AGRICULTURAL TECHNOLOGY'S EFFECTS ON ENTREPRENEURSHIP: A CASE STUDY OF THE MOPANI DISTRICT MUNICIPALITY IN THE LIMPOPO PROVINCE, SOUTH AFRICA

By

MANGENA MOKGADI LUCY

Student No: 8802335

A dissertation submitted in fulfilment of the requirements for the degree of Master's of Commerce

At the

DEPARTMENT OF BUSINESS MANAGEMENT

FACULTY OF MANAGEMENT, COMMERCE, AND LAW

UNIVERSITY OF VENDA

Supervisor: Dr. Nkondo L.G.

Co-supervisor: Dr. Nemushungwa, A.

(2022)

DECLARATION

I, Mangena Mokgadi Lucy, hereby declare that I am the sole and legitimate owner of this dissertation whose title reads; **Agricultural Technology's Effects on Entrepreneurship: A Case Study of the Mopani District Municipality in the Limpopo Province, South Africa**, as it is my work by origin and execution. I further declare that this dissertation has never been previously submitted for a degree to this or any other institution of Higher Education and Training, and that all the sources cited herein are acknowledged by means of a full reference list.

Signature: 

Date: 13.02.2023.

ACKNOWLEDGEMENT

My sincere gratitude and appreciation to the Almighty God and everyone who supported me in various capacities during this study. I am greatly indebted to my supervisor Dr. Nkondo, L.G. and co-supervisor Dr. Nemushungwa, A. who expertly led this research project.

I am also grateful and appreciative to the following institutions and individuals:

- The University of Venda's Department of Business Management.
- The MDM for allowing us to conduct this study there.
- Selected businesses' participants, for their time and inputs.
- My family and friends for their invaluable support.

ABSTRACT

Traditionally, agriculture was considered a low-tech industry with limited technical dynamics. As modernisation engulfed human kind, changes to the agricultural sector occurred, spearheaded by economic liberalisation. Economic liberalisation helped to reduce the sector's protection. These changes brought new entrepreneurial players into the sector, in addition to innovation and portfolio entrepreneurship. Despite these positive changes, the agricultural sector faces entrepreneurship challenges. A lot of these situational challenges are widely publicised in literature but not much has been written about agricultural entrepreneurship. This study, therefore, brings a new dimension to the entrepreneurship field of research. That is, the need for a study about the agricultural technology's effects on entrepreneurship is long overdue. Against this backdrop, this study investigated the agricultural technology's effects on entrepreneurship in the Mopani District Municipality. The study adopted a qualitative approach with a sample of ten participants using purposive sampling. Interpretive paradigm was used to underpin the study. Data was collected through interviews and analysed using thematic analysis. The study found that agricultural technology provides unparalleled benefits to farmers despite negative consequences associated with its use. The study recommends that farmers should familiarise themselves with the new agricultural technology's effects on their trade before embracing it. Policy makers are encouraged to formulate appropriate policies that would help to develop the farmers' knowledge and skills about agricultural technology.

Keywords: Agricultural technology, effects, entrepreneurship, interpretive paradigm, challenges.

Contents

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS.

AI	Artificial Intelligence
APS	Advance Photo System
COVID-19	Coronavirus Disease 2019
ERP	Enterprise Resource Planning
GIS	Geographic Information System
GPS	Global Positioning System
ICT	Information and Communication Technology
IT	Information Technology
LIDAR	Light Detection and Ranging
MRP	Material Requirements Planning
PC	Personal Computer
STATS SA	Statistics South Africa
WEF	World Economic Forum
WWW	World Wide Web
2U	Two Units
3D	Three Dimensional

CHAPTER 1: INTRODUCTION AND BACKGROUND TO THE STUDY

1.1 INTRODUCTION AND BACKGROUND

South Africa faces major challenges, such as poverty, low level of skills and work, and an urgent need for economic growth (Mzimba, 2017). Although South Africa faces all the political and economic complexities and problems, people “s desire to have better youth skills, a strong domestic system, ample job opportunities and a better life with faster economic growth means that its future will be brighter (Mobius, 2017). Nonetheless, seemingly inspiring and empowering technology may exacerbate social problems. On the other hand, the South African government is optimistic about opportunities of the fourth industrial revolution. Business systems have reached to a point where it is difficult to imagine work even in small organisations without key technologies for example, personal computers, receiving emails and keeping records. Technological innovation will speed up the work process and improve work accuracy. However, technology can have negative impact on entrepreneurship and it can cause employees to lose their jobs and reduce productivity. The importance of this study is to assist both entrepreneur, policy makers, and other relevant stakeholders in reflecting on the advent of technology and it will also assist the state in making a well informed choice as to whether to embrace the fourth industrial revolution in its entirely or in making choices on which aspects of the fourth industrial revolution to embrace because to embrace the whole fourth industrial revolution may according to this study result in job blood path.

People used to rely on the sun’s energy and nature to survive. The Industrial Revolution (IR), however, changed the way we lived for the better. The IR was the transition from the old to new manufacturing modes. This transition included moving away from manual production processes to machine use and their development, and the increased steam power use.

The IR includes periods in modern human history where technological innovation resulted in radical shifts in our socio-economic status. The reality is that the global economy has so far experienced three major industrial revolutions. According to the World Economic Forum as quoted by the Department of Trade and Industry (2018),

the world has entered the Fourth Industrial Revolution (4IR). The past three centuries saw a series of industrial revolutionary transformations that affected people's social and economic domains (Kravchenko & Kyzymenko, 2019). Each industrial revolution brought with it an innovative approach that significantly transformed the traditional industrial modes, the entire society, and people's ways of life at that time (Kravchenko and Kyzymenko, 2019).

The first industrial revolution took place between 1760 and 1840. It led to the steam-powered locomotive's invention and mechanised textile manufacturing (Cunningham, 2018). The steam engine's origination transformed farming from the feudal society's modes of production to the new machine led manufacturing systems (Mohajan, 2019). During this period, coal was the main source of energy, while trains were the primary mode of transport. That era marked the transition from manual labour to factory production due to mechanical engineering advancement (Mohajan, 2019).

The twentieth century ushered in the electricity era that spearheaded mass production and hence the second industrial revolution (Cunningham, 2018). The second industrial revolution was dominated by the internal combustion engine's invention, conveyer unification, automation, and chemical industry (Mohajan, 2019).

The third industrial revolution started in the early 1960s. It was characterised by the introduction of electronics and information technology to automate production (Xu, David, & Kim, 2018). The third industrial revolution permitted the use of advanced information technologies in production, including energy (renewable), smart grid technology, and hybrid engines, among others (Xu et al., 2018 cited in Taiwo & Vezi-Magigaba, 2021). The 4IR came into existence in 2016. Computer generated product designs and three-dimensional (3D) printing (to created solid objects by building up successive layers of materials), characterise the 4IR (Schwab, 2016).

The 4IR is, therefore, the digital revolution that began in the middle of the last century, and was full blown from 2016 onwards. It is characterised by a fusion of technologies that blur the lines among the physical, digital, and biological spheres (Prisecaru, 2016). Every industrial revolution's essence was and is to increase production. Thus, the three previous industrial revolutions, that is the first, second and third were triggered by technical innovations. The internet impacts the 4IR, enhancing the communication between people and machines in cyber-physical systems through enormous networks

in the process. Furthermore, the internet enables the collection and analysis of various data across machines, allowing for faster and, more efficient and flexible processes to produce higher quality goods at lower costs (Bondar, 2017). The emerging fifth industrial revolution is dawning upon the world, yet developing countries such as South Africa are still relying on the 4IR.

1.2 RESEARCH PROBLEM

In the 17th century, agriculture was characterised by low-tech production systems dominated by subsistence farmers (Cunningham 2018). That is there was no need to produce commercially as subsistence farmers were self-sufficient. Technological production was not necessary, and hence unknown. However, the last decade brought about changes that saw economic liberalisation and reduced agricultural markets' protection. Increasingly, agricultural businesses adapted to their market's vagaries, changing consumer habits, and enhanced environmental regulations, new product quality requirements, chain management, food safety, and sustainability (Lans, Seuneke, & Klerkx, 2013). These changes introduced new contestants, innovation, and portfolio entrepreneurship.

Modern agricultural technology increased employment rates, efficiency in food production, saved time, and reduced costs. Farmers gained significant benefits from the latest technological innovations. Farming is a business enterprise that depends on nature. Thus, farmers are faced by natural challenges such as drought, pests, and flooding, *inter alia*. These are attributed to climate change due to the increased greenhouse emissions that contribute to global warming, use of fossil fuel, and deforestation, among other factors (Gibb, 2015). King (2017) stressed that of late, farmers adopted new technology in their pursuit for more yields in their belief that 'bigger is better', thereby rendering small-scale operations impractical. Nonetheless, advances in robotics and sensing technologies threaten to disrupt today's agri-business model. There is a potential for intelligent robots to change farming's economic model to make small producer farming feasible once more.

Entrepreneurship studies focus on various entrepreneurial situations compared to agricultural entrepreneurship (Condor, 2019). There is, therefore, a dearth in literature on the agricultural technology's effects on entrepreneurship. Consequently, studies

about the agricultural technology's effects on entrepreneurship are needed. This study would help fill the gap in literature regarding this area of research.

1.3 AIM OF THE STUDY

This study's aim is;

- To investigate the effects of agriculture's technological advancement on entrepreneurship in the Mopani District Municipality, South Africa.

1.4 OBJECTIVES OF THE STUDY

This study's objectives are;

- To determine the Mopani District Municipality's business organisations' technological advancement and their current conditions.
- To evaluate whether agriculture's technological use has alleviated unemployment or worsened it.
- To investigate the need for technological advancement in agricultural entrepreneurship.

1.5 RESEARCH QUESTIONS

This study answered the following central questions;

- How are the Mopani District Municipality's business organisations' technological advancement and their current conditions?
- How has agriculture's technological use either alleviated unemployment or worsened it?
- What is the need for technological advancement in agricultural entrepreneurship?

1.6 JUSTIFICATION FOR THE RESEARCH

Information and knowledge are important if farmers are to understand and appreciate the role played by technology to boost agricultural productivity. While information on its own is not a panacea, it can help farmers make better decisions about what agricultural inputs and practices to adopt. Information can give farmers more bargaining power in their interactions with buyers (Mohajan, 2019). This study would, therefore, assist both entrepreneurs and the state to make informed choices regarding embracing the 4IR in its entirety or some of its aspects.

1.7 DELIMITATION OF THE STUDY

This study is limited to entrepreneurship. Entrepreneurship in this study's context consists of primary, secondary, and tertiary sectors. The primary sector consists of a variety of companies that extract or gather products from nature. Numerous sub-sectors are included in it, such as agriculture, forestry, and fishing (Pettinger, 2018). The secondary sector is made up of numerous companies that transform raw materials into finished goods. It includes of industries including manufacturing, construction, and utilities. (Pettinger, 2018). Tertiary sector consists of different businesses that are providing services. It comprises wholesale and retail, warehousing and transportation (Pettinger, 2018). This study focused on the Mopani District Municipality's primary sectors, specifically small businesses that specialise in farming and forestry.

1.8 DEFINITION OF OPERATIONAL CONCEPTS

1.8.1 Technology

According to Burung (2020), technology is a body of knowledge, skills, and techniques by which people transform and utilise the environment to create tools, process actions, and extract materials to meet their needs. Java (2020) stated that technology is the application of scientific knowledge for practical purposes, particularly in industries. It is the substances, both material and immaterial, resulting from the application of mental and physical exertion to accomplish some worth. Technology utilises few assets to efficiently manufacture products (Java, 2020). This study used Burung's (2020) definition of technology.

1.8.2 The 4IR

The 4IR is the fourth major industrial period since the initial industrial revolution in the eighteenth century. It is portrayed by a combination of technologies that obscure the lines among the physical, digital, and biological spheres; collectively alluded to as cyber-physical frameworks (Xu *et al*., 2018). According to Schwab (2015), cited in Xu *et al*. (2018), the 4IR is depicted as a world where people move between digital domains and disconnected reality using connected technology to enable and manage their lives. This study used Xu *et al*.'s (2018) definition of the concept.

1.8.3 Entrepreneurship

Ferreira (2020) defined entrepreneurship as a systematic invention that consists of a planned and organised search for changes and a systematic assessment of economic and social innovation. The process through which an entrepreneur establishes his business is known as entrepreneurship (Ferreira, 2020). Entrepreneurship could mean either small or large businesses or, economic and non- economic activities (Ferreira, 2020). It is considered risky and dynamic because a huge amount is invested in starting up a business. This study concurs with Ferreira's (2020) definition, which elaborates entrepreneurship to fit in well with it.

1.8.4 Unemployment

Unemployment refers to people who are employable but are not employed because they cannot find jobs (Ndzwayiba, 2020). Working individuals but are not in the right jobs are included in this group (Ndzwayiba, 2020). Unemployment is a genuine social and economic issue that impact people's lives (Corporate Finance Institute, 2015). This study adopted Ndzwayiba's (2020) definition of the concept.

1.8.5 Primary sector

Pettinger (2018) referred to the primary sector as concerned with extracting raw materials. The sector includes fishing, farming, mining, forestry, and oil extraction. It includes all business sectors that transform natural resources into commodities. The primary sector deals with natural resources. Pettinger's (2018) explanation of this concept was implemented in this study.

1.9. LITERATURE REVIEW

1.9.1 Introduction

This chapter developed an understanding of the magnitude of the effects of agricultural technology on entrepreneurship, investigated the requirements for technological advancement and entrepreneurship, found out the current condition of technological advancement in South Africa, and the extent to which technology plays a role in either lessening or worsening unemployment and poverty. Technology has a hierarchical structure, and entrepreneurs should understand that. There is a sound relationship between technological advancement and entrepreneurship. That is, latest technology enhances the flow of creative ideas in any organisation. Technology's transformative

impact is visible in the business world, where small businesses experience its good and bad effects (Aquino, 2021).

Technology offers many forms of opportunities to businesses to utilise to better society (Aquino, 2021). New businesses with innovative ideas evolve in developing countries, supporting and investing in digitalisation and digital entrepreneurship (Aquino, 2021). Entrepreneurship is critical in the 4IR's economic dispensation. It is characterised by increased digitalisation and products' interconnectedness, value chains, and business models (Crane Field College, 2018). Organisations co-create new inter-organisational value and supply chains in partnerships with local, regional, and global collaborative business ecosystems (Crane Field College, 2018).

1.9.2 Klaus Schwab's 4IR theory: Key issues for humanity development

The following technologies are potentially the driving force of significant changes in Klaus Schwab's proposed 4IR theory. That is, intelligence demonstrated machines, automated machines, autonomous vehicles, and bulk computing (Schwab, 2016). The said technologies have the potential to play a significant role in changes in the modern man's anthropological practices or his physicality. The 4IR era is a platform to implement artificial intelligence (AI) technologies in close connection with human intelligence. On the other hand, when most traditional human functions in production and everyday life are entrusted to AI, the fundamental revision of human anthropological practices comes to bear. On the other hand, the social component and anthropology face challenges. That is, many people lose their jobs, and conditions for social exclusion are established (people of low-skilled professions would not be able to fit into the 4IR labour market's new demands). At the World Summit on Technological Unemployment, Zahra, Wright, and Abdelgawad (2014) claimed that the above consequence was raised as a concern. Never before have so many industries been upended by new technology at the same time. Though 'creative destruction', or the replacement of lost employment with new ones would be a factor, the newest technologies have the potential to eradicate far more jobs than those currently in existence (Zahra *et al*., 2014).

Robotics, AI, and other disruptive technologies would soon be commonplace due to the rapid technological advancement. An industrial technical system that began in England and Scotland with the invention of a refined steam engine that was used in

the textile industry became international. However, it is not just the extension of the scope and the scale of industrialisation that has changed (Peters, 2017).

The following conceptual framework is proposed to resolve the research problem and its research questions.

Figure1. The impact of technology on entrepreneurship's conceptual framework

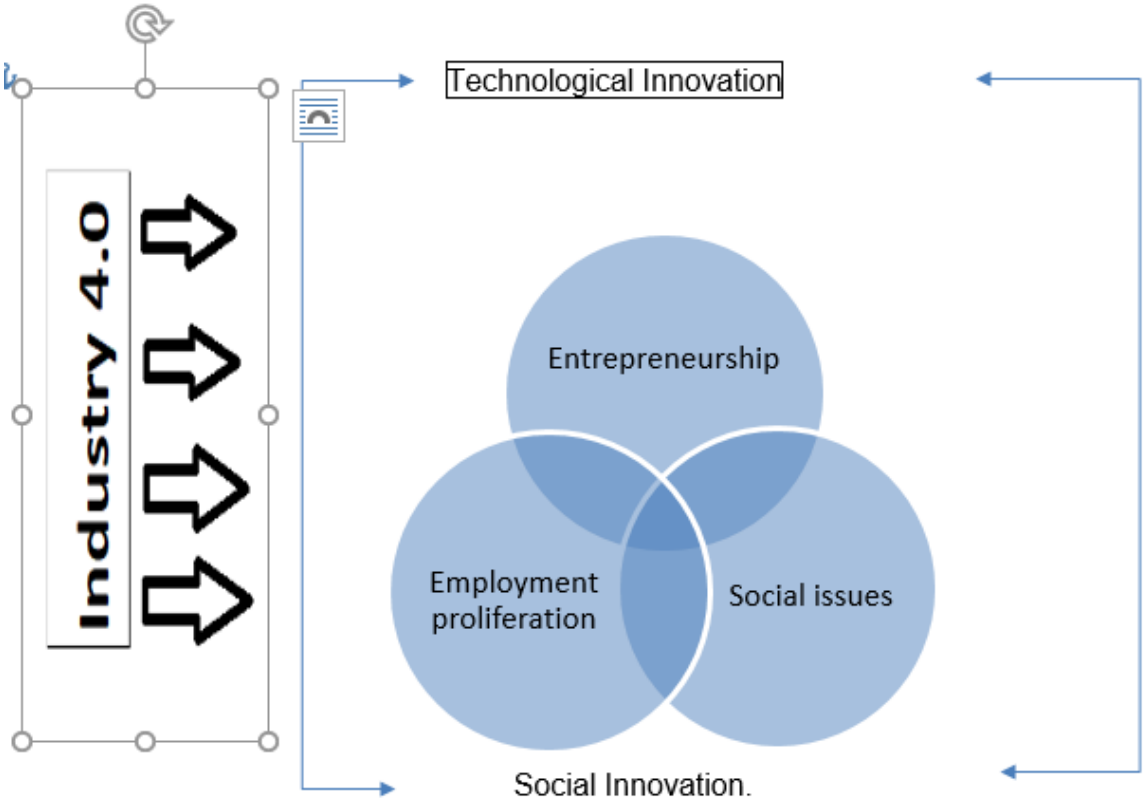

Figure 1. The impact of technology on entrepreneurship's conceptual framework.

Source: (Schwab, 2016).

The conceptual framework above is explained thus; the 4IR is one of change's major drivers in the business world. This means that it is important that entrepreneurs keep up with the latest technological innovations, particularly their benefits to them (Scott-Briggs 2020). There is a strong relationship among entrepreneurship, technology, and social innovation. Technological innovation generally identifies and addresses problems and opportunities, and solves problems using available resources and technological processes while considering those activities' outcomes or consequences. Social innovation involves new social practices that strive to address social needs better than the existing solutions. Entrepreneurs speed up the work process, improve work accuracy, improve working conditions, and increase productivity leading to employment proliferation. On the other hand, the social component faces challenges, that is, many people lose their jobs, and hence social problem related issues.

1.9.3 Degree of the effects of agricultural technology on entrepreneurship in the Mopani District Municipality

According to McOwoblow (2020), development in technology has helped plant, harvest, and sell crops, livestock, and animals. There are applications and websites where tractors and other expensive machinery could be rented (McOwoblow, 2020). There have been advancements in seeds and seedling modifications as well. With a recent introduction to improved seeds and seedlings, it takes a shorter time for crops to grow (McOwoblow, 2020). With the help of technology, middlemen could be excluded from agriculture's supply chain now. Mobile applications and websites have been specifically made for farmers to sell their products (Mc-Owoblow, 2020).

According to the Mkhabela (2020), multiple trends' convergence is at the heart of this technological transformation. The first is a shift from mass manufacturing to the increased efficiency, flexibility, and the cost effectiveness of mass customisation. Rapid advances in 3D printing (additive manufacturing), new material development, and improved customisation techniques, enabled by manufacturing's digitisation, fuel this trend (Mkhabela, 2020). The second shift, aligned to physical technologies, is mass personalisation. Mass personalisation is facilitated by social technology

enhancement, data processing capabilities, and the better integration of customer preferences with purchasing, production, and logistics (Mkhabela, 2020). A third shift is towards the increased use of AI to complement and substitute human thinking, often based on the accumulation of mass data as well as using advances in technology to implement it (Mkhabela, 2020).

1.9.4 The current condition of technological advancement in the Mopani District Municipality

According to the South Africa Country Commercial Guide (2021), South Africa has one of the largest information and communications technology (ICT) markets in Africa. It demonstrates technological leadership in the field of mobile software, security software, and electronic banking. The ICT goods and services business in South Africa has penetrated Africa's fast-growing market. Most of the new fixed and wireless telecommunications networks are supplied by South African companies and the international companies' local subsidiaries. E-commerce and related technologies have grown in popularity, with the South African online retailers reporting a considerable increase in their online buyers' year over year statistics.

1.9.5 The extent to which technology has either lessened or worsened unemployment and poverty

Casey (2018) stated that economists, politicians, and technology executives believe that the technological unemployment era is approaching. The shift in opinion is mostly due to automation, which could eliminate the human aspect from the supply chain. This approach reduces the compensation effects that previously permitted certain types of technology to create a net job (Casey, 2018). Regoli (2019) thought that the industrial revolution's pros and cons are struggles. On one side, many believe that society would not be where it is today without it. On the other side, societies must continue to focus on innovation without compromising safety or value. Latino (2019) believes that the 4IR increases job opportunities, making it possible for more people to have jobs because it inspires innovation, increases production levels, and creates competition.

On the other hand, during the first industrial revolution, many people lost their jobs because many business organisations' essential concern was profit (Regoli, 2019).

That revolution created a race to the bottom regarding worker compensation (Regoli, 2019). Business organisations could hire workers that would work for the lowest pay. Consequently, local jobs could get poached by foreign workers willing to work for much lower compensation (Regoli, 2019). Statistics South Africa Quarter Labour Force Survey (Stats S. A.) (2021), noted that South Africa experiences a 34.4% unemployment rate. Hibito (2017) opined that experience tells that technology can both worsen and mitigate poverty.

1.9.6 Requirements for technological advancements and entrepreneurship

Agwu and Onwuegbuzie (2018) asserted that technology has become a critical factor in most businesses. It was established that advances in global technologies have a positive effect on most entrepreneurial profitability, even though not all entrepreneurs have adapted the use of technological products to conduct their businesses (Agwu & Onwuegbuzie, 2018). McAravey (2018) reported that Citrix revealed that 92% of businesses across South Africa's key industrial sectors agree that digital adoption has a direct impact on company profits. Despite this realisation, more than half of these businesses (54%) indicated that they are unprepared for the future, demonstrating the high awareness of the need to adapt technologies.

Mkhabela (2020) pointed out that education is one of the most important components in development since it increases people's productivity and creativity while encouraging entrepreneurship and technological advances. Education is also necessary to safeguard people's economic and social progress, as well as to enhance income distribution. It has never been more crucial to invest in people as the world faces 4IR's profound economic, social, and political challenges. It has never been more important to invest in people. Mkhabela (2020) opined that education is and would continue to be vital to promote inclusive economic growth and ensure a prosperous future for all. Nonetheless, the 4IR's technologies create new pressures on labour markets, education reforms, lifelong learning, and reskilling initiatives. These would be key to ensure that individuals have access to economic opportunities by remaining competitive in the new world of work, and that businesses have access to the talent they need for future jobs.

The South African Country Commercial Guide (2021) claimed that major improvements could be achieved by intra-firm means such as personnel training and conducting in-house research and development activities. Development economists agree that local networks and clustering might help enterprises to develop and become competitive (South African Country Commercial Guide, 2021). Interactive learning between foreign firms and their local business partners is important to develop the South African industry's technological capabilities. Adams and Adams (2019) acknowledged that prioritising markets that provide a conducive environment for digital transformation would be key. Nigeria and South Africa lead the way in this regard, with Egypt, Kenya, Ghana, Senegal, and Uganda on their footsteps.

1.9.7 Reasons for entrepreneurs to incorporate technology

1.9.7.1 Communication

Ghamgui and Singh (2017) believe that good communication is necessary to allow information's efficient flow in a business. For the organisation to interact internally and internationally, technology provides many channels. Whether it be creating virtual work-spaces where employees could collaborate and develop ideas or use video conferencing to communicate with international businesses, technology could be used as an outlet that allows businesses to collect feedback from their customers (Ghamgui & Singh, 2017).

1.9.7.2 Productivity

Vardhan (2017) asserted that technological advances of different sorts have introduced advanced machines into the working environment and enabled organisations to automate work processes. Products and information could be quickly processed, requiring little or no effort by entering data on PCs and digitally transmitting them to recipients. Modern technology's advantages help empower organisations to increase productivity to elevated levels and reduce the expense of producing numerous products to levels where a wide scope of consumers can afford them

(Vardhan, 2017). Different types of the manufacturing technology incorporate, among others, automation and robotics (Cerra, 2019).

1.9.7.3 Reduced costs

Asaolu (2017) averred that these advantages lessen the costs of doing business. An increment in productivity enables entrepreneurs to accomplish more with fewer employees, and regularly decreases payroll costs on monotonous yet vital business obligations. Advances in communication could reduce travel costs by permitting distant executives to use the internet instead of meeting physically. Data storage reduces warehousing costs when report loads are put in hard drives (Asaolu, 2017).

1.10 NEGATIVE IMPACTS OF TECHNOLOGY ON ENTREPRENEURS

1.10.1 Security

Behrens (2018) argued that when entrepreneurs integrate technology into their business, they should be aware of the inherent risk that comes with it. That is, entrepreneurs might put themselves at risk of malware attacks when using technology and technological products. There are various online security threats, thus entrepreneurs should research before implementing them (Behrens, 2018).

1.10.2 Increased distraction in business

Yiga (2018) stated that technology offers entertainment that interrupts both entrepreneurs and workers, thereby decreasing the business organisation's productivity levels. For instance, the web based games, music, videos, and chatting platforms general consume a lot of the workers' productive time (Yiga, 2018).

1.11 RESEARCH METHODOLOGY

1.11.1 Introduction

This section illustrates the study's research methodology and its design. The aim is to ensure the alignment among the purpose of the study, research objectives, and research design. In addition, there is also the sample size and, data collection and analysis methods. The ethical considerations undertaken by this study are also outlined here. That is, being responsible for doing research and always taking the moral high ground (Saunders, Lewis, & Thornhill, 2012).

1.11.2 Research approach

The qualitative methodology, interpretive paradigm, and the careful use of the internet were used to obtain reliable and valid data in order to answer the research questions. The chosen methodology ensured that accurate information was collected. This research approach assisted in identifying the opportunities to address challenges associated with technological risks. Adopting the qualitative approach helped to understand complex data (Bryman, 2006 cited in Saunders, Lewis, & Thornhill 2012).

Secondary sources were used to obtain secondary data. Such sources allowed for an overview of the specific areas covered in literature. These also helped this study to narrow the gap between the available information and the required one (Saunders, Lewin & Thornhill 2012). Kuhn coined the term paradigm to describe an integrated cluster of substantive concepts, variables, and issues associated with appropriate methods and tools. Paradigm is a way of thinking about how to do research. It includes the methodology, approach, ontology, and epistemology required to conduct research (Bryman, 2006 cited in Saunders, Lewis & Thornhill 2012). Research paradigm offers a pattern of beliefs and understanding from which theories and practices of one's research project operates (Bryman, 2004 cited in Saunders, Lewis & Thornhill 2012). For this study, constructivism was used. Constructivists believe that there is no single reality or truth but rather multiple realities (Bryman, 2004 cited in Saunders, Lewis &Thornhill 2012). Constructivists invest their time and energy to decipher and interpret

an action's significance. For this reason, Constructivists tend to use qualitative research methods such as interviews or case studies to provide different perspectives (Bryman, 2004 cited by Saunders, Lewis & Thornhill 2012). Constructivism seeks to address the question 'why'. In this case, why do entrepreneurs embrace technology and its implication thereof?

1.11.3 Research design

The research design is a strategy of inquiry… (Jilcha, 2019). It summarise the sample size, data collection and analysis methods. The research design helps to provide the study's appropriate framework. This study is designed to contribute to an ongoing debate about technology and its impact on entrepreneurship. In order to achieve the study's objectives, a descriptive research design was utilised because the research described the entrepreneurs' situation. The descriptive research design is a theory-based design that involves collecting, analysing, and presenting collected data. The descriptive research portrays an accurate profile of persons, events, or situations (Jilcha, 2019). Jilcha (2019) reported that the research design offers the researcher a profile of described relevant aspects of the phenomenon of interest from an individual, organisational, and industry-oriented perspective.

1.11.4 Population and sampling

This study's population were small businesses within the Mopani District Municipality's primary sector. It is difficult to ascertain the exact number of businesses in the said municipality's primary sector. The non-probability sampling strategy was used in this study. Using the researcher's judgment, non-probability sampling helped to select a sample in which not all individuals in the population had an equal chance to participate in the study (Parveen & Showkat, 2017). This study required the researcher to get the small entrepreneurs' point of views on the impact of technology. The study's focus was on the primary sector, specifically entrepreneurs who specialise in farming and forestry. The sample comprised of a minimum number of ten business organisations in the Limpopo Province located in the Mopani District Municipality. The maximum number of participants depended on data saturation. The participants were randomly picked from the identified business organisations.

1.11.5. Data collection procedure

A direct observation that involved observing without interacting with the participants was utilised in conjunction with interviews. The following modernised machinery were observed; irrigation machinery, soil cultivation implements, and harvesting equipment. Their utilisation increases productivity, efficiency, and accuracy. It accelerates work but leads to the reduction of workers on the one hand, and the employment of cheap exploitable labour on the other. The face-to-face semi-structured interviews allowed the researcher to interact with the participants while observing their non-verbal cues during interviews. The researcher obtained an understanding of the participants' views through interview dialogues.

1.11.6 Data analysis method

Data analysis in qualitative research is a process of systematically collecting, arranging, and processing data to make an informed decision (Wong, 2008). Interviews and observations, and notes the researcher took were processed to increase the understanding of the phenomenon. There are several techniques to analyse data in qualitative research. The study used thematic data analysis method to analyse the data. The data from interviews will be transcribed from the recordings and field notes, and then analysed according to the emergent themes.

1.11.7 Ethical considerations

Saunders, Lewis & Thornhill (2012) asserted that the research ethics is the appropriateness of the researcher's conduct in connection with the rights of individuals and businesses affected by it. The following ethical issues were observed,

The rights of the participants. The partakers could refuse to participate, and this right was respected.

Right to privacy and voluntary participation. To take part in research should be voluntary and entrepreneurs could refuse to divulge certain information. Even though this might have affected the frequencies of answers as wanted by the researcher. This did not affect this study as the observation method complemented interviews. The right to privacy was respected and voluntary participation enhanced.

Anonymity. The participants' wish to remain anonymous was respected.

Confidentiality. The participants were assured that the data collected would only be used for the stated purpose of the research and that no other person would access that information. This was very important because information can be disseminated at the click of a button. It also means that one knows their participants but one removes all identifying information from the report. All participants have the right to privacy and one should protect them. One cannot collect data anonymously but one should secure their participants' confidentiality whenever one can (Bhandari, 2021).

1.12 OUTLINE OF THE STUDY

Chapter 1 introduces this study's major concepts and components and gives key information and enlightenment of the research problem. The study's objectives are outlined in this chapter as well. Key terms are defined in addition to the study's research questions. The layout of the chapters is also outlined.

Chapter 2 focuses on the study's theoretical framework, the degree of the effect of technology on entrepreneurship in the Mopani District Municipality, the positive and negative effects of technology on entrepreneurs, the benefits of the 4IR, the requirements of technological advancement and entrepreneurship, and the extent to which technology has played a role in worsening or alleviating unemployment and poverty are reviewed.

Chapter 3 provides a detailed justification of the study's research methodology and its research design. This chapter also details how data are collected and the sources where those data were obtained, the population, the data collection process, and other techniques utilised in analysing data.

Chapter 4 provides a detailed analysis and interpretation of data presented. The first part of the chapter contains the descriptive analysis of the research findings and the second part deliberates on the research findings' inferential analysis.

The succeeding chapter exclusively focuses on the research findings obtained from the conducted research. This study's results are compared to those of other scholars, either to support or refute their claims or findings.

Chapter 5 concludes this study. This is done through providing a summary of the findings. Thereafter, the study's recommendations about the effects of agricultural

technology on entrepreneurship are provided. The chapter addresses the research aims and objectives, confirms, and reports on the conclusions in relation to the study's objectives. The study's limitations, its proposed contribution to the body of knowledge in this field of research, suggestions for further research, and the conclusion end the study.

1.13 LIMITATIONS

This study is limited to investigating and understanding the effects of agricultural technology on entrepreneurship in the Mopani District Municipality of the Limpopo Province in South Africa.

1.14 SUMMARY OF CHAPTER 1

For individuals who are still uncertain about whether technology would replace jobs or not, there is no doubt that technology shapes the future. If one talks about marketing and business, the need for technology is profound. Today's world is technology driven. Many entrepreneurs benefit from technology. When the industrial revolution began, the assumption was that technology would replace jobs and increase unemployment. However, advances in electronics and robotics are likely to bring the same technological changes that replace unskilled labour, while simultaneously increasing the need for skilled workers and expertise. As a result, the time is now to embrace technological jobs to be at the technology and innovation's cutting edge. Thus, science and technology are relied upon to ensure the sustainable development of mankind and entrepreneurship. Agricultural technology plays an important role in the country's food security and the farmers' income. It constantly improves labour productivity, land's productivity, and the agricultural products' quality. Technology also makes full use of the available resources to improve agriculture's economic benefits and promote rural communities' economic development and upliftment.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

This chapter reviews literature about the effects of agricultural technology on the Mopani District Municipality's entrepreneurship. Also covered here are the theoretical framework, the technological advancement requirements, degree of the effects of agricultural technology on entrepreneurship, the breakthrough in technology, technology's disadvantages, and the extent to which technology has played a role in mitigating or worsening poverty and unemployment. This study adopted the qualitative research approach in order to obtain reliable results.

2.2 THEORETICAL FRAMEWORK

Laura (2018) indicated that technology advances rapidly, making the world undergo fundamental changes. Scott-Briggs (2020) also observed that technology is one of the major drivers of change in the business world. Wilburn (2018) noted that in nearly every corner of the world (from Mumbai to Madrid, for example), one cannot enter a café or walk down the street without seeing someone on their mobile phone, laptop or tablet conversing, texting or surfing the internet. Activities, jobs, skills, culture and needs have changed due to technology. In short, technology has become ubiquitous, and hence changes every aspect of how people live. Entrepreneurship has significantly contributed to technology development. Conversely, technology has equally impacted entrepreneurship, that is, it has helped to establish a sense of modern entrepreneurship (Wilburn, 2018). Wilburn (2018) claimed that at St. Edward's University, technology has accelerated the university's ability to help entrepreneurship to do more with less, with excellent results. Wilburn (2018) added that IA, big data, and internet systems work collectively to create programmes that businesses can utilise to reduce the time it takes to create and deliver products to customers.

Nigeria's Airtel Mobile Company (2019) found that technological advancement helps bring new ideas within an organisation. That is, new methods to decrease costs, new business growth concepts such as Uber, Airbnb, and new business models help to gain competitive benefits such as an eBay's online auction. The company's research

also found that proper technological advancement not only increases efficiency but also promotes the idea of entrepreneurship in an organisation where employees provide creative ideas to enhance business operations. Different tools such as communication, user experience, online selling, and updating of technologies impact entrepreneurship development. The Admin News Reporter (2018) announced that the advancement and new forms of technology such as internet technologies help to create a virtual global environment like conference calls and video chats. Time's value is considered, thereby minimising the need to travel. Thus, technology builds bridges that facilitate smooth operations and the ease of conducting business.

Using significant market research, technology assists the entrepreneur in making better decisions in challenging circumstances. Adetayo (2019) cited in Wilburn (2018) asserted that these technologies are in part inspired by the internet, which has not only enabled people to link easily in the World Wide Web (WWW) but it has also made it possible to quickly spread knowledge and information. However, Hoselitz (2017) cited by Nigeria" s Airtel Mobile Company (2019), raised issues about technology's downside, that is, youth become too attached to it that productivity is hampered in the process. Youth spend too much time surfing the internet. Worse more, industrialisation comes with pollution (Firican, 2020). Factories, autos, and airplanes pollute the air in some of the World's most modern cities. Improperly dumped chemicals and wastes cause water and land pollution.

Despite technological advancement's positive impact on entrepreneurship development, Sharma (2013) cited by Nigeria" s Airtel Mobile Company (2019), identified technological disadvantages such as false information, inappropriate use of technology, and delayed adaptation processes. Firican (2020) mentioned the issues to do with cybersecurity risks and ethical issues. In contrast, Well (2015) cited by Nigeria 's Airtel Mobile Company (2019), saw opportunities where organisations could engage with customers to solve issues to do with misleading information and adapt to technology by becoming aware of it through implementing the change management system. Arogundade (2016) cited by Nigeria" s Airtel Mobile Company (2019), opined that the misuse of technology might be combated by implementing similar control mechanism, establishing legal boundaries, and punishing those who break the laws to cause harm.

Anwana (2020) admitted that technology-based entrepreneurship has a substantial positive economic and social effect in South Africa. South Africa's Get-smarter start-up demonstrates that an internationally relevant and high-growth business could be developed during the 4IR. Ghamgui (2017) acknowledged that some South African entrepreneurs do not fully utilise technology to its complete extent to propel themselves to new heights. Tendai, Nicole, and Tafadzwa (2018) found that some small businesses are hesitant to adopt and adapt technology due to perceived costs and risks. Sitharam 2016) cited in Tendai *et al*. (2018) reasoned that without technology, small businesses struggle to grow because technology helps to stimulate innovation in firms. Technology encourages the diffusion, development, adoption, and use of the cutting-edge business techniques (Tendai *et al*., 2018). Technology improves a company's productiveness, responsiveness, and customer services. As a result, if the company wants to boost efficiency and productivity it has to embrace technology. (Tendai *et al*., 2018).

2.3 THE REQUIREMENTS OF TECHNOLOGICAL ADVANCEMENTS AND ENTREPRENEURSHIP

Agwu and Onwuegbuzie (2018) believe that technology has become central in most businesses' success. It was established that advances in global technologies have a positive effect on most entrepreneurial profitability, even though not all entrepreneurs adapt the use of technology to conduct their businesses (Agwu & Onwuegbuzie, 2018). McAravey (2018) mentioned that Citrix revealed that 92% of businesses across South Africa's key industrial sectors agree that digital adoption has a direct impact on company profits. Despite such broad realisation, more than half of these businesses (54%) indicated that they are unprepared to adapt technologies.

Mkhabela (2020) is of the idea that education is one of the most important components in development since it increases people's productivity and creativity while encouraging entrepreneurship and technological advances. It is also necessary for assuring economic and social progress, as well as enhancing income distribution. It has never been more crucial to invest in people as the world faces the profound 4IR's economic, social, and political challenges. South Africa could use the systems thinking tools to reskill its enormous pool of educated workers who are affected by employment

changes. Mkhabela (2020) admitted that education is and would continue to promote inclusive economic growth to ensure a prosperous future for all. Nevertheless, the 4IR's technologies create new pressures on labour markets, education reforms, lifelong learning, and reskills initiatives. These would be key to ensuring that individuals have access to economic opportunities by remaining competitive in the new world of work and that businesses have access to the talent they need for future jobs.

The South African Country Commercial Guide (2021) stated that major improvements could be achieved by intra-firm means such as personnel training and doing in-house research and development activities. Development economists agree that local networks and clustering might help enterprises to develop and become competitive (South African Country Commercial Guide, 2021). The Guide added that interactive learning between foreign firms and their local business partners helps to develop the South African industries' technological capabilities. Adams and Adams (2019) reported that the prioritisation of markets that provide a conducive environment for digital transformation would be key. Nigeria and South Africa lead the way here, with Egypt, Kenya, Ghana, Senegal and Uganda following behind.

2.4 EFFECTS OF TECHNOLOGY ON ENTREPRENEURSHIP

Aquino (2021) discovered that social media had a busy year in 2010 where Facebook introduced the deals feature to help local companies target specific audiences and Groupon became the largest coupon-sharing site while Twitter raised $3.7 billion capital from Kleiner Perkins and other venture investors. Small businesses embrace social media to reach out to potential clients in growing numbers. Over the last year, online advertising increased drastically (Aquino, 2021).

The Bureau of Labour Statistics in the United States (2021) claimed that working from home was not a new concept. What is new is that technology allows more businesses to close their physical offices in favour of virtual ones, with receptionists and physical addresses (Aquino, 2021). There are no statistics on the number of people who use virtual offices but the Bureau of Labour Statistics' self-employed workers are three times more likely than others to work from home (Aquino, 2021). Cloud Computing Services and web-based tools like the voice-over-internet protocol allow self-employed people to be in charge of larger companies (Aquino, 2021). Another cost-

cutting innovation is cloud computing, which allows business organisations to operate online without having to maintain their servers, routers, and other expensive hardware (Aquino, 2021).

Chao, Pham, and Seregine (2018) noted that while the competition between machinery and workers has long existed in the realm of physical tasks, it has only been recently introduced into the domain to potentially eliminate mental work. Modern technology such as microchips and computers has the drudgery in the same way that heavy machinery has reduced the need for physical work (Chao *et al*., 2018). Jobs in industry and agriculture decreased in the United States at the beginning of the century. However, the loss of those jobs opened the door to the creation of millions of new jobs and economic growth in other industries (Chao *et al*., 2018). The Pennsylvania State University (2016) pointed out that China has become the world's first obese country, overpassing the United States. To certain extent, this is due to the manpower decrease needed in agriculture. Aquino (2021) agreed that the AI-based systems already improve accuracy and efficiency at work.

Anwana (2020) reasoned that in South Africa, the technology-based innovative start-ups have experienced a healthy inflow of investment and growth. The country's two major economic hubs, Johannesburg and Cape Town, saw the most significant developments in the last five years. The ecosystem's growth has largely been driven by the private sector's strong efforts to organise through associations such as Silicon Cape and Corporate South Africa's investments in accelerators, incubators, and innovation programmes. In South Africa, 107 technology-related deals were completed in 2018. South Africa greatly benefits from technology-based entrepreneurship, both economically and socially. Get-smarter is an Ed-Tech business that offers short-term online courses to distance-learning students in partnership with top tier universities. It was purchased by 2U, an American Ed-Tech giant for $103 million in 2017. They claim that over 500 jobs were initially created and the number has since risen to over 1000 jobs in Cape Town. Cape Town's Sweep-South is another example of a start-up that makes beneficial, social, and economic impact in society. Sweep-South is a digital on-demand cleaning business that matches domestic workers with cleaning opportunities in homes and offices (Anwana, 2020).

2.5 POSITIVE EFFECTS OF TECHNOLOGY IN BUSINESS

Muhammed (2018) asserted that Middle East people live in strange and amazing technological periods. If one pays attention to media, one would notice that the advancement is quick and rapidly overwhelming. That is, the block chain, deep learning, neural networks and, robotics and smart AI-assistants help one to schedule meetings. Feroz (2018) agreed that organisations and companies utilise computers, latest software and applications, and high speed internet to move their businesses from local to global markets in order to compete with the industry's giant competitors from around the world. Technology's benefits to business are countless regardless of the industry's type (Feroz, 2018). Technology's advantages to business are; increased production, effective communication, and reduced costs, *inter alia*.

2.5.1 Increased production

Ramey (2015) mentioned that agricultural entrepreneurs' outputs have increased after the introduction of genetically engineered crops. These crops were developed to withstand extreme climate, pests, and diseases. They grow quickly and the farmer sees quick returns on his investments. Scott-Brigg (2020) and Balabushkin (2019) alluded to the fact that technology is available to aid productivity and increase business efficiency for one to get through most of her to do list faster. Technology streamlines many of the usual tasks, from managing one's account to improving the sales processes. Vardhan (2017) claimed that technological advancement brought with it advanced machines that automate work processes. By entering data on PCs and digitally transmitting those to receivers, products and information could be handled swiftly and with little or no effort (Vardhan, 2017). Manufacturing technology has progressed to a point that it is now required in manufacturing tasks that seek to reduce costs and eliminate waste. Any of these technologies such as ERP, MRP, or APS programming could be programmed to regulate the manufacturing processes to ensure that they run smoothly (Vardhan, 2017). Feroz (2018) pointed out that entrepreneurs could increase productivity by using various gadgets, machines, and equipment to quickly complete assigned jobs and activities.

2.5.2 Effective communication

Feroz (2018) asserted that technology's advantages in the field of business communication are unavoidable in the mobile devices era where workers communicate with one another to discuss business related issues in real time. Businesses and companies increasingly use virtual meetings to keep their business operations functional even when senior managers are not available. They may organise video conferences and meetings to interact quickly and efficiently using the latest compliance messaging applications and high speed internet. Companies could also build trust by providing good customer services with the business technology's help (Feroz, 2018). Hessert (2017) believes that technology makes communication easy. That is, people could now interact and see each other while talking to them via software such as skype or video chat.

Miller (2015) cited in Jilcha (2019) averred that mobile devices and other cell phones keep labourers connected, allowing them to share information via video content and virtual whiteboards and effectively locatable wherever they travel, cutting down on the time it takes to order a gathering. The internet provides a wealth of communication opportunities, allowing organisations to arrange for online meetings under any circumstance (Miller, 2015 cited in Jilcha, 2019). Organisations that exploit global systems end up working in markets throughout the world, allowing them to serve clients and belittle other providers from anywhere else. Effective communication facilitates innovation (Naude, 2017). It helps to prepare and execute plans. Communication technology builds a productive relationship, and new technology improves sound quality.

2.5.3 Reduced costs

Hessert (2017) opined that most of the entrepreneurs make use of technology in order to cut business costs. Technology could help one to handle work for two to three workers. Increased productivity because of technology's implementation in business is the most effective strategy to reduce business costs, that is, by having fewer

personnel at the workplace (Feroz, 2018). In many ways, technological advancements reduce business costs and expenses. For example, because most companies use the maintenance management software, properly maintained business assets are less likely to breakdown, and this helps the business to run smoothly without asset failure (Feroz, 2018). On the other hand, new communication solutions lower the business travel costs since video calling applications and software eliminate the need to visit an oversees client (Feroz, 2018). Furthermore, the contemporary computers' analyses and computing capabilities save money by allowing design firms to model virtual prototypes before building them (Feroz, 2018). Or a business organisation to simulate the effects of a suggested change in their business model before making costly changes (Feroz, 2018).

Asaolu (2017) stated that the accompanying benefits result in a cheaper cost structure and an increase in income for business organisations. Fortunately, there are also various technological concepts that might be implemented in business to reduce costs such as cloud computing, client relationship, the management software, business to business coordination, video conferencing, and webinar (Asaolu, 2017). Scott-Briggs (2020) admitted that everyone knows that starting up a business is expensive, and many companies fail in their initial stages due to cash flow issues. Many prospective entrepreneurs fail to start-up a business because they believe that they cannot afford it (Scott-Briggs, 2020).

However, technology can help to save money by reducing the amount of money spent on menial tasks and costs associated with using office space or hiring employees to carry out manual tasks (Scott-Briggs, 2020). Technology can also help one to be in a financially better position with online crowd-funding and fundraisers allowing one to get the capital that one needs to kick-start a venture without ready cash (Scott-Briggs, 2020).

2.5.4 Targeted marketing schemes and web-based advertising

Traditional marketing approaches could only go so far, especially in the digital age when more and more people open online shops (Scott-Briggs, 2020). By using targeted marketing, technology assists in the creation of current and persuasive marketing strategies. This allows one to segment audience and personalise one's

branding to their preferences (Scott-Briggs, 2020). Balabushkin (2019) could tap into a larger market than they previously had access to. Balabushkin (2019) found that more than sixty per cent of modern customers search for items online before they make purchases. If this proves difficult, there are numerous digital marketing software and specialists available to assist in the development of effective schemes for one's company (Scott-Briggs, 2020). The idea is to connect with potential customers that are more likely to invest in one's products and services (Scott-Briggs, 2020).

Lyfe Marketing (2019) noted that a solid digital marketing strategy is cost-effective for small businesses. One can reach a wider audience on the internet than one ever could with a local billboard or newspaper (Lyfe Marketing, 2019). Social media marketing is one of the popular and effective types of marketing that small businesses might utilise because it is not hard to understand (Lyfe Marketing, 2019). Rehman (2019) revealed that various companies expand their business online. Entrepreneurs could spend money online to promote their businesses on different websites through advertisements. Some of the known websites for promoting business are Facebook, Twitter, and Instagram (Rehman, 2019).

2.6 NEGATIVE EFFECTS OF TECHNOLOGY ON ENTREPRENEURS

Thompson (2018) argued that technology is a double-edged sword. In spite of the fact that adapting new technology can be gainful to a business, new technology comes with unique sets of risks. Without appropriate worker training on how to utilise a new software system, for example, technology could really diminish productivity and even reduce employee satisfaction (Thompson, 2018). The individuals' fast movement and corporate tasks data to online databases also make business organisations progressively powerless against cyber-attacks (Mercer, 2019). The following are technology risks, among others; increased security risks, increased distraction, and new technology.

2.6.1 Increased security risks

Behrens (2018) thought that as entrepreneurs integrate more technology into their business, they should be aware that there is an inherent risk that comes with it. In simple terms, when it comes to technology and technological products, entrepreneurs might put themselves at risk from malware attacks. There are various online security threats out there… (Behrens, 2018). McAfee (2018) realised that organisations

worldwide lose up to $400 billion because of hacking, credit card fraud, and intellectual property theft.

Yika (2018) said that technology has additionally allowed individuals to commit crimes directly from their homes under secrecy. This is known as cybercrime and it could be defined as any online criminal act committed utilising computers or other electronic gadgets to hurt others (Yika, 2018). It is essential to know and realise that there is a wide range of online crime and wrongdoing. All cases ought to be taken very seriously. Identity theft, credit card fraud, sexual harassment, and cyberbullying are just a few of the dangers that might occur (Yika, 2018). Through mobile devices, some malicious individuals steal business and consumer information, consequently costing business organisations a lot of money (Yika, 2018).

Firican (2020) asserted that when everything is connected, the risk of hacking data and tampering with them or using them for malicious intent is now more prevalent. It is not as contained as before. Dimitrieska, Stankovska, and Efremova (2018) assumed that when human lives become increasingly connected to different devices such as cell phones, cars, and light switches to home security cameras and smart speakers, a higher level of alert is raised. Privacy would be the main issue in this era (Dimitrieska *et al*., 2018).

2.6.2 Increased distraction in business

Yika (2018) pointed out that technology offers different types of entertainment, which act as an interruption to workers, prompting a decrease in productivity levels. For instance, web based games, music, videos, and chatting platforms generally consume the workers' working time (Yika, 2018). Adam and Adam (2019) identified a variety of factors that contribute to digital addiction. Technology can be an addiction when certain individuals constantly use their cell phones while driving (Ahmed, 2019). Latino (2019) argued that once one is hindered while carrying out a responsibility, chances increase that one would forget and overlook a significant step in the process. Chances are that one might even forget to return to the original task. Distractions bring down the entrepreneurs' productivity and energy (Latino, 2019). Rehman (2019) alluded to the fact that if employees use software to complete daily tasks, then their mind would not grow, they would face challenges at work and their talent would stall. Rehman (2019) added that if there occurred any problem on the internet, their work stops.

2.6.3 New technology

Technology is expensive as well. Behrens (2018) argued that even though technology helps to solve operational costs and increase productivity, to buy machines that replace workers is quite expensive. Such machines require continuous maintenance and standby technicians to operate and fix them in cases of break downs. Whenever entrepreneurs implement new technology, they would often spend several hours training employees on using those (Behrens, 2018). This generally costs entrepreneurs a lot of time and money when they should be concentrating on their core business (Behrens, 2018). Robb (2017) reported that for any technology, there is the upfront cost of producing it. Often, developing new technology costs millions if not billions in research.

2.7 THE EXTENT TO WHICH TECHNOLOGY WORSENS OR ALLEVIATES UNEMPLOYMENT AND POVERTY

Regoli (2019) argued that most of the processes and procedures developed during the industrial revolution required fossil fuel to operate. Fossil fuels are finite by definition, which means that one day they would inevitably run out. Unless new technologies are developed to stop our dependence on non-renewable energy sources, the developed world might one day become undeveloped states and cause another societal shift from urban to rural (Regoli, 2019). He added that every nation has encountered its industrial revolution. A considerable number of the world's poorest nations today depend on goods and services provided by industries outside their borders (Regoli, 2019). This means that whatever few resources they have go to products they need (Regoli, 2019).

Vardhan (2019) stated that while automation and the increased utilisation of high-technology machinery increases productivity. Additionally, it empowers business organisations to produce products and services with fewer labourers. Employees in jobs requiring a couple of skills would be the first to be laid off (Vardhan, 2017). At a time when fewer individuals are employed, the entire economy develops and grows slowly. The risk is that with fewer individuals earning a salary, there would be less demand for goods that business organisations produce (Vardhan, 2017). Less cash

would be paid in tax if technology like robots replaces workers. According to Stats-SA, South Africa has a 34.4% unemployment rate. As indicated by Le Roux cited in Ramey (2012), labourers of all skill levels. are in danger. Accountants, auditors, and dental experts are profoundly skilled but their occupations are incredibly susceptible to automation.

It is commonly acknowledged that technology has contributed to the worsening of economic poverty and widening income inequalities (Habito, 2017). As a result of unequal access to information and communication technology, the digital divide has grown between the rich and poor countries, as well as between affluent and poor individuals. Technology contributes to the betterment of people's lives. Experience tells that technology might exacerbate or alleviate poverty and inequality. In terms of social dimension, unemployment has become an issue for both the rich and poor countries. More unskilled and low-skilled workers lose their jobs as the technology-based production processes become less reliant on human labour (Habito, 2017). Technology has exacerbated environmental poverty. Technology-driven and energy-intensive industrialisation has resulted in widespread pollution and environmental deterioration. Genetically modified organisms, which are already widely used in commercial agriculture and food production, have sparked significant concerns about their potential negative effects on human health and the environment. Politically, the global financial crisis demonstrated how the technology-driven banking industry might jeopardise national sovereignty.

Governments are ill-equipped to prevent economic crises caused by private individuals such as foreign currency traders and fund managers, or, in the worst-case scenario, internet hackers. With a few computer keystrokes, technology would enable split-second transactions that potentially move billions of dollars across borders. However, poverty in all its forms does not have to deteriorate as a result of technological advancement. Placed at the disposal of the entire population, particularly in rural areas, the ICT could help disadvantaged rural populations achieve what their wealthier urban counterparts did, for example, by providing telephone, computer, and internet stations in every community.

Patil (2022) acknowledged that technology has changed lives for the better and made work processes easier for people. However, some conservative thinkers have made it

a long debated topic, citing the recent fear that technological advancements cause unemployment by changing the working processes. As technology advances, the labour market automatically decreases and is replaced by machines, resulting in more unemployment. Many procedures and processes that were once done manually are now being automated.

Now, it does not appear that AI would develop robots capable of entirely replacing people. In this situation, what would be the impact of technology in the workplace is unquestionably a source of anxiety. In workplaces, technological development has unquestionably impacted the amount, manner, and work conditions. Those who were curious to learn how technology destroys jobs should examine the reality that it has also created new jobs for those who keep up with it. However, many individuals today believe that technology's impact on employment destruction is greater than that on job creation. Technology's impact on our lives is rapidly evolving. Technology advancement has sparked concerns that it would replace various jobs held by unskilled workers who are unaware of the contemporary technological advancements. Working people must be more flexible in their employment and lifelong learners in order to stay up with technology. However, not everyone is resistant to change. As a result, new technology has a significant impact on local career chances. That is, most blue collar jobs are being replaced by computers, causing job loss anxiety. Technological advancement's impact on the labour market is that by eliminating human error and risk factors, the machine improves efficiency and performance. This destroys jobs for unskilled labour due to their inability to adapt to changes. Technology and unemployment are two sides of the same coin. If one is unable to cope with the technology change then there is an equal chance for them to face unemployment. The rate of technology development has seen workers are unable to keep up with the rate of technological advancement since it is so rapid.

2.8 SUMMARY OF CHAPTER 2

From the descriptive survey done by Nigeria "s Airtel Mobile Company (2019), it is evident that proper technological advancement not only increases efficiency but also promotes the idea of entrepreneurship in an organisation where employees provide creative ideas to enhance business operations. Different tools such as communication,

user experience, online selling, and updating technologies have an impact on the entrepreneurship development (Nigeria" s Airtel Mobile Company, 2019). Marie (2021) found that the 4IR's benefit could be cheaper goods and services, and its biggest threat being the growing gap between corporations and the population. There are also challenges such as inequality, ethical dilemmas, and cybersecurity.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 INTRODUCTION

The research procedure is described in detail in this chapter. The chapter illustrates the methods used to collect data and justifies why the said methods were opted for instead of others. The chapter also describes various research stages, which include the research paradigm, the research design, population and sampling, data collection procedures, data analysis methods, and ethical considerations. The aim is to ensure the alignment among the study purpose, research objectives, and research design. The study explored technology's effects on the Mopani District Municipality's entrepreneurship. This study would have contributed to the debate about technology's effects on entrepreneurship as there is no apparent consensus among scholars in this field of research.

3.2 RESEARCH PARADIGM

According to Ulz (2023), research paradigm refers to the beliefs and assumptions that provide the structure for the research. A research paradigm is a worldview or philosophical framework that controls how research is conducted. It comprises concepts, opinions, and biases. The research paradigm within which a study is placed influences how the research will be carried out. All aspects of the research plan, such as the study's goal, research question, tools or measurements, and analysis techniques, are guided by this fundamental idea. (Ulz, 2023) The positivist or interpretivist model types constitute the foundation of the majority of research paradigms. Both interpretivist and positivist research paradigms produce quantitative and qualitative studies, respectively. The positivist paradigm contends that there is a single, quantifiable reality. According to the interpretivism paradigm, there are various realities as opposed to one main reality. The study of interpretive paradigm is conducted in the real world of the people being studied, not in an artificial environment such as a laboratory. This study adopted the interpretivist paradigm research.

3.3 RESEARCH DESIGN

Jilcha (2019) explained the research design as the strategy of enquiry and the research method. It helps to summarise the sample size and, data collection and analysis methods. Another component that relates to the design are ethics. Ethics are

about being responsive to doing research and one's moral high ground. The research design's goal is to provide the study's acceptable framework (Jilcha, 2019). The decisions made about the research approach are informed by the research design. The latter determines how the relevant information would be obtained. The research design involves making several interrelated decisions (Jilcha, 2019).

This study employed the descriptive research design to address the agricultural technology's effects on entrepreneurship in the Mopani District Municipality. Saunders and Miller (2012) cited in Jilcha (2019) acknowledged that the descriptive research portrays an accurate profile of persons, events, or situations. The design helps researchers to profile described relevant aspects of the phenomenon of interests from an individual, organisational, and industry-oriented perspective. Therefore, the research design enabled the researcher to gather data from a wide range of participants about the effects of agricultural technology on entrepreneurship in the Mopani District Municipality (Jilcha, 2019).

3.4 POPULATION AND SAMPLING

Population and sampling are significant terms in research. Bhandari (2021) regards a population as a group of individuals with common connections. It is the entire group that one wants to draw conclusions about. A parameter is made up of all the data sets' constituents and the measurable population characteristics such as mean and standard deviations. A population does not always refer to individuals in a research. It can mean a group containing elements of what one wants to study such as objects, events, organisations, countries, and species, *inter alia* (Bhandari, 2021). Collecting data from a full community is usually simple when the population is small, accessible, and cooperative. When the population is large, geographically dispersed, or difficult to contact, it is necessary to use a sample (Bhandari, 2021).

Bhandari (2021) reiterated that a sample is a subset of the population. Sampling is the process of selecting the sample from the population. A sample is a specific group that one collects data from. The sample size refers to a number of people in that sample. The sample size is smaller than the population size (Bhandari, 2021). The more applicable the population sample, the more confident the researcher can be in the results' quality. Inferences about the population are made using samples. Samples are practical, cost effective, convenient, and inexpensive to obtain (Bhandari, 2021).

There are two sampling methods; the probability and non-probability. This study used the non-probability sampling in order to obtain the entrepreneurs' perceptions about farming and forestry. This study opted for a sample size comprised of ten business organisations in the Mopani District Municipality. The non-probability sampling is a method where each member of the population does not have an equal chance of being selected (Parveen & Showkat, 2017). With the non- probability sampling, the units of analysis could be selected at the researcher's discretion. When the researcher desires to select members, the non-probability sampling is better (Bhandari, 2021). This study benefitted from purposive sampling as it was cost-efficient and allowed for more time when gathering data (Yin, 2011). This was the suitable sampling technique for this study because participants are located far apart.

3.5 DATA COLLECTION PROCEDURE

Bhandari (2021) explained data collection as a systematic process of collecting, monitoring, measuring, and analysing precise insights for the study using the standard verified techniques. Kabir (2016) argued that the purpose of any data gathering is to capture high quality evidence that can be used to construct a convincing and credible response to the questions posed. In most cases, data collection is the primary and most critical research phase, irrespective of the field of study (Bhandari, 2021). Regardless of the field of study or preference for defining data (qualitative, quantitative) accurate data collection is essential to maintain the research's integrity. Using field notes, sketches, audiotapes, photographs, and other appropriate sources, the researcher must document any potentially helpful data thoroughly, accurately, and systematically (Kabir, 2016).

There are basically four options for gathering data; in-person interviews, mail, phone, and online. This study adopted the in-person interviews. That is, a semi-structured interview guide consisting of open ended questions was developed and used. In-person interviews were conducted to find out the following; the current condition of technological advancements in Mopani District Municipality's business organisations, the technological advancement and entrepreneurship's requirements, and the extent to which technology has played a role in alleviating or worsening unemployment and poverty. Interviews are when one tries to gain an in-depth understanding of

perceptions or opinions about a topic (Bhandari, 2021). Observation is to understand an issue/aspect in its natural setting, measure, or survey a sample without trying to affect them (Bhandari, 2021).

The interview process was executed face to face between the researcher and the participants. The data collection process was done using English in the majority of cases. The Sepedi language was used by some participants in order to effectively respond to some of the questions. The researcher translated their responses into English. During the interview sessions, the researcher used an audio recorder to record the participants' responses while noting down key words. The irrigation machinery, soils, cultivation implements, and harvesting equipment were observed. The irrigation machineries are equipment used to water crops on a large scale. Pump units and central pivot irrigation systems are generally included. The cultivation equipment is used to plough the fields in preparation for planting. Examples of cultivation equipment include tilers, disk harrows, and mould board ploughs. The harvesting equipment are used to harvest crops when ripe and fully matured. Examples include diggers, trailers, and combined-harvesters.

3.6 DATA ANALYSIS

Calzon (2021) said that data analysis is the process of collecting, modelling, and analysing data to extract insights that support decision-making. LeCompte and Schensul cited in Calzon (2021) explained data analysis as a process used by researchers to reduce data to a story by interpreting them to derive insights. The data analysis process helps to break down a vast amount of information into smaller bits. Three essential aspects take place during the data analysis process. These are; data organisation, summarisation, and categorisation. Collectively, these three aspects contribute to becoming the second known method used for data reduction. Data analysis helps to discover patterns and themes in the data, allowing for easier identification and linkage. Researchers analyse data in both top down and bottom-up fashion (Calzon, 2021). Marshall and Rossman cited in Calzon (2021) defined data analysis as a messy, ambiguous, and time consuming but a creative and exciting process of bringing a large amount of data to order, structure, and meaning.

Data analysis and interpretation is the process of using deductive and inductive reasoning to do research and analyse data. Data can be in different forms. That is,

qualitative data where data is presented in words and descriptions. The data collection and analysis' basic goal is to obtain unbiased final insights. This study acquired its data from interviews where audio tapes were transcribed according to each participant's responses. Data were classified and coded according to the themes and sub-themes that emerged. The said themes and sub-themes were then defined.

3.7 ETHICAL CONSIDERATIONS

Ethical considerations in research are a set of principles that guide researchers (Bhandari, 2021). When gathering data from people, scientists and researchers must always adhere to a set of rules. Human research's goal often includes understanding real-life phenomena, studying effective treatments, investigating behaviours, and improving lives in ways possible (Bhandari, 2021). What one decides to research and how one conducts that research involves key ethical considerations. These considerations help to protect the participants' rights, enhance research validity, and maintain scientific integrity.

Research ethics matter for scientific integrity, human rights and, integrity and collaboration between science and society. These principles make sure that participation in studies is voluntarily informed and safe for research subjects. It is always necessary to prevent permanent or excessive harm to participants, whether in-advertent or not. Defying research ethics lowers the credibility of one's research. That is, it is hard for others to trust one's data if one's methods are morally questionable. Even if a research idea is valuable to society, it does not justify violating the participants' rights and dignity. There are several ethical issues one should always pay attention to in one's research and these issues overlap with each other (Bhandari, 2021). These ethical issues were observed; voluntary participation, informed consent, anonymity, and confidentiality.

3.7.1 Voluntary participation

The participants were informed that they were free to choose to participate without any pressure or coercion. That is, they had the right to refuse to participate and this was respected. They were also free to withdraw from or leave the study at any point in time

if they so wished. The participants were not obliged to provide reasons for leaving the study. It is important to make it clear to one's participants that there are no negative consequences or repercussions to their refusal to participate (Bhandari, 2021).

3.7.2 Informed consent

Informed consent refers to a situation in which all potential participants receive and understand all the information needed to decide whether they want to participate or not (Bhandari, 2021). This include information about the study's purpose, benefits, risks and, funding and institutional approval. Participants were assured that their data would be kept confidential and that they could withdraw their information by contacting the researcher/supervisor. The participants were informed about why the research was conducted and were not subjected to unknown agreements in the process. Thus, the participants willingly took part in this study. No one was tricked into participating here.

3.7.3 Anonymity

Anonymity means that one does not know who the participants are and one cannot link any individual participant to their data (Bhandari, 2021). One can only guarantee anonymity by not collecting any personally identifying information such as names, phone numbers, or email addresses. The use of IP addresses, physical characteristics, photos, and videos were prohibited. The participants' wishes to remain anonymous were respected. This study's participants were told that their personal names, phone numbers, addresses, and their business information would not be recorded.

3.7.4 Confidentiality

Confidentiality means that one knows who the participants are but one removes all identifying information from the report. Participants have the right to privacy, and hence one should protect their personal data to maintain confidentiality. Even if one cannot collect data anonymously, one should ensure confidentiality whenever one can (Bhandari, 2021). The participants were informed that their personal information would remain anonymous and that the information they provided would be secured. The data collected were kept confidential and placed in safe that require access code.

3.8 SUMMARY OF CHAPTER 3

This study focused on the agricultural technological advancement in the Mopani District Municipality. As a result, the research approach used here was customised to meet particular needs. Although the qualitative approach received the most attention, inductive reasoning was also used. In order to learn more about agricultural technology's advancement in the Mopani District Municipality's business enterprises, interview questions were developed for data collection purposes. The interview questions were based on the study's objectives.

CHAPTER 4: DATA PRESENTATION, ANALYSIS, AND INTERPRETATION

4.1 INTRODUCTION

This study's data analysis outcomes are presented in detail here. The results are presented under the following major themes; the current condition of technological advancement, the extent to which technology plays a role in alleviating or worsening unemployment, and the technological advancement and entrepreneurship's requirements. This chapter describes the participants and presents the analysed data's results. The data were collected from ten participants using an interview guide. The semi-structured interviews with farmers operating in the Mopani District Municipality were one of the methods used to collect data.

4.2 THE CURRENT CONDITION OF TECHNOLOGICAL ADVANCEMENT IN THE MOPANI DISTRICT MUNICIPALITY

To address the above theme, the participants were asked to describe the current technological advancement in their businesses. Before doing so, however, the section first describes the participants in terms of their careers and level of education, *inter alia*. Such information is provided in Table 4.1.

4.2.1 Description of participants

The participating group included farmers specialising in different products. The participants were selected randomly without considering their age, race, and sex. The participants were selected from different business organisations in the Mopani District Municipality. Table 4.1 presents demographic data about the ten sampled entrepreneurs in the Mopani District Municipality.

Table 4.1: Participants' demographic data.

	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5
Type of business	Florist	Farmer: Crops	Farmer: Livestock	Forester	Forester
Education and training	BA (Social Work)	Certificate in Security	BA in Education	Diploma in Management	BCOM
Age	72	35	65	45	40
Years in Business	53	12	40	10	4

	Participant 6	Participant 7	Participant 8	Participant 9	Participant 10
Type of business	Crop farmer	Livestock farmer	Fruit farmer	Nursery	Fruits
Education and training	Diploma in Business Management	Diploma in policing	BA	N/A	Diploma in human resource
Age	63	62	75	70	43
Years of operation	17	23	30	32	14

Source: Researcher's creation.

Please note that P1, P2, P5…stands for Participant 1, 2, 5…

4.2.2 Understanding technological advancement

After collecting data through interviews, the researcher compared the data collected to ensure various viewpoints, beliefs, and opinions' consistency on how the Mopani Municipality District's entrepreneurs perceive or understand technological advancement. Different viewpoints, beliefs, and opinions were consolidated to produce solid results as indicated in sections below.

Table 4.2: Beliefs about technological advancements.

Major theme	Sub-themes
Technological advancement	Understanding technology
	Modern technology used
	Direct impact on the outcomes
	Ability to learn
	Future of technology
	Proactivity and innovation
Major theme	Sub-themes
Technological advancement	Understanding technology
	Modern technology used
	Direct impact on the outcomes
	Ability to learn
	Future of technology
	Proactivity and innovation

4.2.2.1 Understanding technology

The study results show that technology transforms the natural environment to accommodate human needs. The following statements from the participants confirm that understanding technology has benefits.

In response to the above idea, P3 stated that,

Technology is the use of modern machinery to make work simpler. It creates employment for the educated people. In general, technology makes it easier for business owners to supervise their businesses from a distance.

P 4 explained that,

Technology is used to improve our desires and wants because of the usage of modern machines.

P 5 reasoned thus,

Technology enables business owners to finish tasks that would typically require weeks of effort in a relatively short amount of time. It is used in farming, communication, transport, and education.

The above responses confirm that technological knowledge is helpful in agri-business.

4.2.2.2 Modern technology used

Given the participants' interview responses, it is clear that some farmers are aware of and use modern technology in the Mopani District Municipality. The introduction of new technology to the agricultural sector helped to boost productivity levels, along with an improvement in cost and labour employed. The GIS and GPS technologies have allowed specific agriculture for data collection, farm planning and, field and field mapping, and is used to give direction to the automated tractor. Various entrepreneurs that support surveys agreed with the above observations. Some of the participants' responses to theme 4.2.2.2 appear below.

P 2 claimed that,

I take advantage of the newest technology and use it to my benefit. I have the automated dairy equipment, automated feeder systems, automated cleaning systems, cameras, drones, and sensors.

P 4 elaborated thus,

I operate with the following; the GPS, GIS, LIDAR, log loaders, and stump grinders. The above mentioned tools are of great importance to forester because they are fast and efficient.

P 6 illustrated that,

In my business, I do use technology. Currently, I believe every business does. In my business, technology use is broad, starting from communication. Sometimes we do have meetings online where we use zoom, especially with people that are not closer to us. We have WhatsApp Groups for staff members. In the administration office there are laptops, and copying machines. A lot of information is captured online than it is manually. In the fields, moisture sensors and other equipment are used to water the plants. I do not have enough automated technology.

These results confirm that some farmers use and are happy about the current technological advancements in their agri-businesses. Conversely, some farmers admitted that they do not have technological machineries because of the type of products they produce. Their views on this issue are as follows;

P 1 indicated that,

I still use and rely on the traditional farming methods. That is, I do not require any form of technology in my business organisation because I deal with products that do not require any form of machine. So, I cannot comment on something that I do not use.

P 8 summed it thus,

I deal with kiwi products and avocados. When planting, there is no need to use automated machines.

These results show that some farmers in the Mopani District Municipality use the current technology to run their businesses while others, because of the nature of what they produce, still rely on the traditional farming methods. Entrepreneurs need to be creative and original in order to be competitive.

4.2.2.3 Direct impact on the outcomes

Agri-business demands high performance. If an organisation is well structured and embraces technology, then best outputs can be experienced. If there are strong systems in place to help farmers, high yields can be realised. The following are the participants' views on this idea.

P 4 said that, When the COVID-19 epidemic hit, I realised how important it was to have technological machines as I was able to work and manage production in my farm alone because people's movements were restricted.

P 3 was short and precise,

Technology saves me costs in terms of labour and boosts production.

P 6 asserted that,

Technology boosts my business in many ways. That is, it helps me to advertise my products on different social media platforms, communicate with customers, and one can update their location online so that people can know where to find their business.

P 8 revealed that,

Technology helps me to improve my business systems, products, and services. However, to develop and train employees requires a lot of money. For now, I do not have the financial capacity to do that.

P 10 opined that,

Technology has assisted me a lot in terms of increasing the farm's production capacity. It also makes it easier and simple to do work in the farm. For example, disinfecting through spraying machines.

These results indicate that technology directly impact output. That is, technology does increase productivity and one can work effectively using it without employees.

4.2.2.4 Ability to learn

Technological innovations have greatly shaped agricultural endeavours in the Mopani District Municipality. The smart application of new technologies could further help

farmers increase their yield margins in several ways. Nevertheless, the above might not be achieved if farmers do not embrace technological innovations. Some farmers noted that there is a need for both employees and employers to embrace new technology in agri-business. The participants' views in this respect provided an understanding of their beliefs on the above idea.

P 1 admitted that,

Technological changes are complicated and require well experienced and trained entrepreneurs.

P 4 claimed that,

Technology shapes my business and how my employees approach their work. Employees are motivated to learn more, and hence improved yields.

P 5 believed that,

Technology has pushed me to new heights. My employees have learned how to research, advertise, and hold virtual meetings to discuss business operational issues.

P 6 explained that,

Technology is used to develop both the employers and employees' farming skills. As technology develops, so do our knowledge and understanding of the farming business.

P 10 argued that,

While technology constantly evolves, some farmers maintain their studies to improve their farming skills and confront challenges they face. Given the rate at which we embrace technology, South Africa would soon have plenty of agro-technological appliances. Online shopping is now popular everywhere.

The results indicate that technology is used for research to help develop both the farmers and their employees. The farmers and their workers are also motivated to learn more about their businesses. Skills acquisition has helped farmers boost their sales, save productions costs, and increase productivity in their farms. Contrary to the

above, one participant differed with others on this idea. The said participant's contradictory view appears next.

P 9 argued that,

To me, technology causes distractions. For example, cellphones are used to abuse work time. Sometimes workers spent most of their work time on social media.

4.2.2.5 Future of technology

Another characteristic that came out of the study was the future of technology. There are several technologies that are presently available but are still under development. These include smart phones and drones. Modern farmers are equipped with smart crop sensors. Changes in technology include functional improvements in technology that is widely adopted. The following are the participants' views on this matter.

P 2 observed that,

Every element of life changes due to technological advancement, including how businesses are run and controlled, and how people live. Smartphones are utilised for research and advertisement.

P 3 opined thus,

I think it is important to accept and welcome technological advancement because it raises productivity and generally enhances our quality of life. Waru Warus are used to irrigate crops and store water. Some people would rather shop online than buy from local vendors. The challenge is with the elderly people who have little or no access to technology. Some are being scammed as they order online by fraudulent websites.

P 4 pointed out that,

I use GPS and other sophisticated tools to get soil data. "An array of similar hand-held receivers is used to download data from GPS, which is then stored in databases that combine them with other GIS information. Log loaders are used to collect and sort logs into heap load piles that are of sufficient size, and then move them into trucks for transportation.

P 5 asserted that,

Technology's fascination cannot be underestimated. To reject it is to refuse positive change progress. The LIDAR technology (Light Detection and Ranging) gathers tree measurements. Comprehensive images are also advantageous to contemporary foresters.

4.2.2.6 Proactivity and innovation

Both the employers and employees should be proactive and innovative in agri-business. It is believed that better performance's ingredient is the proactive and innovative behaviour of both employees and employers. That is, employees should support one to advance fresh ideas and those who can avoid or manage uncertainty. Agricultural producers might boost productivity through innovation. The participants said of the following regarding this issue.

P 2 agreed that,

Yes, I am aware, and it is really helping a lot in our farm. I realise its effects on my farm and I hope to adjust as it advances. One needs to be innovative. I deal with livestock and I am happy about the current technological advancements.

P 4 was of the view that,

Technology makes it easier to provide answers and solutions to problems. I utilise the GPS, GIS, LIDAR, log loaders and stump grinders because of technological improvements. The said tools are very important to foresters because they are fast and efficient.

P 5 admitted thus,

Yes, I admit that modern machinery is helpful and necessary to my farm. I am also keen to research and learn more.

P 8 explained that,

Technology constantly changes. As new information emerges around the use of technology, new ideas develop to improve current technology.

These results confirm that some farmers are proactive and innovative. Such farmers can cope with the current conditions brought by technological advancement.

4.3 THE EXTENT TO WHICH TECHNOLOGY HAS PLAYED A ROLE IN ALLEVIATING OR WORSENING UNEMPLOYMENT AND POVERTY

To address this objective, the participants were asked to describe the extent to which technology plays in alleviating or worsening unemployment. The purpose was to determine how farmers perceive and feel about technology. The following table indicate technology's benefits and problems.

Table 4.3: Technology's benefits and negative consequences.

Main theme	Sub-theme
Negative consequences	Technology and unemployment
	High costs of maintenance
	Lack of practical knowledge and skills
Benefits	Technology alleviating unemployment
	Economic growth
	Increased productivity
	Digital marketing and communication

4.3.1 Technology's negative consequences

The participants were asked for their views regarding the above idea and their responses were compared. The said comparison made it apparent that modern technology has a lot of advantages in agriculture. However, negative consequences were also identified. The following sub-section provides technology's negative consequences in the Mopani District Municipality's agri-business.

4.3.1.1 Technological unemployment

The participants' remarks reflect how they feel technology has brought problems to their sector. Many individuals lose their employment as automation takes over more

and more aspects of our human life. Technological unemployment describes a structural rise in unemployment caused by technological change. The participants provided their views as follows;

P 6 asserted that,

At the moment, technology is the primary cause of the deterioration of both unemployment and poverty because most of our youth are not enthusiastic about farming and its technological appliances whereas adults do not understand technology at all and are also reluctant to learn.

P 7 observed that,

My farm has two employees but I would have had more if not for technological advancements. Technology has worsened unemployment as modern machines forced me to retrench some of my workers. Many people become jobless and poor.

P 8 reasoned thus,

I think that the usage of technology worsens unemployment. With manual machines and tools, employees are required to operate them but the same cannot be said of the automated machines. The latter can operate twenty-four hours' non-stop.

P 9 admitted that,

Yes, it exacerbates poverty. Technology affects employment creation as machines are able to increase production when operated by a few individuals. Most workers become redundant, particularly those without qualifications. The agricultural sector is where many people without qualifications are employed. Therefore, the introduction of machines negatively affects their employment.

The results show that there is a need for farmers to understand and appreciate the technology's negative effects for them to plan accordingly.

4.3.1.2 High cost of maintenance

Agricultural technology's high maintenance costs are one of the drawbacks in the Mopani District Municipality's agricultural sector. The hefty maintenance costs make it

hard for small enterprises and farmers to survive. Farmers find it challenging to keep up with technology because they cannot afford its high maintenance costs. The participants lamented the problems they face in the following manner.

P 8 complained thus,

Besides, technological gadgets and machinery are expensive and sometimes one might be forced to reduce the number of his employees.

P 5 lamented thus,

Since automated machines are expensive, only competent and trained employees might operate them. This means that those who are not trained would be retrenched, leading to their poverty.

4.3.1.3 Lack of practical knowledge

Some farmers do not understand how to use current technologies in farming. This is a challenge in the case district. The said farmers still use the traditional farming methods. For them, using contemporary technology in farming is a challenge since they do not fully comprehend the benefits and risks associated with using technology in agriculture. Participants 1, 8, and 9 provided these views;

P 1 claimed that, I still use and rely on the traditional farming methods. That is, I do not require any form of technology in my business organisation.

P 8 said,

I sell kiwi products and avocados. When planting, there is no need to use automated machines.

P 9's response was,

I have no interest in the current technological advancement because I am unable to operate modern machines. They require advanced computer literacy and they are also a luxury in my view.

4.3.2 Benefits of technology

This section provides the technology's benefits as provided by the participants. After deliberations with the participants, their responses were to the effect that indeed there

are a wide range of technology's benefits in the Mopani District Municipality's farming sector. Some of their views are given below based on the sub-themes discussed during interviews.

4.3.2.1 Technology in alleviating unemployment

In contrast to technology's negative consequences such as, *inter alia*, technological unemployment, retrenchments, and reduced working hours, there are positives that technology brings to farmers. The participants were given the opportunity to list what they believed were technology's benefits. Their views appear below.

P 4 illustrated that,

Technology empowers poor people in rural areas to access food as it enhances productivity and high yields. One of the most effective ways to combat poverty is through modern technology.

P 10 explained that,

Technology alleviates unemployment. People are exposed to different ways of survival by technology use. Technological exposure is critical in alleviating poverty. The use of technology helps to increase food production.

4.3.2.2 Economic growth

Companies that use technology have the potential to save a lot of money by replacing human labour with technological innovations, and hence create more jobs. When a lot of people are employed, the government is likely to get additional revenue through either direct or indirect tax. This adds value to the country's economy. The participants expressed their thoughts over this idea in the following manner.

P 2 reasoned in this way,

Economic expansion is driven by technology. There is improved standard of living. Technology opens up avenues to new and better types of work.

P 10 admitted that,

Technology makes people start businesses without any infrastructure. I have seen people running businesses from home. I have also seen people working from home. Anything is possible with technology.

4.3.2.3 Increased productivity

Modern technical equipment and machinery operate faster than people do. As such, technology increases productivity. With modern technology's help, farmers can do a lot of work with less efforts and in less time. The participants were of these opinions;

P 2 revealed that,

Since the introduction of modern machines, production has increased, milking and cleaning is done within a short period of time. I do not complain about theft. Technological equipment such as trackers are used to monitor troops.

P 3 asserted that,

In my daily activities, I use technology in the form of computers and printing machines to produce information relevant to my business. I also use technology to communicate with various stakeholders from all over the world.

P 7 claimed that,

My work is made simple because everything is technologically managed and controlled. I now enjoy farming because of that. Technology brings about 24/7 working environment that helps my employees to work from home and to make informed decisions in difficult situations.

P 8 stated that,

Modern technology has contributed to my business organisation increasing productivity. It has also helped to drastically produce products.

P 10 opined that,

Personally, I like technology not only for what I can produce but because it is fast and saves time. Technology has assisted me a lot in terms of increasing production in my farm. It also makes our work easier and simple. For example, we disinfect using spraying machines.

4.3.2.4 Digital marketing and communication

One of technology's benefits is digital marketing. Digital marketing has become prominent largely because it reaches a wide range of audience and also offers a number of other advantages as well. When one posts an advertisement online, customers can see it no matter where they are. This makes it easy to reach many customers. It also has lower costs. Technology enables entrepreneurs to communicate with customers in real-time. The participants shared their views thus;

P 2 said that,

The competition is too high nowadays. Competitors do research and come up with innovative ideas to attract customers and market their products easily. If one still relies on the traditional farming methods, it would be difficult for that individual to compete. Technology changed the way I operate for the better.

P 3 affirmed that,

I also use technology to communicate with various stakeholders from all over the world.

4.4 THE REQUIREMENTS OF TECHNOLOGICAL ADVANCEMENTS AND ENTREPRENEURSHIP

Participants were requested to give their views on the technological advancement and entrepreneurship's requirements to address this objective. The idea that technological advancement and entrepreneurship is the chariot that brings jobs, training, development, and skilling to people is crucial. Lifelong learning is a way to address skills shortages and to protect ourselves against obsolescence. The following table indicates technological advancements' requirements.

Table 4.4: Technological advancements and entrepreneurship's requirements.

Main Theme	Sub-themes
Requirements of technological advancement	Adequate education and training in farming
	Innovation and self-motivation
	Risk taking

4.4.2. Requirements of technological advancement

For technological advancement to bring about benefits, circumstances should be right for businesses to effectively use technology. In this case, there was a need to identify what gives rise to technological innovation and development. The following sub-themes; adequate education and training in farming, innovation and self-motivation, and risk taking were identified and are discussed below.

4.4.2.1 Adequate education and training in farming

Education is key to agricultural prosperity. That is, when farmers have less knowledge about what affects their work, no progress could be realised given that they would not be able to identify and solve issues that affect them. The participants provided the following when questioned about education's importance in their business.

P 2 indicated that,

It requires some level of education, technological skills, and knowledge.

P 4 added that,

Training both farmers and employees is the best requirement. The results mean that education and training are crucial in agri-business.

4.4.2.2 Innovation and self-motivation

Innovation and self–motivation are active characteristics that people need to use in order to help them look at the world in new ways. Innovation helps to find answers and solutions to issues that affect our lives. The participants offered varied reasons when asked about their feelings towards innovation and self-motivation.

P 4 illustrated that, Technology now makes it easier to provide answers and solutions to our problems.

P 5 suggested that, One needs to have innovative thinking, be self-motivated and understands what to offer.

4.4.2.3 Risk taking

Risk taking is about dealing with uncertainty and accepting that one could lose money, freedom, or reputation when embarking on a particular project. Risk is part of entrepreneurship. The participants explained how they take risks.

P 3 averred thus,

The requirements for technological advancement is the willingness to take risks and action, which are biased towards continuous development.

4.5 SUMMARY OF CHAPTER 4

Agricultural technology investments, that is, both the advanced and traditional technologies, are a game changer in terms of yield improvement and national food security. However, some farmers in the Mopani District Municipality use limited machinery but are ready to learn more about new technology. The study's findings are addressed in chapter five.

CHAPTER 5: DISCUSSION OF FINDINGS

5.1 INTRODUCTION

The study's justification, literature review, research methodology, data analysis, and this study's results were outlined in the previous four chapters. This chapter discusses the study's results in relation to the literature reviewed in chapter two. It should be noted that this study's results might complement or contradict what literature says about issues raised by the study. This chapter is presented in four sections. The first section introduces the chapter, then this study's overall summary, followed by the summary of the results, and the chapter conclusion.

5.2 SUMMARY OF THE STUDY

Technology is part of life but comes with benefits and challenges. Wolff (2021) stressed that technology is changing the world around people in unexpected ways. It offers numerous forms of opportunities to businesses to improve society. Technology helps to achieve increased profits with less in-puts. There are a number of goods that people used to do without but technology has availed these now. Technology's transformative impact is there for all to see throughout the business world, with entrepreneurs enjoying its benefits (Wolff, 2021). The smart application of new technologies would help farmers to drastically increase their yield margins (Goedde, Katz, Mernard, & Revellat, 2020). This study sought to understand agricultural technology and its effects on entrepreneurship in the Mopani District Municipality. The study investigated the degree to which technology impact entrepreneurship in the Mopani District Municipality. Its investigation was underpinned by the three research questions provided in chapter one. The qualitative research methodology was adopted to conduct this study.

5.3 THE CURRENT CONDITION OF TECHNOLOGICAL ADVANCEMENTS IN THE MOPANI DISTRICT MUNICIPALITY

This study's results are discussed one objective after the other. For example, the current condition of technological advancement in the Mopani District Municipality. The three themes that emerged here were; technological advancements, negative consequences and technology's benefits, and technological advancements' requirements.

5.3.1. Theme one: Technological advancement

5.3.1.1 Understanding technology.

Feroz (2018) revealed that the use of technological innovation makes work simpler, create employment, increases productivity and efficiency, improves desires, saves costs, and enables business owners to finish tasks that would typically require weeks of effort in a relatively short space of time. The study's participants who are farmers in the Mopani District Municipality do understand what agricultural technology entails. The study found that several technological appliances were used by most participants in the Mopani District Municipality to prove their yields. Technology used ranged from automated dairy machines, automated feeder systems, and automated cleaning systems, to cameras, drones, and sensors.

5.3.1.2 Modern technology used

The observations confirmed that most participants use GIS and GPS. Their use has led to precise agricultural data collection, farm planning, and field mapping. Foresters use LIDAR, log loaders, stamp grinders, and moisture sensors, among others. Technology has positively impacted the way entrepreneurs and employees communicate and interact with each another. The study results also showed that businesses and companies can communicate personally with their clients through telephone calls, internet, and social media platforms. This enables companies to get feedback about their products, including complaints. The results are consistent with Ghamgui and Singh's (2017) observations that for the organisations to interact internally and internationally, technology provides many channels, and it could be used as an outlet, which allows businesses to collect feedback from their customers. In addition, the study also found that computers connected to high-speed internet allow

workers and employers to collaborate and discuss business related issues more efficiently than ever before. The results from this study indicated that farm owners in the Mopani District Municipality do apply digital technologies in their businesses. These digital technologies positively impact productivity, revenue, operating costs, obtaining new information, finding new business, and customer satisfaction.

Thibodeaux (2017) asserted that entrepreneurs face high labour costs, and this calls for better methods to minimise such costs. This study's results are in line with the above observations because combined-harvesters and planters simplify tasks and reduce labour costs. Conversely, other results showed that even though some farmers are aware of the current technological advancement, they still rely and prefer using traditional farming methods because of what they produce**.** On the other hand, few participants did not use agricultural technology for the following reasons; lack of knowledge, affordability, and lack of access to those technologies.

5.3.1.3 Direct impact on outcomes

Saunders (2020) found that recent advances in AI and machine learning marked the beginning of a seismic shift in the world, and people must find ways to quickly adapt by continually updating their skills. Nichols (2018) indicated that technology makes high-value learning in workplaces. This study's results similarly observed that most participants during COVID-19 pandemic realised how important it was to have technological machinery because movements were restricted. It was very challenging to do business during COVID-19. Some participants resorted to social media platforms for advertising, meetings, and communications**.** The study results suggest that technological innovations have greatly shaped agriculture but the above might not be achieved if farmers are not ready to embrace them and learn.

5.3.1.4 Ability to learn

With regard to the ability to learn, the study found that most participants agreed that both employers and employees must continue to learn and develop themselves. That is, technological changes are complicated and require training and research. The results are consistent with Tarver (2022) who emphasised that great entrepreneurs must be able to communicate effectively, learn, and strategies. Karen (2021) reiterated that many entrepreneurs seek for the IT experts' guidance to understand data storage,

security issues, mobility, and other operational mechanisms for their infrastructure. Thus, farmers have to be strategic and keep on learning new skills to stop becoming redundant. In addition, Mkhabela (2020) pointed out that education in every sense is one of the fundamental factors in entrepreneurship as it raises the farmers' productivity and creativity.

With regard to the ability to learn, the study found that most participants agreed that both employers and employees must continue to learn and develop themselves. That is, technological changes are complicated and require training and research. The results are consistent with Tarver (2022) who emphasised that great entrepreneurs must be able to communicate effectively, learn, and strategise. Karen (2021) reiterated that many entrepreneurs seek for the IT experts' guidance to understand data storage, security issues, mobility, and other operational mechanisms for their infrastructure. Thus, farmers have to be strategic and keep on learning new skills to stop becoming redundant. In addition, Mkhabela (2020) pointed out that education in every sense is one of the fundamental factors in entrepreneurship as it raises the farmers' productivity and creativity.

Conversely, this study's participants saw technology as a distraction to their employees who use cell phones or social media during working hours. The results are in line with Prasanna's (2020) assertion that people get distracted easily by using cell phones rather than being productive. Employees find it hard to concentrate on their daily duties as most of them have laptops or smart phones. Some workers are addicted to playing online games (Prasanna, 2020).

5.3.1.5 Future of technology

The study established that most participants use several technological appliances in order to increase productivity and efficiency. Furthermore, farmers intend to have more sophisticated machinery in future. Wyman (2018) noted that future agriculture would use sophisticated technologies such as robots, temperature sensors, and aerial images to enable farmers to be more profitable.

5.3.1.6 Proactivity and innovation

With regard to proactivity and innovation, the study results revealed that there are several technological appliances presently available but not yet developed. Smart phones are used for research and advertising, Waru Warus are used for irrigation and

water storage, and some farmers shop online. These situations urge one to be proactive and innovative in order to manage uncertainties. The results dovetail with Ndemo's (2021) findings that solutions to problems require critical thinking, and it is through creativity that people are able to think about different ways to deliver their business' promise to the target market.

5.4 THE EXTENT TO WHICH TECHNOLOGY HAS PLAYED A ROLE IN WORSENING OR ALLEVIATING UNEMPLOYMENT AND POVERTY

5.4.1 Theme two: Negative consequences and benefits of technology

The second objective, which reads; the extent to which technology has played a role in alleviating and worsening unemployment and poverty was investigated. In that regard, the researcher identified the second theme; the negative consequences and benefits of technology. It was realised that most participants showed that they individually encounter numerous issues because of technological developments in agriculture. With specific focus on technology's negative consequences, sub-themes were identified as technological unemployment, high costs of maintenance and, lack of practical knowledge and skills.

5.4.1.1 Technological unemployment

Habito (2017) reiterated that many individuals lose their employment due to automation taking over more and more aspects of human life. Patil (2022) expressed his idea that computers have replaced most of the blue-collar jobs, creating fear of job losses. The use of machines increases efficiency and performance by eliminating human error and risk factors. This destroys jobs for the unskilled. This study's results revealed that technology is a problem to both the rich and poor nations as it relies less on human labour. The indication is that technology operates twenty-four hours nonstop. The study results suggest that a number of employees have been retrenched due to automation, and hence the high rate of unemployment that leads to poverty. As technology-based production processes rely less and less on human labour, more and more unskilled and low-skilled workers find themselves losing their jobs. The study

established that one of the participants reduced the number of his workers from forty-five to twenty-four.

5.4.1.2 High cost of maintenance

The study established that some entrepreneurs are troubled by high costs of maintenance as it makes it hard for small entrepreneurs to realise profits. The Prometheus Group (2020) noted that as equipment failures can be unpredictable, organisations might find themselves paying more for emergency parts shipping, travel time, and after-hours support because labour and replacement parts might not always be accessible. As a result, maintaining an appropriate budget is challenging, as more funds are required for unpredictable or emergency parts' replacement.

5.4.1.3 Lack of practical knowledge and skills

One challenge faced by entrepreneurs is lack of practical knowledge and skills. The results indicate that lack of technological knowledge and relevant skills makes it hard for one to cope with the current technological conditions. This can jeopardise companies with misaligned talent plans. Some farmers were said to still rely on the traditional farming methods. Posthuma-Coelho (2016) confirmed that practical knowledge is gained through doing work and it is based on the real-life endeavours and tasks. For example, if one studies about a specific machine and its engine parts in class, one would gain knowledge and the principles of work about that machine's parts but one would lack practical knowledge about it.

5.4.2 Benefits of technology

In order to mitigate the adverse effects of food insufficiency and insecurity, countries rely on technological innovations in their agricultural sectors to keep up with the increasing food demands. Here are the sub themes to agricultural technology: technology in alleviating unemployment, growth in economy, increased productivity and, digital marketing and communication.

5.4.2.1 Technology in alleviating unemployment

Wilson (2018) confirmed that technology creates an increase in employment opportunities. The factory wages are more than what people received as farmers (Wilson, 2018). As factories grew, more managers and workers were needed to run them, which increased the number of positions available and overall earnings. Dimitrieska *et al*. (2018) agreed that technology destroys current jobs but creates new ones. This study's results reflect that people need exposure to different ways of survival by using technology. This study found that some people operate from home without any infrastructure. Patil (2022) claimed that technology has simultaneously created new jobs for people who keep up with it.

5.4.2.2 Growth in economy

The study results indicate that companies that use technology save more money by replacing human labour with technological innovations, thus creating more jobs. Uddin (2020) made similar observations that agriculture is essential for stimulating the global economy and can lead to higher job creation, especially when one considers the national poverty reduction efforts. More agricultural productivity means greater income for farmers, lower food prices, increased food supplies, and more job opportunities in both rural and urban areas.

5.4.2.3 Increased productivity

The study revealed that modern technical equipment and machinery operate faster than people do. As such, they are used to increase productivity. The results are similar to Wilson's (2018) findings that production rate is multiplied because of the innovation in machinery. Food prices are reduced because of mass production, leading to higher standards of living.

5.4.2.4 Digital marketing and communication

Feroz (2018) acknowledged the benefits and the use of digital marketing and communication by entrepreneurs thus; in mobile devices era, workers and employers

are connected to each other to discuss business related matters timeously. Businesses and companies now use virtual meetings more frequently to maintain corporate operations. To interact quickly and efficiently, they can organise video conferences and meetings with the help of modern and compliant messaging tools and fast internet. Aquino (2021) concurred that as social media becomes more entrenched in our daily lives, small businesses now use it to reach out to potential customers in greater numbers. Online advertising has significantly grown over the past years. This study observed that with the help of social media, farmers are able to reach wide and far customers. They can use it to recruit skilled employees, buy online, and easily communicate with various stakeholders.

5.5 THE REQUIREMENTS OF TECHNOLOGICAL ADVANCEMENTS AND ENTREPRENEURSHIP

5.5.1 Theme three: Technological advancements and entrepreneurship's requirements

The third specific objective was; the requirements of technological advancement and entrepreneurship. This objective was addressed during the data collection process. In this case, the researcher identified the third theme with specific focus on sub-themes; adequate education and training, innovation and self-motivation, and risk-taking.

5.5.1.1 Adequate education and training in farming

Mkhabela (2020) noted that education in every sense is one of the fundamental factors in development as it enhances our productivity. The study found that few participants did not have any form of education while others did not specialise in agriculture. Those without any form of education indicated that they learned their trade from their parents. The study also found that farmers face unique challenges in their businesses and require education and training to ensure their success. They need to educate themselves to become aware of the fast agricultural changes taking place around the globe. Mkhabela (2020) concluded that education is important to improve agricultural productivity. Anokye (2015) stated that one's educational level increases output, and the extension services have a greater impact on agricultural productivity than formal education.

5.5.1.2 Innovation and self-motivation

The study established that entrepreneurship and innovation are rural economic development's potential drivers. Dickes (2020) impressed that farming as a lifestyle becomes the main focus and requires full commitment, often at the cost of recreation**.** The majority of farmers benefit from being flexible instead of sticking to their original intentions. The study found that innovation and self-motivation are characteristics that people need to help them see the world critically.

5.5.1.3 Risk taking

Sciabarrasi (2022) established several basic sources of agricultural risks that should be addressed namely; financial risks, production risks, human resource risks, marketing risks, and legal risks. This study found that risks are part of entrepreneurship and should be embraced as such. According to Ferreira (2020) entrepreneurship is considered risky and dynamic because a huge amount is invested in starting up a business.

5.6 SUMMARY OF CHAPTER 5

This study's results were discussed, summarised, and analysed. They were compared with literature reviewed. The results indicate that entrepreneurs in the Mopani District Municipality make use of agricultural technology in their businesses. It was observed that agricultural technology has a significant impact in terms of productivity, increasing revenue, and minimising operational costs. The chapter also highlighted the academic debate by other scholars who mostly noted issues similar to this study's findings. The conclusion and this study's recommendations are in the next chapter.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 INTRODUCTION

In previous chapters, the study's justifications, literature review, the research methodology, data analysis, and the discussion of results were done. Chapter one outlined this study's objectives. A comprehensive literature review revealed a gap in knowledge with respect to this study. This study sought to address the identified gap, and hence the formulation of the objectives below.

- To determine the current conditions of technological advancements in the Mopani District Municipality's business organisations.
- To evaluate the extent to which technology has played a role in worsening or alleviating unemployment and poverty.
- To investigate the requirements of technological advancements and entrepreneurship.

The study is concluded in this chapter by discussing its findings and then providing the concluding remarks. The study's limitations and its recommendations also appear here.

6.2 SUMMARY OF THE RESULTS

The study identified the following themes; understanding technology, modern technology used, direct impact on the outcomes, ability to learn, future of technology, proactivity and innovation. The study found that the majority of entrepreneurs in the Mopani District Municipality were aware and did comprehend what agricultural technology entails. A variety of technological appliances were used and their utilisation simplified work, improved productivity, and efficiency. The study also discovered that because technology is complex and always evolving, entrepreneurs must constantly learn new skills and develop themselves. They need to be proactive and innovative in order to address unforeseen challenges and their solutions.

Additionally, the study revealed that agricultural technology has positive and negative consequences. The negative consequences include technological unemployment, high costs of maintenance, and the lack of practical knowledge and skills. Benefits include technology in alleviating unemployment, growth in economy, increased productivity and, digital marketing and communication. Furthermore, the study established that the current condition of technological advancement requires the following; adequate education and training, innovation and self-motivation, and risk-taking.

6.3 CONCLUSION ON RESEARCH QUESTIONS AND OBJECTIVES

By responding to the research questions that served as the basis for this study's formulation, the study examined the research results in this chapter. The gap identified in chapter one is as follows;

There is a common misconception that technological advancements in Africa are far behind the rest of the world. The developments in technology has helped in planting, harvesting and selling of crops, and livestock. It was found that in recent years, technology such as cloud computing, open-source software, and digital tools have become increasingly affordable and accessible to farmers. The unanswered question that remains is whether the mentioned misconception and technology's effects in other provinces and countries are the same with the ones that are experienced by entrepreneurs in the Mopani District Municipality. There is a need to understand the effects of technology on entrepreneurs, and hence this study's focus.

The study argued that the majority of farmers in the Mopani District Municipality are aware and do understand the current condition of agricultural technological advancements. They agree that the use of modern technology makes work simpler, increase productivity, and save costs. Furthermore, the study argued that agricultural technology has both benefits, disadvantages, and requirements. As such, the study provides an in-depth understanding of the effects of agricultural technology on entrepreneurship. The following problem statement was formulated after thoroughly reviewing the related literature;

There is a need to effectively contribute to the academic and on-going debate about the effects of agricultural technology on entrepreneurship because agricultural innovations have greatly shaped agriculture throughout time and have both advantages and disadvantages. Scholars have no consensus about the effects of agricultural technology on entrepreneurship.

In order to contribute to the on-going debate, the following research questions were formulated:

- What is the current condition of technological advancement in the Mopani District Municipality's business organisation?
- To what extent does technology play a role in worsening or alleviating unemployment and poverty?
- What are the requirements of technological advancement and entrepreneurship?

6.3.1. Conclusion to the first research question

Research question 1: **RQ1:** What is the current condition of technological advancement in the Mopani District Municipality's business organisation? The study established that the majority of entrepreneurs in the Mopani District Municipality were aware and did comprehend what agricultural technology entails. A variety of technological appliances was used and their utilisation simplified work, improved productivity, and efficiency. The study identified the following themes; understanding technology, modern technology used, direct impact on the outcomes, ability to learn, future of technology, proactivity, and innovation.

6.3.2. Conclusion to the second research question

Research question 2: **RQ2:** To what extent does technology play a role in worsening or alleviating unemployment and poverty? With regard to the second research question as provided above, the study revealed that agricultural technology has both negative consequences and benefits. The negative consequences include technological unemployment, high cost of maintenance and lack of practical knowledge and skills. The benefits include technology in alleviating unemployment, growth in economy, increased productivity and digital marketing and communication.

6.3.3 Conclusion to the third research question

Research question 3: **RQ3:** What are the requirements of technological advancement and entrepreneurship? The study's results revealed that because technology is complex and always evolves, entrepreneurs must constantly learn new skills to keep themselves abreast. They need to be proactive and innovative in order to address unforeseen challenges. Furthermore, the study established that the current conditions of technological advancement require the following; adequate education and training, innovation and, self-motivation and risk-taking.

6.4 CONCLUSION ON THE RESEARCH PROBLEM AND CONTRIBUTIONS TO THE BODY OF KNOWLEDGE IN THE AREA OF RESEARCH

The research problem investigated in this study is stated above. This study made effective contributions to the academic and on-going debate about the effects of agricultural technology on entrepreneurship.

6.4.1 The study's contributions to the body of knowledge in the area of research

1. As a contribution to the on-going debate, the study discussed the effects of agricultural technology on entrepreneurship in the Mopani District Municipality.

2. The information collected about the effects of agricultural technology on entrepreneurship, the current condition of technological advancement in business organisations, the extent to which technology has played a role in worsening or alleviating unemployment and poverty, and the requirements of technology and entrepreneurship might help entrepreneurs and policy makers to make informed decisions before embracing technology.

The aim of this study was to assist various parties involved or affected by the introduction of agricultural technology. The identified parties included farmers and entrepreneurs, their family members, society at large, and policy makers.

6.5 IMPLICATIONS FOR PRACTICE AND RECOMMENDATIONS TO THE AFFECTED OR INVOLVED PARTIES

6.5.1 Farmers

It is with great expectation that this study would be useful to farmers. It is crucial for the potential and existing farmers to be aware and understand the effects of agricultural technology, be aware of technology's benefits, and its disadvantages. It is also advisable to be aware of the current conditions and requirements for technology use and entrepreneurship. This study, therefore, recommends that farmers should search for more information about agricultural technology, learn, and understand before they embrace it.

6.5.2 The family members and society

Given that most people's perceptions of farming are outdated and of low-tech industry that has not changed much in years, considering the fact that being a farmer or an entrepreneur comes with a lot of responsibility, considering the importance of farming to the family members and farmers, and the role they play in the community and the economy, it is necessary for the society and family members to offer emotional support to farmers.

6.5.3 Policy makers

It is believed that this study would be useful to policy makers when they develop and implement policies to consider the farmers' contributions as entrepreneurs in the country's economic well-being. A recommendation would be that policymakers should implement the appropriate policies to work towards providing adequate knowledge, skills, and support to farmers to develop them to ensure their sustainability. Given what other scholars and this study established about government supporting structures being reluctant to offer necessary support to these entrepreneurs, it is also recommended that policy makers should initiate appropriate forums and workshops to

help educate farmers to enhance their knowledge and skills to acquire assistance from relevant authorities.

6.6 LIMITATIONS OF THE STUDY

This dissertation had the following limitations:

The scope of the study was limited to the Mopani District Municipality in the Limpopo Province of South Africa. Therefore, its findings might not apply to other regions in South Africa or beyond. However, with great caution, some general implications might be drawn from the study. The study employed a qualitative research methodology, and it does not draw any statistical conclusion regarding the effects of agricultural technology on entrepreneurship.

6.7 RECOMMENDATIONS FOR FURTHER RESEARCH

Human life without technology is unimaginable because it is inevitable, a necessary component of human evolution, and it is here to stay. Therefore, current and future entrepreneurs would have to embrace it. It would be beneficial for other researchers to conduct a quantitative replication of this study with other municipalities in other provinces in South Africa.

6.8 CONCLUSION

In this chapter, the research problem was resolved, the study's contribution was described, the study's results were also presented, the limitations of the study, conclusion, and recommendations for further research based on the body of existing literature were also presented. From the data collected and analysed, conclusions were drawn, which indicated that farmers in the Mopani District Municipality make use of digital technology in their business organisations. It was also noted that the digital technology has a significant impact in terms of productivity and efficiency, communication, acceleration, reducing costs, web based advertising, research and development.

REFERENCE LIST

Adams and Adams, (2019). Technological development and innovation is changing the way business is done in Africa. Pretoria. South Africa. https://www.manodaq.com /South Africa.

Admin- News Reporter, (2018). What is the role of technology in entrepreneurship? https://www.trionds.com/role-technology-entrepreneurship.

Agwu, M.E. and Onwuegbuzie, H.N. (2018). Effect of International marketing environment on entrepreneurship development. https://www.researchgate.net /publication/327897747_Effects_of_international_marketing_environments_on_entrepreneurship_development

Ahmed, A. (2019). Challenges and Risks of Technology. Saudi Arabia.

Anokye, A., Oduro-ofori, E., & Nao, A. (2015). Effects of education on the agricultural Productivity of Farmers in the Offinso Municipality. https://www.researchgate.net/public.

Anwana, E. and Anwana, T. (2020). Enhancing the entrepreneurship framework in South Africa. https://www.abacademies.org/articles/Enhancing-the Entrepreneurship-Framework-in-South-Africa.

Aquino, J. (2021). How Technology Changed Entrepreneurship. American Express Company. United States.

Aquino, J. (2010). How technology changed entrepreneurship. American Express Company. United States.

Asaulo, H. (2017). Technology concepts to reduce costs for your business. https ://www.business2community.com/ business.

Balabushkin, D. (2019). The positive impact of technology on business https://www.tmcnet.com/topics/articles/2019/12/12.

Behrens, A. (2018). Positive and Negative Impact of Technology on business. https://positivenegativeimpact.com/technology.

Bhandari, P. (2020). Population vs Samples Definitions, Differences & Examples. https://www.scribbr.com/methodology/population-vs-sample.

Bhandari, P. (2021). Ethical consideration in research, types and examples. Scribbr. https://www.scribbr.com/ methodology.

Bondar, K. (2017). What is in reality Industry4-0? http://innovacima.com/en/2017/11/09 what-is-industry-4-0.

Burung, M. (2020). Technology Mania. https://techbloginfos.blogspot.com/2020/.

Casey, G. (2018). Technology and Unemployment. Brown University. www.sevenpillarsinstitute.org /technology and unemployment

Calzon, B. (2021). Your Modern Business Guide. To Data Analysis Methods and Techniques. https://www.datapin.com/blog/data.

Cerra, M.J. (2019). A short story producing for profit, Tanya Menendez.

Chao, T., Pham, T., & Seregine, M. (2018). The issues: How will technology impact us? https://cs.stanford.edu/people/ero/1999-oo/technology.

Condor, R. (2019). Entrepreneurship in agriculture: A literature Review. International Journal of Entrepreneurship and Small Business. E.M. Normandie Business School 40(4) DOI 10.504/IJESB.2020.10031117.

Corporate Finance Institute. (2015). What is unemployment? Education INC.

Cranefield College. (2018). Profound Importance of Entrepreneurship. www.businesses essential.co.za

Cunningham, S. (2018). WEF and the Fourth Industrial Revolution in South Africa. https://www.researchgate.net/public.

Department of Trade and Industry. (2018). World Economic Forum and the Fourth Industrial Revolution in South Africa Trade &Industrial Policy Strategies (TIPS) Research Report for Department of Trade and Industry.

Dickes, L. and Arogundade, T. (2020). Innovation and Self-Motivation. Clemson University.

Dimitrieska, S., Stankovska, A., and EFremova, T. (2018).4th Industrial Revolution-Advantages and Disadvantages. ISSN 2367-7600-1312-594.

Feroz, R. (2018). Advantages of technology in business. https://technofaq.org/posts/2018/02/07/advantages of technology in business.

Ferreira, N.M. (2020). What is Entrepreneurship? Entrepreneur, definition, and meaning. https://nio5.ac.in/media/document/330sec.

Firican, G. (2020). Pros and Cons of the fourth industrial revolution. University of British Columbia. https://www.lightsondata.com/pros-cons-4th-industrial revolution.

Ghamgui, A. and Singh, A. (2017). Importance of Technology in Entrepreneurship Ambassador. University of Windsor Campus.

Goedde, L., Katz, J., Menard, A., and Revellat, J. (2020). Agricultures connected future. How technology can yield new growth. https://www.mckinsey.com /our-people/alexandre-menard .

Gibb, T. (2015). Greenhouse gases: Their impact and climate change. Michigan State University Extension.

Habito, C.F. (2017). Does Technology Worsen Poverty? Philippine Daily Inquirer. @inquirerdotnet .Philippine Daily Inquirer

Hessert, J. (2017). Seven positive effects of technology in modern day business https://socialnomics.net /2017/07/18/7-positive-effects-of0technology-in-modern-day-business. https://mikejava42.medium.com/

Java, M. (2020). Practical Application of Knowledge: Technology. https://mikejava42.medium.com/ the-practical-application-of-knowledge.

Jilcha, K. (2019). Research Design and Methodology. Addis Ababa Institute of Technology.Do1:10.5772/intechoper 85731.Journal of Financial Research Vol.9, No2, (2018). Doi:10.5430/if. v9n2p90.

Kabir, S. (2016). Methods of Data Collection. Curtin University.

Karen, A. (2021). 10 Break Through Technologies. https://technologyreview.com/ 2021/02/24...

King, A. (2017). Technology: The future of agriculture nature. 544,521-523/2017. https://www.nature.com / articles/

Kravchenko, A. and Kyzymenko, I. (2019). The Fourth Industrial Revolution New Paradigm of Society Development or Post-humanist. Philosophy and Cosmology. Volume 22, 2019:120-128. https://doi.org/10.29202/phil-cosm/22/ .

Lans, T., Seuneke, P., and Klerkx, L. (2013). Agricultural Entrepreneurship. Publisher Springer.DOI:10.1007/978-1-4614-3858-8-496.

Latino, J.R. (2019). Shaping technological future. National Geographic Magazine.

Laura, A. (2018). What is the impact of technology on small business? https://thriveglobal.com/stories/what-is-the-impact-of-technology-on-business.

Lavopa, A. and Delera, M. (2021). What is the fourth industrial revolution? UNIDO. https://iap.unido.org/article/ what-fourth-industrial-revolution.

Lyfe Marketing. (2019). Digital marketing. Types of marketing strategies that actually work for your business. https://www.lyfemarketing.com /.

Macdonald et al. (2009). Research Methodology. Pretoria University. https://www.scribd.com /document 359167119.

Marie, C. 2021. What are the disadvantages of fourth Industrial Revolution? https://wikilivre.org/culture

McAravey, B. (2018). The role of technology in shaping. South African businesses. Citrix. South Africa.

Mc-owoblow, (2020). Effect of Technology Advancements in Agriculture/ Agriculture Technology. Castilla-LaMoncha University Spain. https://03schools.com/ effect-of-technology-advancements-in-agriculture.

MERCER, M. (2019). Risk of Technology. Marsh and MacLennon Companies.

Mkhabela, M. (2020). World Economic Forum. https://www.io/co.za.

Miller, J. (2015). Technology and Revolution. Oxford Martin School.

Mohajan, H.K. (2019). The First Industrial Revolution: Creation of a New Global Human Era Journal of Social Sciences and Humanities Vol.5, No.4, 2019, pp.377-387 https://www.aiscience.org/journal/jssh ISSN: 2381-7763(Print), ISSN: 2381-7771(Online).

Morrar, R., Arman, H., and Mousa, S. (2017). The Fourth Industrial Revolution. (Industry4.0): A Social Innovation Perspective.timreview.ca/ sites/default/files/article.

Muhammed, A. (2018). Why entrepreneurs should keep up with new technologies. https://www.entrepreneur.com/art.

Naude, W. (2017). Entrepreneurship Education and the Fourth Industrial Revolution in Africa. Netherland.

Ndemo.B. (2021). Creativity and Innovation (on/6 benefits to Entrepreneurs. Nairobi. Garage. Connect. Cowork" create. https://nairobigarage.com / creativity**.**

Ndzwayiba, A. (2020). What is unemployment? Fort Hare University. https://www.researchgate.net/ public…/344641992. W.

Nichols, M.R. (2018). How has Technology changed employee Training and continuing Education. https://trainingmag.com/ how-has-technology-…. Opportunities and Challenges. https://ijfr.sciedupress.com International.

Nigeria" s Airtel Mobile Company, (2019). The impact of technological advancement on entrepreneurship in an organization. Nigeria. http://dx.doi.org/10.29322/IJSRP.9.06.2019.

Parveen, H. and Showkat, N. (2017). Non-Probability and Probability Sampling. chapter:goo.al/sVnjrL.Publisher.

Patil, M.R. (2022). Impact of technology on employment and unemployment. PTVA'S Institute of management.

Pennsylvania State University, (2016). The use of Technology vs Human Labor. Penn State. China.

Pettinger, T. (2018). Primary Sector of the Economy. https://www.economicshelp.org/co.

Peters, J. (2017). Robort learning Technische Universitat Darmstadt.

Posthuma-Coelho, A. (2016). Theoretical vs Practical Knowledge. https://medium.com/@amandaposthuma/ theoretical-vs-practical-knowledge-86cab1113abd

Prasanna, (2022). Advantages and Disadvantages of Technology. Modern Technology advantages and disadvantages on youth in society. https://www.aplus topper.com/advantages.

Pretoria University, Research Methodology. https://www.scribd.com/document/359167119.

Prisecaru, P. (2016). Challenges of the Fourth Industrial Revolution https://ideas.repecoog/a/khe/jourl/v8y2016ilp.

Prometheus Group. (2020). Disadvantages of a reactive maintenance program. https://www.prometheusgroup.com/a.c.

Ramey, K. (2012}. Advantages and Disadvantages of IT, https://www.ramey,c

Rehman, J. 2019. Advantages and disadvantages of technology in business. https://www.itrelease.com

Regoli, N. (2019). 12th Industrial Revolution Pros and Cons. Vittana.

Robb, A. (2017). The cost and benefits of new technology.

https://study.com /academy/lesson.

Saunders, A. (2020). Technology's impact on growth and Employment. University of British Columbia's Saunders School of Business. Canada.

Saunders, M., Lewis, P., and Thornhill, A. (2012). Research methods for business students. Sixth edition. Essex Pearson Education Ltd.

Schwab, K. (2016). Fourth Industrial Revolution: What it means, how to respond: World Economic Forum. https://www.weforum.org.

Sciabarrasi, M. (2022). Risk Management and crop insurance, University of Massachusetts Amherst.

Scott-Briggs, A. (2020). The Benefits of Using Technology for Entrepreneurs and their Businesses.https://techbullion.com/the-benefit-of-using-technology-for-entrepreneurs-and -their-businesses.

South-Africa-Country Commercial Guide. (2021). Information technology. https://www.trade.gov /knowledge-product.

Spacey, J. (2020). 23 Sectors of the Economy. https://simplicable.com/en/ sectors…

Statistics South Africa Quarter Labour Force Survey. (2021). General Maluleke. https://www.statssa.gov.za/ publications/P0211/P02111stQuarter2021.

Tafadzwa, C.W.T. and Nicole, T. (2018). The effect of the use of technology on the performance of immigrant owned SMME's in the Eastern Cape Province South Africa. https://www.abacademies.org/article/ The-effect-of-tech-on-the-performance-of-immigrant-owned-smme's-in-the-Eastern-Cape-Province- South-Africa.

Taiwo, S.O. and Vezi- Magigaba, M.F.2021.Human Capital Perspective of Previous Industrial Revolutions: Review in support of 4IR and its possible impacts. Fort Hare University.DOI:10.5281/zenodo.5167883

Tarver, E. (2022). Five skills every entrepreneur should have. https://www.investopedia.com/ article…

Tendai, C., Nicole, D., Tafadzwa, W. (2018). The effect of the use of technology on the performance of immigrant- owned SMMEs in the Eastern Cape Province, South Africa. https://www.abacademics.org/article/ The-effect-of the-use……

Thibodeaux, W. (2017). Major factors affecting labour costs. https://bizfluent.com/infer 12091242.

Thompson, J. (2018). Positive and Negative Effects of Technology in Business. Devra Gartenstein.

Uddin, A. (2020). Growth in economy. https:///www.academia.edu.

Ulz, J. (2023). What is a research paradigm? Types of research paradigms with examples. https://researcher.life/blog/article/ what-...

Vardhan, H. (2017). What is the Fourth Industrial Revolution? A Genesis. https://www.google.com/

Wilburn, H.R., and Wilburn, K.M. (2018). The impact of technology on business and society. St Edward University.

Wilson, D. (2018). Understanding the impact of Technology on Business. Burch and Cracchiolo.

Wolff, J. (2021). How Is Technology Changing the World, and How Should the World Change Technology? University of California Press. https://doi.org/10.1525/gp.2021.27353.

Wong, L.P. (2008). Data analysis in qualitative research: A brief guide to using nvivo. Malays Fam Physician. https://www.ncbi.nlm.nlm.nih.gov/pmc/articles.

Wyman, O. (2018). Agriculture 4.0- The future of farming technology. https://www.oliverwyman.com/ our-expertise/ ins.

Xu, M., David, J.M. and Kim, S.H. (2018). The Fourth Industrial Revolution: Opportunities and Challenges International Journal of Financial Research, Sciedu Press, vol.9(2), p. 90-95, April. https://ideas.repec.org/ a/jfr/ijfr11/v9y2018i2p9.

Yiga, P. (2018). Negative effects of technology on business. Yiga Phillip. Yosaki Magazine.

Yin, R.K. (2011). Qualitative Research from Start to Finish. New York: Guilford, https://www.scirp.org/ (S(351jmbntv.

Zahra, S.A., Wright, M., and Abdelgawad, S.G. (2014). Contextualization and the advancement of entrepreneurship research. International Small Business Journal. 32(5) p.479-500.

Zamora, R. (2019). Technological advancement in Africa. https://borgenproject.org/ technological-advancement-in-Africa.

ANNEXTURE 1

INTERVIEW GUIDE

Research Project Title:

AGRICULTURAL TECHNOLOGY'S EFFECTS ON ENTREPRENEURSHIP: A CASE STUDY OF MOPANI DISTRICT MUNICIPALITY IN LIMPOPO PROVINCE, OF SOUTH AFRICA

Compiled by: Mangena Mokgadi Lucy

Dear Participant,

My name is Mangena Mokgadi Lucy, a student pursuing a Master of Commerce degree in Business Management at the University of Venda. In order to complete my project, I am inviting you to participate in this research whose title reads: ***The effects of agricultural technology on entrepreneurship: A Case of the Mopani District Municipality in Limpopo Province.***

The research questions formulated for the study are:

RQ1: To what degree or magnitude does technology have an effect on the entrepreneurship in the Mopani District Municipality?

RQ2: What is the current condition of technological advancement in the Mopani District Municipality's business organisation?

RQ3: To what extent does technology play a role in worsening or alleviating unemployment and poverty?

RQ4: What are the requirements of technological advancement and entrepreneurship?

Be assured that all the information gathered from you will remain confidential.

Thank you for taking your time to participate

Yours sincerely,

Mangena Mokgadi, Lucy.

Email: mokgadimangena1120@gmail.com

Cell phone number: +27 795 170 059

A: DEMOGRAPHICS

Type of Business	
Education and Training	
Age	
Years of operation	

B: Conceptualisation of the effects of technology on entrepreneurship

1. What is your understanding of technology in general?
2. Comment on your use of technology in your business?
3. How is technology affecting entrepreneurship?
4. To what extent is technology affecting entrepreneurship or your business operations?

C: Conceptualisation of the current condition of technological advancement

5. Comment on the technological changes or advancement.

6. Would you say that you are aware of the current technological condition? Please elaborate this condition.

D: Conceptualisation of role of technology in poverty and unemployment

7. Would you say technology is worsening or alleviating poverty? Please elaborate.

8. Comment on the effect of technology on employment.

E: Conceptualisation of the technological requirements

9. What do you think are the requirements for technological advancement in entrepreneurship?

10. How can technology advance entrepreneurship?

THANK YOU FOR YOUR PARTICIPATION!!!

ANNEXTURE 2

PROPOSED BUDGET

ITERM	UNITS	AMOUNT
A. STATIONARY		
1. MEMORY STICK	1X`R100	R100
2. EXTERNAL HARDRIVE FOR DATA STORAGE	1XR1551, 00	R1 551, 00
3. NOTE BOOK	1XR12	R12
4. PENS	12XR5	R60
	SUB TOTAL	R1723, 00
B. TRAVELLING EXPENSES		
1. MANKWENG TO TZANEEN	104KM	R800
2. MANKWENG TO MOKOPANE	160 KM	R1 000
3. MANKWENG TO MOKETSI ZZ2 COMPANY	150KM	R900
	SUB TOTAL	R1700
C. SUBSISTENCE		
1. FOOD FOR TWO PEOPLE	2*R100 FOR3	R600
D. TECHNICAL		
1. PRINTING AND BINDING		R150
2. LANGUAGE EDITER		R1200
	SUBTOTAL	R1350, 00
DATA COLLECTION		
TRANSLATION TO LOCAL LANGUAGE	R50 PER DAY FOR 3 DAYS	R450
	GRAND TOTAL	R5 923

ANNEXURE 3

GHANTT CHART

APPENDIX I:GHANTT CHART

ACTIVITY	January	February	March	April	May	June	July	August	September	October	November	December
1. Proposal Development												
ation to the Department of business ma												
Presentation to school og higher degre												
4.Submission of proposal to UHDC												
5.Univen research Ethics Committee												
6. Data Collection												
2022												
Data analysis and interpretation												
8.Submission of first draft												
9.Submission of second draft												
mission of final draft to the school com												
11.Submission of final draft												

ANNEXTURE 4
ETHICAL CLEARANCE CERTIFICATE

ETHICS APPROVAL CERTIFICATE

RESEARCH AND INNOVATION
OFFICE OF THE DIRECTOR

NAME OF RESEARCHER/INVESTIGATOR:
Ms ML Mangena

STUDENT NO:
8802335

PROJECT TITLE: The effect of agricultural technology on entrepreneurship: A perspective on the Mopani district municipality in Limpopo province.

ETHICAL CLEARENCE NO: FMCL/22/BMA/02/0507

SUPERVISORS/ CO-RESEARCHERS/ CO-INVESTIGATORS

NAME	INSTITUTION & DEPARTMENT	ROLE
Dr LG Nkondo	University of Venda (Business Management)	Supervisor
Mrs AI Nemushungwa	University of Venda (Business Management)	Co - Supervisor
Ms ML Mangena	University of Venda	Investigator – Student

Type: **Masters Research**
Risk: **Minimal risk to humans, animals or environment (Category 2)**
Approval Period: **July 2022 – July 2024**

The Research Ethics Social Sciences Committee (RESSC) hereby approves your project as indicated above.

General Conditions
While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, please note the following.

- The project leader (principal investigator) must report in the prescribed format to the REC:
  - Annually (or as otherwise requested) on the progress of the project, and upon completion of the project
  - Within 48hrs in case of any adverse event (or any matter that interrupts sound ethical principles) during the course of the project.
  - Annually a number of projects may be randomly selected for an external audit.
- The approval applies strictly to the protocol as stipulated in the application form. Would any changes to the protocol be deemed necessary during the course of the project, the project leader must apply for approval of these changes at the REC. Would there be deviated from the project protocol without the necessary approval of such changes, the ethics approval is immediately and automatically forfeited.
- The date of approval indicates the first date that the project may be started. Would the project have to continue after the expiry date; a new application must be made to the REC and new approval received before or on the expiry date.
- In the interest of ethical responsibility, the REC retains the right to:
  - Request access to any information or data at any time during the course or after completion of the project,
  - To ask further questions; Seek additional information; Require further modification or monitor the conduct of your research or the informed consent process.
  - withdraw or postpone approval if:
  - Any unethical principles or practices of the project are revealed or suspected.
  - It becomes apparent that any relevant information was withheld from the REC or that information has been false or misrepresented.
  - The required annual report and reporting of adverse events was not done timely and accurately,
  - New institutional rules, national legislation or international conventions deem it necessary

ISSUED BY:
UNIVERSITY OF VENDA, RESEARCH ETHICS COMMITTEE
Date Considered: May 2022

Name of the RESSC Chairperson of the Committee: Prof TS Mashau

Signature

UNIVERSITY OF VENDA
OFFICE OF THE DIRECTOR
RESEARCH AND INNOVATION
2022 -07- 0 6
Private Bag X5050
Thohoyandou 0950

University of Venda
PRIVATE BAG X5050, THOHOYANDOU, 0950, LIMPOPO PROVINCE, SOUTH AFRICA
TELEPHONE (015) 962 8504/8313 FAX (015) 962 9080
"A quality driven financially sustainable, rural-based Comprehensive University"