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2023
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Maphosa, Grant. (2024). Exploring employee perceptions on the adoption of 4IR-driven job automation in the South African Food Manufacturing Industry[Master's dissertation, University of the Witwatersrand, Johannesburg].WireDSpace.

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Exploring employee perceptions on the adoption of 4IR-driven job automation in the South African Food Manufacturing Industry

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

Johannesburg, 2023

(Version 2022-2023)

ABSTRACT

The Fourth Industrial Revolution (or 4IR in short) is characterised by the latest technologies that mostly serve as solutions for automating tasks. Examples include the internet of things, cloud computing, artificial intelligence with machine learning and robotic process automation.

The food value chain is no exception to this automation. All processes involved in converting the raw agricultural produce into finished goods for sale and consumption are expected to eventually integrate the 4IR technological advances, which automate job functions. In the South African Food manufacturing industry, these traditionally manual tasks are performed by a high number of employees, many of which perform lower-occupational level manual functions.

The study's purpose was to explore the South African Food manufacturing industry's employee's perceptions of this 4IR phenomenon, with the technologies that will be possibly automating their job functions or overall employment. This is to intentionally address the main research problem of not knowing the employee's views on the subject, in addition to not being able to track the policymakers and employers' efforts in managing the transition to 4IR-adoption in the industry.

The research study was conducted through interviewing 14 participants who are employed by the South African Food manufacturing industry. They were expected to share their perceptions by answering open-ended questions, and their responses were analysed qualitatively. Their responses were coded and grouped to themes, and findings led to recommendations such as accelerating the change management process to identify upskilling requirements sooner.

KEYWORDS

South Africa, 4IR, Automation, Food Manufacturing, Employees, Employment, Jobs, Adoption

DECLARATION

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

Signed in Johannesburg

On the 31st day of May 2024

Contents

ABSTRACT ..... **ii**

KEYWORDS ..... **iii**

DECLARATION ..... **iv**

LIST OF FIGURES, TABLES CHARTS ..... **vii**

LIST OF ACRONYMS ..... **viii**

CHAPTER 1. INTRODUCTION **1**

1.1 PURPOSE OF THE STUDY 1
1.2 BACKGROUND OF THE STUDY 1
1.3 RESEARCH PROBLEM 4
1.4 RESEARCH QUESTIONS 5
1.5 SIGNIFICANCE OF THE STUDY 5
1.6 DELIMITATIONS OF THE STUDY 7
1.7 DEFINITION OF TERMS 7
1.8 ASSUMPTIONS 8
1.9 CHAPTER OUTLINE 8

CHAPTER 2. LITERATURE REVIEW **10**

2.1 INTRODUCTION 10
2.2 DEFINITION OF TOPIC OR BACKGROUND DISCUSSION 11
2.3 FIRST RESEARCH QUESTION 13
2.4 SECOND RESEARCH QUESTION 17
2.5 CONCLUSION OF LITERATURE REVIEW 20
2.6 ANALYTICAL FRAMEWORK 22
2.6.1 THEORETICAL FRAMEWORK 22
2.6.2 CONCEPTUAL FRAMEWORK 25

CHAPTER 3. RESEARCH METHODOLOGY **28**

3.1 RESEARCH APPROACH 28
3.2 RESEARCH DESIGN 30
3.3 DATA COLLECTION METHODS 31
3.4 POPULATION AND SAMPLE 32
3.4.1 POPULATION 32

3.4.2 Sample and sampling method 33
3.5 The research instruments 34
3.6 Procedure for data collection 35
3.7 Data analysis and interpretation 35
3.8 Trustworthiness 36
3.8.1 Credibility 36
3.8.2 Transferability 37
3.8.3 Dependability 37
3.8.4 Confirmability 37
3.9 Demographic profile of respondents 37

CHAPTER 4. DATA PRESENTATION AND DISCUSSION 38

4.1 Introduction 38
4.2 Participant sample description 38
4.3 Ethical considerations 39
4.4 Analysis of findings 39
4.3.1 Overarching theme 1: Food manufacturing employees mostly have positive thoughts about their industry and the use of technology. 39
4.3.2 Overarching theme 2: Familiarity with 4IR through increased adoption of the latest technological tools for further automation and digitization of functions 42
4.3.3 Overarching theme 3: Numerous automation and digitization solutions have been recently introduced at our workplace. 47
4.3.4 Overarching theme 4: Robotics and automation would be mostly beneficial to the business at the expense of job losses. 50
4.5 Summary of results 59

CHAPTER 5. CONCLUSIONS AND RECOMMENDATIONS 60

5.1 Introduction 60
5.2 Conclusion to research questions 60
5.2.1 Research question 1: How do South African Food Manufacturing Industry employees from different occupational categories perceive the 4th Industrial Revolution or the digital technologies that characterise it? 60
5.2.2 Research question 2: How do South African Food Manufacturing Industry employees perceive potential job displacements resulting from 4IR automation? 61
5.3 Limitations 61
5.4 Recommendations 61

REFERENCES 63

APPENDIX 1 – Instrument (Interview Guide) 67

APPENDIX 2 – Codes and Themes 68

LIST OF FIGURES, TABLES CHARTS

Figure 1.1: Food manufacturing industry value chains **(**Samundo et al.,2019) **…**6

Figure 2.1 Conceptual framework of SA food manufacturing employees' perception of the transition to 4IR **……** 26

Chart 4.1: Respondents' feelings about using technology at their workplace **...**41

Chart 4.2 Respondents' familiarity with the Fourth Industrial Revolution or 4IR 45

Chart 4.3 Respondents' introduction to new technologies that include automated ways of working at their workplace and thoughts about them **……** 48

Chart 4.4 Respondents' thoughts about robotics and automation being used for work previously done by employees **……** 51

Table 4.1 Respondents' thoughts around robotics and automation technologies replacing their current roles **……**53

LIST OF ACRONYMS

4IR – Fourth Industrial Revolution

AI – Artificial Intelligence

FOODBEV – Food and Beverages

FOODBEVSETA – Food and Beverages Sector for Education and Training Authority

ILO - International Labour Organization

IOT – Internet of Things

OCR – Optical Character Recognition

PC4IR - Presidential Commission on the 4th Industrial Revolution

RPA – Robotic Process Automation

SA – South Africa

SETA – Sector for Education and Training Authority

STATS SA – Statistics South Africa

CHAPTER 1. INTRODUCTION

1.1 Purpose of the study

This is a qualitative research study that was intended to explore South African food manufacturing industry employees' perceptions of the 4IR-driven automation of jobs within their industry.

This research aimed to understand the extent of their awareness and beliefs about the subject.

1.2 Background of the study

The study's background entailed an overview of the South African Food Manufacturing Industry, its employees, and the emergence of the Fourth Industrial Revolution (4IR).

The South African Food Manufacturing Industry

The South African Manufacturing industry is South Africa's third largest contributor to the to the Gross Domestic Product (GDP) at 13% (STATS SA, 2023). Within the manufacturing sector, the food & beverages sector is identified as a 20.75% volume contributor to the total manufacturing sector's production outputs (STATS SA, 23). Its seasonally adjusted sales reported in February 2023 amounted to R63.88 billion, making it the highest contributing manufacturing division (STATS SA, 2023). It was notably recognised as a key South African economic sector.

The 2022/2023 sector skills plan study conducted and presented by the Food and Beverages Sector for Education and Training Authority (FoodBev SETA)

presented employer and employee profiles from the South African food and beverage manufacturing sector. The study found that the sector had 14 748 registered companies and employed 226 855 employees (FoodBev SETA, 2021). 44% of the employees are in the early years of their careers (less than 35 years old). The sector is predominantly occupied by employees who perform elementary, manual non-technical functions. (FoodBev SETA, 2021).

Urbanisation has been one of the factors affecting the demand and supply of food manufacturing employment, as substantiated by FoodBev SETA (2021). The study indicated that employers and employees in the Food Manufacturing sector are also mostly based in the economic hubs that are Gauteng and the Western cape, where most of the manufacturing organisations are setup. Technological advancements were however noted as a major factor affecting skill requirement changes. The FoodBev SETA (2021) report noted that the companies in the sector are pursuing new means of improving the product and service offerings, moving away from the predominant lower-level jobs, and requiring more advanced technological skills. The stakeholders in the study reportedly expressed that the technology advancements are in line with the shift towards the 4IR (FoodBev SETA, 2021).

The Fourth Industrial Revolution (4IR)

The 4IR term was popularised by Klaus Schwab, founder, and executive chairman of the World Economic Forum, who authored a book titled the “The Fourth Industrial Revolution”. He noted that “4IR is characterized by a range of new technologies that are fusing the physical, digital and biological worlds, impacting all disciplines, economies and industries, and even challenging ideas

about what it means to be human". He also stated that today's transformation is unique due to the speed with which the new ideas and technologies spread (Schwab, 2015).

Technologies that are characterised by AI, automation and robotics were also titled "The Second Machine Age" by Brynjolfsson (2014). The Roberts (2022) 4IR description is that of a series of in technological revolutions that are interconnected, which include artificial intelligence, quantum computing, biotechnology, nanotechnology, and human-machine interface.

In a study looking into 4IR from a South African perspective, Marwala (2020) noted that South Africa is facing a human capital challenge, due to a shortage of scientists, engineers, and digital skills. Looking at automation and artificial intelligence, the 4IR threat to jobs is mainly from using machines to perform traditionally human tasks (Marwala, 2020). Although automation is not a new concept, machines in the fourth industrial revolution, have more use than those of the previous industrial revolution and they will take on more jobs (Marwala, 2020). Furthermore, it is not only unskilled workers who are facing the potential job losses, as skilled workers are also affected by intelligent machine takeovers (Marwala, 2020).

Employee perceptions of the 4IR impact on jobs have not been explored enough though, as acknowledged by Oosthuizen (2019), who stated that future research needs to consider different industries' perceptions and experiences of 4IR in more detail. In a study focused on employees' feedback on 4IR and employment equity issues, most respondents leaned towards addressing their employment equity issues and not 4IR, which itself, shed some light (Oosthuizen, 2019).

Future research needs to take different industries into account and study impact, perceptions, and experiences of the 4IR in workplaces in greater detail (Oosthuizen, 2019).

In context, 4IR brings about new digital technological solutions such as IOT, cloud computing, AI, big data, OCR, machine learning and Robotic Process automation. These 4IR technologies are mostly solutions for automating tasks traditionally performed by employees of all levels, from “blue collar” to “white collar”.

1.3 Research problem

The Fourth Industrial Revolution presents technological automation solutions that will improve organisational efficiency and reduce labour costs. The insights from the background to the study however highlighted that there is large scale employment in the Food Manufacturing Industry. The dominant employee profile is that of a young male/female, employed by a Gauteng-based Food Manufacturing company in a lower level, unskilled/low skilled elementary role.

As the rollout of 4IR is expected to be at rapid speeds, as stated by Schwab (2015), job automation is expected to involve replacing some employee functions and actual jobs with technologically advanced automation tools such as Robotic Process Automation, OCR, 3D printing devices, Internet of Things, cloud computing and artificial intelligence. These technologies are in place to automate most types of work. They also do not spare any “white collar” jobs, such as finance roles (Marwala, 2020).

The transition to 4IR jobs thus prompted a need to further explore what the change means to employees. To date, little was known regarding employees' perception of 4IR-driven job automation and the impact on jobs in the food manufacturing industry, and most other industries for that matter, as it was found by Oosthuizen (2019), which is the main research problem.

It was therefore important to conduct qualitative research to gain in-depth findings about this. The findings were expected to assist actors in the industry to navigate the transition challenges related to employees, as they take advantage of the 4IR.

1.4 Research questions

1. How do South African Food Manufacturing Industry employees from different occupational categories perceive the 4th Industrial Revolution or the digital technologies that characterise it?
2. How do South African Food Manufacturing Industry employees perceive potential job displacements resulting from 4IR automation?

1.5 Significance of the study

To substantiate this study's relevance, the **Food industry's value chains**, as presented by Samundo (2019) in Figure 1.1, illustrates that the latest 4IR technological advances are being integrated into the value chains. They include advances in automation tools such as robotics, IOT sensors and smart devices.

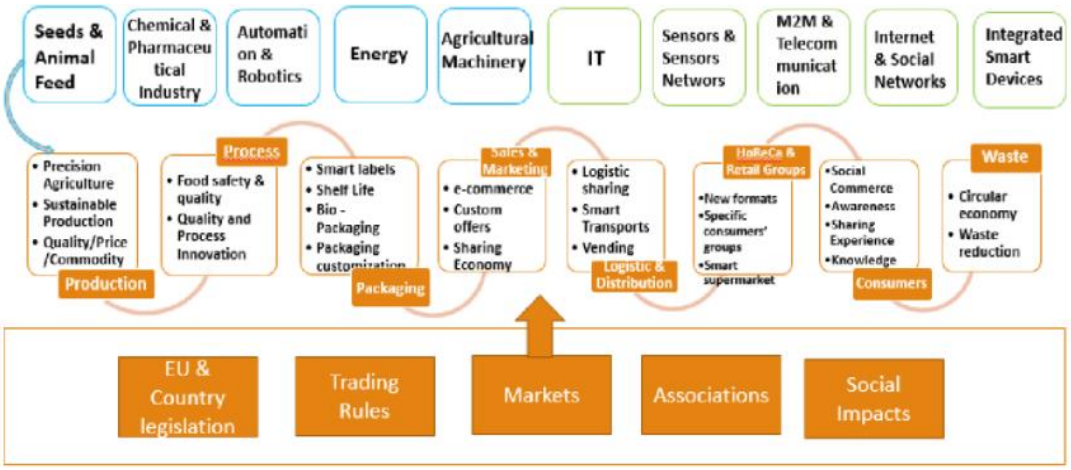


Figure 1.1 Food industry value chains (Samundo, 2019) P3

The food manufacturing industry is a major employer in South Africa (more than two hundred thousand employees) and it's the third largest contributor to the South African GPD (STATS SA, 2021), The FoodBev SETA (2021) reported that the industry is changing, through pursuing more advanced technological skills and moving away from employees who perform lower-level functions. This study was thus significant to providing employee's perspectives of how they will fit in the future food value chain. The employee awareness of 4IR and the process of transitioning towards adopting these technologies was met with "organisational change management" as an answer to forming basis of this study.

Kurt Lewin's (1948) Change Management Theory is that of an intentional or planned change guide that consists of three distinct and vital stages, which are "unfreeze, change & then refreeze". The initial 'unfreeze' stage is to find a method of making it possible for individuals to let go of an old way of work that was in some way counterproductive. This is the stage where the desire to change occurs, or at least the recognition that change is needed. This recognition of the

change needed signifies part of the employee perception that this study seeks to ascertain, in relation to the Food Manufacturing Industry.

Another area of significance for the study is that of policy making. Policymakers such as the 4IR commission, DTI, Department of Labour, Department of Higher Education and Communication and Digital technologies require insights from this study to make policy decisions. The insight will support the government agency data gathered through organisations such as FoodBev SETA and STATS SA. This is to make policy decisions that are centred around raising awareness of 4IR, skilling, reskilling and upskilling the potentially affected employees in the Food Manufacturing Industry.

1.6 Delimitations of the study

The study's delimitations imply that it purposefully excludes:

I. Other sectors that are not part of Food Manufacturing
II. Food Manufacturing employees that are not from South African-based companies.
III. Employees with no access to interview devices and/or software

1.7 Definition of terms

I. **4IR (Fourth Industrial Revolution)** is characterised by the fusion of technologies, which blur the lines between the physical, digital, and biological spheres (Schwab, 2016)
II. **Food Manufacturing Industry** refers to the industry that is comprised of companies that process raw materials into edible finished goods.

III. **Organisational change management** is the method of leveraging change to bring about a successful resolution, and it typically includes three major phases: Preparation, implementation, and follow-through (Stobierski, 2020)

IV. **Value chain** a chain of activities that an organisation performs to deliver a valuable product for the market (Simatupang, 2017)

1.8 Assumptions

The researcher made the following assumptions in the proposal:

I. Food manufacturing employees' perceptions of 4IR job-automation may be understood through employee responses.

II. 4IR skills can be learnt.

III. The research findings from this study are based on respondents' understanding all the interview questions.

IV. The findings from this research may assist in informing researchers, industry leaders and relevant government authorities about employee managing perceptions.

1.9 Chapter Outline

Chapter 1 provides an introduction and background to the study. It also includes the purposes of the study, the research problem, the research questions, and significance of the study. It further outlines the delimitations of the study, definition of terms and assumptions of the study.

Chapter 2 introduces the literature review, provides the background and definition of the topic, addresses the first research questions, provides the review of the literature and conclusions drawn from it. It also provides an analytical framework, which contain theories and concepts that are relevant to the study.

Chapter 3 details the research methodology to be used. This includes the approach to the research, the design, the data collection methods, the population, and sample to draw data from, the research instrument and procedure for collecting data. It also details how data is analysed and interpreted, the limitations to the study, the data validity and reliability. It also provides the demographic profile of respondents, along with ethical considerations for the study.

Chapter 4 entails reviewing and discussing findings from the research interviews conducted. The findings are comprised of interview answers by participants and themes resulting from the coded interview answers. It also compares the themes to the literature review in the study.

Chapter 5 includes the summary and recommendations for the overall research study.

CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

This literature review is a compilation of research material that aided in addressing the research on “exploring employee perceptions on the adoption of 4IR-driven job automation in the South African Food Manufacturing Industry.”

It explored the background and recent state of the manufacturing industry in South Africa. It considered the food manufacturing industry’s role in employment, in the context of the number of employees and the skill complement. This was in consideration of the research topic’s construct of employment in the South African Food Manufacturing Industry.

It further delved into the history of industrial revolutions, starting from the 1st to the 4th Industrial Revolution’s (4IR). 4IR, which is characterised by technological advances and digitalisation solutions such as Artificial Intelligence (AI), machine learning (ML), blockchain, Robotic Process Automation (RPA), internet of things (IOT), digitalization, big data, autonomous vehicles, additive manufacturing, nanotechnology, biotechnology, and 3D food printing technologies, which is a key prompter to this study.

It also considered measures taken by policymakers to address and mitigate the potential impact of 4IR in South Africa and particularly for food manufacturers, and the steps to be considered by employers and other decision makers when adopting the change or transition to the new technologies.

It further explored guidelines for improving 4IR adoption readiness by the industry and its employees from a change management and skills perspective.

2.2 Definition of topic or background discussion

4IR and Employees

This topic of 4IR, in relation to employees has been a subject that has drawn the attention of policymakers, governments, and authors. This includes high level policymakers such as the International Labour Organisation's (ILO). The 2019 "Work for a Brighter Future" report compiled by the International Labour Organisation's Global Commission on the Future of Work examined how to achieve a better future of work for all, at a time of unprecedented change and exceptional challenges in the world of work (ILO, 2019).

It was Co-chaired by South African President Cyril Ramaphosa and Swedish Prime Minister Stefan Löfven, the independent 27-member Commission included leading global figures from business, trade unions, think tanks, government, and non-governmental organizations. In the report, they state that technological advances, which include artificial intelligence, automation and robotics will create new jobs, but the individuals who will be losing jobs in this transition may be the least equipped to seize the newly presented opportunities. Today's skills will not match jobs of tomorrow and the newly acquired skills may quickly become obsolete/redundant (ILO, 2019).

In the ILO (2019) report, the commission's resolution was that of "delivering the social contract: a human-centred agenda", which entailed the following 3 action pillars:

I. Invest in people's capabilities by enabling them to acquire skills, reskill and upskill them and support them throughout the different transitions they will face over the course of their life.
II. Invest in the institutions of work to ensure a future of work with freedom, economic, dignity, security, and equality.
III. Invest in decent and sustainable work and shape rules and incentives in a way that can align economic and social policy and business practice with this agenda.

The ILO (2019) report thus provided an opportunity for this study to identify what actions have been taken so far by the key policymakers. It helped to inform this study about the extent to which the impact of 4IR on South African employees is acknowledged by the state and what measures have they put in place to prepare the industries and employees for the coming changes. The change process in the study is related to certain skills or job functions becoming obsolete and making way for 4IR technologies. The process also covers the need and absorption of certain skills for industries to thrive after the change. The changes in skills and jobs are also key to the study, as it aims to gain the employees' views on the expected changes.

Some authors' findings about food manufacturing and employee views about the Fourth Industrial Revolution are shared in the following literature review, which relate to the two research questions.

2.3 First research question

How do South African Food Manufacturing Industry employees from different occupational categories perceive the 4th Industrial Revolution or the digital technologies that characterise it?

4IR automation adoption in the South African food manufacturing industry

Roberts (2022) published a journal titled “Promise or precarity? South African attitudes towards the automation revolution” noted that there is little research about public opinion about the Fourth Industrial Revolution available. The research from Roberts (2022) utilized South African Social Attitudes Survey data to determine the extent of the South African public’s acceptance of automation and robots. The findings from the research suggested that there were mostly dislikes of these technologies, as there is a fear of an increase in inequality and joblessness. In terms of demographics, the older generation is expected to be less open to the adoption of automation and robotics due to less familiarity than most of the younger generation (Roberts, 2022). Those with internet access also reportedly showed more acceptance than those who didn’t (Roberts, 2022). However, variables that make up core demographics were found to not be the main attitude predictors towards robotics, but mostly awareness and vulnerability of workers (Roberts, 2022).

Roberts (2022) found that about 13% of the current job activities may be automated by 2030. Roberts (2022) also found that data from the South African Social Attitudes Survey suggested that 40% to 50% of the South African adult public did not have basic knowledge of the 4IR technologies. Furthermore, the research study by Roberts (2022) expressed that about three quarters of South

African adults believed that computer programs or machines will assume the jobs that are currently performed by humans. From the same study, 62% of workers reportedly expressed fear of job losses due to automation.

Roberts (2022), in conclusion suggested that the national policy framework on 4IR needs to consider how many South Africans have reservations about 4IR technologies and come up with solutions to protect the well-being and dignity of South Africans.

A journal completed by Oosthuizen (2019) covered South African employees' perspectives on both employment equity and 4IR's impact on work. It involved conducting research on employees from eleven different organizations. The research mainly highlighted how employees were mostly preoccupied by employment equity issues such as race, age and gender and not new challenges such as 4IR. It further indicated how there are limited studies about employee perceptions about 4IR.

From a South African food manufacturing perspective, the Jideani (2020) journal titled "Impact of Industrial Revolutions on Food Machinery-An Overview" aimed to highlight the difference between 4IR and the previous industrial revolutions. It's faster in impact and niches of the latest technological solutions such as machine learning, AI, big data and even 3d technologies for food printing.

The previous industrial revolutions had different impacts on machinery in the food industry. The first industrial revolution entailed transitioning from methods that use hands to water and steam powered machinery for food manufacturing. The second industrial revolution entailed the use of electricity for the food

machinery to achieve mass production. The third was then characterized by using computers and information technology for automating some production processes (Jideani, 2020).

Key to the study, is how 4IR it impacts on food manufacturing machinery. Artificial Intelligence includes machine learning, where machines have the capacity to learn and meet the manufacturing needs. The need for advanced scientific skills is thus evident for managing these technologies (Jideani, 2020).

Marwala (2020) expressed that South Africa's 4IR plans also include elements of the third industrial revolution due to lagging in fully implementing it, whilst there are many other countries that have advanced to a point of mainly focusing the 4IR plans on artificial intelligence (AI).

The South African manufacturing sector is albeit already evidently adopting 4IR at a quick rate, as its operators are already using robots to improve their capacity through supporting employee operational and safety efforts. South African Breweries is one of the companies that focused their capital towards adopting the latest technology in 2018, by investing 438 million rands towards the expansion and increased automation of their brewery (Marwala, 2020).

Marwala (2020) also noted that recommendations were submitted to South Africa's Presidential Commission on the 4th Industrial Revolution (PC4IR), which responsible for presenting SA's overarching strategy for 4IR and recommending frameworks for institutions and various sectors and society's roles in these plans (Government gazette, 2020). The recommendations

included measures such as setting up an AI institute, a platform for advanced manufacturing, 4IR infrastructure development, policy, and legislation for 4IR and providing incentives to industries, platforms, and applications of 4IR in the future. These recommendations are intended for South Africa to stay up to date and mitigate against unemployment and experience growth.

Following the introduction and adoption of the 4IR technologies, the companies' digital transformation implementation may require sustainability measures. Westerman (2014) documented steps that are required to make sustaining the transition a success. These include the building of foundational skills, incentivising or rewarding efforts, measuring, monitoring, and iterating. When focusing on the building of foundational skills, the application encompasses identifying the organization's digital skills gap and then considering the optimal solutions to fill the gaps. This process will explore options such as training existing employees, partnering with digital expects, improving the IT/business relationship or recruiting new external digitally skilled employees (Westerman, 2014). In the food manufacturing sector, Coca-Cola recruited Robert Kotick in 2012, who was previously a game company CEO to join its board and assist in improving their digital engagement with their global customer base. Nestle also recruited Pete Blackshaw to be their global digital and social media head to fast track them in meeting their strategic digital marketing objectives. These food manufacturing companies opted to have their digital transformation skill base start at the top. Some solutions may include the standardisation and automation of repetitive tasks that may reduce the number of staff as seen with another manufacturer (Westerman, 2014).

Westerman (2014) also wrote about adoption in the context of new ways of working. Adoption in the case of new technology that is implemented and integrated into the organisation involves employees embracing the transition and using these technologies. It tends to be more effective with top leadership, such as executives providing support or leading by example.

Furthermore, deploying technology without putting measures in place to ensure that there is adoption may lead to lack of usage and wasted investments. Benefits are thus only realised when there is widespread adoption of the new technologies (Westerman, 2014).

2.4 Second research question

How do South African Food Manufacturing Industry employees from different occupational levels perceive potential job displacements resulting from 4IR automation?

4IR job displacements

The van Rensburg et al. (2021) take on the perceived impact of 4IR on jobs is that African countries have lower numbers of routine and repetitive “mid-skill” jobs that may be subjected to automation. It states that there is a significantly lower risk of machines replacing middle-skilled workers. Furthermore, the digital technologies’ application will result in job creation for the mid-, low, and high-skill employment segments. Parallels were drawn with Germany, to understand how their deployment of technological advances impacted jobs over 20 years up to 2014. The result was that two jobs were replaced by each extra robot. The highly skilled labour market however benefitted from new tech-related jobs and

more employment was created outside of manufacturing to absorb other jobseekers. The firms also reportedly approached affected workers and offered them extra training for them to operate in new functions (van Rensburg et al., 2021).

With van Rensburg et al. (2021) looking into the African context, the question of infrastructure availably is also considered. As many African countries don't have access to a reliable supply of electricity and internet connectivity, the dynamics are different to the EU countries. South Africa is reportedly expected to licence faster 5G networks which will also help in reducing the cost of communications. It would be a positive way forward considering that the IMF (2018) report shared that Sub-Saharan African countries' internet use by the population only averaged 20%, whereas the European Union's was 81% (van Rensburg et al., 2021).

It was agreed that there will be losses of traditional jobs with the advent of the latest technologies, albeit the number of new jobs as a result is expected to be higher if African countries take advantage of the digital technologies' capabilities and opportunities % (van Rensburg et al., 2021).

Roberts (2022) on the other hand expressed that even though 4IR may likely create certain jobs, not every person will be able access them. This was after conducting surveys on workers, where 42% of them believed that they did not have adequate ICT skills. Moreover, the workers whose jobs are more vulnerable to automation and AI displacement are expectedly more hostile to

technological change (Roberts, 2022). This study also supported its proposition that favorable attitudes towards robotics will be based in the state's capacity to manage the technological change. In conclusion, Roberts (2022) presented interventions by the state's policymakers and 4IR-ready skills as measures that can address South African attitudes towards automation.

In relation to 4IR-readiness skills for workers, Akyazi et al. (2020) compiled a paper titled "A guide for the food industry to meet the future skills requirements emerging with industry 4.0." which details how the emerging manufacturing now entails using smart technologies. The food industry now expects rapid and constant changes due to automation that will allow the more innovative and efficient processes, products, and services.

The introduction of these new technological solutions prompted a need for new skills in the food industry. A focused study for on identifying and comparing the current with the new skill requirements for the food industry was conducted. The findings were that new skills will be required to meet the demands of the new technologies (Akyazi, 2020)

According to Frey (2017), advances in technology that include Artificial Intelligence and its subfields such as machine learning include measures intended to automate cognitive tasks. This means that there are job functions that may not be simple and repetitive, but also at risk of automation.

The set of skills that are required to perform in a 4IR-driven environment, as categorised by Deloitte (2020) for workforce readiness are soft, technical and entrepreneurship skills. They also place lifelong learning is a key pillar to this

framework of skills. These skills provide potential guidelines for the Food Manufacturing sector's employee capacity requirements, which contrasts most of the current dominant skills, as indicated by the FoodBev SETA (2018) findings.

2.5 Conclusion of Literature Review

Conclusions drawn from this literature review include the fact that there are potential challenges faced by the Food Manufacturing Industry, such as the labour pool's unemployment risk and limited measures to prepare for the automation brought on by the Fourth Industrial Revolution.

As Roberts (2022) studied employee attitudes 4IR and found that most of the employees are uncomfortable with automation and robotics. Their profiles were mostly of the older generation, lack of awareness, limited internet connectivity and performing jobs that are vulnerable to automation. On the other hand, Oosthuizen (2019) presented findings that suggested that employees were less concerned by 4IR than employment equity issues.

In terms of the food manufacturing industry's progress so far, Jideani (2020) expressed how the industry will be impacted by the adoption of 4IR, which will lead to machines meeting manufacturing needs through artificial intelligence (AI) and needing advanced scientific skills moving forward. Marwala (2020) however argued that the South African manufacturing sector is still lagging in implementing 4IR technologies, and only a few companies are past the point of the third industrial automation technologies.

Studies related to employees and expected job displacements entailed (van Rensburg et al., 2021) expressing that more jobs resulting from 4IR-automation

will offset traditional jobs if companies take advantage of the latest digital technologies. Roberts (2022), on the contrary highlighted that not every person will have access to the new digital technology jobs. Certain skills are also required to thrive in the 4IR-related job opportunities (Akyazi, 2020)

Literature reports suggest that more jobs in the sector are to be automated. There is a high complement of an unskilled labour force which implies a mismatch of demand and supply. Some employees may be facing an employment crisis, which requires urgent attention. Measures taken to transition towards the adoption 4IR-driven job automation in the food manufacturing industry require further research. Policymakers and employers may not yet be leveraging on the studies around this subject. Affected employees' feedback is not in widespread publications. The authors cited in the literature review are, in a nutshell stating that what is key to overcome the job displacement challenges brought on by 4IR is to have employees with skills that are relevant to the new technologies in the food manufacturing industry.

The subject of employee perceptions, in relation to 4IR automation is seemingly not explored in detail in literature. To answer both research questions, Roberts (2022) gives us a good indication of how almost half the population weren't familiar with 4IR and how most workers covered by the study conducted had aversion towards 4IR technologies and saw job-loss risks.

2.6 ANALYTICAL FRAMEWORK

The analytical framework provides an overview of the theories and models that are relevant to the study. In the context of this study, 4IR transitions and job displacement implies change. Employee awareness of the possible changes and the effect of the changes in jobs inform the tested empirical theories adopted for this study.

2.6.1 Theoretical Framework

The transitional requirements' for creating awareness and preparing employees for the adoption and use of 4IR technologies in the South African Food Manufacturing industries requires using a well-coordinated change management process. Further to that, communicating and facilitating the effect of automation on jobs is also subject to change management.

Kurt Lewin's time-tested **Change Management Theory** is a theory that is easily applied and often considered the epitome of change models. It is suitable for personal, group and organizational change and underpins this study.

Lewin (1890 – 1947), was a Gestalt social psychologist, He was acknowledged as the "founding father of social change theories", since several contemporary models are at least loosely based on his work. Lewin's change theory is based on an intentional/ planned change guidance that consists of three distinct and vital stages, which are "unfreeze, change & then refreeze". It was further edited by Cartwright (1951) as follows.

I. Unfreezing

The initial ‘planned change’ stage includes is to find a method of making it possible for individuals to let go of an old way of work that was limited in productivity in some way. This is the stage where the desire to change occurs, or at least the recognition that change is needed.

Unfreezing the forces that maintain current behaviour are reduced by analysing the current situation. The importance of change is realised through dialogue and activities like team building, personal development, and brainstorming. A more transparent and inclusive process allows for individuals to quickly people through the unfreezing stage.

II. Changing

The second stage entails a change of thoughts, feelings, behaviour, or all three, that is in a way, better or more productive than the old way of doing things. The individuals that are subjected to the change are convinced of the benefits of the new way that outweigh the old. Analysis of the current situation, new structures and processes are introduced to achieve the desired levels of improvement.

III. Refreezing

The third and last stage entails establishing the change as being a new habit or process, so that it becomes the new standard of operating. Refreezing is a process in place to help ensure that going back to the old ways of doing things is avoided. The stage is reinforced through incentives, rewards, policies in place, leadership support and training and re-training for employees.

Some more recent studies include disagreements about Lewin's model. Kanter et al. (1992) claimed that Lewin's model is a "quaintly linear and static conception that treats an organization as an ice cube, which wildly inappropriate that it's difficult to see why it has not only survived but prospered". The authors' perceptive includes the role of the change management in terms of a strategy that centralises how the emotions, fears, and hopes of people are managed.

Child (2005) also claimed that "the idea of 'refreezing' is rigid and not appropriate in today's complex world that requires flexibility and adaptation".

The adaptation of new 4IR technological advances by employees in the Food Manufacturing Industry may not be successful if their roles are subject to automation. Communicating the expected change with the potentially affected employees signifies the beginning of the "unfreezing" step of the Lewin Change Theory applies. In this instance, it relates to initiatives that raise awareness of the expected changes.

The second step of "changing" will encompass equipping the current labour force with the necessary skills to survive and thrive in the potentially 4IR-driven automated Food Manufacturing Industry. The final "refreezing" step implies the reinforcement of the change to ensure that employees would not regress back to their old ways.

This step would also ensure that they have a future of work with freedom, dignity, security, and equality as outlined in the 2019 "Work for a Brighter Future" report, compiled by the International Labour Organisation's (ILO) Global Commission on the Future of Work (ILO, 2019). The Lewin Change Theory is adopted for this study, with due consideration and accommodation of the Kanter et al. (1992) input

about centralising people's emotions and hopes for the future. The skills required for this future of work are also regarded as a key factor to the change as presented by Deloitte (2018).

The steps involved in a change management process that result in the adoption new 4IR technologies will guide the research approach. The approach will be cognisant of these steps to determine whether participants have experienced the change process. Their experiences and views will address the research questions and provide the required insights.

2.6.2 Conceptual framework

Ravitch (2016) describes a conceptual framework as an argument over why the study topic matters, to whom does it matter and why the proposed means of completing the study are appropriate and rigorous. The inferred rigour relates to how the research questions are aligned to the topic and how the chosen research methods address the questions (Ravitch, 2016). Upon reviewing the literature through utilising peer reviewed journal articles, academic books and other relevant resources, the concepts and possible relationships are outlined in the following framework:

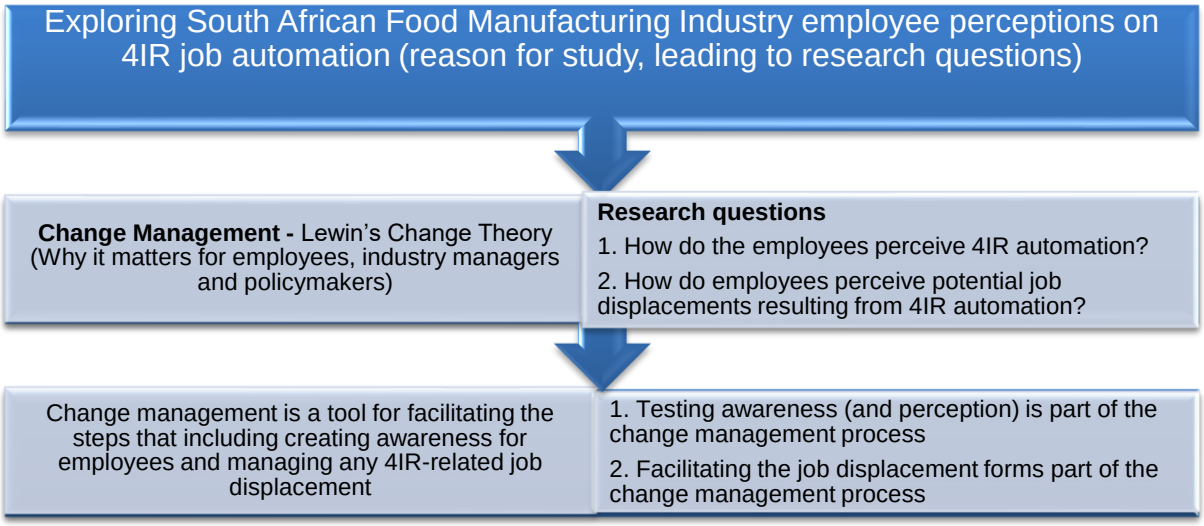


Figure 2.1 Conceptual framework of SA food manufacturing employees' perception of the transition to 4IR (Author's construction)

Managing employee experiences and perceptions forms part of the change process. The perceptions that may result from their exposure to new 4IR-driven automation may depend on interventions by decision makers in their industry. Their feedback may be used for exploring whether the steps relevant to the change process have been followed and highlight any further interventions that may be required.

Furthermore, any change management process status related to the implementation of 4IR-driven automation serves as an indicator of what would inform employees' perceptions of the subject of 4IR-related job displacement. This will help in addressing the second research question, which relates to these perceptions.

The conceptual framework in figure 2.1 illustrates that the study flows from the top by identifying the study topic, which defined the reason for the study and

prompted the following research questions. It is also followed by identifying why the study matters and to who whom it matters. This highlights where change management fits into the study, which in this instance, is Lewin's change theory. This will help industry leaders have a better understanding of the employees' perceptions, to better navigate the implementation of the change management process. The last part of the flow further elaborates how the chosen exploratory qualitative research method will address the research questions. The next chapter provides a more expanded view of the research methodology applied for this study.

CHAPTER 3. RESEARCH METHODOLOGY

This chapter provides details of the proposed research methodology that used to conduct the research study. It includes sections as follows:

3.1) Research approach; 3.2) research design; 3.3) data collection methods; 3.4) population, sample, and sampling method; 3.5) the research instruments; 3.6) procedures for data collection; 3.7) data analysis and interpretation; 3.8) limitations of the study; 3.9) validity and reliability, demographic profile of respondents; 3.10) demographic profile of respondents 3.11) ethical considerations.

3.1 Research approach

A **qualitative approach** was taken for this research. The term “qualitative research” is used to describe a set of approaches for analysing data based on natural language, that is using words and expressions to share experiences (Levitt, 2018).

Merriam (2015) shared four characteristics of a qualitative research study. They relate to this study as follows:

I. Understanding how people make sense of their world or experiences. In this instance, the subjects or participants of the study are the people, the food manufacturing industry is the world of interest, and their understanding of 4IR-related job automation is what the study intended to make sense of.

II. The primary instrument is the researcher for data collection and analysis. The researcher is the one who is primarily collecting, analysing and presenting findings from the participants gained through online interviews.

III. It is an inductive process, meaning that the researchers' theory or concept is built on gathering data and not on deductively testing a hypothesis. In this study, the researcher inductively gathered data in the form of interview transcripts to build theories based on results.

IV. Richly descriptive words and pictures instead of numbers convey the researcher's findings. Interview excepts or quotes from participating food manufacturing employees were included.

The research study met the Merriam (2015) criteria for a qualitative research study and, hence, the approach.

The qualitative approach

Based on the research questions, the study sought to explore and gain an in-depth understanding of the food manufacturing employee views and experiences about their organisations' adoption of 4IR-driven automation. Furthermore, it focused on understanding the employees' perceptions of job automation and unemployment due to 4IR technologies.

The open-ended questions were addressed to the Food Manufacturing industry participants. Gathering information about individuals about their environment and developing that information to make sense, as an interpretative nugget (Roller, 2015) reinforce the need for a qualitative approach.

3.2 Research design

The research design is comprised of a framework used when collecting and analysing data. The chosen research design reflected decisions about what priority is being given to a range of research dimensions (Bryman, 2012). There are various types of research designs. The basic interpretive qualitative research or basic qualitative study design was, however, the best fitting for this research. The basic qualitative study meant that researcher's interest was mainly on how the people in the study interpreted their lived experience, how the people constructed their worlds and what meaning did they attribute to those experiences Merriam (2015). Other qualitative research designs have other dimensions Merriam (2015).

Qualitative research design

As previously stated, this study was based on a basic interpretive qualitative research design or basic qualitative study.

The Food Manufacturing Industry employees were thus the individuals who shared their experiences and meaning of them in the interview responses.

It thus had the following benefits for this study:

I. The employees shared their thought through in-depth interviews, which was insightful to this study.
II. It provided an indication of the extent to which 4IR-related organisational change management has been implemented in the Food Manufacturing industry.

III. It aided in understanding the degree to which the industry has successfully adopted 4IR for job automation, based on employee input.

The challenges for this study were:

I. Participants deflecting from the actual study and commenting on 4IR in general, instead of their specific work environment.

3.3 Data collection methods

The data from the food manufacturing industry employees was collected through online interviews over a year, upon gaining full permission from the employees. The interviews were designed to provide insights for the research study, as follows:

Interviews

Interviews were conducted by means of having one-on-one discussions with the sampled food manufacturing industry employees. Gillham (2000) basically describes a research interview as a conversation, usually between 2 people, where one person (the interviewer) is seeking responses about a particular purpose from the other person in the conversation (the interviewee). It may or not be for the benefit of the interviewed person.

The interviews were semi-structured. This means that the researcher had a list of questions to cover that serve as an interview guide (APPENDIX 1) but has flexibility to not follow the exact interview guide or script when posing the questions. The interviewees also have leeway in how to reply. Questions that are

not in the interview guide may be included, based on relevance to the research topic and accommodating things said by the interviewee. (Bryman, 2012)

These interviews were conducted online by the researcher (interviewer), the employees will be the interviewees. The interview questions followed the interview guide. The employee responses were captured and recorded using digital applications such as “Microsoft Teams, Zoom, Google Meets” and any other similar digital means. These interviews were beneficial to the research, as they provided a platform to explore and capture the employee responses. The responses aided in answering the research questions.

These responses constitute primary data, as they were directly captured by the researcher when interviewing participants.

3.4 Population and sample

3.4.1 *Population*

A population, in statistics is defined as “an entire group about which some information is required to be ascertained. It need not be a group of people.” (Banerjee et al, 2010).

For the purposes of this study, it is however a group of people. That is the South African Food Manufacturing Industry employees from all levels and from different companies are identified as the population in this study. As the study is focused on the industry, representation from multiple employees across several companies from the industry were required.

3.4.2 *Sample and sampling method*

The qualitative research sample selection and method will be applied to the study as follows:

Sample

A sample is referred to as any part of the fully defined population (Banerjee et al, 2010).

As the study was only based on the food manufacturing employees, which is a homogeneous group, a minimum of 12 employees was targeted. This reason behind it was a theoretical saturation's guided sample of 12 participants among a relatively homogeneous population (Boddy, 2016). Hennink (2022) conducted empirically studies of qualitative research sample sizes saturation and found that the relatively homogenous study populations reached saturation at 12-13 interviews.

The sample was based on achieving representation from each employee level for the qualitative research interviews. That is at least 2 junior and 2 senior employees from at least 3 companies. This makes it a sample of at least 12 food manufacturing industry employees.

Sampling method

A purposive non-probability sampling method was employed for this study. The "non-probability" aspect implies that the researcher does not want research participants to be sampled on a random basis. The objective of purposive sampling is that of sampling participants strategically, in a manner that ensures that the sampled participants are relevant to the posed research questions. (Bryman, 2012)

It’s applicable to this study, as food manufacturing industry employees purposely make up the sample profile, instead of random participants that may not fit the profile.

3.5 The research instruments

For the qualitative approach, online employee interviews were utilised as the research instruments aiding the researcher. The interviews were conducted online over a year. The participant responses, based on interview questions, were recorded.

There were advantages associated with online interviews for this study as listed below:

I. The sampled employees will be sufficient to draw meaningful insights, as their responses would be detailed enough to provide clear understanding.
II. Follow-up questions may be asked of the employees, if the need arises, to capture any additional information that will benefit the study.
III. The responding employees may feel more comfortable to share information, due to the interpersonal nature of an interview.

Some interview challenges impacting the study were as follows:

I. Interviewed employees providing biased feedback, based on their position in the company, like senior employees defending their efforts.
II. The preparation, data collection, analysis and reporting of interview data demanding a lot more time and effort than quantitative survey data, for instance.

III. Employees questioning the benefit or incentive for them to participate in the interview.

3.6 Procedure for data collection

The number of food manufacturing industry employees of different occupational levels interviewed online amounted to 14 at the end. The data available was in the form transcripts from the interviews.

3.7 Data analysis and interpretation

The reflexive thematic analysis approach was used to analyse the transcripts or interview data. Reflexive thematic analysis is described as an interpretative approach to qualitative analysis which is theoretically flexible in facilitating the process of identifying and analysing patterns or themes from a given set of data (Bryne, 2022)

The process was as follows:

I. All the interview transcripts were stored in a Microsoft Excel document.
II. The researcher read through the transcripts for familiarisation with the data. Familiarisation entails immersion into the data, to gain insights and identify patterns (Terry, 2017)
III. The different interviews responses were then latently coded in the same Microsoft Excel document. Latent coding entailed working “bottom up” with the interview data by identifying data with the same implicit meaning and assigning the same code (Terry, 2017). As several employees shared

more than one sentiment for some of the interview questions, there were cases where there were more codes than the number of participants.

IV. The list of codes generated from the previous step of the process were the grouped into themes. Developing themes involves clustering codes based on their relationships or similarity (Terry, 2017)

V. The themes developed would be used to generate insights for answering the research questions. The overarching themes generated from the interview data would be used to answer the research questions.

3.8 Trustworthiness

According to Bryman (2012), trustworthiness is comprised of four criteria for assessing the quality of a qualitative study. These include credibility, transferability, dependability, and confirmability.

3.8.1 *Credibility*

The employee interviews were recorded with the intention of making the data from the findings credible through good practice and being able to avail the results to the relevant interested parties. The study addresses this by ensuring that actual food manufacturing industry participants are interviewed. The research instrument, data collection and analysis methods adhere to qualitative research methods.

3.8.2 *Transferability*

The interviews with employees for the qualitative study would result in findings that may be, to some degree made applicable to other manufacturing industries, due to similarity in operations. Food manufacturing employees are arguably having similar views to other manufacturing employees may be the case in point for the transferability of this findings from this study.

3.8.3 *Dependability*

All the records of the research process, including the interviews and the methods of analysing the data may be availed for any audit requirements. This makes the qualitative research conducted of the food manufacturing employees dependable.

3.8.4 *Confirmability*

The research findings are influenced by the researcher's bias or personal values as the researcher's opinion on the subject is not included in the research data collected from interviewing participants. It's based on objectivity.

3.9 Demographic profile of respondents

To answer the research questions, the demographic profile of respondents were as follows:

I. Male and female employees.
II. All levels of the organisation.
III. All age groups.
IV. Employed by a South African Food Manufacturing industry organisation.

CHAPTER 4. DATA PRESENTATION AND DISCUSSION

4.1 Introduction

Following the interviews conducted on the fourteen selected respondents across the food manufacturing clerical/operational, middle, and senior management level representatives, the findings are presented in this chapter.

The results were captured in the form of transcripts from the recorded interviews. Each respondent was asked the same set of interview questions. The transcripts of interview responses were then subjected to the qualitative research method's thematic analysis in a Microsoft excel document. This involved coding the participants' responses in a summarised manner, where the same responses with different word choices were assigned the same codes. The codes were then assigned to themes, based on their similarity and how they convey the same message. As several employees shared more than one sentiment for some of the interview questions, there were cases where there were more codes created than the number of participants, as indicated in chapter 3.7.

This chapter subsequently entails observing and analysing how each theme and its applicable responses compares to the literature review and answers the research questions. This will in turn assist by providing solutions to the research problem at hand.

4.2 Participant sample description

The 14 interviewed participants are all from South African food manufacturing companies split as follows:

I. 5 Senior managers
II. 4 Mid-level management
III. 4 Lower-level operational clerical employees

4.3 Ethical considerations

The new detailed WBS ethics form was filled and submitted to university's Ethics committee for approval. Commitment to the guidelines of the form will be maintained when conducting surveys and interviews. The was submitted as an addendum.

4.4 Analysis of findings

The analysis of findings using thematic analysis resulted in a total of four overarching themes to address the two research questions. The inductive thematic analysis (as indicated in Chapter 3.1) was presented and compared to the literature review findings. This is applied to each relevant research question, to be able to determine what insights have been gained from the research.

First research question

How do South African Food Manufacturing Industry employees from different occupational categories perceive the 4th Industrial Revolution or the digital technologies that characterise it?

4.3.1 Overarching theme 1: Food manufacturing employees mostly have positive thoughts about their industry and the use of technology.

This overarching theme presents the general sentiments of employees in relation to their occupations and the use technology in their respective workplaces. It sets the tone for understanding how they value their work and how they perceive the importance of technology to assist them in their organisations and functions. This

is prior to addressing the 4th Industrial Revolution or the digital technologies that characterise it, as there were existing technologies from the previous industrial revolutions prior to this. This aids in understanding whether the participants have had an overall appreciation of the benefits of technology in general.

The literature review findings presented by Jideani (2020) indicated that 4IR differs from the previous industrial revolutions by the pace of adoption. These include the third industrial revolution's computer usage automation for some production processes. The interview responses clearly indicate that the participants had already largely adopted the technologies brought on by the previous industrial revolutions and they appreciate how they assist in easing their work. This theme from this study has findings that are somewhat contrary to the study by Roberts (2022), which found many employees being fearful of new technologies. Roberts (2022) did however note that those responses were mostly influenced by lack of awareness and vulnerability to automation.

The respondents expressed sentiments such as "makes life easier." (Respondent 2), "It cuts a lot of manual work." (Respondent 3), "provides far greater access to relevant information in order to more efficiently and effectively manage a business in totality." (Respondent 6) "It improves things." (Respondent 7), "technology is very important for us." (Respondent 8), "It's for doing things better." (Respondent 10), "There is a lot of efficiency that comes from having a forward-thinking technology space." (Respondent 11), "The use of technology makes things very easy." (Respondent 14). More light on these responses is presented in the following chart (Chart 4.1 Respondents' feelings about using technology at their workplace). It paints a picture of mostly seeing the improvements in efficiency and value that technological solutions add to the

employees' work. There is a small compliment of employees who find themselves challenged by the need to use all the technological tools provided to them at work.

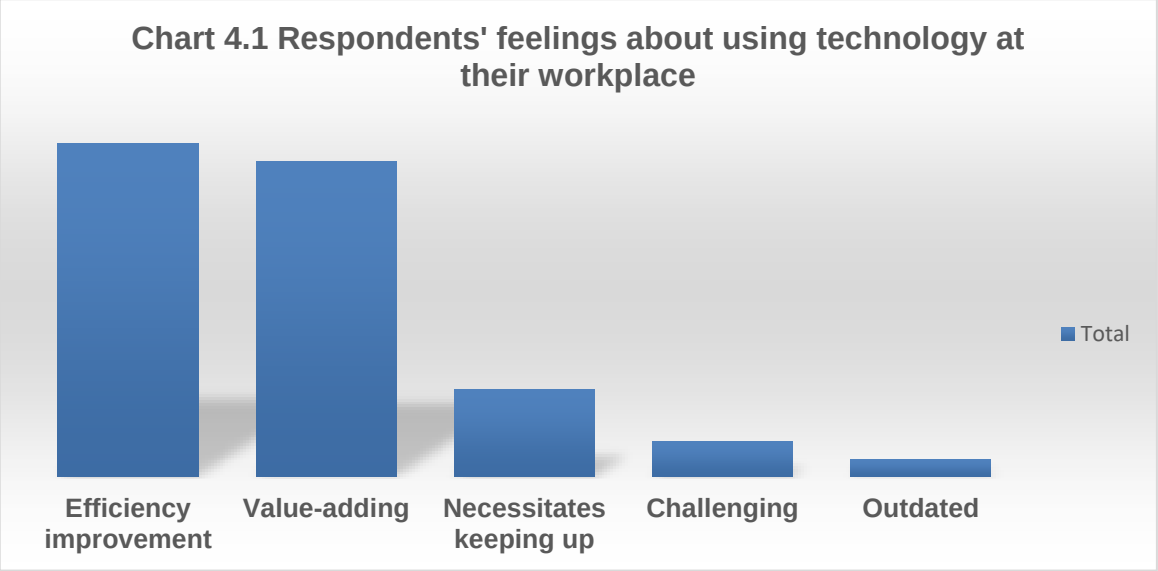


Chart 4.1 Respondents' feelings about using technology at their workplace (Author's construction)

Furthermore, in relation to the rapid pace of adoption, some of the employees are visibly aware of new technologies that are more constantly being introduced to their industry. Expressions from the interviews include "technology changing every day". "You have to stay up to speed with it". (Respondent 4), "you have to adapt to these technological innovations." (Respondent 5), "anyone that talks about a digital strategy, then quite clearly they are behind the curve." (Respondent 6), "We can't run away from technology". "The world is changing." (Respondent 10). "You should be able to move with times." (Respondent 12),

As Jideani (2020), concluded that machines will have the means to learn and fulfil manufacturing needs, advanced scientific skills by employees will be required to manage these technologies. This theme is also comprised of some food

manufacturing employees acknowledging that technology is constantly evolving and includes automation of functions.

From an adoption perspective, Westerman (2014) referred to how employees in an organisation must embrace new technologies and leadership support is an important part of the adoption journey. Without an effective transition and widespread adoption, investments will be wasted. Most of the responses from the participants suggest that they embrace technology and the benefits it brings, as previously seen in Chart 4.1. The respondents who however find technological use challenging in their workplaces, with statements such as “the learning part is quite tricky”, “that’s probably the challenge." (Respondent 4) may require change management measures to assist them with a process that helps them adopt the new tools or systems that are introduced to them.

4.3.2 Overarching theme 2: Familiarity with 4IR through increased adoption of the latest technological tools for further automation and digitization of functions

This theme particularly encompasses a summary of the food manufacturing participants’ responses to their understanding of technology and their familiarity with the Fourth industrial revolution or 4IR in short. The insights gained from addressing their understanding of technology helped provide clarity on whether their basic understanding of technology is one that can distinguish between the latest 4IR solutions from the existing computer or automation tools presented in the Third industrial revolution. Their responses to their familiarity with 4IR then became key to answering the first research question.

To ascertain what previous similar research concluded about this theme, Roberts (2022) did highlight that lack of awareness was a contributor to the fear of robotics in a study about employee attitudes towards 4IR.

In terms of adoption, the point of distinguishing between the implementation of the third and fourth industrial revolution in South African manufacturing is also relevant, as it was covered by Marwala (2020). Marwala stated that South African manufacturing companies' 4IR plans have third industrial revolution elements that have yet to be adopted. This thus makes the case of highlighting whether the respondents can tell them apart. Marwala (2020) further noted that, by the same token, there are South African manufacturers who are rapidly adopting 4IR solutions. These are comprised of artificial intelligence (AI) and robotics. Examples given include the South African Breweries' major capital investments towards automating their manufacturing facility using the latest technology (Marwala, 2020). The interview participants' responses to understanding technology mostly included how it makes work easier, followed by hardware and then efficiency improvement.

The respondents who stated that it makes work easier expressed their understating of technology use as "programs that we use to simplify what we do" (Respondent 3), "systems that try to simplify work via automation" (Respondent 4), "advancement, that actually makes life easier for a lot of people and solves a lot of problems." (Respondent 5), "Something that makes things easier" (Respondent 7), "eliminates manual interventions on processes and systems." (Respondent 10), These responses indicate that there is a basic understanding of technology and its benefits.

The second most significant definition of technology, being hardware and software was captured through responses such as "It's systems that we use, computer-based systems that we use" (Respondent 9), "normally in the form of software in terms of work. Obviously, we've got computers as well that form part of technology. The systems and the different apps that I work on" (Respondent 14) and "what we use to basically communicate, to make information flow. Your cell phones, your PCs, and your systems" (Respondent 8). This indicates that computer hardware and software are quite top of mind when it comes to defining technology for these respondents.

Then, the third most dominant response, being efficiency improvement was more about the benefits, where expressions included "it just basically helps processes be a little bit more seamless and efficient", "it has as its roots in speed, efficiency, productivity" (Respondent 8), "it just basically helps processes be a little bit more seamless and efficient." (Respondent 8), and "collection of information in a much more efficient way, rather than wasting so much time." (Respondent 12),

Exploring the respondent's understanding of technology indicates that the most significant number of participants are exposed to its role in the business and benefits of automation tools for efficiency improvement. This agrees to the research findings relating to the adoption of the third and fourth industrial revolution by Marwala (2020). This subject then segues into the question of respondents' familiarity with 4IR specifically.

Although the research seeks to isolate 4IR understanding from computers and automation form the third industrial revolution, the interview responses indicated

that most of the elements that come to mind relate to automation and digitization of functions which may not be from the latest technologies.

The responses indicated that they are largely aware of the possible effects of new technological advances to their industry. The findings are presented in summary in the following chart (Chart 4.2).

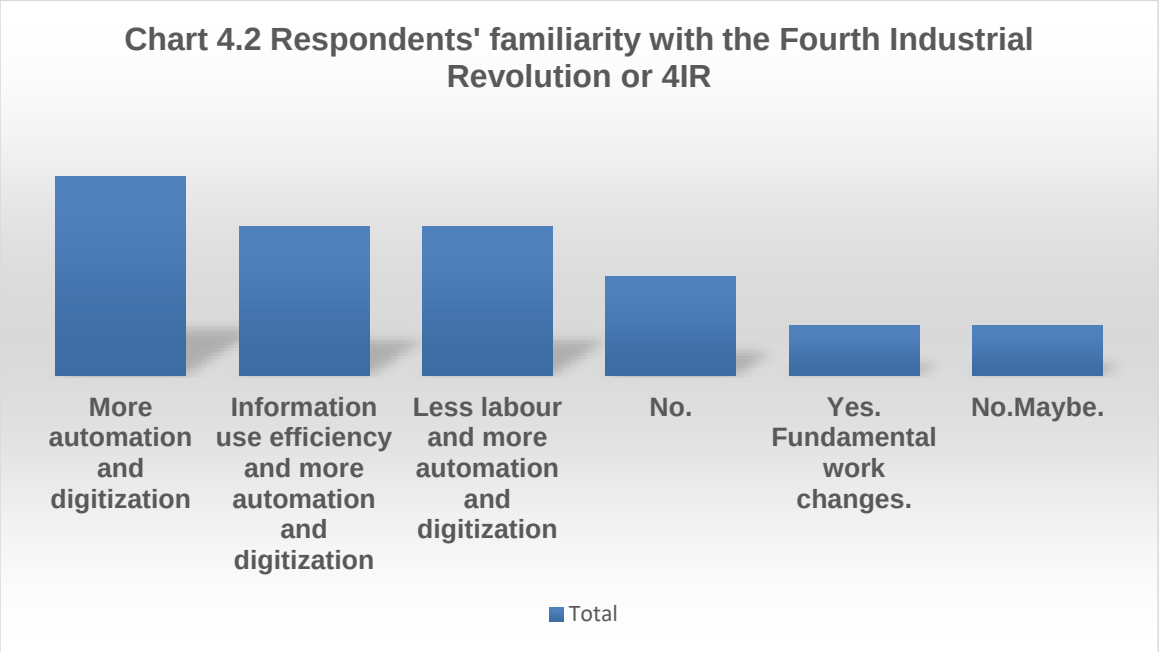


Chart 4.2 Respondents' familiarity with the Fourth Industrial Revolution or 4IR (Author's Construction)

Overall, it was only a small number of respondents who admitted to not being familiar with the term and what it entails. The large number that was more familiar shed significant light to the research question. Most of the respondents' familiarity seemed to however be related to the effects of 4IR, such as automation and digitization more than identifying the technologies that characterise it, that is AI machine learning, IOT, OCR, RPA, etc. Only a third of the respondents

mentioned them, such as “I think robotics, I think artificial intelligence” (Respondent 8) and "It's more about how to perform within the space of artificial intelligence and automation and do away with the manual labour-intensive way of working" (Respondent 11).

In Lewin’s change theory, the second step involves change of thoughts, feelings, behaviour, or all three. The interviewed participants’ responses suggest that a lot of them have experienced this second step. As Westerman (2014) stated that there’s standardisation and automation of repetitive tasks when deploying new digital technologies, most of the respondents agreed to the fact. Most of the participants’ responses suggest that they already understand that effect, as seen in chart 4.2. To then ensure there’s a successful and sustainable transition towards the new digital technologies, identifying and building foundational skills may be required (Westerman, 2014). This may apply to the participants who seemed to not have the latest 4IR technologies in their radar.

The building of the skills was substantiated by Marwala (2020), who shared the recommendations that were submitted to South Africa’s Presidential Commission on the 4th Industrial Revolution (PC4IR), which was responsible for presenting SA’s overarching 4IR strategy (Government gazette, 2020). This is because the recommendations included measures such as setting up an AI institute, a platform for advanced manufacturing, 4IR infrastructure development, policy, and legislation for 4IR and providing incentives to industries, platforms, and applications of 4IR in the future. These recommendations were meant for South Africa to stay up to date and mitigate against unemployment, but also apply to

employees in the food manufacturing sector. This in turn links to the next research question.

Second research question

How do South African Food Manufacturing Industry employees perceive potential job displacements resulting from 4IR automation?

4.3.3 Overarching theme 3: Numerous automation and digitization solutions have been recently introduced at our workplace.

This overarching theme groups the general sentiments of employees about the introduction and implementation of automation and digitization technologies in their respective organisations. The responses that make it up are intended to help identify the extent to which 4IR digital technologies have been introduced to the sampled food manufacturing companies' respondents. The feedback would then shed further light on whether the perceived 4IR technologies are not just technologies from the third industrial revolution. Furthermore, the participating employees' perceptions of these technologies is also addressed.

Literature from Frey (2017) noted that new advances in technology include Artificial Intelligence and its subfields like machine learning have measures intended to automate cognitive tasks. Akyazi et al, (2020) also noted that the latest means of manufacturing entails using smart technologies. The food industry is to expect quick and constant changes resulting from automation, which would lead to more innovative and efficient processes, products, and services (Akyazi et al, 2020).

Although Roberts (2022) study highlighted that 40% to 50% of the South African public had no basic knowledge of 4IR, the responses from this study's interviewed participants regarding being introduced to new technologies that included automated ways of working were mostly "yes", as seen in Chart 4.3 below.

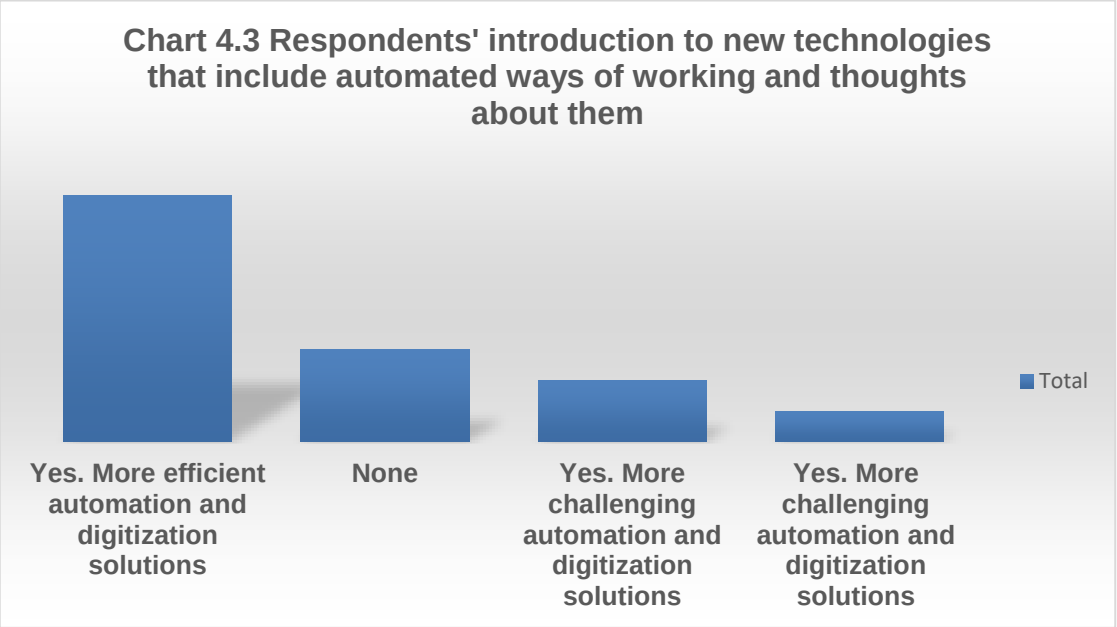


Chart 4.3 Respondents' introduction to new technologies that include automated ways of working and thoughts about them (Author's construction)

Addressing their thoughts about the technologies resulted in most of them stating they have been recently introduced to the technologies that digitize and automate their work with greater efficiency. Some notable responses that agree with Akyazi et al, (2020) regarding smart technologies include "Yes, the integrated business planning tool that's been implemented", just actually populates the entire end-to-end supply chain and shoots out the demand capacity, rough check capacity planning, etcetera" (Respondent 2), "Well, automation is good". "There's less time running reports manually"." it's quite efficient". "It helps with efficiency." (Respondent 3), "Yes". "We have now been introduced to an auto-clearing

system whereby you now just do things once". "It makes things easier"." It saves us time". "We have time to do other stuff". "It really helps a lot." (Respondent 7), “Yes, I think it's fantastic, I've seen the benefits of it, but I've also seen the cost-savings, an automated palletiser specifically, there isn't that much defects, it makes working a lot easier" (Respondent 11) and "Yes, we have now been introduced to an auto-clearing system whereby you now just do things once, It make things easier, it saves us time. We have time to do other stuff. It really helps a lot". There’s also a response that is quoted "I have introduced some things, like holograms, able to display some sort of interactive message with different panels showing different things. Shoppers become very interactive. It doesn't require a physical person to talk to the product" (Respondent 10) which to some extent agrees with Frey’s (2017) statement about how latest advances in technology include artificial intelligence and its subsets, like machine learning for automating cognitive tasks.

Noting the last step of Lewin’s change theory, which involves establishing the change as the new norm and includes incentivising employees for adopting and embracing the new ways. The findings from the theme suggest that most of the interviewed food manufacturing industry employees agree are accepting of the new technologies. Based on the sentiments they shared, most of them see the benefits of cost and time savings associated with the newly introduced systems. There is also evidence that suggests that some of the organizations were only adopting third industrial revolution technologies recently. To quote some responses, "most things we have to go into the systems physically and pull them out and clean them up. They do physical counts. They don't have this thing that some other companies have, that counts material coming in and out and then it

updates" (Respondent 9) and "Since we are working from home, they've introduced paperless work. We are no longer using papers. We do everything remotely, but sometimes it's challenging because it creates more work" (Respondent 13). This suggests that some of the food manufacturers are lagging in the 4IR adoption curve, whilst most are already making capital investments to keep up. In turn most of the employees have been somewhat exposed to automation and digitization, along with the resulting efficiency benefits. The next step of this study was to further delve into the effects of adopting 4IR technologies, as highlighted in the final overarching theme that follows.

4.3.4 Overarching theme 4: Robotics and automation would be mostly beneficial to the business at the expense of job losses.

This theme resulted from the participating food manufacturing employees sharing their sentiments over robotics and automation being used for work previously done by employees and whether they believe that their jobs are at risk of automation. This part of the interview was intended to ascertain how the employees perceive the impact of 4IR technologies (as they define them) on jobs or employment in their industry. It is expected to aid in providing substantial feedback to then answer the second research question about “How do South African Food Manufacturing Industry employees perceive potential job displacements resulting from 4IR automation?”

Considerations such as Frey’s (2017) documented study on how new technological advances like AI are measures intended to automate cognitive tasks, where job functions that may not be simple and repetitive are also at risk of automation meant that employees who held more senior decision-making

decisions also had to reflect on how they would be possibly impacted. Whether they believe that their jobs are safe from 4IR-driven automation or not.

State representatives who contributed to the International Labour Organisation's (ILO) 2019 "Work for a Brighter Future" report acknowledged that new jobs will be created by robotics and automation and there may be individuals who will lose jobs in this transition due to being underequipped to take on the newly created opportunities (ILO, 2019), The FoodBev SETA (2021) also notably reported on how the food industry was moving away from employees who perform lower level functions. Roberts (2022) further reported that 62% of workers expressed that they are afraid of job losses due to automation and that about 13% of the current job activities may be automated by 2030 (Roberts, 2022).

Responding to the questions, most the participants however indicated that they see robotics and automation as an opportunity for businesses to improve their way manufacturing and selling food, but they expected it be followed by an increase in unemployment. Only a few shared the belief that employees are still required, as seen in the following chart (Chart 4.4).

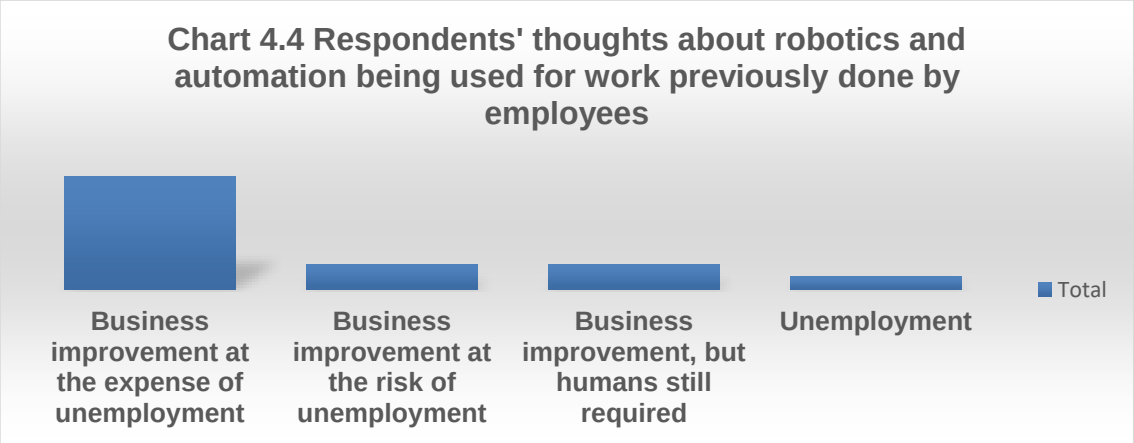


Chart 4.4 Respondents' thoughts about robotics and automation being used for work previously done by employees. (Author's construction)

The respondents who shared the belief that the new technology would be improving their food manufacturing businesses at the expense of unemployment expressed that "It's got its pros, and its cons. Pros is accuracy you know and maybe less time used but cons are people lose their jobs". "Cause now if everything is going to be automated or use robots and all that, obviously, unemployment, it causes unemployment" (Respondent 1), "Well, I think it's a necessity. It's bound to happen because there's certain things that people are doing manually that could be automated and so helps us to get the job done quicker and reduce man hours" (Respondent 3), "It will help us save time and reduce the cost of labour". "a great concept for companies to have, but for employees, they will only hire a few employees to operate the machines." (Respondent 9) and "In a factory setting, it makes sense because of batch production, economies of scale and of scope, so makes a lot of sense. I am for it, but obviously like any other person who is in South Africa, with high unemployment, there's the downside of things where it's going to cost a lot in terms of jobs. I might be replaced by basically a robot or an app you know. So, for the company it's a good thing. It's going to save money, I guess, but as an employee, it's really not something I would look forward to if it's going to cost me my job." (Respondent 14). These responses support Frey's (2017) findings on how more cognitive jobs are also subject to AI replacement.

Participants further elaborated their thinking in relation to robotics and automation technologies replacing our current roles at work as presented table 4.1 below:

Table 4.1 Respondents' thoughts around robotics and automation technologies replacing their current roles	**Respondent count**
Not all jobs. Where possible, yes.	3
It's heading there.	2
It's heading there. The company benefits. The consumer benefits. It's conflicted.	2
It's heading there. Employees need upskilling.	2
Not all jobs. Where possible, yes. Not anytime soon. Human creative time-benefit.	1
Where possible, yes. The company benefits.	1
It's heading there. The company benefits. It's morally conflicting. Employees need upskilling.	1
Not all jobs. Employees need upskilling.	1
Not all jobs.	1
Grand Total	**14**

Table 4.1 Respondents' thoughts around robotics and automation technologies replacing their current roles.

The tabled responses indicate that most of the participants perceive that the food manufacturing companies are headed toward 4IR-driven automation of jobs. The thoughts they shared included "Eventually, I think that's the direction that most companies are taking" (Respondent 1), "Yes, it is replacing our current jobs because, even in the food industry people are losing their jobs. “So, I think it will

make an impact on my side in the food industry” (Respondent 13) and "But now there's a machine that does this, that's literally automated. There are some people who now have lost their jobs because of that machine. Their positions got redundant because we no longer need people who are going to pack our pallets for us because a machine can do it, so that's the risk" (Respondent 8).

Samundo et al. (2019) presented the integration of the latest 4IR technological advances into the food value chains, with automation tools such as robotics, IOT sensors and smart devices being adopted. The new advanced value chain seemingly provides logic behind expected job losses raised by the respondents in the quoted answers.

There is some contrast to the respondents’ views from the van Rensburg et al. (2021) literature on the perceived impact of 4IR on jobs. This is where the African infrastructure context is considered. Factors such as limited internet connectivity and electricity supply, like in South Africa which may be a restrictor to full 4IR adoption and its subsequent impact on jobs. Losses of traditional jobs with the advent of the latest technologies will reportedly lead to higher tech-related employment for the mid-, low, and high-skill employment segments, if African countries take advantage of the digital technologies’ capabilities and opportunities (van Rensburg et al., 2021).

The respondents who believe that not all jobs are subject to this automation followed in dominance. Their answers included logic like "Because at the end of the day, companies need people to be employed to make money. That's where the buying power and all of that comes from. If people are not employed, then what?" (Respondent 14), "I believe there's always room for people to do

something, because even all the robots and all these systems, they somewhere somehow need a human touch" (Respondent 12), "As much as people are worrying that AI and robotics will replace the current work, I think it frees up a lot of people to actually be more creative. I think it's a long way away from robotics replacing, you know, entire workforces. Obviously this all dependent on the on the job. But I think in in raw material manufacturing, you definitely do need a human element to it." (Respondent 5) and "It will help us save time and reduce the cost of labour. A great concept for companies to have, but for employees, they will only hire a few employees to operate the machines" (Respondent 9).

Similarly, there were also food manufacturing participants who believe that the 4IR-driven automation of jobs will only replace jobs where possible, with views such as "it shouldn't replace everything. I think it should only be replaced to the extent where there's a very well predefined gap area that required that technology to be implemented" (Respondent 2) and "Maybe you can have certain processes that are automated and certain robotics that do certain other jobs, but there's always going to be that human element that's needed, especially when it comes to decision making" (Respondent 3). These responses somewhat disagree to Frey's (2017) reported AI solutions, such as machine learning also replacing cognitive tasks.

Far less than half of the participants raised the upskilling of employees as a requirement for the companies to address the robotics and automation's impact on jobs. They expressed those concerns in their responses such as "We have to adapt, we have to upskill ourselves to the new ways of working or new ways of doing things" (Respondent 10), " So it's killing job opportunities for some of the

people. You find that the people who've been there for ten to twenty years weren't even upgrading themselves because they were so used to what they were doing manually, but these automatic things need skills that people don't have, and they can't even go back to school. I feel that the companies must at least introduce classes, instead of bringing new people who are advanced, they should be training those who've been there" (Respondent 7) and "I think it's a bigger, obviously conversation of how we empower ourselves as well. To be more skilled and to learn about these different technologies, so that we can be the ones that are trying to improve on them. So that they don't, in essence, take our jobs, but assist us or aid us in doing our jobs. So, I think it's a difficult space to be in. We all just must prepare ourselves in terms of how to make sure that we can perform our daily tasks in a way that is not replaceable by the technology, but aided by it, so that we ultimately just perform better" (Respondent 11).

In agreement with the participants, the need for upskilling was addressed by Akyazi et al. (2020), noting that the introduction of smart technologies for manufacturing will now need some new skills in the food industry. It brings up the question of what the new skill requirements for the food manufacturing industry would be. It also brings up the question of whether the employees are ready to meet any future skill requirements. The Deloitte (2020) study listed workforce readiness, soft, technical and entrepreneurship skills, along with lifelong learning as skill requirements for performing in a 4IR-driven work environment. These skills have notable disparity to the current dominant food manufacturing skills, as indicated by the FoodBev SETA (2018), which presented a report about the industry being dominated by elementary workers, manual operators, and clerical employees.

From an occupational level point of view, there was an almost equal representation of lower-level employees and senior managers per similar response. This means that similar sentiments that were clustered into codes and then themes came from almost the same number of respondents from different occupational levels. Codes relating to how new technology “eases work”, the familiarity with 4IR code being” yes” and 4IR technologies replacing jobs’ codes being “it’s heading there” and “not all jobs” were linked to all job levels almost equally. This implies that the study found did not find significant disparities to responses based on occupational levels.

In reference to Lewin’s Change Management Theory, with the three vital stages of change, which are “unfreeze, change & then refreeze”. The literature and findings from the thematic analysis provided insights on what extent the 4IR change means to the affected food manufacturing employees.

In Lewin’s “unfreeze” stage, the current situation is analyzed. Exploring the employees’ perception of 4IR technologies and related job losses, which is linked to the research questions, resulted in literature that informed this study of some employees’ knowledge and attitudes about automation and job displacements. The thematic analysis in this study also indicated there were overarching themes of positive about technology use and familiarity with the 4IR concept. Most respondents also revealed, through another theme, that there’s been some introductions of new technologies, that include automated ways of working at their workplaces. This is not withstanding that the study from Marwala (2020) expressed that some South African manufacturing companies are still lagging with the third industrial revolution.

Lewin's "changing" stage which relates to organizations putting measures in place to change thoughts, feelings, behaviour, or all of them. This study presented measures taken by state representatives in the form of the 2019 "Work for a Brighter Future" report, which compiled by the International Labour Organisation's Global Commission on the Future of Work (ILO, 2019) which included high level policymakers. As the commission reportedly examined ways to achieve a better future of work for all (ILO, 2019). As literature from Roberts (2022) revealed that there were largely negative attitudes and unfamiliarity about automation and robotic technology and the Oosthuizen (2019) study also revealed less concern about 4IR, managing thoughts, feelings, behaviour is proving to be an apparent need. The sentiments from the respondents in this study were also shared under the umbrella or theme of robotics and automation being beneficial to the business but detrimental to jobs. This is also reflective of the change management aspect of changing thoughts or feelings.

The last step of "refreezing" in Lewin's model, which is mainly about putting measures to ensure that individuals that are subject to change do not go back to their old ways and fully adopt the new. Literature from Schwab (2015) expressed that 4IR entails replacing several functions and jobs with technologically advanced automation tools such as Robotic Process Automation, OCR, 3D printing devices, Internet of Things, cloud computing and artificial intelligence. Marwala, (2020) noted that they also do not spare any "white collar" jobs. This stage would mean accepting the 4IR technologies as the new norm. Most Respondents from this study's interviews acknowledged that the 4IR technologies are part of the future and will replace most functions in the food manufacturing environment.

The literature and findings from the study assisted in identifying how the theoretical framework, which entailed Lewin's Change Theory underpins the study, as presented in conceptual framework.

4.5 Summary of results

Key findings from the study include:

I. Most of the participating food manufacturing employees (of different occupational levels) appreciate their roles and responsibilities and how technology can best help them perform their work at ease.

II. Most of the participants believe and understand that the fourth industrial revolution or 4IR implementation leads to digitization and automation of some functions and jobs.

III. A significantly large number of the respondents believe that 4IR will improve efficiency, which includes cost and time savings for their work.

IV. A lot of the respondents see job losses being inevitable, when 4IR-driven automation is adopted, albeit it will help improve the business.

V. A few of the responses from the food manufacturing participants indicated the need to upskill the current workforce to meet the 4IR skill set requirements.

CHAPTER 5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The conclusion of the study considers the literature reviews and findings from the research interviews to identify the extent to which the research questions are answered, and the research problem may be solved through the recommended solution.

5.2 Conclusion to research questions

5.2.1 *Research question 1: How do South African Food Manufacturing Industry employees from different occupational categories perceive the 4th Industrial Revolution or the digital technologies that characterise it?*

Most of the responses suggest that employees understand the fundamental role of the technologies that are associated with the 4th Industrial Revolution or the digital technologies that characterise it more than identifying the technologies themselves. This is due to the respondents alluding to technology that forms part of the third industrial revolution. The third that was then characterized by using computers and information technology for automating some production processes (Jideani & Afam, 2020).

The findings may be used to guide policymakers and employers to further understand the employee's thoughts about 4IR technologies, as they embark on adopting them of more of them. They also aid in understanding which stage of the management of change would they want to start with.

5.2.2 *Research question 2: How do South African Food Manufacturing Industry employees perceive potential job displacements resulting from 4IR automation?*

Most respondents largely have a perception that 4IR will lead to job displacement. A few of the participating employees believed that there are jobs that are safe from automation. Even fewer responding employees expressed that upskilling is a key necessity for food manufacturing employees to meet skill requirements.

5.3 Limitations

The limitations to the study included:

I. No in-person interviews imply no ability to read expressions and body language, which provide more insights when conducting interviews.
II. Surveys will require compatible devices that the employees may not have access to.

5.4 Recommendations

As this study's significance was the future food manufacturing value chain, which includes the integration of the latest job automation technology, the food manufacturing employees' input was explored in this study.

Recommendations to policymakers include intensifying and accelerating the means to raise awareness of the effects of 4IR for employers and employees. This means establishing an active taskforce that identifies 4IR job-automation knowledge gaps across the many companies that make up the Food Manufacturing industry.

Furthermore, a deliberate industry-wide change management process is urgently required as a measure to mitigate against job losses where possible. This is further to deploying the 4IR commission, departments of trade and industry and labour and higher education to educate the present and future employers, and employees about the importance of employees having the means to adapt to the ways of working.

These measures require recruiting and retaining based on upskilling and reskilling employees to meet the 4IR-inclusive skill requirements. To share sentiments like one of the research participants, “businesses need employed people to buy their products”. Efforts to protect and advance employees to adapt and thrive in a 4IR-driven food manufacturing environment will not only protect most employment but will also aid the very same businesses to retain a customer base.

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APPENDIX 1 – Instrument (Interview Guide)

Unstructured interview guide for Food Manufacturing Industry employees

a. How do you find working in a food manufacturing company?
b. How do you feel about using technology at your workplace?
c. What would you say is technology in your opinion?
d. Would you say that you are familiar with the Fourth Industrial Revolution or 4IR, in short? If so, what would you say it is about?
e. Would say that “4IR” exists in your work? If so, in what way?
f. Have you personally been introduced to new technologies that include automated ways of working at your workplace? If so, what do you think of them?
g. What do you think of robotics and automation being used for work previously done by employees?
h. What are thoughts around these robotics and automation technologies replacing our current roles at work?

APPENDIX 2 – Codes and Themes

Respondent number	a. Respondents' feelings about working in a food manufacturing company code	a. Respondents' feelings about working in a food manufacturing company sub-theme	a. Respondents' feelings about working in a food manufacturing company theme
1	Challenging	Challenging	Positive thoughts about the industry
6	Challenging	Challenging	Positive thoughts about the industry
9	Challenging	Challenging	Positive thoughts about the industry
11	Challenging	Challenging	Positive thoughts about the industry
12	Challenging	Challenging	Positive thoughts about the industry
14	Challenging	Challenging	Positive thoughts about the industry
2	Complex	Complex	Positive thoughts about the industry
12	Complex	Complex	Positive thoughts about the industry
2	Continuous learning	Progress-driven	Positive thoughts about the industry
4	Continuous learning	Progress-driven	Positive thoughts about the industry
10	Continuous learning	Progress-driven	Positive thoughts about the industry
11	Continuous learning	Progress-driven	Positive thoughts about the industry
14	Continuous learning	Progress-driven	Positive thoughts about the industry
6	Dynamic	Progress-driven	Positive thoughts about the industry
10	Dynamic	Progress-driven	Positive thoughts about the industry
11	Dynamic	Progress-driven	Positive thoughts about the industry
12	Dynamic	Progress-driven	Positive thoughts about the industry
7	Enjoyable	Enjoyable	Positive thoughts about the industry
11	Enjoyable	Enjoyable	Positive thoughts about the industry
3	Feels good	Enjoyable	Positive thoughts about the industry
5	Feels good	Enjoyable	Positive thoughts about the industry
6	Feels good	Enjoyable	Positive thoughts about the industry
8	Feels good	Enjoyable	Positive thoughts about the industry
13	Feels good	Enjoyable	Positive thoughts about the industry
14	Feels good	Enjoyable	Positive thoughts about the industry
1	I love it	Enjoyable	Positive thoughts about the industry
2	Interesting	Enjoyable	Positive thoughts about the industry
4	Interesting	Enjoyable	Positive thoughts about the industry
10	Interesting	Enjoyable	Positive thoughts about the industry
12	Interesting	Enjoyable	Positive thoughts about the industry
3	Positively impacting	Value-adding	Positive thoughts about the industry
5	Positively impacting	Value-adding	Positive thoughts about the industry
6	Positively impacting	Value-adding	Positive thoughts about the industry
8	Positively impacting	Value-adding	Positive thoughts about the industry
10	Positively impacting	Value-adding	Positive thoughts about the industry
13	Positively impacting	Value-adding	Positive thoughts about the industry
9	Frustrating	Not enjoyable	Negative thoughts about the industry

Respondent number	b. Respondents' feelings about using technology at their workplace code	b. Respondents' feelings about using technology at their workplace sub-theme	b. Respondents' feelings about using technology at their workplace theme	Overarching Theme 1
4	Challenging	Challenging	Positive thoughts about technology value at their company	Food manufacturing employees mostly have positive thoughts about their industry and the use of technology
13	Challenging	Challenging	Positive thoughts about technology value at their company	
4	Necessitates keeping up	Necessitates keeping up	Positive thoughts about technology value at their company	
5	Necessitates keeping up	Necessitates keeping up	Positive thoughts about technology value at their company	
6	Necessitates keeping up	Necessitates keeping up	Positive thoughts about technology value at their company	
10	Necessitates keeping up	Necessitates keeping up	Positive thoughts about technology value at their company	
12	Necessitates keeping up	Necessitates keeping up	Positive thoughts about technology value at their company	
6	Efficiency improvement	Efficiency improvement	Positive thoughts about technology value at their company	
10	Efficiency improvement	Efficiency improvement	Positive thoughts about technology value at their company	
11	Efficiency improvement	Efficiency improvement	Positive thoughts about technology value at their company	
14	Efficiency improvement	Efficiency improvement	Positive thoughts about technology value at their company	
3	More automation	Efficiency improvement	Positive thoughts about technology value at their company	
6	More automation	Efficiency improvement	Positive thoughts about technology value at their company	
7	More automation	Efficiency improvement	Positive thoughts about technology value at their company	
9	More automation	Efficiency improvement	Positive thoughts about technology value at their company	
10	More automation	Efficiency improvement	Positive thoughts about technology value at their company	
11	More automation	Efficiency improvement	Positive thoughts about technology value at their company	
14	More automation	Efficiency improvement	Positive thoughts about technology value at their company	
3	Quicker processes	Efficiency improvement	Positive thoughts about technology value at their company	
6	Quicker processes	Efficiency improvement	Positive thoughts about technology value at their company	
9	Quicker processes	Efficiency improvement	Positive thoughts about technology value at their company	
11	Quicker processes	Efficiency improvement	Positive thoughts about technology value at their company	
12	Quicker processes	Efficiency improvement	Positive thoughts about technology value at their company	
14	Quicker processes	Efficiency improvement	Positive thoughts about technology value at their company	
6	Saves costs	Efficiency improvement	Positive thoughts about technology value at their company	
10	Saves costs	Efficiency improvement	Positive thoughts about technology value at their company	
6	Better customer service	Value-adding	Positive thoughts about technology value at their company	
7	Better customer service	Value-adding	Positive thoughts about technology value at their company	
6	Better product outputs	Value-adding	Positive thoughts about technology value at their company	
10	Better product outputs	Value-adding	Positive thoughts about technology value at their company	
4	Eases work	Value-adding	Positive thoughts about technology value at their company	
5	Eases work	Value-adding	Positive thoughts about technology value at their company	
6	Eases work	Value-adding	Positive thoughts about technology value at their company	
2	Eases work	Value-adding	Positive thoughts about technology value at their company	
3	Eases work	Value-adding	Positive thoughts about technology value at their company	
10	Eases work	Value-adding	Positive thoughts about technology value at their company	
14	Eases work	Value-adding	Positive thoughts about technology value at their company	
8	Important	Value-adding	Positive thoughts about technology value at their company	
12	Important	Value-adding	Positive thoughts about technology value at their company	
7	Work improvement	Value-adding	Positive thoughts about technology value at their company	
8	Work improvement	Value-adding	Positive thoughts about technology value at their company	
11	Work improvement	Value-adding	Positive thoughts about technology value at their company	
12	Work improvement	Value-adding	Positive thoughts about technology value at their company	
10	Work improvement	Value-adding	Positive thoughts about technology value at their company	
1	A bit outdated	Outdated	Negative thoughts about using technology value at their com	

ndent number	c. Respondents' own definition of technology code	c. Respondents' own definition of technology sub-theme	c. Respondents' own definition of technology Theme
5	Advancements	Progress-driven	Work improvement tools
4	Automation	Automation tools	Work improvement tools
6	Automation	Automation tools	Work improvement tools
10	Automation	Automation tools	Work improvement tools
6	Digitization	digitization tools	Work improvement tools
12	Digitization	digitization tools	Work improvement tools
3	Eases work	Value-adding	Work improvement tools
4	Eases work	Value-adding	Work improvement tools
5	Eases work	Value-adding	Work improvement tools
7	Eases work	Value-adding	Work improvement tools
8	Eases work	Value-adding	Work improvement tools
9	Eases work	Value-adding	Work improvement tools
13	Eases work	Value-adding	Work improvement tools
6	Efficiency improvement	Efficiency improvement	Work improvement tools
8	Efficiency improvement	Efficiency improvement	Work improvement tools
10	Efficiency improvement	Efficiency improvement	Work improvement tools
12	Efficiency improvement	Efficiency improvement	Work improvement tools
3	Hardware and software	Computational	Work improvement tools
4	Hardware and software	Computational	Work improvement tools
8	Hardware and software	Computational	Work improvement tools
9	Hardware and software	Computational	Work improvement tools
13	Hardware and software	Computational	Work improvement tools
14	Hardware and software	Computational	Work improvement tools
5	Human capacity test	Progress-driven	Work improvement tools
6	Improved communication	Value-adding	Work improvement tools
7	Improved communication	Value-adding	Work improvement tools
8	Improved communication	Value-adding	Work improvement tools
2	Information access ease	Value-adding	Work improvement tools
6	Information access ease	Value-adding	Work improvement tools
6	Innovation	Progress-driven	Work improvement tools
11	Innovation	Progress-driven	Work improvement tools
1	Necessitates keeping up	Progress-driven	Work improvement tools
6	Necessitates keeping up	Progress-driven	Work improvement tools
1	Science	Progress-driven	Work improvement tools
13	Science	Progress-driven	Work improvement tools

Respondent number	d. Respondents' familiarity with the Fourth Industrial Revolution or 4IR, in short code	d. Respondents' familiarity with the Fourth Industrial Revolution or 4IR, in sub-theme	d. Respondents' familiarity with the Fourth Industrial Revolution or 4IR, in theme	Overarching Theme 2
4	Yes.Awareness.Efficient information use.Efficiency improvement.	Information use efficiency and more automation and digitization	Increased automation and digitization	Familiarity with 4IR through increased adoption of the latest technological tools for further automation and digitization of functions
12	Yes.Maybe.Automation.Efficiency improvement knowledge.	Information use efficiency and more automation and digitization	Increased automation and digitization	
6	Yes.Technology platform.Efficiency improvement.Improved customer communication.	Information use efficiency and more automation and digitization	Increased automation and digitization	
9	Maybe.Automation.Less labour-intensive.	Less labour and more automation and digitization	Increased automation and digitization	
11	Yes.AI.Automation.Less labour-intensive.	Less labour and more automation and digitization	Increased automation and digitization	
14	Yes.Automation.Less labour-intensive. Technological advancement emphasis	Less labour and more automation and digitization	Increased automation and digitization	
5	Yes.Digitization.Online activities.	More automation and digitization	Increased automation and digitization	
7	Yes.Digitization.Online activities.	More automation and digitization	Increased automation and digitization	
8	Yes.Digitization.Online activities.Robotics.AI.Coding.	More automation and digitization	Increased automation and digitization	
10	Yes.Digitization.Robotics.Technological advancement emphasis.	More automation and digitization	Increased automation and digitization	
13	Yes. Fundamental work changes.	Yes. Fundamental work changes.	Increased automation and digitization	
1	No.	No.	Not familiar	
3	No.	No.	Not familiar	
2	No.Maybe.	No.Maybe.	Not sure	

t	e. Responses regarding "4IR" existence at work code	e. Responses regarding "4IR" existence at work sub-theme	e. Responses regarding "4IR" existence at work Theme
12	Yes.Automation.	Yes. More automation	Increased automation and digitization
10	Yes.It's starting.Reporting systems.Manufacturing systems.	Yes. More automation	Increased automation and digitization
8	Yes.Minimally.Biometric sensors.	Yes. More digitization	Increased automation and digitization
4	Yes.New system implemented	Yes. More digitization	Increased automation and digitization
11	Yes.Not 100%.Automation.	Yes. More automation	Increased automation and digitization
7	Yes. Technology adoption. Automation.	Yes. More automation	Increased automation and digitization
6	Of course.Innovation.Technology adoption. Digital communication.	Yes. More digitization	Increased automation and digitization
13	Yes. Computer usage.	Yes. More automation	Increased automation and digitization
5	Yes. Social media. Online meetings.	Yes. More digitization	Increased automation and digitization
14	Yes. Some of it.Data usage.	Yes. Some	Increased automation and digitization
9	No.Mostly manual. Mostly MS Excel.	No.	Non-existent
1	No.	No.	Non-existent
3	No.	No.	Non-existent
2	Unsure.	No.Maybe.	Not sure

Respondent number	f. Respondents' introduction to new technologies that include automated ways of working at their workplace and thoughts about them code	f. Respondents' introduction to new technologies that include automated ways of working at their workplace and thoughts about them sub-theme	f. Respondents' introduction to new technologies that include automated ways of working at their workplace and thoughts about them theme
10	Yes.Hologram technology.Interactive communication technology.Expensive.Impactful.	Yes. More efficient automation and digitization solutions	Yes. More efficient automation and digitization solutions
6	Yes.ERP solutions.Communication tools.Manufacturing technologies.Digital platforms.Social media.Improved outputs.Quicker processes.Efficient.Improved consumer communication. Innovation.Technology adoption.Waste elimination.Digitization.Improved profitability.	Yes. More efficient automation and digitization solutions	Yes. More efficient automation and digitization solutions
12	Yes.Electronic data interchange.Customer integrating system.Digitization.Automation.Record-keeping efficiency.Improved customer-supplier communication.Eases work.Quicker processes.Efficient.	Yes. More efficient automation and digitization solutions	Yes. More efficient automation and digitization solutions
3	Yes.Eases work.Quicker processes.Efficient.	Yes. More efficient automation and digitization solutions	Yes. More efficient automation and digitization solutions
1	Yes.Eases work.Quicker processes.	Yes. More efficient automation and digitization solutions	Yes. More efficient automation and digitization solutions
11	Yes.Automation.Expensive.Cost-saving.Eases work.	Yes. More efficient automation and digitization solutions	Yes. More efficient automation and digitization solutions
7	Yes.Automation.Eases work. Quicker processes..	Yes. More efficient automation and digitization solutions	Yes. More efficient automation and digitization solutions
2	Yes. Automation solution.	Yes. More efficient automation and digitization solutions	Yes. More efficient automation and digitization solutions
13	Yes.Digitization.Challenging.System restrictions. Extra work.	Yes. More challenging automation and digitization solutions	Yes. More challenging automation and digitization solutions
4	Yes.Automation.Cloud-based system.Challenging.Beneficial in long-term.	Yes. More challenging automation and digitization solutions	Yes. More challenging automation and digitization solutions
14	Yes. Automation solution.Challenging.Extra work.	Yes. More challenging automation and digitization solutions	Yes. More challenging automation and digitization solutions
5	No.Read about them. Chip monitoring. Eases work.	None	No
9	No.No automation solution.	None	No
8	No	None	No

t number	f. Respondents' introduction to new technologies that include automated ways of working at their workplace and thoughts about them code	f. Respondents' introduction to new technologies that include automated ways of working at their workplace and thoughts about them theme	Overarching Theme 3
10	Yes.Hologram technology.Interactive communication technology.Expensive.Impactful.	Yes. More efficient automation and digitization solutions	Numerous automation and digitization solutions have been recently introduced at our workplace
6	Yes.ERP solutions.Communication tools.Manufacturing technologies.Digital platforms.Social media.Improved outputs.Quicker processes.Efficient.Improved consumer communication. Innovation.Technology adoption.Waste elimination.Digitization.Improved profitability.	Yes. More efficient automation and digitization solutions	
12	Yes.Electronic data interchange.Customer integrating system.Digitization.Automation.Record-keeping efficiency.Improved customer-supplier communication.Eases work.Quicker processes.Efficient.	Yes. More efficient automation and digitization solutions	
3	Yes.Eases work.Quicker processes.Efficient.	Yes. More efficient automation and digitization solutions	
1	Yes.Eases work.Quicker processes.	Yes. More efficient automation and digitization solutions	
11	Yes.Automation.Expensive.Cost-saving.Eases work.	Yes. More efficient automation and digitization solutions	
7	Yes.Automation.Eases work. Quicker processes..	Yes. More efficient automation and digitization solutions	
2	Yes. Automation solution.	Yes. More efficient automation and digitization solutions	
13	Yes.Digitization.Challenging.System restrictions. Extra work.	Yes. More challenging automation and digitization solutions	
4	Yes.Automation.Cloud-based system.Challenging.Beneficial in long-term.	Yes. More challenging automation and digitization solutions	
14	Yes. Automation solution.Challenging.Extra work.	Yes. More challenging automation and digitization solutions	
5	No.Read about them. Chip monitoring. Eases work.	No	
9	No.No automation solution.	No	
8	No	No	

›pondent number	g. Respondents' thoughts about robotics and automation being used for work previously done by employees code	g. Respondents' thoughts about robotics and automation being used for work previously done by employees theme
6	Emotive topic.Involves trade unions.Headcount priority.Technology benefits disregarded	Business improvement at the risk of unemployment
5	Improved business efficiency pros.Automation has limitations.Humans still required.	Business improvement, but humans still required
1	Improved business efficiency pros.Job loss cons.	Business improvement at the expense of unemployment
2	Improved business efficiency pros.Job loss cons.	Business improvement at the expense of unemployment
3	Improved business efficiency pros.Job loss cons.	Business improvement at the expense of unemployment
4	Improved business efficiency pros.Job loss cons.	Business improvement at the expense of unemployment
8	Improved business efficiency pros.Job loss cons.	Business improvement at the expense of unemployment
7	Improved business efficiency pros.Job loss cons.	Business improvement at the expense of unemployment
14	Improved business efficiency pros.Job loss cons.	Business improvement at the expense of unemployment
10	Improved business efficiency pros.Job loss cons.Automation has limitations. Humans sti	Business improvement, but humans still required
9	Improved business efficiency pros.Less human intervention.	Business improvement at the expense of unemployment
11	Improved business efficiency pros.Less human intervention.	Business improvement at the expense of unemployment
12	Improved business efficiency pros.Less human intervention. Employee upskilling require	Business improvement at the risk of unemployment
13	Job loss cons.	Unemployment

t number	Designation	h. Respondents' thoughts around robotics and automation technologies replacing our current roles at work code	h. Respondents' thoughts around robotics and automation technologies replacing our current roles at work theme	Overarching Theme 4
1	Materials buyer	It's heading there.	Agree	Robotics and automation would be mostly beneficial to the business at the expense of job losses
13	Claims clerk	It's heading there.	Agree	
10	Category Shopper Manager	It's heading there.Employees need upskilling.	Agree	
7	Credit controller	It's heading there.Employees need upskilling.	Agree	
11	Supply-chain planner	It's heading there. The company benefits. It's morally conflicting. Employees need upskill	Agree	
6	Managing Director, C-Suite consultant for FMCG industry and former Tiger Brands Managing executive	It's heading there. The company benefits. The consumer benefits. It's conflicted.	Agree	
8	Factory Logistics Officer	It's heading there. The company benefits. The consumer benefits. It's conflicted.	Agree	
14	Supply Channel & Raw Material Deployment Planner	Not all jobs.	Where possible, yes	
12	Planner	Not all jobs. Employees need upskilling.	Where possible, yes	
2	Manager, procurement commodity packaging	Not all jobs. Where possible, yes.	Where possible, yes	
3	Planning Manager	Not all jobs. Where possible, yes.	Where possible, yes	
4	Accounting officer	Not all jobs. Where possible, yes.	Where possible, yes	
5	Executive Business owner	Not all jobs. Where possible, yes. Not anytime soon. Human creative time-benefit.	Where possible, yes	
9	Materials Planner	Where possible, yes. The company benefits.	Where possible, yes	