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The extent of job automation in the automobile sector in South Africa

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Abstract

This study argues that the automobile sector's body shop is fully automated, the paint shop is 80% automated, there is about 20% technology utilization in the car assembly line, and the supply for logistics is making a lot more use of machines as well. These percentages are an indicator of how workers have lost the contest with technology in the industry. Many workers are being deskilled and the remaining workers are being reshuffled to assembly lines likely to be automated with time. There should be interventions to ready the workers to adapt to society and the economy, or there will be massive unemployment.

Keywords

Automobile sector, fourth industrial revolution, job automation, South Africa, unemployment

Introduction

The auto industry in South Africa (SA) is changing very fast, bringing in hybrid production systems and the automation of factories (National Association of Automobile Manufacturers of South Africa [NAAMSA], 2019). The desire to catch up with the rest of the globe, to compensate for lost time, has led to an effort to boost worldwide inclusion since the collapse of apartheid in South African. All of these factors have influenced the path taken by industrialization methods and the connections between state and multinational business (Barnes et al., 2018). During the 2019 NAAMSA Automotive Conference, it was argued 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. They were looking far into the future of the automobile, they said, and the best way to work on current and future developments would be to prepare for the new opportunities that

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are arising from new technologies and market demands (NAAMSA, 2019). NAAMSA recorded a dramatic annual increase in total domestic vehicle production. This development impacted the Gross Domestic Product (GDP) level from 0.8% in 2018 to 1.2% in 2019 and is projected to increase to 1.8% in 2020. But as the production of cars increases, the workforce does not, however, experience the same positive growth in the car industry.

The total employment in automobile manufacturing as of 31 March 2016 was 31,258, showing a decrease of 174 workers from the 31,432 at the end of the fourth quarter of 2015. As of 30 June 2017, there were 30,356 auto manufacturing jobs overall compared to 30,197 at the end of March 2017, reflecting a growth of 159. As of 31 December 2018, there were 29,484 jobs, which was 781 or 2.6% lower than the 30,265 jobs recorded at the end of September 2018. As of 31 March 2019, jobs numbered 30,030, reflecting a marginal decline of 2 from the 30,032 since the end of December 2018. As of 30 June 2019, the overall number of autoworkers was 30,118, reflecting an increase in 86 employees over the 30,032 (NAAMSA, 2019) at the end of March 2019. These statistics indicate that between 2016 to 2019 the number of workers dropped by 1314. The NAAMSA report indicates that employment in this industry has stagnated while the number of car units produced is on the increase. SA's car industry can certainly count on a more efficient production system, more optimal innovations and better integration into world markets today but the development of the sector has not come without cost, and that is the lack of important job creation (Barnes et al., 2018).

In the production sector, 87% of job losses were as a result of the growing efficiency of factories through automation and enhanced technology while the remaining percentage was trade-related. All in all, from 2000 to 2010, the number of workers required to make a car in the automobile industry reduced year on year (Hicks and Devaraj, 2015). However, manufacturing production growth has been mixed across sectors, as history suggests. We have seen rapid, positive rates of societal and workforce change. Data, however, indicate that the employment market is not steadily growing along with this change; rather, the overall employment rate has been declining in South Africa. Investments by automakers on machines rose from 15% in the 1980s to 55% by the year 2010 (Vulavala and Ulmer, 2014: 27); 90% of these robots are employed in the assembly lines and half of the machines assist in making automobiles. The complex human skills being acquired to work alongside these different technologies can nevertheless in turn be easily mechanized (Ford, 2015). It is evident that the automotive industry is rapidly automating and the rate of job loss is increasing (Hicks and Devaraj, 2015).

Gross automobile sales in the vehicle business sector in South Africa rose to $38.1 billion in 2018 compared to $37.57 billion in 2017. Exports of automobile goods contributed $13.52 billion in 2018, or 14.3%, of gross South African exports. As the country's largest manufacturing sector, automotive and parts growth accounted for 29.9% of South Africa's manufacturing output in 2018. Also, the investments of the seven main original equipment manufacturers (OEMs) in the country amounted to another significant $545 million in 2018, along with an expenditure of $265 million in the automotive components sector (Export.gov, 2019). Evidence indicates that both globalization and labour-saving manufacturing technological progress have been behind these economic improvements (Rodrik,

2016: 1–2). The automotive industry has adopted production and leadership methods that have changed the manufacturing environment through the use of state-of-the-art technologies (Ambe and Badenhorst-Wess, 2013: 1).

The South African automotive industry has experienced an incredible transition, but new production models and job security have to be balanced (Masondo, 2010: 103). Most of autoworkers are unionized under the National Union of Metalworkers of South Africa (NUMSA), which is the largest trade union in the South African automotive industry. According to NUMSA, it is necessary to take into account that this transition is creating more and more unstable plant workers' jobs (NUMSA, 2016), redundancies and severance compensation plans for some employees (Hlatshwayo, 2017), as technology efficiently performs tasks previously done by those workers (NUMSA, 2016). Given the shocking unemployment rate in the country, there is a near-zero chance for discharged workers to find another job (NUMSA, 2016). As the chief executive officers (CEOs) of automotive companies unilaterally acquire and install technology in the assembly plants, neither employees nor their unions have the power to change this technical revolution in the South African automotive market (Mashilo, 2010; Masondo, 2010).

The point remains that South African industrial jobs have been steadily declining since 1989–1990 and based on the pattern depicted by this past performance, employment growth in the manufacturing sector will persist in its decline or may only sluggishly increase (Naudé et al., 2015: 259). Even if there is employment growth, it will only go up by 1% per year. It is estimated that by 2030, employment in this sector will have declined further (Naudé et al., 2015). Apart from a slight increase in 2006–8, employment growth in the manufacturing sector in South Africa has declined steadily year on year since 1995 (Black et al., 2017; Masondo, 2018), despite an increase in manufacturing output, and the sector has seen further significant declines since 2008, dropping to 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 industrialization (Lorentzen and Barnes, 2004: 493; Naudé et al., 2015: 258), advancing at an extraordinary and exponential rate (Black et al., 2016: 13; Deloitte, 2018: 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 fall short in this regard, then the economy will rely on labour-saving machines which tend to be available at low cost and are highly labour efficient in quality (National Economic Development and Labour Council [NEDLAC], 2019: 39). This is possible as the motor companies demand constant innovation and creativity (Department of Trade and Industry, 2018: 5), which will impact on how work is done; meaning that the current technologies are ever smarter than those that went before, and are constantly being adopted in the workplace (Deloitte, 2018: 2).

South African's duties on export and import are much higher in comparison with other countries such as their BRIC (Brazil, Russia, India, China) counterparts. 'This leads to high prices of new vehicles in South Africa and makes South African automotive manufacturers globally uncompetitive' (Ambe and Badenhorst-Wess, 2013: 6) and it takes time to resolve labour disputes. When it comes to South African labour costs and wages, as indicated by

Naudé et al. (2015: 257), the cost of labour in the country's manufacturing sector is significantly higher than those comparable sectors in Lithuania, Malaysia and Poland, for example. South African manufacturing workers earn almost 50% higher than in most countries. Comparing firm-level automotive technological capabilities between Brazil, India and South Africa, Rasiah (2011: 203) found that despite Brazil and South Africa enjoying stronger exposure to external markets, their automobile sectors had slightly lower technological capabilities than those in India; but firms in Brazil and South Africa enjoy higher integration in global trade markets than firms in India. Nevertheless, foreign ownership of car companies in South Africa was positively correlated with the potential for strong technological spillovers from foreign to local firms (Rasiah, 2011). Meanwhile, foreign transplants from Asia never made significant inroads in the European car markets and despite the growing rate of robotic adoption in Germany, automobile employment levels remain stable (Cody, 2015) without causing human redundancies and job loss.

However, in South Africa, NAAMSA's 2020 employment statistics show that aggregate auto industry employment as of 31 March 2020 totalled 29,996, reflecting a decline of 670 jobs compared to the 30,666 industry headcount as at the end of December 2019 and has consistently declined yearly before now as the level of job automation increases each decade in South Africa. It is not within the scope of this article to make a distinction between automation in the South African auto industry going back decades and that of recent years. Nonetheless, as revealed by MacDuffie and Pil (1997), automation of car plants has increased in all departments since 1989. Between 1989 and 1994, the total number of robots used per car increased by some 60%, from 2.3 in 1989 to 3.7 in 1994. Robotics dominates in body, welding and paint shops where robots can conduct the same task as many times as possible with greater precision than human input in the car industry (Cody, 2015: 9–10).

Considering the increase of technology in the automobile sector, its preference over human workers, and its domination of tasks previously performed by autoworkers, the specific research objective of this study, therefore, was to investigate the rate of technological implementation in the motor industry in South Africa. The study makes some empirical contributions. First, it discusses the areas where auto management prefers to automate particular tasks in the motor sector. Second, we report on the degree of robot application and the level at which human tasks are dominated by robots in the industry. Also, this article discusses how South Africa's automobile labour process might have thwarted job creation and accelerated job insecurity. This study should be of interest to industrial employment policymakers, automobile management, autoworkers, as well as to their unions.

Conceptual-cum-theoretical framework: A literature review

While labour process theory (LPT) is the core theoretical framework of this study, corporate social responsibility theory (CSR) is pushed to the background of this study; nonetheless, both theories are pertinent to the study's analysis. Braverman's (1974) LPT posits that technology is used by companies to control work procedures and the process of assembling products hence weakening the rights of workers and taking over their jobs. The recent contributors to the labour process literature concur with Braverman that the main focus for management is on job reorganization and profitability through the mechanization of the

workplace to stay ahead of the competition (Vidal, 2007) – a process which has resulted in the deskilling of many workers and the loss of their jobs (Adler, 1990; Milkman, 1997; Thompson, 1983, 2010).

Automation and deskilling of workers

The organization 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 a need for less skilled jobs and the loss of manufacturing expertise (Thompson, 1983: 2–3). The ability of the new robotic 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: 4). In the capitalist labour process there is no imperative to deskill, but the desire to cheapen the costs of labour will in specific conditions result in deskilling, while in others it may be necessary to move into new divisions of production with more skilled labour power (Thompson, 2010: 10). Thus, workers expend more on upgrading their skills, in line with the evolving labour power caused by the technology, in an effort to protect their livelihoods (Milkman, 1997), but this skill upgrade may serve for nothing or vaporizes (Thompson, 2010: 11).

The reason is that the emergence of unique new skills in each era was and will be subject to management control and undermined as the investment demands the biggest profit. Hence, management will continuously routinize and make work uninteresting by transforming workplace tasks with technology. Thus, as the constant revolutionization of production continues to give rise to new skills, it shortly becomes susceptible to that same process that deskills workers (Braverman, 1998: 176). So under capitalism, there is a natural tendency to degrade work. This is a new form of work-related instability which has emerged, with employees being informed that they no longer have a position 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 (Thompson, 2010).

Labour process of unemployment

For Adler (1990: 785) any worker faces unemployment, be it in the seasonal wide-scale unemployment arising from the recurrent economic crises of capitalism or 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. For instance, most factory workers such as autoworkers have been driven into long-term unemployment or fragile underpaid occupations and have experienced a drastic deterioration in their living conditions (Milkman, 1997: 11). Such workers are dismissed as redundant entities by their managers and face a grim future of economic poverty and societal loss of dignity (Braverman, 1974; Komlos, 2016; Milkman, 1997; Porter and Kramer, 2006).

The argument is that the employment 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 (Milkman, 1997). This economic move has contributed to generate instability and eventually made less powerful groups weaker, undermining whatever

mechanisms of self-protection millions of workers had already established (Milkman, 1997). This is a brazen assault on labour organizations and sadly, industrial jobs may not be around much longer (Milkman, 1997).

For example, Canis (2019) detailed that the global demand for automotive electrification is expanding and 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. The transition to electric cars and away from combustion engines is likely to have significant implications for the automotive assembly and production sectors, with the potential to eliminate a large number of assembly line workers, automobile employment, and parts manufacturers in general. As proof of this, conventional motors have up to 2000 parts in their powertrains, while electrical motors can have up to 20 components. The electric powertrain has only a handful instead of the 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 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 and Barnes, 2004: 493) – meaning that the sector is restructuring to trim down and become extra competitive (Black and Hasson, 2012: 6). This restructuring trend has resulted in the workers' loss of tasks across the entire plant, and frustration and job uncertainty dominate the minds and lives of the autoworkers (Barchiesi, 2000). The tendency toward the degradation of labour and mechanization of jobs not only still prevails but is also expanding and deepening, supported by policies of flexibilization and deregulation of labour (Previtali and Fagiani, 2015: 77).

To supplement the labour process theory, corporate social responsibility (CSR) was employed in this study. The manufacturing sector has become more destructive than ever before given the kind of innovations in the pipeline that create more losers through job loss, employment uncertainty, deskilling and inequality. CSR argues that 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 and Siu, 2012), job destruction (Brynjolfsson and McAfee, 2011), higher automatable occupations (Frey and Osborne, 2013), labour market polarization (World Bank, 2016) and deskilling (Braverman, 1974). It will be irrational if the capabilities of machines surpass most capabilities of the workers (Pratt, 2015). Today's corporate world according to Freeman and Elms (2018) should bring 'continuous creation', not the outdated story of 'creative destruction'. Organizations that cross the needs of one stakeholder with the interests of another quickly find that there is no hiding place in today's world (Freeman and Elms, 2018). As a consequence, companies must engage in stakeholder-oriented CSR.

In South Africa, the private sector has been forced to implement socioeconomically responsible strategies (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 socioeconomic opportunities such as employment.

Democratic by nature, which means that decisions are taken by agreement between members, trade unions in South Africa are also a powerful driving force of CSR; they are sensitive to the broader societal issues affecting their members (Harvey et al., 2017). They have the legal authority to hold the company to account in deliberative processes (Harvey et al., 2017: 43) and are easily able to demand and monitor compliance by the firm and also to enforce it where necessary as 'warriors of social justice'.

Still, trade unions have indicated that the automobile sector in South Africa lacks CSR with regard to workers' future when it comes to workplace automation and work transformation, and plans are single-handedly made by the management and imposed on the workers and their unions (Mashilo, 2010), which reduces the workers' bargaining power (Butollo et al., 2019). For Webster et al. (2019: 14–16) workers and trade unions in SA's car plants do not oppose the restructuring of the workplace per se, however the position of trade unions such as NUMSA is that the restructuring of the automotive labour process must be equally beneficial to all the stakeholders involved in the organization (NUMSA, 1993). Despite this outcry, job automation, job loss and deskilling persist in the auto sector and for this reason, the union still maintains its stance that management must adopt the best possible technology, but only on the basis of maximizing benefits for all those involved in the company, which includes the plant autoworkers (NUMSA, 2019). Thus, while LPT reiterated the negative aspects of task automation and subsequent job loss, CSR is about finding 'better ways of doing things', both now and in the future and that benefit both the management and their employees.

Methodology

The study focuses on the automobile sector in South Africa and was conducted to understand the level of job automation in automobile companies. A qualitative method was used to analyse a varied array of responses related to task automation among a wide range of auto plant workers in the face of automation. The idea of adopting qualitative in-depth interviews was to allow autoworkers and the management to express their experiences, interpret the negative or positive effects of technology and their views on the future of work with technology. From a socioeconomic perspective, the speed of job automation in South Africa's auto sector is an area of research worth examining because it is important to the labour market, the economy and policymakers and 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.

With a purposive-snowball sampling procedure, a total of 30 participants (27 males and 3 females) from three car companies were interviewed between 2017 and 2019: two managers and five auto plant employees from company A; two union representatives from company B; two union representatives and 19 employees from company C. These respondents were interviewed because of their accessibility, their first-hand experience with robotics and the technological expansion occurring in their organizations, and were in the best position to answer any question concerning the study at hand. The production managers were approached and requested to be interviewed and the managers were requested to allow some of their workers to take part in the interviews. In addition, union representatives were identified and approached to be interviewed and they were also asked to identify

workers/members suitable and available to be interviewed. Twenty-eight in-depth interviews were conducted face-to-face while two were done by telephone. The study used thematic and content analyses to construct arguments from the data. Quoting the respondents verbatim allowed the researchers to examine what was said word by word, and the hidden meanings implied in the quotes from the managers, autoworkers and the union, and also to consider the emotional state of the interviewees. The study first looked at the management's perspective on technological task domination, followed by the workers' view.

Results

Management's perspective on technological domination: preference between workers and machines

This section of the study sought to understand if management has a preference for more technologies in the plant than human workers. One can argue that technology is faster, more stable, accurate and reliable and does not require salaries or leave as workers do. Therefore, management might prefer to have more machines than employees. The management representatives agreed that they do not necessarily prefer machines over workers; however, the machines are required as some jobs cannot be done with human effort alone. Hence, it is not about preference but about productivity, quality and making profits. The following interview excerpts from the management representatives from the companies studied show their views on this point:

> I do not think we prefer machines over humans, but certainly, we prefer more automation for [a] number [of] 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 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[s] not just in the manufacturing world, but also in the other sectors in the world who also use more robot technology than other artificial intelligent technology. (Interviewee 2, Male, Production Manager)

It was made clear that management does not necessarily prefer machines over human workers, but in this competitive world, they need to purposively think about production, quality and improving workplace economics. The other manager expressed a similar view on the issue of preference 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 [in] 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 7, Male, Production Manager)

The comments show 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 was given by one of the participants is that one cannot expect workers to lift a car

while another is working underneath it, but a machine can do that without endangering the workers. It has been shown that machines are needed as well as the workers, but looking at the type of industry under study, they make use of more machines than human workers.

Technology or human workers: employees' perspective

The workers believe that management prefers machines to workers. But some participants also pointed out that as much as the employers prefer machines over them, management still needs workers for certain jobs such as human resources management and maintenance. The following are some of the interview quotations which represent the view of all workers:

> Yes, they do, forgetting that even though the robots are efficient, if there is a breakdown, 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 technology to be delivered from outside countries or repaired. (Interviewee 4, Male, Autoworker)

> 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 complaints, the payslip is always the same but people get tired, but with robot and technology, it moves fast. Also, technology cut[s] cost and avoids the labour issue of the workers and their unions. Hence, they are more reliable, so I get why they prefer technology. (Interviewee 5, Male, Autoworker)

> 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 help compete ahead of other car companies. One could see it in their faces and tone that the employer[s] wish they have more of robots. (Interviewee 16, Male, Autoworker)

From the accounts above, workers agreed that management prefers robots to workers, because robots produce more in a limited time and work consistently. However, an important factor to note is that robots sometimes malfunction or break down, which takes time to fix. The main argument is that the employer has more to gain with robots than with workers. Robots do not go on sick leave or vacation, which saves a lot of money. Organizations also save a lot of money as robots do not need wages. Thus, if given the chance, they would replace workers with machines as they perform more tasks efficiently and do not need negotiations to boost productivity. 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.

An increase in the number of technologies in the workplace: management's view

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 produces the best quality cars on the market. One management representative 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, [the] 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 very dominant machines, the moving line machine, which moves the cars along, and up and down. (Interviewee 2, Male, Production Manager)

The above participant has indicated an increase in technology since 2003. In some of the car assembly lines, work areas such as the paint shop make use of robotics in over 80% of their work, which clearly shows that the use of technology is dominating tasks in the car industry. Results in this section confirm that car companies feel they work better with these technologies, to meet new opportunities, and new market demands and have a role to play in ensuring support for technological innovation. The next section presents the view of workers on this issue, where they have a similar response to their employers.

Technology increase at the workplace: workers' view

Workers revealed that there used to be more workers in the auto industry but there are now more robots doing work that used to be done by humans, which has also made work faster. The following excerpts represent the views of the employees interviewed:

> 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 5, Male, Autoworker)

> 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 lasts for 2 minutes because of the robots working 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 13, Male, Autoworker)

> 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 11, Male, Autoworker)

From the above quotations, it is indicated that most of the work has been automated, which makes manufacturing easier, faster, and more units of cars are produced daily. Another revelation in this study is that while work moves at a faster pace 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 vehicle model is introduced and some noted that new technologies are being introduced year on year. Therefore, management is always looking for a way to maximize profit and accelerate work; hence, there are more robots each year in the company. This signifies unequal development whereby employment in this industry is stagnant while the unit of cars produced is on the increase.

Notwithstanding that these robots have eased the process of labour, one can argue that 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. Arguably, the state, corporations, unions (in this case NUMSA), workers, consumers (with insatiable demands and tastes) and society in general all have a role to play individually and collectively to effect real change for all parties to reduce the extent to which machines are replacing workers in the automotive workplace.

Machines substituting workers in the automobile world

Management was asked if machines are replacing the number of current workers in their workforce, and the following was stated:

> Robots are replacing workers in some shops, and they are also recreating other jobs and tasks for artisans and workers with much higher skills. (Interviewee 7, Male, Production Manager)

One can argue that to some extent they are replacing particular workers, especially if workers are found lacking in terms of skills. Economic growth in the automobile industry at present and the pace at which it operates requires that fewer jobs are created for human workers. On the other hand, one manager pointed out that:

> We recognize those jobs where the human factor is critical, and you can't 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 2, Male, Production Manager)

The participant went on to explain at length 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 technologists 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. We are 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 employees. However, other areas 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.

As revealed above, the motor industry uses more technology than workers. Nevertheless, it would be nigh impossible for machines to replace all employees as human workers are still needed in certain jobs and also to maintain the equipment. 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 mostly to do with managing the technology, but few jobs for the workers affected in the production system, who are then reskilled. This means that employment in this industry will stay stagnant and, again, workers will benefit from any job creation disproportionately little. As a result, the number of people that will remain unemployed will be higher than the numbers employed. Technology has been praised for its incomparable efficiency and precision, which makes workers more fearful of technology replacing them. The management representative pointed out that they value the contribution of 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 [who] 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 advanced 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 8, Male, Autoworker)

> 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 23, Male, Autoworker)

> 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 is not increasing, but the number of robots is increasing. (Interviewee 26, Female, Autoworker)

> 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 'reserved to be flushed' shop. (Interviewee 28, Male, Autoworker)

It can be noted that indeed a number of the workers have been replaced by 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 only be done with precision by humans, such as the trimmings in the inside of the vehicles; however, it was noted that the assembly line will soon be affected and will not be able to absorb the mass transfer of workers, considering that no new employment is created when workers leave or for new entrants. Hence, it is clear that technology does dominate in the motor industry, as discussed below.

Technology dominating jobs

Management were asked whether the technology is dominating the jobs in their workplace. As pointed out in the discussion above, there has been an increase in machines since years back. The following excerpts show the responses from the 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 skills. (Interviewee 2, Male, Production Manager)

> 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 [are] 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 is 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 7, Male, Production Manager)

This is a confirmation from management that there are advantages associated with using robots and this has resulted in many human tasks being reduced as a result of work automation. A 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. For workers to remain competitive in this industry, they have to possess certain qualities and skills as new technologies are introduced. If they do not possess these skills, they might lose their jobs. As one of the managers indicated, they have fewer employees but they earn higher salaries because of the higher skills they possess.

From the workers' perspective, all but two participants agreed that machines perform more tasks than human workers. The two respondents who did not agree with the statement argued that the machines do not perform more tasks considering that workers use manpower, which is subject to human limitations; so a direct comparison of the two kinds of labour would not be fair. Workers responded as follows:

> Somehow the robots replicate what [a] 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 11, Female, Autoworker)

> No, they do not, because today there is no machine that is not being operated or supervised by a human being. (Interviewee 12, Male, Autoworker)

> 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 28, Male, Autoworker)

This reveals that workers have a different perspective regarding robot task domination. The revelation here is that machines perform more tasks than workers as robots do not rest and perform faster. However some workers argued it is just that technologies are programmed to do things faster and consistently at a greater velocity than humans, but because workers utilize their human power, workers do more jobs with their labour than the robots.

As indicated above, a good number of tasks have been automated in some departments, hence there is the need to know which departments or tasks can be easily replaced by machines, which will be examined in the next section.

Departments or tasks that can be further substituted by machines

Some departments or tasks are not affected when a new technology is introduced in the workplace. However, others can easily be replaced by machines. More of these sophisticated technologies were being deployed in the automotive industry 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, the placing and tightening of the hundreds of studs, nuts and bolts in the body shell of a car that go to make the seats or

the engine, which are processes taking place in 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 line 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.

While management indicated the possibility of the administration department and assembly being partly automated, workers had this to say on whether or not to adopt extra robots to assist in other tasks:

> 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, Male, Autoworker)

> 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, Male, Autoworker)

This statement was substantiated by other 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, Male, Autoworker)

It can be concluded that a few workers need more robots as they have too large a workload and it is almost impossible to meet current market needs without these robots if there are fewer hands that are overwhelmed with work. Findings show that the number of workers in the body shop, press shop and paint shop has shrunk dramatically with more robots; for this reason, the workers in that department need extra assistance in the area of their tasks. 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 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 as fully automated as it can ever likely be.

Seemingly workers have shaped technology implementation in two ways in the automobile sector: through arguing for the redesign of the workstations to reduce repetitive tasks to ensure workers' health and safety and through asking for the rate of the adoption of robots to be minimized where tasks and jobs are being shed. As one worker expressed:

> Robots take away the repetitive work and by implication reduce the work fatigue and pressure of the workers, so is a good idea in the sense that we become a team pursuing one goal of productivity because I honestly cannot really imagine doing [a] particular job all day but my fear is that it can easily replace me; if not this particular robot, it may be another superior one to be implemented. (Interviewee 3, Male, Autoworker)

Another respondent further indicated that:

> NUMSA always insist that workers and their trade union must be consulted prior to buying any robot so that there will be an agreement or negotiation to ascertain that workers' jobs will not be affected. They also insist that workers must be constantly reskilled should they be lacking in some required skills. [It] Is unfortunate that the power of management overrides these issues and [they] carry on with whatever that makes them profit but it is always a battle between NUMSA and management with regards to these issues whereby we push back through strikes to curb job automation with a whole lot of other labour related issues. (Interviewee 21, Male, Autoworker)

Findings from the above interview excerpts revealed that in some cases the change that robots bring to car plants allows autoworkers to move away from routine strenuous tasks, recognizing the complementary effect of machines on autoworkers' labour and accepting robotic usage as the culture of the company. However, in most cases, workers are unsure they will remain employed due to the efficiency demonstrated by their robotic teammates. Nonetheless, in either case, these technologies automate tasks previously done by autoworkers. In short, machines can relieve workers from strenuous tasks and in so doing, can also relieve workers of their jobs entirely. Evidently, workers' trade unions do not have much scope to enforce the contractual agreement (that workers and their representatives should be consulted before adopting any robotics) as it is being undermined by auto management, and robots continue to have adverse effects on workers, which in turn weakens employees' rights and job security. Even though the power of labour is destabilized in this sense, workers and their trade unions have continued to contest this authoritarian labour process and come together to find an improved work process that will also benefit their members, be it work safety or job security. The findings of this study are comparable to literature that has established links between the evolution of work, creative destruction, job automation, unemployment, deskilling, job insecurity and social disorder in South Africa. The next section discusses the corresponding literature and theories that concur with the results of this study.

Discussion

As the findings indicate, irrespective that there are still jobs that require the human touch, 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 human intelligence coupled with the fact that they have been imitating human labour for years, then they can also be programmed to do far more than they are doing at present, unless robot inventors and adopters choose not to go to that extreme. According to labour process theorists such as Previtali and Fagiani (2015), in the long run, the scientific-technological revolution

will mean the percentage of the population connected to technically and technologically advanced industries like automotives will gradually decrease or become obsolete. Many studies in the South African context (see Barchiesi, 2010; Hlatshwayo and Buhlungu, 2017; NUMSA, 2019; Phillips et al., 2018) argue that when companies introduce new machines, a lot of jobs will be cut or workers will become redundant.

According to NAAMSA's report, the auto industry in SA is changing very fast bringing in hybrid production systems and the automation of factories (NAAMSA, 2019); while the role of South Africa's painting and coating assembly line workers is decreasing, the role of factory automation is increasing (NEDLAC, 2019: 89). Increases in production techniques or strategies lead to lower labour demand in South Africa, such as the substitution of people with job-saving equipment (NEDLAC, 2019: 33). The conclusion therefore reached by Naudé et al. (2015: 259) is that there will be a constant decline in the employment rate in the manufacturing companies in South Africa. Job decline in this sector will continue since the auto industry spends a higher proportion of its investment in high-tech plant. Hlatshwayo and Buhlungu (2017: 138) and Barnes et al. (2018) also point to the increase in technology in SA's auto companies. Such technical progress has contributed to substantial annual increases in overall domestic vehicle output that has also had a beneficial effect on export and GDP levels, as noted earlier, from 0.8% in 2018 to 1.2% in 2019 and projected to rise to 1.8% in 2020 (NAAMSA, 2019). (The sector currently expresses negative annualized GDP growth rate for 2020 because the global automotive industry has been hit hard by the Covid-19 pandemic with a significant fall in demand forecast.)

Deonarain (2019: 14) concluded that estimating the employment effect of new technology is a complex process: although jobs are at risk, especially in the automation of routine processes across skill levels, new opportunities arise in other areas of work. Those with a high level of skill can be incorporated somewhere else, whereas mid-qualified auto workers might be at high risk unless retrained. The findings further affirm the evolutionary economic perspective of creative destruction, theorizing that capitalism is ultimately all about 'perennial gales of creative destruction' (Schumpeter, 1947). It is a process in which several jobs can be destroyed in the short term; however, new employment families are probably to be created in the longer term. Nevertheless, some scholars have argued that automation leads only to career losses and impedes the creation of jobs (Gelb and Khan, 2016: 7). In fact, in South Africa, for every 10 jobs destroyed in the manufacturing sector, only 9 jobs are created (Kerr et al., 2014). As part of the workplace-related risk reduction strategy, human–machine collaboration is essential for the expected benefits of digitization to be evenly distributed. This can be achieved by increasing skills, retraining, joint decision making on auto workplace restructuring and favourable company policies (Deonarain, 2019: 26).

Automotive investment in robotics increased from 15% in the 1980s to 55% by 2010 (Vulavala and Ulmer, 2014: 27). This shows that the advance and adoption of robots in the last 50 years is astonishing. These findings corroborate Braverman's (1998) and Previtali and Fagiani's (2015) notion that labour has been reorganized to the extreme in pursuit of speed, competition and surplus-value. South Africa has seen successful technological performance, growth rates, trade rate increases and GDP growth. However, SA's autoworkers have not enjoyed the same positive growth. As noted at the beginning

of this article, from 2016 to 2019, the number of manufacturing employees fell by 1314, and no significant job creation took place (Barnes et al., 2018).

This was why Braverman (1974) stressed that the way the capitalist system expands and operates devalues the skills of human workers and makes the importance of labour meaningless, all in the quest for economic growth. As the World Commission on Environment and Development (WCED) rightly stated: 'sustainable development is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED, 1987: 43). Most of the time, workplace technology is motivated by one basic requirement, without taking full account of the larger or potential impacts. The focus of sustainable development is broader but ensures social inclusion, creates equal opportunity, and responds to the complex interests of all citizens in current and future businesses and societies. Sustainable development embedded in CSR is about finding 'better ways of doing things', both for the future and the present.

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 (Phillips et al., 2018: 6). One in three workers in South Africa (5.7 million jobs) is actually at risk of complete automation. This will aggravate the risk of unemployment, creating more job displacement in a distressing scenario (Phillips et al., 2018: 7–9), and will add significant stress on an already pressured South African economy. Given the above, we need to balance these modern manufacturing technologies with work security (Masondo, 2010: 103).

It can be argued that technological change will not greatly improve the prospects for employment by itself and, insofar as it can create more jobs, it will probably create work for most of the new technologies and a few reskilled employees in the existing system. This indicates that workers do not prosper in the first place from the creation of jobs, or at most very little.

Conclusion

Based on the findings of this study, in this competitive world auto management deliberately aims for productivity, efficiency, safety of workers and quality to improve their workplace economies and ease the process of labour in the car sector. As a result, the implementation of robotics has increased in the sector to dominate and automate many tasks previously assigned to autoworkers. Consequently, this deliberate business move by management has reduced the level of human labour and relocated a significant number of automated autoworkers from the affected departments to one assembly line department which is also partially automated. However, the assembly line may be gradually automated further and will not be able to absorb mass transferred workers, considering the insignificant number of new tasks created for the workers already in the system, and implying no new employment for new entrants.

The adoption of technologies can relieve workers from strenuous tasks and boost productivity but by so doing, will most likely relieve workers of their jobs entirely. It was observed that the capacity of labour to collectively restructure the auto sector with management is weakened due to the authoritarian power of the management; nonetheless,

workers and their representatives have relentlessly disputed this one-party labour process and come together to amend auto work processes to benefit all stakeholders in the industry. Thus, instead of innovation fetishism, we should seriously examine how far innovation can boost the human condition before it becomes a problem (job loss, employment uncertainty, deskilling and inequality). The state, car companies, unions (such as NUMSA), workers, consumers (with insatiable demands and tastes) and society in general all have a role to play in effecting real change.

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