For evolutionary economic theory, businesses must thrive on incremental technological waves of creative destruction where there will be winners and losers, but it is important that businesses

pursue practices that will generate maximum gains for their corporations at the same time. Labour process acknowledges this positive side of workplace diversity but views this replacement of investment for labour, evolutionary technological trend and task automation as degrading work through directing workers to slighter tasks that were extracted from a general understanding of the production process and are more deleterious on the side of the workers.

CSR as the mediator of this study admits that creative destruction of the economic theory has become more destructive than ever before given the kind of innovations in the pipeline that creates more losers through job loss, employment uncertainty, deskilling and inequality. CSR suggests that we ought to reflect on the laws and practices that will support those who are in fear of being impacted as companies make money. The goal of such institutions would be to guarantee that the misery of the losers would be reduced in the cycle of creative destruction and to manage the risk of inventions and to promote developments that reduce the distress they inflict in the society.

The automotive industry has adopted technology that has changed the manufacturing atmosphere. This study investigated the extent of job automation in the automobile sector in South Africa. To get a clear picture of the extent to which technology has taken over jobs of the South African workforce, the researcher interviewed workers and management. Management had to explain if they preferred machines more than workers and if the technology is dominating jobs. While the workers provided information on how technology is replacing workers and which departments are mostly affected. The study analysed the results using themes and direct quotations from participants. Evolutionary economic perspective, labour process insight and CSR approach guided this chapter and the whole study. The next chapter takes the readiness of the workforce for the future work into consideration.

Chaper 10

Empirical Findings: Uncovering Uncovering the Readiness of the Labour Force in Embracing the Outcome of Technological Domination

10.1 INTRODUCTION

Despite the option of reskilling and upskilling, workers express little readiness of technological domination in the workplace and while their union have constantly challenged this rate of rapid job automation, autoworkers feel that it is a lost battle. Technology is ever-changing, and most organisation uses technology to compete globally. Evolutionary economists agree that robotics is the driving force of evolutionary destruction and progression as it leads to less effective, low quality and fewer creative activities being substituted with more efficient, higher quality and more innovative activities. The key argument of the whole study connects with the core argument of this chapter which shows that technologies in the car companies are increasing each year and dominating jobs in the automobile sector in South Africa; hence, workers need to be ready to embrace the outcomes that come with technology. This study shows that, for workers to stay competitive and be ready with this changing work environment, they need to be trained and have the skills required to work in collaboration with the machines.

This chapter focused on uncovering the readiness of the automobile labour force in embracing the outcome of technological domination in the motor industry in South Africa. It looks at the readiness of workers from the management's and the employee's perspectives. The management provided information on their take on the workers' readiness for change. The workers offered information on the training they receive pertaining to the adoption of advanced technology, their readiness for change and if they have other job alternatives should automation replaces their skills. Although, some scholars argue that we cannot correctly predict the rate of technology dominance and the outcome it might have on the future of workers. However, it is rational to understand the readiness of the South African workforce to adapt to this 4th technological evolution and given the fact that workers readiness for the future of work has received less empirical attention.

10.2 The Core Argument of the Chapter

Workers are not ready for the rate of task mechanization and unemployment as a result of job automation. In support of the arguments as elucidated in the previous chapters, this chapter

contends that automation has been going on for decades and will continue as an irreversible process that might stagnate further employment of human workers. Even without any additional job provision in the sector, car production has seen a significant increase in job loss. Irrespective of this one-sided improvement, autoworkers have not adjusted perfectly to workplace technological domination and are not ready for the changes that come with job automation.

There is a general fear of workers losing their employment to technology and not finding another job in other sector taking into account the mass of the unemployed youth that exist already in South Africa. Indeed, none of the workers is ready to lose their jobs in a late stage of their career when age is a factor and not on their side. Some workers are not ready for alternative jobs as they have been in the industry for so long. Although others are reluctantly willing to venture into farming and businesses, they do not have the financial resources to reskill and start-up small business. Again, few of the workers who are skilled electricians and technicians believe to have some hope of remaining in their work or survive outside the company while few believe that further training will increase their chances of remaining in the company or get employed outside the company. The general indication is that these workers are uncertain of what to do if technology replaces them. This shows that autoworkers have built their careers around the car industry.

Some scholars have argued that historically, automation created jobs as it destroyed. To some extent, yes, however; history hardly repeats itself. The fact that some jobs were created last time is no guarantee that this will happen again this time. It is expected that people learn from history and make smarter decisions. Arguably, this supposed ‘smarter decision” has turned to smarter technologies, smarter factories, and smarter management and less smart workers with an uncertain future of wait and see.

Retraining and reskilling as solutions to job automation is not an outright answer that will lead to job security. The notion is that only a small percentage of those affected by automation in South Africa can be reemployed in the labour market even after reskilling. Admittedly, the job is an exchange of labour for money but most importantly, work is with a sense of purpose and identity. Aside from the possible loss of income from vanishing automobile jobs, employment uncertainty is a feeling of no human usefulness.

10.3 Management View on Worker's Readiness in Embracing Technology Domination

Technology has always been and always will be a partner to human civilization if modern society is willing to handle the potential consequences on a global scale. This section focuses on the management's view of their workforce's readiness to adapt to changes that come with new production technology. The result of this chapter of the study shows that management believed that their workers are always ready for the change that comes with new technology. According to one of the manager, their workers have always been ready for change as they have been working for the organisation for some time and have experienced changes that come with the adoption of new technology:

> *These technologies have been introduced incrementally for the past 3 to 4 models, and each one is 7 years. So, for the last 14 to 21 years, our workforce has been adapting to the new way of doing business (Interviewee No 1, October 2017)*

The other manager had the same view though he added that:

> *No one is ever ready for change even when they have prepared for it, although, workers have adapted to it. the technologies adopted could impact negatively on jobs as time goes on, but we have not retrenched for the last 20 years, however, we have not employed workers massively in the last couple of years either, although; productivity has not been affected. The volume of cars has gone up by 50%. In the next model, we can increase to 20 cars per hour to 30 cars. I believe that existing jobs are not really under tremendous threat by technologies but they may be threatened by economic challenges such as market collapses (Interviewee No 2, October 2017)*

This section revealed that automation has been going on for decades and will continue as an irreversible process that might stagnate further employment of human workers. Even without any additional job provision in the sector, car production and daily unit of cars have seen a significant increase. Also, the revelation in this section is that new job positions are definitely impacted by technology as there are no new job openings, but it does not necessarily affect employees already in the system. Irrespective of this one-sided improvement, autoworkers have adjusted perfectly to workplace technological domination but they are not ready for the changes that come with production technology and automobile workplace restructuring. Aside that technology job domination can affect the number of workers in the system, it was noted

that workers can lose their jobs as a result of business failure and economic failures (operational requirements). With regards to this failure, section 189 of the South African Labour Relations Act (LRA) permits employers to dismiss employees for operational requirements. These are defined as requirements based on economic, technological, structural or similar needs of the employer. Meaning that the termination is not due to any negligence of the individual, it is a mechanism by which the company evaluates its business needs to increase profits or minimize costs, contributing to a decrease of its workers. In this case, LRA's operational requirements are inconsonant with the position of evolutionary economic philosophy which posits that corporations must adopt the best profitable business practises that yield robust revenue. Consequently, NUMSA has condemned this method; stressing that organisations exploit Section 189 of the LRA to retrench workers using these mechanisms as ammunition to justify the agenda to automate jobs and purely to strengthen their balance sheet by citing operational reasons.

10.4 Future Readiness - Workers' perspective

This section looked at the workers' readiness for change and training as one way of being prepared for the 4IR. The argument is that job automation is happening, however, workers do not have effective plans on how to adapt to the change that it brings. Training is a way to get ready for job automation, in this section, most employees agreed that they had received training but some stated that only machine operators receive training:

> *It depends on the shops, some get training once, but if you compare to shops like body shop they get continuous training as they mainly work with the machines. If you train me on something and I didn't work with that thing for one month or 6 months, I might forget. We do need training, but the management does not train us often in the assembling line. This affects our readiness (Interviewee No 8, October 2017).*

And

> *After training, employees receive certification, which is good for their portfolios. For example, there is electrical certification, mechanical certification and a combination of both. With these certificates, one can get a job somewhere else if anything happens here. (Interviewee No 15, July 2018).*

It turns out that workers in certain shops that deals more with machine daily are trained regularly but the employers train only the workers they feel need to know how the robots work. High demand for electricians in the auto industries as a result of automation implies that workers have an opportunity to be retrained and upskill themselves. Auto companies these days are only vying for that unique worker who possesses a well-rounded knowledge of state-of-the-art technologies. Workers are not ready for the change that comes with new technology as it usually entails job loss and moving to other new departments or left with less challenging work. In this study, most of the participants are not ready for the technology work reorganisation as they stated that they could never be ready for technological change as it might mean loss of jobs. Below are few of the chorused interview excerpts representing all the workers' views regarding readiness for change in the labour market:

You can never be ready for robots to be doing what you are doing. We can only accept it because there is nothing to do about it. For sure, it is depressing to think of, especially when age is not on my side and I know there are no jobs out there. (Interviewee No 14, July 2018).

And

How can I say I am ready when it is possible to lose my job to something that will ever work better than me such as robot? If the workers are calm about the change then it is because there is no other choice for this. The workers are actually scared by what is happening and the possibility of the worst to happen. It is like a war out there if you look at the unemployment rate (Interviewee No 30, October 2019)

The indication is the general fear of losing their employment to technology and not finding another job in other sector taking into account the unemployment rate that already exists in South Africa. It also shows that no one is ready to lose their jobs in a late stage of their career when age is a factor and not on your side. Seemingly, the older population will benefit less from these technological opportunities.

10.4.1 Job Alternatives when Automation Replaces Workers Skills

This study argues that technology replaces jobs or downgrade jobs, and workers are uncertain about their job security in the car companies. It is, therefore, crucial to understand if workers have the idea of alternative jobs and plans should automation replaces their skills. In South

Africa, where the unemployment rate is high, it is very difficult to get a new job easily even with the experienced and skilled workers. This section of the chapter argues that some of the workers are older, and they do not see themselves looking for another job, but some workers have an idea on what they will do; however, it will not be easy due to lack of finances. When it comes to alternative livelihood means or jobs for the autoworkers, different workers revealed that:

I would have loved to go into farming, but I do not have land for that and the financial resources to start up a farm (Interviewee No 11, October 2017).

And

My family owns a farm, but I have always run away from it. I will see when the need desperately arises. (Interviewee No 24, December 2018)

Some workers are willing to venture into farming, but they do not have the financial resources for the start-up while other workers have the resources but lack the urge to be farmers. As for the increasing demand for jobs, precariousness and uncertainty of jobs, it will be sustainable to strengthen further effort to integrate possible affected youth into the agricultural sector. Moreover, research indicates that South African farmers are ageing with the average age of over 60 years.

Future prosperity and development in agriculture, therefore, depend heavily on more young minds joining the industry with a plethora of career opportunities that the sector has to give. Nonetheless, some workers in the plant indicated finding another job that aligns to their technical professions such as electrician, technician, computer scientist and mechanics. According to many workers:

I have a technician qualification. So, if it happens tomorrow, I will have to find another technician job somewhere else. (Interviewee No 5, October 2017).

and

Although there are jobs for me, if technology replaces me, I will go and fix your iron, and kettles, all electrical equipment because I am a qualified electrician (Interviewee No 21, December 2018).

and

I think the network business for now. Even though some people are using them as scams. Also, as long as digital is coming in, someone must fix that digital machine, so in terms of skill, one gets training that he wants which is going to need one's commitment. (Interviewee No 27, December 2018).

And

I want to see if I can get some training to be an electrician. I heard that that is the next skill to get now and to become a computer scientist. (Interviewee No 26, December 2018)

The indication here is that workers believe that the skills they already possess will enable them to secure an alternative job outside their present companies. Some of them believe that reskilling further will increase their chances of remaining in the company to maintain the machines or acquire computer science skills. In other words, auto companies these days are only retaining uniquely skilled workers who are capable to work with technologies and will generate profit. Employees need to be educated in diverse abilities in the current situation of technological unemployment to enhance their likelihood of finding a useful alternative career.

Although retraining will help workers to acquire the skills needed by the motor sector, it may not help them to secure alternative employment. That said, business as an alternative career route has been on the mind of these workers, then again, lack of personal saving has served as a constraint on trading on this possible career path. For instance, two ladies in their early 40s put the point most concisely:

I feel it is a trap. why I said so is that I got my bonus of thirty-something thousand and before December, I use that money in 3 weeks, and by January I don't have money, whereas we can do something, then we can train ourselves, and we can start a business with the money, but we don't talk about those things, we get that money, we eat it alone as if there is no tomorrow (Interviewee No 15, July 2018).

The above except means that in comparison to dangerous and unsatisfactory factory jobs, employees dream of self-entrepreneurial solutions. Without doubt, venturing into business and becoming an entrepreneur to counteract factory job insecurity and unemployment is a good

sustainable livelihood backup plan for autoworkers. Although, starting up and maintaining the business might be challenging for most of these workers. One of the reasons is the lack of savings on the side of the individual. Naturally, an individual with entrepreneurial potential would have a clear sense of the importance of saving.

Arguing along with the idea of the spirit of entrepreneurship from a sociological standpoint and as in 'The Protestant Ethic and the Spirit of Capitalism' by Marx Weber in 1904 which hypothesizes that for individual or groups to succeed in business and economic development, there must be a presence of values such as ascetic self-denial, which discourages extravagant lifestyles and encourages a positive attitude towards savings and investment. This is the best strategy to accumulate sufficient wealth to establish and sustain any business. To clarify this, autoworkers that are considering the business as an alternative career path must abstain from lifestyles that encourage the misuse of their earnings on unproductive investment projects.

Aside from lack of savings as constraints in establishing a business as an alternative career route; the findings in this section of the study also shows that lack of business training is another issue restricting these workers from venturing into business. But they attributed this to insufficient money to fund the training. It is worth stressing that the workers may have outstanding insights that allow them to identify niches with potential to become lucrative businessmen and women, but they do not have the skills to take the business from one point to another.

Another observation is that these workers might not survive the negative effect of automation, considering that South African stakeholders which include the workers are living beyond their means, this hampers work creation and sustainability. This confirms that "*rather than to save and use their bonus money to invest in their training or establish a business, instead; they squander the money within a very short time"*. It should be noted that a proportion of those trapped in such circumstances may have trouble in obtaining employment that is consistent with their living standards.

With that in mind, as long as the rate of technology adoption continues on its speedy path, some workers believe that there will be no alternative job for anyone:

No. there is no way that you can be able to have an alternative job whereas the robot is continuing to work. But I have not thought of anything as an alternative job. This job is all I can think of for now (Interviewee No 25, December 2018).

The findings in this section show that some workers are not ready for alternative jobs as it is difficult to start afresh in this economy. The general indication is that these workers are uncertain of what to do if technology replaces them. This shows that autoworkers have built their careers around the car industry. They also believe that there is no job for them since machines are dominating almost all sectors.

Form a labour process perspective, workers cannot be entirely ready for the changes that accompany technological adoption despite upskilling. The reason is that machines are not at fault in displacing workers from their jobs which affects their uncertainty to survive even outside work but the constraints of the capitalist production in which these robots are being used are therefore not attributable to the requisite availability of social services, but to the consequences of an all-powerful economy, dominated by capital and its competitive intervention, which is both unpredictable and profoundly hostile to any sense of identity. There are a constant organizational "routine, search, selection and new ways of doing things" that tend to "unready worker's readiness."

Workers, as consumers, experience a habitual phase at every successive stage of the process of proletarianization that grows stronger as monopoly capital is increasingly conquering cultural and affective spheres of life. This process is seen as the reverse of the destruction and its severe social and psychological consequences in the workforce.

10.5 Policy Implications

In relation to job automation, the future of workers, their inability to find jobs, to be retained in the job irrespective of reskilling or upskilling, their uncertainty of alternative job and lack of resources to pursue another career have been taken-for-granted because the policymakers are collectively in denial of such possibilities. The state must foster positive social-economic change to deflect harm for a more just and equal world not cause harm that perpetuates economic and social inequality, unemployment, poverty, job uncertainty, deskilling, undervalue of the human right to work, and social divide. The notion that the economic

evolution at its rate should maintain its status quo with the idea that history repeats itself in terms of equal creative destruction is wrong.

10.6 Conclusion

While management is certain of their position in the local and global market economy with the aid of smart technologies, workers on the other end are uncertain of their future in their workplace, career and the society. This chapter looked into the readiness of the autoworkers in accepting the outcome of job automation in the motor industry. In-depth interviews were employed to gather primary data from the participants. The study also analysed the findings from the perspectives of labour process theory, evolutionary economic approach and CSR insight. This chapter concludes that workers are not ready for the change that usually comes with technology as they face job losses or are moved to other departments. Some of the employees receive constant training which is a kind of readiness for workplace change, but it is usually to those employees who work directly with machines. When faced with job losses, most of the workers feel that they do not have alternative career options to follow as unemployment rates are high in South Africa.

Adoption of technology need not be a threat to jobs in the automobile sector and the future of worker's discussions are essential in these uncertain times. It can be concluded that people do not have the means to requalify for higher-end technical jobs and may be unemployed. Companies do not see it as their responsibility to prepare workers and the educational systems are not prepared yet for this industrial boom. The CSR in line with the LPT argued against these irresponsible economic activities that neglect the welfare of workers, which could trigger a social disorder, anger, poverty and frustration in society.

The only thing keeping workers in the car industry is that some of the tasks require human workers, they have to maintain the robots and are protected most times by the union. Hence, the next chapter looks at the union's influence on job automation.

Chaper 11

Empirical Findings: Trade Union's Influence on Job Automation

11.1 INTRODUCTION

While trade unions have little or no influence in job automation in the motor sector, they, however, play a significant role in the training of workers and in fighting retrenchment. The argument in this chapter is that auto-management partly informs the workers about their plans to introduce more technologies in the factory but informing the workers does not mean that the management is expecting workers and their union to contribute in this decision making. Union indicates that the number of robots in the plant is reducing the number of their members. This contention concurs with the main thesis of this study which revealed that although automation comes with a lot of efficiencies, it has negatively affected the welfare of the workers through its unilateral decision on the adoption of robots in the auto sector.

According to LPT, power and control are detached from the workers in the industrial sector which is one of many managerial styles which shows the obvious decision-making consequence to industrialization. The CSR concludes that instead of a unilateral decision making, consulting employees on the application of innovative changes may empower employees to understand their future with the company and the situation of the workplace CSR practices by taking into consideration the necessity to adopt more technology, other possible changes and the effects these transformations may bring. Such knowledge will enable employees to realize how the transformation may influence them.

This chapter presents the findings on how autoworkers' trade union with specific reference to NUMSA has influenced the rate of robotics in the automobile industry in South Africa. To understand the influence of union on technology evolution and workers' job security is important. The primary data of this chapter was gathered through in-depth interviews and the findings were interpreted.

11.2 The Core Argument of this Chapter

In the automobile sector, consultation sometimes takes place between management and union regarding the introduction of a new machine, but the positive or negative view of the workers and their representatives are irrelevant to the management's "already made top-down

decision". The idea is to include autoworkers and their representatives as 'collaborators' or 'associates', the formation of problem-solving and decision-making groups without the workers and their union successfully contributing to the decision making. This can be argued to be a disguise system which enhances the control and power of management since the workforce are sometimes incorporated in the attendance of the decision-making meetings but lack the power to effect restructuring decisions which affect them.

The implemented technologies have decreased the number of union members in the sector. On one hand, instead of workers being retrenched when their skills are no longer needed, the union persuades management to retrain the workers to be relocated to any other department where they can be useful again and union also suggest that their members should be trained to become producers and suppliers of car components and also robot installers and repairers rather than management outsourcing for such people outside the company. On the other hand, union are providing training such as computer skills to their members which boost their relevance in the company and job security.

The findings of this study do not imply that spontaneous entrepreneurial activities of trying novel possibilities of manufacturing are not necessary. Rather, it highlights that, since the evolutionary creative destruction fully recognizes gainers in this economic activity and ignores the losers whose skills are deskilled in the process; hence, a sustainable, responsible corporate social good while making a profit will be the best work restructuring.

11.3 Implementing Technologies and Consulting the Union

In this section, the researcher wanted to know how regular the management consults union and their members in the automobile sector. This was to get insight if the union determine what, how, when and if the technology is needed and the rate. The following are some of the interview excerpts on union and worker's consultation regarding technological adoption:

> *In most cases, management does not share that information with us. All that we are doing is to see. For example, VW is closing on the 12th of December, normally we close on the 15th of December, but the reason for closing on the 12th is that they want to service the production systems. Now when we come back in January, part of servicing will also be the installation of new technologies and robots, and then the union has not been taken on board. So, these are some of the things that make things very difficult for*

the union to have proper planning on setting interventions, especially around skill development. The management must engage with the union and be transparent with the union. Take the union as your strategic partner in driving processes. As much as these are your employees, they are also our members. There is a merged dichotomy because we want the company to be profitable. Most of the technologies are coming from overseas, and only the personnel from overseas will be able to install these technologies. (Interviewee No 22, December 2018.)

And

There is what we call standard agreements between trade union and management. When these agreements were introduced the trade union was taken through in terms of competitiveness and productivity. Unions are consulted, but the question might be: did we as a union ever have thorough plans to counter such a massive growth of technology. That is where a trade union needs to look at, to ask have we done our job in making sure that we can counter this situation? (Interviewee No 16, July 2018)

Findings show that management sometimes consults union and workers on any new machine they introduce, but management usually has an attitude of stating that they do not owe the workers and their union any explanation and consultation. The aim is to engage the trade union in the problem-solving and decision-making committees as voiceless stakeholders. However, this inclusion is a camouflage system that enhances control and management authority as trade union lacks the power to make a structural policy that affects their member.

A typical example of no consultation, disregard and frustrated union influence was demonstrated in the most recent case of the ArcelorMittal South Africa (AMSA), which in many respects exemplifies SA automobile sector's problems in relation to the unilateral decision on the side of the auto management. For instance, in July 2019, NUMSA indicated how management disregard the workers and the union when they make a decision that affects workers such as retrenchment. The management at AMSA informed the media on their plans to retrench workers and did not bother to inform the union until much later. For this, management must be strongly condemned. They displayed a total disregard for their employees and the union. The notice (of retrenchment) was received [by NUMSA] on the 10th of July 2019, hours after AMSA had gone public to the media about its intentions to restructure. AMSA already made a determination of the number of workers who will be affected by hinting

at 2,000 job losses. This means that more than the number anticipated will lose their jobs, according to NUMSA.

The findings further indicate that even when unions are consulted, they usually do not have plans to respond to such a massive growth of technology. It is understandable that technological evolution is necessary for the South African car companies and do not need government support or a framework for technological advancements because decisions are taken in their respective offices outside South Africa. Nevertheless, car manufacturers in South Africa should be more committed and transparent to their workers. Importantly, if they are to make adjustments to a policy that impacts workers directly and indirectly, and also impacts on the society within which they operate.

11.4 Union's Perspective on Technology

This section focuses on the unions' perspective on the impact of technology in reducing the number of workers in the car assemblies. Unions are there to protect the workers from being unfairly dismissed and protecting their members' rights. They engage with management and the government on issues around the restructuring of the sector, workplace and the economy with a constructed purpose to ensure a living wage, job security and, to meet the basic needs of the citizens and create additional jobs. When it comes to technology reducing the number of workers, trade union revealed that:

> *Yes, surely, they implement technology because technology comes with modern ways of modernising or simplifying the operation and another issue is that of trade liberalisation that is supported by the state as an attempt to increase output to compete on the global market. This reduces the number of the previous operation and the people in the workplace (Interviewee No 29, October 2019).*

A shop steward lamented that the rate at which workers' jobs have been affected because of robotics in the workplace:

> *"Many workers were retrenched as a result of technology. Although the employer will never say to you that they are retrenching you because of technologies. For instance, in 2016 when VW introduced more than 340 robots, some artisans were told that "your skills are no longer needed" these were fitters (fitting antennas). The company now*

needs electricians. Just imagine telling artisans which is a scarce skill in the country, that their skills are not needed. However, NUMSA was able to box the company to say they cannot tell workers now that the company does not need those. The management did not prepare these workers in advance for reskilling to become electricians. Therefore, the management cannot retrench these workers because they did not give them an opportunity. So NUMSA wrote in the Commission for Conciliation, Mediation and Arbitration (CCMA) to facilitate the process. Now those workers were reskilled and retrained, and they did not lose their jobs. For example, when I was employed by VW many years ago, we were just above 10,000 employees, and there were fewer robots at the time. However, now we are standing at just above 4,000, and the rest of the workers were retrenched, or they were released by the company, and now those jobs are being done by the robots" (Interviewee No 22, December 2018).

And

"For example, in Toyota, there were 300 plant workers and a model were introduced which necessitated more robots. On the process, 85 worker's jobs were affected." (Interviewee No 30., October 2019)

The indication here is that union recognises the importance of these technologies and its connection to trade liberalisation in the auto sector, nevertheless, they maintain that the rate at which it is implemented is resulting to employees losing their jobs. The union participants in this study complained that many workers have been deskilled and the management was forced to reskill the affected workers. Unions are trying to identify the skills that the robot or technology cannot perform, and redirect, re-skilled or upskill the workers, hence fostering a relationship between a human being and the robot to co-exist and work together. The point is that manufacturing management is more concerned about the mechanization of work, productivity and successful business competition but it does not include substantively empowering their workforce.

11.5 Training, retrenchment and unions influence

Union must be proactive when it comes to retraining and upskilling the workers to be an agile workforce. Union representatives had this to say to support the union's position on worker's training and retrenchment:

The management is very reluctant to train workers. We engage in negotiation to ascertain that no dismissal will result from the introduction of new robots and we insist that the workers be retrained for instance to become engineers and repairers of the robots or on the needed skills to be absorbed in tasks where necessary. For example, the affected workers can be retrained to become component developers and suppliers of components such as car seats instead of outsourcing for such jobs. The problem is that not all the effected workers can be absorbed and retained. But we always hoped that the negotiation will conclude in productive discussions. (Interviewee No 30, October 2019.).

In this study, union suggest that instead of management to retrench workers because of redundant skills or outsourcing for experts, components developers and suppliers, the deskilled workers should be retrained to design and supply different car components for motor companies and also repair the robots. This means that to some extent, the union has the power to object retrenchment of their members and in this case, their decision making, suggestions and problem-solving abilities and positions are taking into consideration by the management. One shop steward disclosed the progress NUMSA has made on workers' training but complained about the dominant power of MNC management:

We cannot run away from the fact that technology is also driven through computers now. So we have started computer training for workers in VW and the auto sector. We are now happy to report that for the past 2 years that has been taking place. Workers are graduating in numbers in computer training. But the management does not train workers on how to manufacture and install the machines because they want to reserve the skills, knowledge and expertise only to themselves and be in control of processes because once they do that, they are going to lose a lot of money, power and influence. The technologies are manufactured overseas, and only the overseas personnel are contracted to install these technologies (Interviewee No 22, December 2018).

From the results above, NUMSA pushes the management to train and retrain workers and be absorbed in other task and not retrenching them because their current skills are no longer needed. The argument is that NUMSA facilitates computer training for their members and they are witnessing positive results from this training as workers are graduating in numbers. This means that the union makes a good effort to protect its members' interests and help secure their job in the auto industry. The findings also show that management does not train workers on

how to manufacture and install the machines in the South African auto sector *because they only want to conserve resources, knowledge and expertise and manage systems, capital, power and influence*. Although, importing some machines from other countries is inevitable, but producing some of the technologies locally will help create jobs and exporting the machines will establish an advantage in manufacturing competition.

11.6 Strike or Grievances against the Rate of the Adoption of Robots

This section's objective is to understand if there has been any collective protest against the constant implementation of technologies in the automobile industry. It was revealed that there has been a general strike which included against job automation among other workplace issues at a time. As one shop steward put it:

> *Not particularly to Toyota but in general, when autoworkers strike, we strike for many issues which include "down the robots" but we have not strike for solely against job automation. What the union (NUMSA) is saying is that the company should introduce the most necessary possible technology, but only on the basis of maximising benefits to all of us. The thing is that the government supports automation in this industry. When you look at it, a positive percentage of the economic output of South Africa is attributed to the automotive industry. So it is understandable that the government and the car companies push for automation to maintain and increase this positive economic output irrespective of how it affects workers (Interviewee No 29, October 2019).*

As indicated in the findings, the union and their members have not engaged in strike specifically against the rate of robots, however "down the robots" is among the issues they strike for in their general strike. They revealed that their intention is not to disrupt production in the workplace but they want management to employ robots when it is really inevitable and highly necessary to do so if there are no workers to do the job and even at that, exhaust all the options of retraining workers to perform that particular task.

As a solution, in August 2019, Irvin Jim (General Secretary of NUMSA) called on all the Federations of Trade Union in SA to unite all workers, regardless of symbols across all sectors of the economy to take to the street through a Section 77 socio-economic strike to defend worker's jobs. This strike was to take up the fight to defend jobs and fight for job creation. To take this forward, NUMSA called on the Presidency and the entire economic cluster to convene

all stakeholders, who are interested in protecting the current capacity of manufacturing, in creating jobs and in championing the future of South Africa. Together, all these stakeholders will discuss work growth and economic security, since they are regional problems in seeking solutions. There are critical problems. In particular, NUMSA insists that SA will pursue a plan for work, which must not only secure and create jobs but also train workers for the Fourth Industrial Revolution.

11.7 Policy implications

NUMSA embraces smart robotic in the motor industry and assumes that digitisation and automation of work processes will enable the production line to run efficiently, however, the union is resolute that there should not be job losses as a result of introducing technology which shrinks the number of their members adding to the increasing rate of unemployment. Union has already equipped its members with the most needed skills and more efforts are possibly necessary. The loophole in consultation between management and union must be filled. It is assumed that all stakeholders in the automobile sector have one or two vital contributions to make for a wholesome progressive workplace. Hence, transparency, understanding, compromise and respect is the key to this issue of job loss and job automation.

11.8 Conclusion

Engaged with empirical fieldwork and applying methodological exploratory interviews, this chapter uncovers that management partially consults the workers and their union on their intention to implement additional technologies in the plant, however, this consultation is just to inform the workers of the intended technological progress but the decision making of the workers in this regard is not at all needed. It has also shown that workers skills become unnecessary when some robotics come into the auto workplace which necessitates retrenchment of some workers but worker's trade union always insist that the affected group of their members be requalified and be engaged in other tasks within the company.

It is assumed in this chapter that to a greater extent, robotics are dominating jobs in the motor industries. More technology is being introduced every year and workers are losing their jobs or are moved to different departments within the company. This chapter has shown that union recognises the importance of these technologies in the auto sector, nevertheless, they maintained that the rate at which it is implemented is resulting to employees losing their jobs

which is pushing union into considering federal collective action on “down the robots” job security and job creation. Both the argument in this chapter and that is the key argument of the thesis are in relation to each other that technology is being accommodated at the expense of the workers’ employment despite its production efficiencies. The following chapter discusses job creation and destruction and skills needed in the 4IR.

Chaper 12

Systematic Discussion on Skill/Occupations Created and Destroyed

12.1 INTRODUCTION

From a conceptual-cum-theoretical viewpoint, this chapter presents the logical and critical analytical discussion on creative-destruction thesis and occupational structure of South African manufacturing labour market. Standing on the shoulder of CSR and partly leaning on the fence of LPT, this study supports Komlos (2016, p. 16) who stated that "evolutionary creative destruction" is now more disruptive than ever. Komlos points out that the move to a post-industrial economy is far from favourable to the well-being of a significant proportion of citizens, such as autoworkers. Even though we have been driving innovation and rising effectively for a quarter of a century, it does not mean that the cycle will or should continue unabated. A good number of low-skilled workers— and there are more of them — have become steadily obsolete as a consequence of automation; thus, chronic under-employment is here to continue. We, therefore, need to pay closer attention to the destructive forces of technologies (Komlos, 2016, p. 11).

12.2 Job Destruction and Creation

An array of scholars found that industrial revolution prompts a trend of "creative destruction", a scenario where job creation, job destruction, and unemployment increases concurrently, and job finds its new equilibrium (Acemoğlu & Restrepo, 2016; Bessen, 2016; Gelb & Khan, 2016; Heimerl & Raza, 2018). In theory, Schumpeter (1939) regarded innovation to be both the creator and destroyer of firms, sectors and tasks, acknowledging the destructive nature of technological advancement that could translate to 'creative destruction' events. In the South African automobile context, see Figure 11.1 and 11.2, NEDLAC (2019) shares this same view with evolutionary economic insight that while some automobile job roles will decrease, some will increase:

Figure11.1 Roles and Activities Expected to Decrease in the Automotive Industry

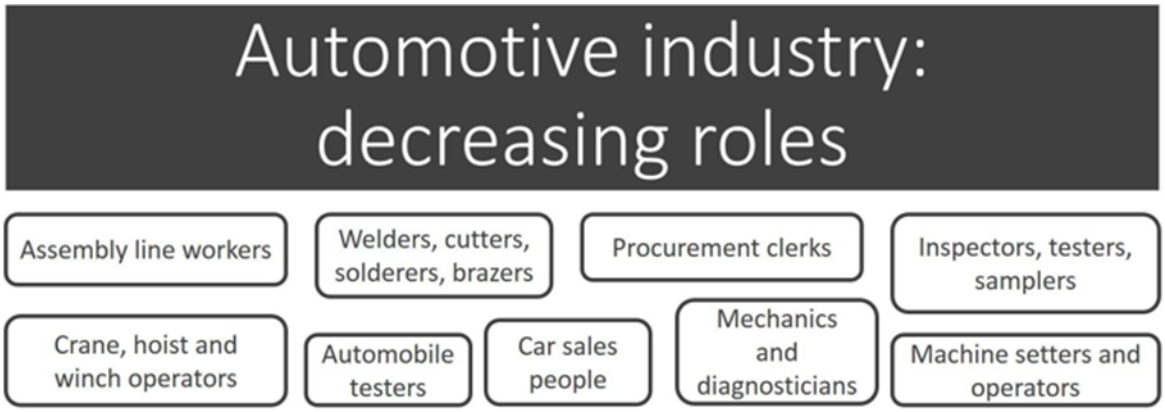
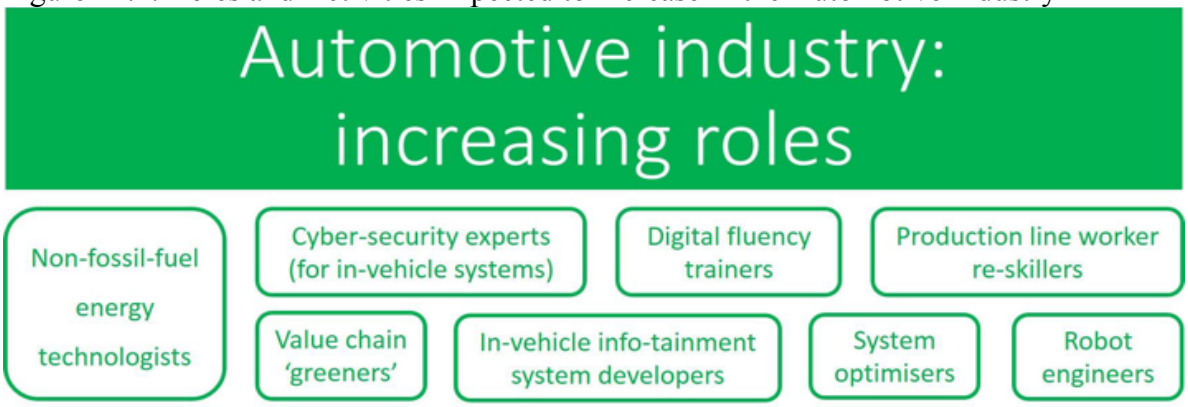


Figure 11.2: Roles and Activities Expected to Increase in the Automotive Industry



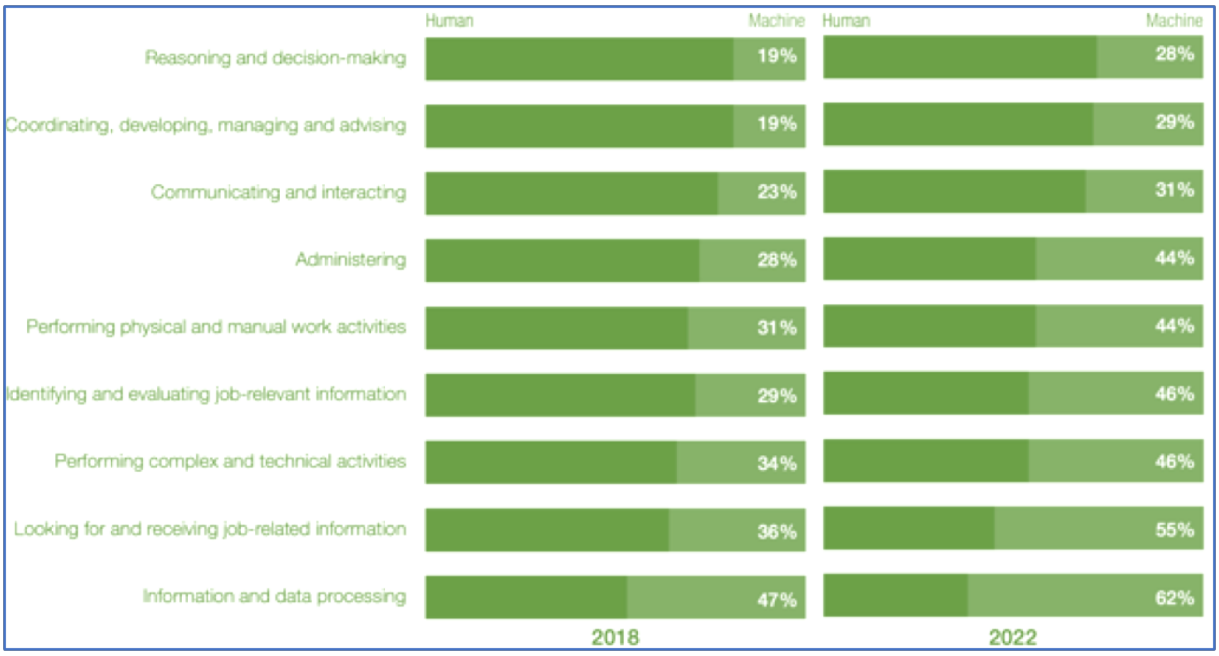
(NEDLAC, 2019, p. 90).

The figures11.1 and 11.2 above show that automation can result in companies replacing one occupation with another. This is a typical manifestation of the process of creative destruction (NEDLAC, 2019). Many of the mechanical and structural work done by automotive manufacturers and suppliers of parts may be replaced by workers with a variety of skills, such as chemical, electrical and electronic engineering, and by imports of lithium-ion batteries, a skill set that is still in limited supply today (Canis, 2019). There is also a need for the production of new high - quality research and development (R&D) job opportunities, design and management positions in the manufacturing process, new expertise in the manufacture of electric motors, machine learning, material scientists, technical analysts, mechanical, electrical, construction and mechanical engineers, and an increase of engineering jobs requiring a high level of software development, science, mathematics and engineering and computing graduates and postgraduates (Econometrics, 2013).

For example, Canis (2019) detailed that the global demand for automotive electrification is expanding. The demand in electric vehicles (EVs), which have already demanded full movement away from new fossil-fuel vehicle sales by 2030, is expected to continue to rise. Ford Motors reported that its electrification spending is growing with 16 full-electric vehicles to be installed by 2022. Starting in 2022, the Volkswagen Group plans to develop electric cars. General Motors announced that 20 new electric energy vehicles will be installed in its five installations by 2023. The vehicle driving cycle in conventional and electric vehicles is, as stated in the Canis (2019) article, substantially different. This is likely to lead to a much smaller workforce in producing an electric vehicle than in creating a different vehicle with a petrol or diesel engine. With electric vehicle powertrains, if installed domestically and not imported, would produce few jobs in manufacturing.

The transition to electric cars and away from combustion engines is possible to have significant implications for the automotive assembly and production sectors, which have the potential to eliminate a large number of assembly line workers, automobile employment and parts manufacturer in general. To back up this argument, conventional motors have up to 2000 parts in their powertrains, while electrical motors can have up to 20 components. About 150,000 of the 590,000 U.S. employees who are involved in producing motor vehicle components make internal combustion engine components. The electric powertrain has only a handful instead of hundreds of moving parts mounted in a traditional drive train. A large number of electronic sensors are used by electric vehicles, but these instruments need less effort to manufacture and install and need further transitioning to new technologies. The World Economic Forum (2018) depicted in figure 11.3 below which shows the pace at which machine intelligence is closing down on various human activities.

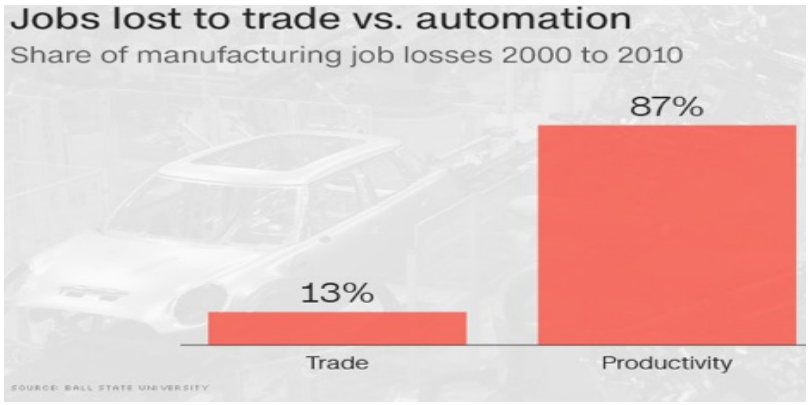
Figure 11.3: Technologies of Yester-Years and Recent-Deep Learning Technologies



(World Economic Forum, 2018b)

The above statistics indicate the rate at which machines are rapidly progressing in learning more of human capabilities which were never imagined before. We have been integrating automation with human employees for decades for well-defined advantages. Years back, while the capacity of machines donates precision, intensity, velocity, cyclical to name a few; human workers on another hand embodies flexibility, astuteness, adaptability, emotion, the capacity to learn different skills and upskill, and sense of estimation. These are complementary skills that exist in workplaces where humans and machines co-work. However, of recent, technologies are capable to perceive and understand on their own with the initiation of the deep learning techniques. These techniques are fit to solve real-world problems to mimic the intelligent decision-making skills of the human workforce. Such techniques possess "state of the art" performances and will further top-up on its capabilities in few years to come. Thus, most susceptible activities to automation are not only physical work but also a good number of mental works. Another similar study by Hicks and Devaraj (2015) painted a picture in the figure below on how far jobs are automated to boost productivity in the manufacturing sector.

Figure 11.4 Jobs Lost to Trade Versus to Automation



Source: Hicks and Devaraj (2015)

For Hicks and Devaraj, the manufacturing sector has continued to grow and continues to be a large, significant and growing part of the economy. Manufacturing employment has stagnated for a long time, mostly because of productivity growth in manufacturing processes. In recent years, three variables have led to shifts in production jobs: growth, globalization and domestic demand. Overwhelmingly, productivity is the biggest impact. Approximately 88 per cent of industrial jobs declines in recent years can be traced to productivity growth, and longer-term changes in production employment are primarily related to industries (2015). These corroborate Braverman's (1998) and Previtali and Fagiani's (2015) notion that labour has been reorganised to the extreme in pursuit of speed, competition and surplus-value.

The overall argument is that it is likely that few employees will be necessary than at present as car battery services have very few components and are much less intricate to build and requires less human labour than the combustion engine powertrains (Canis, 2019). EV has fewer mechanical components, which means that there is less to manufacture and less to disintegrate. The use of electrical components would raise potential dangers, contributing to a further digital manufacturing process (Econometrics, 2013). Again, the new jobs created will be inaccessible to many semi-skilled workers and entirely inaccessible to unskilled workers. The contention here is that robots will destroy much more employment than it creates in the automobile sector.

12.3 **High Demand Jobs and Skill Structure**

The South African Department of Higher Education and Training has compiled a detailed book outlining 370 high-demand jobs in South Africa. The list includes jobs that have experienced strong employment growth or are witnessing labour market declines or occupations that are expected to be in demand in the future. Below are South Africa's 2020 critical skills list for

both local and international workers: Surveyor, java developer, mechanical engineer, IT manager, software engineer, finance manager, pharmacist, analyst. technologist, health professionals and related clinical sciences, business, management, and economics ICT project manager, Information Technology manager, information systems director, ICT systems analyst, programmer analyst, applications programmer, agricultural engineering technologist, agricultural scientist, advocates (See: section 2.17 for more list). A good number of skills still fall under the tech industry umbrella, managerial and financial fields.

For Illanes *et al.* (2018), nearly 14 per cent of the world's labour force — may have to transition to job categories such as digitization, robotics, and developments in AI. The forms of necessary skills by companies need to evolve, with major implications for the career trajectories that people will need to follow. Cukier (2020) indicated that one way to build agile labour is to integrate efforts to construct the skills/training environment into corporate social responsibility and philanthropic initiatives to help young people prepare for tomorrow's work. As a consequence, most executives rapidly see innovation in retraining and upgrading the existing workers as an immediate top ten business priority (Illanes *et al.*, 2018). Companies specifically expect to meet this goal by forming innovative alliances with a wide range of stakeholders: states, educators or individual workers, but companies will take charge in trying to close the growing skills gap (Ibid).

Brende (2019) suggests, however, that if companies work together to create economies of scale, they may jointly reskill 45 per cent of at-risk employees. If governments support this initiative, they may retrain as many as 77% of all at-risk workers thus benefiting from returns on investment (ROIs) in the form of increased tax returns and lower social costs, including unemployment compensation. When companies cannot afford cost-effectively and governments cannot provide alternatives on their own, it is crucial to shift to public-private collaborations that reduce prices and provide tangible social benefits and workable solutions (Ibid). However, with the rapid rate of change and uncertainty, retraining and lifelong learning will be necessary for inclusion in the new digital economy. This is likely to mean that both government and industry will have a role to play in refining the workforce. Integrative and extremely complex measures are essential to ensure that companies and their expertise remain competitive as the future of work evolves (Cukier, 2020).

There is no universal agreement as to who is responsible for upskilling and reskilling (Cukier, 2020). However, for instance, the government of South Africa has taken considerable responsibility through partnering with ICT key players to effect programmes that groom the youth for the 4IR. For instance, 131,980 youths has benefitted from the partnership with Google since 2017 and women profited slightly more than men with 58%. The Huawei Seeds of the Future Program also, in the last three years has been developing learners to cutting-edge ICT skills. Likewise, by 2023, Microsoft is aiming to train one million South African youth. In a similar vein, Cisco has so far trained close to 15, 000 youth. Data Analytics, Block-Chain, Coding, and others are various disciplines linked to 4IR, which the programmes cover. When it comes to e-commerce, it seems that the government is crawling to enable such services that could hasten the establishment of small businesses. As of 2019, 450 females received training on digital skills by the government. However, this number is insignificant and a greater number of females are needed to be trained. Even so, Brende (2019) noted that these initiatives have culminated in a worldwide network of national public-private task forces in a country like South Africa.

Illanes, *et al*. concluded that while these corporations consider retraining as a top ten (60 per cent) or top five (30 per cent) business priority just 16 per cent of corporate leaders felt very prepared to fix future skills shortages, while many feel only "somewhat unprepared." One of the challenges is that many organizations are having a hard time figuring out how job roles should shift and what kind of expertise they would need over the next five to ten years and acknowledged that they currently lack “a good understanding of how automation and/or digitization will affect our future skills needs” (Illanes, et al., 2018).

Both government and organisations face the problem of not knowing what capabilities will be most important to their organization in the future (Cukier, 2020), so it is difficult to plan up-skilling when the future cannot be expected. Such a negative emotion can be understood. Too much traditional training and retraining goes from the bottom up because it does not provide a real direction for new work, relies entirely on theory versus reality, and fails to address ROI (Illanes, *et al.,* 2018). Another problem, according to Brende (2019), is that only 30% of employees at risk of job automation have received training in the past year, and those most at risk are often those who are least likely to receive retraining. To date, only around 25% of these jobs have been successful for the private sector, reflecting the need for business interaction, government investment and public-private partnership to reduce costs and meet thresholds

(Ibid). The report of the WEF's states that: "A large percentage of companies across most industries still have not made significant investments in reskilling and upskilling programmes." Rather, most are looking for new workers who already have the qualifications they need.

The remedy is to implement programs that focuses on employment where there is a strong demand for work and to gather the data needed to prove ROI to learners and employers and to build strong relationships with businesses, states and—to support mid-career workers develop the skills for new jobs (Illanes, *et al.*, 2018). For many businesses, unlocking the reskilling code is to partially observe CSR and about maintaining their "license to operate" and motivating employees to work more efficiently. While others cite "alignment with the mission and values of our organization" as a major reason for action. Handling this technology and economic evolution, in simple terms, is not just a common special and economic good; it is also a competitive absolute requirement, and that is why most corporations said that the key intension of retraining was to "increase employee productivity" (Illanes, *et al.,* 2018).

To be successful in recognizing the advantages of these improvements, at least 54% of all workers will need upskilling and retraining by 2022 (Brende, 2019). Sixty-two per cent of managers estimate that they will need to retrain or absorb about as much as a quarter of their staff between now and 2023 due to increased mechanisation and digitisation (Illanes, et al., 2018). These and other initiatives to invest in improving the skills and abilities of all communities can be the path that we need to push towards equitable, long term growth that optimizes technology to produce an advantage for everyone (Brende, 2019). Investing in human capital will turn them from inactive spectators of instability to successful advocates of positive change in their local, regional and global societies. Decision-makers will have to reconsider novel means of unemployment compensation and job relocation assistance, as well as promote more intense and creative cooperation between the public and private sectors (Illanes, et al., 2018), and people will need to take the lead as well, as will states based on the speed and scale of the potential transformation of the workplace.

However, it does not matter the quality of the skills acquired by the autoworker because automobile sector has the tendency to degrade jobs and deskill despite the number of training and skills upgrade (Braverman, 1998, p. 176). As far as labour process theory is concerned, the capitalist mode of production actively eliminates all-encompassing capabilities as they reside and develops talents and jobs that conform to their desires. After going through some training

only a few of the trained are reintegrated into the labour market, such a move will take effect as a polarizing character. While those that are absorbed will be more or less "trained gorillas", who can follow the instructions of the scientific manager unthinkingly (Braverman, 1998; Previtali and Fagiani, 2015; Smith, 2015). While manufacturing continues to be revolutionized constantly, new skills acquired will soon be prone to the same system that 'releases it' (Braverman, 1998, p. 176).

From the lens of neo-labour process insights; Smith (2015) and Previtali and Fagiani (2015) partly agree that such new conditions of manufacturing require a new and more flexible form of a worker who is capable of meeting the needs of manufacturing processes involving extensive use of technologies and better skills, which can imply not only higher productivity but also higher costs. The level of skills of employees is critical for both workers and employers. In the context of South Africa, increased robotics comes with its associated required skillset for employees (Monaco, Bell & Nyamwena, 2019, p. 24). Without these skill sets, the contribution to productivity will be lost and South Africa is losing more professionals than it is gaining. Meaning that there is a need to reskill and upgrade the skillsets of workers to compete effectively with technologies. Thus, technological change affects the nature of skills (Hlatshwayo, 2017).

In South Africa's context, in spite of the development of a range of tacit skills, workers are subject to a system of informal supervisorial despotism which characterises the internal labour markets of the SA's motor firms (Adler, 1993, p. 35). A new kind of unfair intra-workplace competition is introduced by the company, a competition in which workers' abilities, skills, source of pride, motivation and identity are made useless (Barchiesi, 2000). Regardless of their tacit skills, all-rounder status and knowledge on the job, as a crucial ingredient in the company's success, these workers remain largely unrecognised and generally unrewarded for their contributions. As a result, workers develop a sense of deep frustration in their working lives leading to profound demotivation, with little sense of a future. Their attitude is the direct consequences of the organisation of work and which have implications for productivity in the industry (Adler, 1993, p. 36). In this regard, the predominance of the Taylor model within South African automotive experimentation with scalable, lean output is seen as "hi-tech Taylorism" (Barchiesi, 1998a, p. 65). Nonetheless, irrespective of the inspired theoretical framework, there is general agreement in the literature on the low levels of skill, and dehumanisation correlated with work in the motor industry (Adler, 1993, p. 35).

12.4 Conclusion

Theoretically, as the constant revolutionization of production continues to give rise to new skills, these abilities shortly become susceptible to that same process that devalued the previous skills. The tendency toward deskilling and degradation of labour in the industrial sector such as automobile industry does not only still prevail but also expands and deepens.

The destructive forces of creative destruction have gained the upper hand in shedding jobs. Instead of innovation fetishism, we should seriously examine how far progress can boost the human condition before it becomes a problem (job lose, employment uncertainty, deskilling and inequality). While evolution economic theory has its emphasis on purposely "doing new things" or getting old things done but in a novel way as the "ultimate cause" for organizations, sustainable development imbedded in CSR is about finding "better ways of doing things", both for the future and the present. The development approach adopted by the car sector is affecting everyone. Although, the negative effect is burdening the workers and having real consequences for their work and future. Arguably, the state, corporations, unions (with reference to NUMSA), workers, consumers (with insatiable demands and tastes) and the society in general, all have a role to play in bits and collectively to effect real change.

It is likely that it might be difficult to ensure that this process of technological advancement creates more jobs than it destroys since technology seems to be destroying more jobs than it creates. To date, the destruction seems to be moving in a light rate while the creation of jobs moves at a snail's speed. This would not be so tragic except the process is currently producing tremendous wealth for those who are wealthy already, while most of the public are faced with unemployment, underemployment and job insecurity. Furthermore, past advances in technology replaced muscle power, the current innovations, are replacing brain work and this makes it possible to wonder if there will be new jobs to be created at all. The following chapter reiterates the findings of the whole study and concludes the thesis. It also considered the recommendation and policy implications of the general study.

Chaper 13

Summary of Findings, Conclusions and Recommendations

13.1 INTRODUCTION

The introduction of technologies would improve manufacturing output and will raise the country's GDP. It will also lead to some employment being created and destroyed. Nevertheless, the disruptive impact is more pronounced and contributes to a higher unemployment rate and division of jobs and culture as a whole, since it kills more than it creates because of its rapid destruction. This central thesis synchronizes with the statements made in the other chapters of this study that, given the accuracy in its production progress, job losses in the automobile industry are triggered by automobile task automation.

In line with the position of this study, labour process theory stressed that every unique ability of the worker was subjected to the management control and undermined as the investment needed the biggest profit. Thus, capital is accumulated by management through the labour process using technological adoption. Thus, wealth is amassed by automating tasks for faster efficient productivity and task that were previously completed by humans' power have been taken over by robotics (Braverman, 1974), which destroys the value and skills of human labour. This transformation decision of constant job automation has created unemployment and poverty.

From the view of CSR, Porter and Kramer (2006) suggest that corporations should act in a way that assures long-term financial performance while avoiding short-term socially damaging conduct. For CSR, enterprises are therefore expected to contribute to the development of decent work, economic development, infrastructure, education and skills.

This study investigated technological domination and the future of workers in the labour market in the face of automation in the automobile sector in South Africa. Alignment between job automation, evolutionary economics theory, labour process theory, and Corporate Social Responsibility was deemed important. Therefore, this chapter presents the summary of findings on the rate of technological domination in the South African car companies. This chapter also considers the findings on the human-machine interface; human-worker-robot-worker competition; human-worker readiness for the future of work; and trade union's influence on

job automation. The chapter highlights the key findings of the study and also to reiterate the main argument of the thesis. The study made use of in-depth interview and desktop data. Direct excerpt, thematic and content analysis were utilised to interpret the results of the study. The chapter also provides conclusions and recommendations grounded in the theoretical-cum-conceptual framework, which afforded a logical construction for the compilation and analysis of data within the scope of this study. The chapter further addresses the implications of the findings on the existing theory. Data reported and discussed in chapters 7, 8,9,10 and 11 are summarised in this chapter. Each research question was organised as a chapter in this section of research findings.

13.2 Summary of Findings-for Research Question One: What are the Experiences of Workers about the Introduction of Technology in the Workplace?

This section reiterated the findings of research question one of this study, which generates different themes.

13.2.1 Reason Behind Technological Adoption

It was deemed important to know the rationale of technological adoption in car companies. From the management's perspective, the findings revealed that it is a business imperative for the automobile sector in South Africa to be globally competitive and remain in business. Also, it is highly important to move with the technological trend to ascertain faster, quicker, more accurate productivity and to manufacture cars in bigger volume. Improving safety issues for workers is equally a concern for auto management. These are the factors why management embraces these technologies.

It was made known that technology is necessary for the execution of certain complex tasks in the automobile plant. According to management, since body shops are welded to protect peoples' lives should there be an accident, careful planning is extremely required in engineering to put them together, and the process of fitting those body shops is exceptionally complex. This process is physically impossible and risky to be entrusted to only human workers, given that human consistency is not guaranteed. As a result, too many human errors in the auto sector are a risky business.

13.2.2 Worker-Robot Interface

The question aimed to understand how the workers experienced the introduction of technology in terms of collaboration, safety, repetition of work and job satisfaction. With regards to human-machine collaboration, the result indicates that workers are comfortable to co-work with machines considering that it makes things a little bit easier in the workplace by performing repetitive tasks that are ergonomically harmful and unsafe for workers. However, workers noted that they keep their distance with the robots to ensure safety, to avoid an accident and follow the correct manual procedure to operate the technology. On the issue of job satisfaction, some workers indicate that robots reduce the amount of work they are supposed to do because these machines are constantly executing the task with high efficiency without getting tired which threatens the position of the workers in the organisation. Therefore, these workers have mixed feelings about their robot co-worker.

13.3 Summary of Findings-for Research Question Two: How does Workers' Compete with the Rapid Technological Domination in the Workplace?

This section recapped the findings derived from research question two of this study and below are the different themes spawned from the chapter.

13.3.1 Competing with Advanced Technology through Training: Management's View

The aim here was to understand management's view in connection to workers training and job automation. From the employer's view, there is always a massive investment in training whenever a new model of car is introduced and most importantly, to use the automated agents. The skills needed to co-work with the robots are necessary for optimal performance. Furthermore, it was pointed out that the management invests hugely on accredited technical training centres and retrain existing artisans. A good number of apprentices are also offered training, and some workers are sent to Germany to receive technical related training. However, most of the local workers are trained in the training facility within the company to cut the cost of sending the workers overseas to be trained.

13.3.2 Human-Machine Competition: Employee's Perspective

This section focuses on how employees see themselves as competing or will compete with machines in the future in terms of their skills. Findings revealed that workers harmonised reskilling, multi-skilling, and upskilling as the best way to compete in this 4IR. Although, participants were scathing of a battle already lost to technologies as they felt that the employer

prefers robots to workers. Thus upskilling or reskilling does not guarantee their relevance in the company. Another point is that workers would prefer to compete with their fellow humans, considering that technologies have multiple capabilities and can replicate almost human capabilities. It was interesting to note that the only guaranteed way workers believed they could compete with technologies, for now, is to be skilled to repair and maintain the robots when it is faulty.

13.4 Summary of Findings for Research Question Three: What is the Extent of Job Automation in the Automobile Sector in South Africa?

Findings gathered from research question three of this study will be reiterated in this section and below are the various themes generated from the chapter.

13.4.1 Choosing Between Workers and Machines

The section seeked to know if management prefers more technologies than human workers. Management pointed out that it is not that they prefer machines over human, but again, more automation is highly needed for the following reasons:

- to boost the company's economic improvement;
- higher vehicle output turnover with fewer workers;
- flexibility in the car company.

Additionally, it emerged that the motivation behind technological adoption is not to get rid of workers, the issue is that automation is important for business and competition and to apply technology in critical areas that need it most such as accuracy, repeatability and safety.

13.4.2 Increase in the Adoption of Technologies

This section considered if the number of machines is increasing from the employer's perspective. Results show that technological adoption is absolutely on the increase. Management disclosed that some tasks were massively automated in 2003, ranging from a number of activities in warehousing, from logistics to supply chain. At the same time, robots dominated the welding stations in the body shop. Another revelation is that the paint shop was massively automated about 80%, the assembly ward experience 20% automation, while the body shop was 100% automated, and a significant work automation occurred in 2014.

Management further disclosed that "supply for logistics is making a lot more use of machines as well." Another manager resonated with the above revelation and recalled that there was 1 robot when he first joined the company and after seven-years into the job, a new model of car came with 50 to 240 robots and at present, 550 robots are operating in the company. So, robots have dominated the automobile industry since its introduction for the last 3 or 4 models.

13.4.3 Auto Workers Replaced by Technologies?

The purpose of this section was to determine if machines are shedding the number of workers. From the employer's perspective, some activities are being shredded by technology, but at the same time, some activities are created for higher-skilled employees. Findings further revealed that the ability to detect flaws with the eyes, hand, to inspect, check and identify the quality of parts, is the human factor which technologies are lacking. Irrespective of the benefit of robots in the company, people bring many manufacturing advantages as well.

Revelations were also made on some activities meant for humans such as assembling line bolting pieces, tyres and seats which are not easy for robots since these activities happen inside the car. Besides, more robot technology would require a huge investment. Surprisingly, the management indicated that departments such as administration, financial system, financial management, HR Management, IT, and controlling are not adequately automated but the possibility of automating these section are feasible. Although it was noted that massive replacement of employees would not occur soon.

13.4.4 Technology taking over Task: Employer's View

The purpose of this section was to find out whether technologies are dominating tasks in the car company. It was revealed that for the reason that robots work with speed, produce quality and quantity cars within a short time frame and reduce cost. Given these reasons, workplace tasks are dominated by technology. Management also disclosed that for the reason that technologies require people with higher skills to operate the system, only highly skilled workers are found in the car company and are well paid based on their skills. The point is that changes are subjected to the area of work.

13.4.5 The Automatable Task: Management's Opinion

Tasks that might be automated is what this section uncovered. The management gave an example regarding this that there are hundreds of studs inside the body shell of a car, a bolt that the components get bolted into to make the seats or the engine which makes part of the body shop. The accuracy of placing those studs is critical, and humans are not just capable of that accuracy consistently.

13.4.6 Workers Perspective on Technology

After discussing the management's view on the extent of technology in their organisation, this section looks at the issue from the worker's point of view. The questions posed to employers are the same question for employees to avoid a one-sided view. It was revealed that products are produced at a faster rate with the help of these machines which humans will be unable to do. That is why the number of workers are not increasing; however, the number of robots are increasing. Therefore, workers have the same view with the management that the numbers of technologies increase with every new model, but the number of workers remains the same.

13.4.7 Technology or Workers: Worker's View

To get the workers opinion on whether the management prefers more technologies in their workplaces than human workers; the findings in this section revealed that contrary to the response by the employer on their preference, workers believed that management prefers machines than workers. It is because robots are never absent except when they break down, but guaranteed to be fixed in a short time, and machines do not take sick leave.

13.4.8 Technology Automating Workers: Employee's Opinion

This section aimed to uncover if workers are being replaced by robots. The findings revealed that 20 operators were required in a press shop before now. Currently, there are only 4 operators with 5 robots. A whole lot of process and task are being allocated to the robots. Those affected workers are transferred to other departments for the moment.

13.4.9 Automatable Tasks: Worker's View

To understand the task that can be easily automated, this section revealed that press shop and body shop are already automated. But paint shop and assembly line will still require some

human touch because there are specific areas inaccessible to the robot such as fitting the seats which do not have enough space for the robots to fit in. However, workers foresee that those unaffected departments will soon be affected and the current departments absorbing the affected workers will no longer have space for additional workers.

13.5 Summary of Findings-for Research Question Four: How Ready is the Labour Force to Adapt to the Outcome of Technological Domination?

This section summed up the findings that emerged from research question four of this study and below are the different themes developed from the chapter.

13.5.1 Worker's Future Work Readiness: Managements View

This section focuses on the management's view of their workforce readiness to adapt to change that comes with new technology. Findings revealed that management believed that their workers are always ready for the change that comes with new technology and the auto workforce have been adapting to the new way of doing business.

13.5.2 Readiness to Adapt to Future Work: Workers' Opinion

This section sought to examine workers on their readiness for the future of work. Findings indicated that in order to be ready for future work in the 4IR, training is highly necessary. Workers receive training to use new technology. It was revealed that workers are not sufficiently trained in the motor sector. The frequency of the training depends on the type of task they do. Findings also revealed that workers could never be ready in this automation age, but they can accept it with no other choice.

13.5.3 Alternative Jobs for Workers

In this section, the researcher needed to understand if workers have an alternative career for themselves should they get replaced by automation. The findings revealed that workers feared that there is no other job for them, considering the rate of unemployment in South Africa. Another revelation is that some workers would love to start a business, but due to their inability and lack of finance and habit to save, they will be unable to do so. Furthermore, it was revealed that only electricians and technician are certain of their future in the automobile sector. A good number of workers does not have a career alternative, while others are considering farming.

13.6 Summary of Findings for Research Question Five: What is the Influence of Trade Union with Regards to Technological Domination?

This section sums up the findings that emerged from research question five of this study, and below are different themes developed from the chapter.

13.6.1 Decision-Making Participation and Work Restructuring

With the high adoption of technology, this section sought to investigate the union's influence on work restructuring in the automobile industry. Findings show that NUMSA is sometimes consulted when it comes to the decision that transforms the company, but they are not allowed to contribute to the decision. At times, the introduction of new technologies comes as a surprise to NUMSA. It was also revealed that union does not have thorough plans to counter such a massive growth of technology.

13.6.2 Unions' Perspective on the Reduction of Workers

This section focuses on the unions' perspective on the impact of technology in reducing the number of workers in the car assembly. It was uncovered that many workers were retrenched as a result of technology but through facilitation by CCMA, affected workers were reskilled and retrained to remain in the company. Findings also revealed that the number of workers is reducing because years back, there were more than 10,000 employees and there were fewer robots at the time. However, the number of workers is just slightly above 4,000 currently in the company.

13.6.3 Union Influencing Workers' Training

The influence of union on workers' training is the aim of this section. Findings showed that unions facilitate training for workers, especially, computer training. Union emphasised that the car companies does not train workers on how to design and install modern equipment as they choose to retain this knowledge and abilities within management systems only. Management sometimes does provide training in general but is very hesitant in doing so. The union focused on retraining all immediately impacted employees to learn the necessary skills in activities as appropriate.

13.7 Implications for Existing Theory

It is important to evaluate the findings of this study with existing theories. An integrative theoretical approach which collaborates workforce, technology, labour process and economic improvement were related. It is on this basis that evolutionary economics theory, labour process theory, and corporate social responsibility were distinguished as the most suitable theories for this study and these theories strengthened this thesis. Technology evolves from one era to the other, however, each evolution supersedes others. The adoption of workplace technology is important for productivity and global market competition. It is the way in which technology is adopted and employed that deskills workers, degrades labour and create unemployment. The expectation from management is to engage in corporate activities and decisions that are sustainably responsible.

The main themes that arose from the study which are aligned to the theoretical framework were that human-robot teamwork is business and economically imperative. Due to the high speeds required for productivity and competition, the level of mechanisation of work has increased. As a consequence, capital has become relatively more attractive than labour as a production factor. Such drastic economic move has resulted in the deskilling of workers and unemployment. Technology has destroyed many jobs while some jobs are created. Workers are required to upskill on a constant basis. The decision to restructure the workplace with technologies are unilaterally made by the management and therefore neglecting the input of the union and the workers.

The literature and findings of this study based on the five objectives in light of the theoretical framework led to different policy implications. Objective one showcased the importance of understanding the technological-economic evolution and the usefulness of robot technologies when considering human-robot collaboration, higher productivity, worker's workplace safety, global competition, consistent quality products, larger economic benefits and profit maximisation. Objective two suggested that since the process of work deskills workers and degrades labour, workers need to continually update their skills to compete with robots, retain their existing job, and receive a better earning. Aside skilling up, workers also have to train, retrain and get more education to be able to operate in this labour market that is dominated by technology. As research indicates that unnecessary demands on education and skill are a critical error and a potential risk to our economic and social structure. We hurt people, we

unnecessarily raise labour costs, we build disillusionment and frustration and we kill legitimate expectations by setting standards that are not truly necessary for a certain mission. Thus, despite that constant upskilling will be profitable for workers to remain relevant in the labour market and contribute to the economy; this rate of skill specification and upgrade will polarise our society in the long run, and its traces can be seen presently.

Objective three proved that the rate at which technology is evolving and dominating task is alarming. Many people cannot understand complex technology that accompanied this technological evolution and technology is becoming ever more complex. The issue is that technology in this modern labour process seems to be turning towards destroying more jobs than it creates. The workforce fears that economies will be disrupted as never before. CSR posits that corporation, workers and unions can bargain their way to optimal outcomes that meet the need of the workers while respecting the needs of the organisation.

Objective four showed that a safety net with a new concept would be required. A situation that will enable people to adapt to changes in the labour market and this can be achieved through the combination of well-planned training and education. Moreover, without multi-skill learning, adapting to the new economy where innovative technologies exist will be hard for them. Objective five proved that workers and their union lack of involvement in participating in the decision-making regarding workplace restructuring in this manner create consent to be exploited. Consulting employees of the application of innovative changes may empower employees to understand the situation of the workplace CSR practices by taking into consideration the necessity to adopt more technology, other possible changes and the effects these transformations may bring. According to CSR, it is expected of industries to aid in contributing to the occupation, general equality, education, skills, adhere to labour laws and avoid employment rights violation.

Reacting fast at the right time: as the rate of job automation increases, the policymakers need to react along with this speed. Instead of debating what the right policies are, one or more of the policies must be put in place to counteract the speed of job automation and its effect on the workforce. We can consider which type of reskilling, retraining, and educational configuration that best suit rapid technological change. Thereafter, technologies will be implemented to equip the needed set of skills in people. This policy and other applicable regulations will, at the same time, rectify a few of the problems caused by the technological outcome.

In this automation age, technology is dominating the workplace and workers are uncertain about their future in the labour market. For this reason, integrating the views of evolution economics, labour process and corporate social responsibility have been important in explaining technological domination in the workplace. EET, LPT and the perspective of CSR were appropriate for this study and offered groundwork on why all the viewpoints must be combined in the chase for a rounded socio-economic development.

13.7.1 The implication for the South African automotive sector

Looking at the robot-human interface and capital-intensive production in the car companies, modern car production is centralized with machines, assembly lines and car manufacturing equipment. This contrasts with very early methods of car production, which were much more labour-intensive, with classes of people manually combining multiple elements. The impact of the labour-intensive auto sector is that of labour productivity through increased investment in the capital, which plays an important role in determining long-run economic growth. This increase in capital intensity usually requires sufficiently skilled labour and upskilling. Furthermore, capital-intensive production can lead to more units of cars for export, thereby boosting the country's GDP. This is evident in NAAMSA's statistics 2019 release. Nonetheless, this rate of increase in capital intensity can cause some workers to lose their jobs because they are no longer needed, thus leading to structural unemployment.

With regards to the rate of job automation in the motor industry, it is wrong to assume that since technology has not completely taken over all the task in the industry, it is not possible to happen in the future. Unlike the previous machines, recent technologies are capable of perceiving, displaying, understanding on their own with the initiation of deep learning techniques and solving real-world problems to mimic intelligent decision-making skills of the human workforce. This means that a good number of mental activities are embedded in the latest technologies.

Some argue the "manifestation of the process of creative destruction", yes but it does not create as much as it destroys. It is important to note that the new jobs created in the motor sector only works as long as new fields exist where autoworkers are required. Such evidence was hinted by the management; that even the task of the administration department can simply be substituted by machines "not easy, though it can be done." One can argue that the only reason humans would have jobs in car companies is that management or consumers prefer it. Hence,

it is not difficult to believe that we will reach a point where the rate of automation is higher than the task and the number of jobs in the new fields. To take one example, Mercedes Benz South Africa has 2000 workers in the factory and 550 robots and seemingly, this number of workers will likely go down while the rate of the robots will upsurge.

In the context of deskilling, the clear assumption is that every time the muscle or brain ability of the autoworkers has been tested by the computer, the machine has succeeded, and thus this trend must naturally persist until the physical and mental capacities of the autoworker are completely out of date. Any muscle of the worker's body had already lost its competitive advantage over the computers. Some parts of the human brain have lost their competitive advantage. This is an obvious tendency in the motor industry and our society. Thus, additional brain function in the form of newly created task or job will be competitively challenged by machines and auto workers will lose to the machines. The point is that all these negative economic, social and individual consequences do not bode well for the motor sector in South Africa.

13.7.2 The implication for the South African government, society and state

Arguably one of the most obvious impacts of job automation in South Africa is economic—unemployed people have less money to spend, then businesses will not profit as much, which can, in turn, lead to more unemployment. The most recent typical example can be seen in the SA's Domestic Vehicle Sales Statistics released in early December 2019 by NAAMSA which confirmed that aggregate domestic new vehicle sales, at 44 738 units, reflected a decline of 2 740 units or 5,8% from the 47 478 vehicles sold in November 2018. But the exports are on the rise. Indication further shows that more South African consumers are buying used vehicles than new vehicles and overall, people are spending less on cars be it new or used. This could mean that domestic customers have less money to purchase cars.

Besides the economic impact, social consequences will be huge. People displaced from the auto world of work and the labour market, in general, may, for instance, suffer from depression and other mental issues when they struggle to provide for themselves and their families. Especially if an individual truly needs to keep the current job or wants a job but unable to find employment. It is a point to note that more people without job security will likely add to the statistics released by the South African Depression and Anxiety Group that as of August 2019, 1 in 6 South Africans suffer from anxiety and depression.

Another social issue is crime. Research has documented that when the unemployment rate increases, crime rates tend to rise. It is worth stressing that the negative effects of this "structural possible unemployment" far outweigh the positive effects when it comes to its impact on SA's economy, society and the individuals as well.

13.8 Recommendations

It was revealed in this study that during this current technological revolution, a number of jobs might be destroyed. Also, considering the unilateral decision making by management in the automobile sector in South Africa, this study makes the following recommendations:

- There should be an investment in entrepreneurship skills compatible with this Fourth Industrial Revolution and smartly supported by the government.
- Auto management, NUMSA, the government should smartly invest in the reskilling, upskilling, training and retraining of the auto workforce to possess appropriate competencies required for the industry 4.0.
- Automobile workers have to treat their career as a business and invest in their training, education, reskilling and upskilling to remain relevant in the industry. These skills and training should be under the umbrella of unautomable technical and non-technical job families.
- Accredited professional qualifications should be incorporated with academic qualifications that align with the projected scarce skills in general.
- The cost of academic qualification and professional qualification should be made affordable for all, and special provision or discount should be offered to those who are ready to learn but are unable to afford the cost of their preferred qualification.
- There should be interventions that aim to prepare workers to adapt smoothly to the society and economy, should there be massive technological unemployment.
- The government has to intervene to determine the appropriate sustainable rate of workplace automation in the motor sector.
- There is a need for the government to intervene on the impasse regarding the "unilateral workplace transformation decision making" between autoworkers, NUMSA and management.

- Transparency and accountability is a must on the part of all the stakeholders involved in the automobile industry, particularly from management to make a more sustainable economic decision that will benefit the development of workers.

13.9 Suggestion for Further Studies

Future opportunities for research could address excessive educational and skill requirement as a conceivable threat to our social and economic system in all sectors or localities. Further studies will be necessary to ascertain why the unilateral power of decision making dominates Multinational Corporations operating in foreign countries and ways to bridge such conundrum.

13.10 Conclusion

This study examined the level of technological domination in the auto industry and the future of workers in the motor sector. Data was gathered through in-depth interviews and empirical literature. The study drew motivation from the labour process, evolution theory and CSR. The study argued from evolution economic views that there are many reasons and benefits of adopting technologies in the workplace. The automobile workplace is always evolving with technology and constant skill upgrade due to consumer's demand and preferences. And while some tasks are destroyed, very few are created. However, the rate at which technology is adopted and utilised to execute diverse task has devalued the skills of workers and makes the importance of labour meaningless. While organisations are ready to restructure the process of labour to exploit the full potential of the Fourth Industrial Revolution, workers are deskilled in the process and are not prepared for the negative outcome.

From this standpoint coupled with the study's data, this study also argues that the automobile sector in South Africa has "de-skilling tendencies" "skill substitution tendencies" "skill polarization tendencies" and "skill upgrading tendencies." Among these tendencies, the de-skilling, skill polarization and degradation tendencies are of the highest since the upskilling gathered within or outside the industry does not guarantee continued employment and those retained get a higher wage and possible promotion. While the reserve army of workers (floating, latent, and stagnant [Braverman]) remain employed with the uncertainty of not maintaining their job. Despite this job uncertainty, these workers keep on upskilling with the hope to remain relevant.

Relating to job automation and future of employees' aspect of CSR is that organisations are expected to assist in tackling concerns such as employment rights violation. Braverman also recognized that work is an intrinsic capacity of human beings who realise themselves through its action. It can be argued that the production of humanity is, bilaterally, the formation of humanity that is an educational process, so the origin of education, skills and work coincides with the origin of humanity itself.

The findings of this study do not imply that spontaneous entrepreneurial activities of trying novel possibilities of manufacturing are not necessary. Rather, they highlight that, since the evolutionary creative destruction fully recognizes gainers in this economic activity and ignores losers whose skills are de-skilled in the process, a sustainable, responsible corporate social good while making a profit, will be the best approach in automobile workplace restructuring. The findings call for sustainable corporate responsible auto management.

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APPENDIX A: Interview Guide for Management

University of Fort Hare
Together in Excellence

DEPARTMENT OF SOCIOLOGY
FACULTY OF SOCIAL SCIENCE AND HUMANITIES
Ethics Research Confidentiality and Informed Consent Form for management

My name is Bianca Chigbu, a student at the University of Fort Hare. This study is being undertaken as a Doctor of Philosophy project investigating technological domination and the future of workers in the labour market in the face of automation, utilizing the automobile sector in South Africa as a study site. This study will utilize in-depth interviews as data-gathering instruments. This interview will be audio-taped. The audio recordings will be maintained by the researcher for reference and analysis. These records will be kept confidential. It is expected that the knowledge gained from this study will be used to determine the rate of technological domination and the future of workers in the labour market in this automation age. The interview will be approximately 20 minutes in duration.

The findings of this study will be published. Please understand that you are not being forced to take part in this study and the choice of whether to participate or not are yours alone. However, I would really appreciate it if you do share your thoughts with me. If you do agree to participate, you can withdraw from this study at any time. Kindly answer as truthfully as possible in order to contribute meaningfully to the scientific study. Confidentiality in every aspect of this study will be observed professionally.

INFORMED CONSENT
I hereby agree to participate in research regarding technological domination and the future of workers in the labour market in the face of automation. I understand that I am participating freely and without being forced in any way to do so. I also understand that I can stop this interview at any point should I not want to continue and that this decision will not in any way affect me negatively.
I understand that this is a research project whose purpose is not necessarily to benefit me personally.
I understand that my answers will remain confidential.
I understand that if at all possible, feedback will be given to my organization on the results of the completed research.
I hereby agree to the tape recording of my participation in the study

……..
Signature of participant Date:……..

1. Kindly explain the main reason why your organization adopt sophisticated technologies.

2. Are there other tasks presently that require the assistance of additional robots?
3. Do employees receive any training pertaining to the adoption of advanced technology? If yes, what type of training and why is it important?
4. Would you say that management prefers more technologies than human workers? What is the reason for your answer?
5. Would you say that machines are replacing the number of current workers in your workplace? Kindly explain your answer.
6. Has there been an increase in the number of technologies in your workplace? If yes, please mention the type of machines and what their functions are.
7. From your perspective, would you say that these technologies are dominating jobs? Why?
8. What department or task do you think that machines can easily replace workers in your workplace? Any recent experience?
9. What are the policies or decisions in place for those workers that would be affected by the introduction of electrical cars?
10. Technologies bring great efficiencies and some negative impacts on jobs; can you say workers are ready to adjust to this change? Please explain
11. Would you say that the trade unions are consulted before the introduction of robots and possible layoffs resulting from such decision? If yes, how is it done?

THANK YOU FOR YOUR COOPERATION AND PARTICIPATION!

APPENDIX B: Interview Guide for Employees

University of Fort Hare
Together in Excellence

DEPARTMENT OF SOCIOLOGY
FACULTY OF SOCIAL SCIENCE AND HUMANITIES
Ethics Research Confidentiality and Informed Consent Form for employees

My name is Bianca Chigbu, a student at the University of Fort Hare. This study is being undertaken as a Doctor of Philosophy project investigating technological domination and the future of workers in the labour market in the face of automation, utilizing the automobile sector in South Africa as a study site. This study will utilize in-depth interviews as data-gathering instruments. This interview will be audio-taped. The audio recordings will be maintained by the researcher for reference and analysis. These records will be kept confidential. It is expected that the knowledge gained from this study will be used to determine the rate of technological domination and the future of workers in the labour market in this automation age. The interview will be approximately 20 minutes in duration.

The findings of this study will be published. Please understand that you are not being forced to take part in this study and the choice of whether to participate or not are yours alone. However, I would really appreciate it if you do share your thoughts with me. If you do agree to participate, you can withdraw from this study at any time. Kindly answer as truthfully as possible in order to contribute meaningfully to the scientific study. Confidentiality in every aspect of this study will be observed professionally.

INFORMED CONSENT

I hereby agree to participate in research regarding technological domination and the future of workers in the labour market in the face of automation. I understand that I am participating freely and without being forced in any way to do so. I also understand that I can stop this interview at any point should I not want to continue and that this decision will not in any way affect me negatively.
I understand that this is a research project whose purpose is not necessarily to benefit me personally.
I understand that my answers will remain confidential.
I understand that if at all possible, feedback will be given to my organization on the results of the completed research.
I hereby agree to the tape recording of my participation in the study

……..
Signature of participant Date:……..

1. What are the experiences (in terms of collaboration, safety, repetition, job satisfaction) you have had and currently experiencing with technology in the workplace?
2. Have you noticed any process or task that was being done incorrectly by the machines? How often?
3. Are there other tasks presently that require the assistance of additional robots?
4. Would you say your duties have increased or decreased since some machines were brought in the workplace?
5. In what ways are you competing or going to compete with robots to make sure that machines do not replace your skills?
6. Has there been an increase in the number of technologies in your workplace? If yes, please mention the type of machines and what their functions are.
7. Would you say that management prefers more technologies in your workplace than human workers? Why do you say so?
8. Would you say machines perform more tasks than you? If so, why?
9. Would you say that technologies are now replacing the number of workers and why?
10. What type of tasks or department do you think that machines can easily replace workers in your workplace?
11. Have your plant employees received any training pertaining to the adoption of advanced technology? If yes, how long?
12. Are you ready to adjust to this change? Please explain.
13. Are there other job alternatives for you if automation replaces your skills?

THANK YOU FOR YOUR COOPERATION AND PARTICIPATION!

APPENDIX C: Interview Guide for the Union

University of Fort Hare
Together in Excellence

DEPARTMENT OF SOCIOLOGY
FACULTY OF SOCIAL SCIENCE AND HUMANITIES
Ethics Research Confidentiality and Informed Consent Form for the trade union

My name is Bianca Chigbu, a student at the University of Fort Hare. This study is being undertaken as a Doctor of Philosophy project investigating technological domination and the future of workers in the labour market in the face of automation, utilizing the automobile sector in South Africa as a study site. This study will utilize in-depth interviews as data-gathering instruments. This interview will be audio-taped. The audio recordings will be maintained by the researcher for reference and analysis. These records will be kept confidential. It is expected that the knowledge gained from this study will be used to determine the rate of technological domination and the future of workers in the labour market in this automation age. The interview will be approximately 20 minutes in duration.

The findings of this study will be published. Please understand that you are not being forced to take part in this study and the choice of whether to participate or not are yours alone. However, I would really appreciate it if you do share your thoughts with me. If you do agree to participate, you can withdraw from this study at any time. Kindly answer as truthfully as possible in order to contribute meaningfully to the scientific study. Confidentiality in every aspect of this study will be observed professionally.

INFORMED CONSENT
I hereby agree to participate in research regarding technological domination and the future of workers in the labour market in the face of automation. I understand that I am participating freely and without being forced in any way to do so. I also understand that I can stop this interview at any point should I not want to continue and that this decision will not in any way affect me negatively.
I understand that this is a research project whose purpose is not necessarily to benefit me personally.
I understand that my answers will remain confidential.
I understand that if at all possible, feedback will be given to my organization on the results of the completed research.
I hereby agree to the tape recording of my participation in the study

……..
Signature of participant Date:…….

1. Do plant employees receive any training pertaining to the adoption of advanced technology? If yes, do union facilitate these training?
2. Would you say that the union are always consulted prior to the introduction of new technologies in this organization? If not, why not?
3. Would you say that the union engage in negotiating to ascertain that no dismissal will result from the introduction of new robots?
4. From your perspective, would you say that your union is losing influence in protecting autoworkers in the company?
5. When it comes to handling issues related to the numbers of workplace robots, do workers trust the union?
6. Which department in the company is mostly dominated by robots? What happened to the workers affected?
7. Are there policies that can help affected workers to upskill and so on? Kindly explains your response.
8. Has there been any social/union movement to curb the rate of the adoption of robots and their effect on workers?
9. What would you say about the issue of electric cars being reacted to just recently?

THANK YOU FOR YOUR COOPERATION AND PARTICIPATION!

University of Fort Hare
Together in Excellence

ETHICAL CLEARANCE CERTIFICATE
REC-270710-028-RA Level 01

Certificate Reference Number:	NEK071SCHI01
Project title:	**Technological domination and the future of workers in the labour market in the face of automation: A study of the automobile sector in South Africa.**
Nature of Project:	PhD in Sociology
Principal Researcher:	Bianca Ifeoma Chigbu
Supervisor:	Prof F Nekhwevha
Co-supervisor:	N/A

On behalf of the University of Fort Hare's Research Ethics Committee (UREC) I hereby give ethical approval in respect of the undertakings contained in the above-mentioned project and research instrument(s). Should any other instruments be used, these require separate authorization. The Researcher may therefore commence with the research as from the date of this certificate, using the reference number indicated above.

Please note that the UREC must be informed immediately of

- Any material change in the conditions or undertakings mentioned in the document
- Any material breaches of ethical undertakings or events that impact upon the ethical conduct of the research

The Principal Researcher must report to the UREC in the prescribed format, where applicable, annually, and at the end of the project, in respect of ethical compliance.

Special conditions: Research that includes children as per the official regulations of the act must take the following into account:

Note: The UREC is aware of the provisions of s71 of the National Health Act 61 of 2003 and that matters pertaining to obtaining the Minister's consent are under discussion and remain unresolved. Nonetheless, as was decided at a meeting between the National Health Research Ethics Committee and stakeholders on 6 June 2013, university ethics committees may continue to grant ethical clearance for research involving children without the Minister's consent, provided that the prescripts of the previous rules have been met. This certificate is granted in terms of this agreement.

The UREC retains the right to

- Withdraw or amend this Ethical Clearance Certificate if
  - Any unethical principal or practices are revealed or suspected
  - Relevant information has been withheld or misrepresented
  - Regulatory changes of whatsoever nature so require
  - The conditions contained in the Certificate have not been adhered to

- Request access to any information or data at any time during the course or after completion of the project.

- In addition to the need to comply with the highest level of ethical conduct principle investigators must report back annually as an evaluation and monitoring mechanism on the progress being made by the research. Such a report must be sent to the Dean of Research's office

The Ethics Committee wished you well in your research.

Yours sincerely

Professor Wilson Akpan
Acting Dean of Research

08 November 2016