Readiness of IT organisations to implement Artificial Intelligence to support business processes in Gauteng Province, South Africa

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Leon du Preez

ABSTRACT

Artificial Intelligence (AI) has emerged as a research field and more particularly studies pertaining to the readiness of organisations to implement AI. Although AI implementation has proliferated across industries, many organisations still struggle to successfully achieve their business goals, associated with AI and Fourth Industrial Revolution (4IR). This study attempts to close this gap, by conducting a deductive case study, and thematic analysis into the readiness of a Gauteng-based IT organisation to implement AI towards achieving their business goals, in line with the benefits associated with 4IR. To achieve this, the researcher draws on the Technology-Organisation-Environment (TOE) framework to reflect on the dimensions and group them into strategy, perception and awareness, challenges, and organisational culture, related to contextual factors.

This paper reports on the outcomes of open-ended interviews and focus group discussions involving 31 participants across IT management, senior-, and junior technical staff, about the enabling and hindering factors of AI readiness. The study further offers insights and a research agenda to support IT managers and staff to make informed decisions towards increasing their readiness to implement AI.

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LIST OF ACRONYMS

Acronym	Description
AI	Artificial Intelligence
NLP	Natural Language Processing
ML	Machine Learning
IT	Information Technology
BI	Business Intelligence
ERP	Enterprise Resource Planning
IoT	Internet of Things
SC	Supply Chain
NN	Neural Networks
ASR	Automatic Speech Recognition
RPA	Robotic process automation
TOE	Technology-Organisation-Environment
SOE	State Owned Enterprises
AIOps	Artificial Intelligence Operations
MTTR	Mean Time to Resolve
4IR	Fourth Industrial Revolution
MS	Microsoft
MP4	Media Player 4
POPIA	Protection of Personal Information Act
4IR-T	Fourth Industrial Revolution Technologies
4IR	Fourth Industrial Revolution
2IR	Second Industrial Revolution
3IR	Third Industrial Revolution

ACADEMIC INTEGRITY DECLARATION

Declaration:

I declare that this research paper is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

I further declare that I submitted the dissertation to originality-checking software and that it falls within the accepted requirements for originality.

I further declare that I have not previously submitted this work, or part of it, for examination at Unisa for another qualification or at any other higher education institution.

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CHAPTER ONE – INTRODUCTION

1.1 Industrial Revolution

The term Industrial Revolution is synonymous with the four stages of evolution in production changes which affect human lives. It all started in England, between 1750 to 1850, which saw the dawn of James Watt's steam machine announcing the first industrial revolution (Mohajan, 2019). The mechanistic machine innovation increased production in mainly the transportation, engineering, textile, and metallurgy industries (Maťovčíková, Škola Manažmentu & Trenčín, 2017).

The **second** industrial revolution (2IR) followed in Britain, Germany and the USA, during 1870 – 1914 was characterized by further increases in mass production of rubber, paper, steel and iron, apart from developments in electric power, automobile and aircraft (Zhang & Yang, 2020). **The third** industrial revolution (3IR) began in 1960 when electronics and information technologies like computers, genetic engineering, dexterous robots and zero-emission automobiles were born, aimed at increasing production (Abdin, 2021). It was also characterized by the move of production to low-wage countries and the increase in demand for skilled workers.

The **Fourth Industrial Revolution** (4IR) was declared by Klaus Schwab, and found its origin in the German Government in 2011. It started as "Industrie 4.0", when the government wanted to analyse the consequences of new technologies on the economy, and later presented the findings in Hannover in 2013. 4IR reaches all economies, industries and disciplines, challenging the rapid adaption of businesses, countries, organisations, and humans, to embrace technological change. The technological change goes hand in hand with the adoption of technologies like Blockchain, Internet of Things (IoT), Artificial Intelligence, Bid data and 3d-Printing, collectively known as 4IR technologies (4IR-T) (Burgess & Connell, 2020; Malapane & Paul, 2020; David et al., 2022).

1.1.1 Fourth Industrial Revolution Technologies (4IR-T)

4IR is set to disrupt the technological society, for example, the use of Internet of Things (IoT) devices, Big data, and Artificial Intelligence (AI) enhances decision-

making and efficiencies in operations (Soeiro, 2020). Despite the disruptions and challenges faced by several Industries, 4IR-T is expected to propel organisations forward in gaining a competitive advantage (Asa et al., 2021). Moreover, emerging 4IR-T presents unique challenges for the cooperation of nations and organisations, as there is limited technology governance in the international domain. According to the World Economic Forum (WEF), this is mainly due to the rapidly evolving nature of 4IR-T being implemented constantly, intersecting everywhere, which is contrary to the rule setting approaches traditionally applied (World Economic Forum, 2019).

Parallel to the expansion of the digital domain, spawned the increase in cyber risks, emphasizing the need for more cyber resilience, according to the WEF. The proliferation of connections to the internet has grown by 1000% since 2000, and 300 million additional user connections expanding the attack vector for cyber criminals (statista, 2022). In addition, the number of devices was estimated to be around 20 billion, in the form of IoT sensors, smartphones, and computers in 2017, with continued year-on-year growth of 30% between 2017-2025 (Guo, 2017). Therefore, a foundation is created for AI as the key driver of 4IR-T, infiltrating schools, homes, businesses as well as public spaces, enabling, inter alia, business decision-making, energy efficiency, autonomous driving, and health care (Hilb, 2020).

1.1.2 Applications of 4IR-T

Artificial Intelligence was first introduced when Audrey made its debut in speech recognition in early 1952, with the ability to recognise digits in a single voice, linking voices to persons (Duin et al., 2018; Li & Mills, 2019). Although the field of AI lacks a single definition that is delineated, according to Stewart, Davis and Igoche (2020) it can be referred to as intelligent agents, that mimic human-like reasoning, learning, and self-correction, branching off into several techniques and sub-fields (Arafati et al., 2019). Several AI types and applications are incorporated into the product and service offerings of organisations, such as expert systems, deep learning, natural language processing (NLP), automatic speech recognition and machine learning (Davenport, 2018b). Machine learning (ML) is an AI type which uses algorithms to find patterns in data, thereby reducing the risk of cyberattacks (Wellers et al., 2017).

ML's ability to learn increases continuous improvement potential, driving changes in tasks performed by individuals and automating organisational processes (Brynjolfsson & Mitchell, 2017)

AI applications are aimed at increasing the competitive advantage and goals of businesses. For instance, information technology (IT) capabilities such as cybersecurity applications, enterprise resource planning (ERP) and Business Intelligence (BI) are enhanced, resulting in improved decision-making, performance and efficient resolution times (Raghuram, 2019; Modisane, 2019; Zhaoxue et al., 2022). Holmström (2021) noted that the surge in AI technologies, spurred organisations to diversify their organisational practices and business models, creating new opportunities for digital transformation. Also, AI capabilities have been leveraged by business organisations to collect, synthesize, and analyse large volumes of datasets, increase computing power and adopt open-source software (Kantarcioglu & Shaon, 2019; Savva et al., 2019; Rubai & Ky, 2022).

An example of an AI application in businesses is Chatbots (Xu et al., 2017). Chatbots transformed the call centre and the online shopping industries through the application of Natural Language Processing (NLP) – algorithms that enable computer systems to understand human language (Laudon, 2020). Similarly, Amelia, a Chatbot from Allstate Insurance, converses with online users regarding insurance topics (Raghuram, 2019). In a study conducted by Zhaoxue et al. (2022), it was noted that when combined with Cloud computing and the Internet of Things (IoT), the use of AI increased the performance and reliability of IT operations by assisting individuals to effectively mine information from system log files.

Magwentshu et al. (2019), noted that digital transformation and AI technologies could boost the economy in South Africa significantly, creating more than one million jobs by 2030 and necessitating the need for the upskilling of graduates (Tshibanda & Pradhan, 2021). The increase in job opportunities will transform the labour market positively to achieve the National Development Plan vision for 2030 about transformation in the economic, education, skills, and service areas (Planning Commission - The Presidency, 2011). A study conducted in 2019 demonstrated how

companies from different industries have adapted to include IT in their supply chain to achieve a competitive advantage (Makris, Hansen & Khan, 2019).

According to Ageron, Bentahar and Gunasekaran (2020), the implementation of the Internet of Things (IoT) and AI (ML) increased production availability, simplified operations, reduced cost and automated business processes in the supply chain industry, thereby increasing competitiveness (Tshibanda & Pradhan, 2021). Also, the application of Neural networks (NN) (Artificial neurons and software programs) transformed the health sector by identifying cancerous cells through pattern recognition in images too complicated for Dermatologists to observe (Laudon, 2020; Hemalatha & Kumari, 2021).

According to a PWC report, the Covid-19 pandemic accelerated AI implementations by 18% in response to challenges during 2020 (PWC, 2020). Similarly, Manyika (2017) noted that advancements in AI boost productivity, economic growth, convenience, and safety. In a benchmark conducted by Chen et al. (2015), the incorporation of AI into broadband operations increased the diffusion rate, spurring further innovations for increased economic benefits, cost reduction by making information readily available in real-time and increased automation. With the learning abilities of AI, user experience increases because of access to relevant information, increasing efficiencies for IT operations, enhancing management decision making and enhancing corporate value (Chen et al., 2014; Itu-t, 2018). A literature review on IT operations conducted by Rijal, Colomo-Palacios and Sánchez-Gordón (2022) revealed that AI, Big data and IoT, play a critical role in enhancing IT operations through the automation of tasks, event correlation and systems monitoring (Zhaoxue et al., 2022).

Therefore, among disruptive technologies, AI performs an important role in the digital transformation of IT organisations and continues to show promise by creating new business models, products, and services. However, AI does not simply reduce the number of activities and costs or automate processes, its capability and benefits are the results of how it is woven into the fabric of the organisation, its operations, and technical dimensions (Lahlali, Berbiche & Alami, 2021).

1.2 Background to the research problem

Despite the high expectations attributed to AI adoption, without ensuring adequate readiness to support its application, the implementation is likely to fail and the benefits will not be realised. Furthermore, as postulated in the theory, a higher level of readiness for change increases the success of innovation adoption and decreases the risk of implementation failure (Lokuge et al., 2019). More important are the commitment and capability to effect changes, as contextual factors of readiness to implement AI innovations. Consequently, models of readiness require specific and tailored organisation-specific considerations, focused on organisation, operation and technical factors (Nguyen et al., 2019).

In addition, Alsheiabni, Cheung and Messom (2019) noted that the most common barriers to organisational readiness to adopt AI are lack of funding, and lack of leadership support, which hinders the alignment of organisational resources toward achieving the strategic objectives. Furthermore, the lack of funding to implement and operate AI is exacerbated by facilitating conditions such as electricity challenges and retracting economic activities (Mazibuko-Makena & Kraemer-Mbula, 2021). On the other hand, according to Rao (2017), the top management of the organisation drives a culture of innovativeness, being a salient factor toward organisational readiness. However, organisations with a culture of innovation are more likely to embrace technological transformation to position themselves toward continuous learning, and changes in customer and market demands (Rao, 2017).

Avoiding these common pitfalls does not address underlying infrastructural and cultural preconditions to AI readiness (Pumplun, Tauchert & Heidt, 2019). Besides, underlying infrastructure like electricity, broadband and internet connectivity are predecessors to AI readiness (Van Den Berg & Van Der Lingen, 2019). Consequently, Gartner and Criteo (2017) noted that IT organisations who implement AI without having a clear strategy on where and how to implement are unlikely to achieve the expected benefits. Whereas Frick et al. (2021) highlighted that access to technical innovation and leadership experience to execute the AI strategy is a

major barrier to driving a successful implementation, resulting in confused project team members, thus hindering benefit realisation.

A study about readiness factors found that 41.6% of respondents noted that the required skills were the primary barrier to implementing AI successfully (Alsheiabni, Cheung & Messom, 2019). According to (Hradecky et al., 2022), a lack of understanding can partly be due to the nature of algorithms. However, it remains a crucial step to shaping organisational technical abilities to achieve its goals and increase its readiness to implement AI. On the other hand, as AI transforms work activities, lack of awareness and employee resistance to change further hinder the readiness to implement AI (Frick et al., 2021).

Even though AI is notoriously dynamic and challenging, its adoption entails multiple and continued adjustments in the IT organisation's resources (financial and human), culture and governance and ethical practices culminating in effective operations, to achieve the business value of AI (Davenport, 2018). To this end staff and leaders, as well as customers and other stakeholders, may not be aware or have the skills how to operate, or understand how such a disruptive technology works, possibly impacting its ability to achieve a competitive advantage (Iansiti & Lakhani, 2020). Moreover, AI disrupts business practices, from business processes to human-like activities, which requires new adapted agile operating models and decision-making, at which IT organisations are required to operate (Lahlali, Berbiche & Alami, 2021). IT organisations are faced with the duality of agility vs traditional operating models, increasing the propensity to impact operational readiness to implement AI, by adopting new processes, controls, policies and practices (Haffke, Kalgovas & Benlian, 2017).

In addition, past research showed that several AI language models on the internet produce sexist, anti-Muslimism or racially biased information due to poor quality control and neglect of ethical standards (Dakka et al., 2021). The bias fuels the sentiments that AI adoption and use are unethical, resulting in low levels of trust. As a result, resistance to change may follow, possibly impacting the readiness of organisations to explore AI implementations (Miller, 2022). Despite, AI

implementations growing at a rapid rate, regulation and ethical considerations lagged, consequently some organisations either adopted a risk-averse strategy and others hastily implemented AI, without considering the impact on staff and customer sentiments (Calagna, Cassidy & Park, 2021). Therefore, organisations wanting to reap full benefits from AI implementations can increase their readiness by considering organisational, operational and technical factors (Jöhnk, Weißert & Wyrtki, 2021).

1.2.1 Research problem

The readiness of IT organisations to implement AI technologies is negatively impacted by the lack of management skills, infrastructure deficiencies and complexity of algorithms (Alsheiabni, Cheung & Messom, 2019; Jöhnk, Weißert & Wyrtki, 2021). Subsequently, the lack of management skills may culminate in poor technology integration into the business strategy, dearth of awareness in the organisation and low AI knowledge among staff, which negatively impacts innovation and organisation culture (Talwar & Koury, 2017; Baslom & Tong, 2019).

Furthermore, the cost of infrastructure, access to broadband internet and stable electricity supply impact the ability of AI to create value for the organisation and its stakeholders (Madida, Rugbeer & Naidoo, 2019; Lynch, 2022). Whilst there have been successful implementations of AI, some IT organisations still rush into the process before considering the ethical and regulatory aspects, resulting in poor quality outputs from AI models and mistrust (Jones & Steinhardt, 2022; Miller, 2022).

Also, AI algorithms are complex to design and deploy, hence contributing to the lack of understanding and technical skills to achieve the business goals of IT organisations (Hradecky et al., 2022). Therefore, without a readiness assessment, organisations may be at risk of toxic algorithms, less than an adequate audit of required human, financial and technical resources, competitive disadvantage, and ultimately a failed AI implementation.

1.3 Research aim

The research aims to explore the readiness of IT organisations to implement AI towards realising their business goals, in line with the benefits of the Fourth Industrial Revolution (4IR).

1.4 Research questions

1.4.1 Main research question

How can IT organisations determine their readiness to implement AI towards realising their business goals?

1.4.2 Sub-research questions and objectives

Table 1: Research questions and objectives

Sub-research questions	Objectives
Sub-question 1: What is the status of IT strategy for achieving business goals in IT organisations?	Objective: To understand how IT organisations currently align their business processes and IT capabilities.
Sub-question 2: What are the perceptions of the employees on AI implementation to support business processes?	Objective: To gain insights into the awareness of employees on the acceptance of or resistance to AI implementation to support business processes.
Sub-question 3: What are the challenges that may hinder the implementation of AI in IT organisations?	Objective: To identify the potential use challenges that may hinder AI implementation.
Sub question 4: What organisation cultural practices would influence the implementation of AI?	Objective: To determine the organisational culture requirements to enable the successful implementation of AI.

1.5 Research design

1.5.1 Research Strategy

The purpose of this study is to explore the readiness of IT organisations to implement AI towards realising their business goals, in line with the benefits of the Fourth Industrial Revolution (4IR). For this reason, the researcher will adopt a case study strategy since the context of the research focuses on the setting where AI is not yet implemented in an IT Management organisation (Ebneyamini & Sadeghi Moghadam, 2018). Further to the context, the IT Management organisation is relatively small in size (68) and hence a large sample is not possible, increasing the plausibility of a qualitative approach (Blumberg, Cooper & Schindler, 2008). Additionally, the involvement of IT Management, technology implementors, and staff performing business process activities which will likely be impacted to some degree or the other lend itself more towards an interview approach.

According to Ebneyamini and Sadeghi Moghadam (2018), a case study is an approach researchers apply to generate in-depth explorations of complex issues manifesting in real-life settings, events, or issues of the phenomenon of interest. Thus, the context of the study lends itself to a more suitable case study design, which will be used to address the sub-research questions highlighted in subsection 3.3. The literature reviewed contributes to the succinct definition of the sample selected in the organisation, the geographic location, areas to be investigated and the types of evidence that will be collected. Therefore, a thorough understanding of the case requires the collection of multiple sources of evidence through the lens of the TOE framework (Bryan & Zuva, 2021). The interviews with individuals will be conducted with open-ended questioning, commonly used in a qualitative method, supported by focus group discussions. The latter will allow for multiple data sources to assist with data triangulation, drawing similar conclusions from focus group discussions to validate findings (Ebneyamini & Sadeghi Moghadam, 2018).

Case studies are not flawless as qualitative datasets may proliferate to an extent that the sheer data volume inhibits analysis and conclusion with the available resources. Although care will be taken to avoid collecting unnecessary data within a

reasonable time to complete the data analysis and interpretations of findings successfully, responders will be requested to verify the interpretation. According to Nowell et al. (2017), qualitative research is a valued method that requires rigorous methodical methods, due to its complexity to create meaningful results. Contrary to quantitative methods, which are predominantly concerned with numbers, qualitative methods use descriptions, videos, images, and as in this case study, interviews, to collect data (Nowell et al., 2017).

1.5.2 Research approach

A deductive approach is used in cases where the literature about the phenomenon being tested is adequately researched. Moreover, this approach is used when the researcher has studied the literature and can draw comparisons between the data collected and the literature rather than recreating the theory, whereas, in an inductive approach the theory is created (Melnikovas, 2018). In this study, the researcher will aim to explore the readiness of IT organisations through the lens of the TOE framework (Malope, Van der Poll & Ncube, 2021). By applying deductive reasoning, the researcher will be guided to identify how IT organisations can implement AI towards realising their business goals, in line with the benefits of the Fourth Industrial Revolution.

1.5.3 Ethical Considerations

All the necessary ethical considerations, the privacy of information and security will be adhered to. Before commencing the engagement with participants to collect data, the requisite ethical clearance applications will be made to the ethics committee of the University of South Africa School of Business and Leadership. Participants will be made aware of the context of the research, inclusive of the collection, data management processes, what data security processes will be applied, and how long data will be retained. Moreover, informed consent will be sought from each participant to freely participate, with the option to cease participating at any time during the interview process (Saunders, Lewis & Thornhill, 2019). Furthermore, participants will only be engaged once ethical clearance has been obtained from the

ethics committee of the University of South Africa School of Business and Leadership.

Participants will be protected from mental discomfort when conducting the interview and focus group discussions by not running excessively long data collection sessions, as well as creating an environment that is conducive to eliciting proper responses. Personal information will remain confidential to ensure the right to privacy of all participants is protected (Blumberg, Cooper & Schindler, 2008).

Participants may derive a biased perception from the interviews, despite the protection of personal information, and the level of readiness. As such, the researcher will aim to communicate the outcome in a manner that portrays the benefits to all staff and the organisation. Furthermore, these benefits may for example reduce the risk of poor financial investments, as well as point out the AI skills development needs. Likewise, the wider organisation will benefit from the increased readiness, as it is continually assessed, positively contributing to the preparedness to implement AI. However, the wider organisation may not be aware of the hindering factors, and how it applies to the IT organisation, which may likely be addressed through stakeholder collaboration. Equally, these new insights may increase the possibility of a successful AI implementation.

1.5.4 Sample timeline

The schedule in Table 2 below indicates the activities associated with the research project from initiation until final submission. Furthermore, the major milestones completed are: Unit 1: Supervisor allocation and proposal approval; Unit 2: Writing the literature review; Unit 3: Write up research methodology. Still to be completed are Units 4 to 7. In addition, the total time allocated to the project, from its inception until its completion is 156.63 days, with a total estimated budget, based on sunken resource cost, of R 2 317 800. Also, no direct or additional cost is envisaged to be incurred. However, budgeted and actual costs do not include that of Unisa staff or employees. Finally, the completed milestones have already reported an actual cost of R690 600 and total project completion of 46%, as of 20 June 2022.

Table 2: Integrated research project schedule

Task ID	Task Name	Duration	Start	Finish	Predecessors	Resource Names	% Complete	Budget Cost	Actual cost	Variance
1	**Integrated research project**	**156.63 days**	**Tue 01 02 22**	**Wed 30 11 22**			**46%**	**R2 317 800.00**	**R690 600.00**	R1 627 200.00
2	**Unit 1: Supervisor allocation and proposal approval**	**47 days**	**Tue 01 02 22**	**Sat 30 04 22**		**Co-supervisor, Researcher, Study group, Supervisor**	**100%**	**R451 200.00**	**R451 200.00**	R0.00
3	Supervisor allocation	13.75 days	Tue 01 02 22	Fri 13 05 22		SBL Supervisor allocation committee	100%	R0.00	R0.00	R0.00
4	Complete Unit 1	40.44 days	Fri 25 02 22	Tue 10 05 22	3		100%	R0.00	R0.00	R0.00
5	**Unit 2: Writing the literature review**	**16.38 days**	**Tue 10 05 22**	**Sun 05 06 22**	**4**	**Researcher, Co-supervisor, Supervisor**	**100%**	**R182 400.00**	**R182 400.00**	R0.00
6	**Unit 3: Write up research methodology**	**7.06 days**	**Mon 06 06 22**	**Mon 13 06 22**	**5**	**Co-supervisor, Researcher, Supervisor**	**100%**	**R57 000.00**	**R57 000.00**	R0.00
7	**Unit 4: Ethical clearance application**	**3.25 days**	**Mon 20 06 22**	**Tue 21 06 22**		**Researcher,SBL Ethics committee**	**0%**	**R90 600.00**	**R0.00**	R90 600.00
8	Complete all necessary ethical clearance forms	4.44 days	Mon 20 06 22	Wed 22 06 22	6	Researcher	0%	R28 200.00	R0.00	R28 200.00
9	Transfer Unit 1 - 3 into the Research proposal template	1 day	Wed 22 06 22	Thu 23 06 22	8	Researcher	0%	R14 400.00	R0.00	R14 400.00
10	Submit the Research proposal and ethical clearance application forms to Supervisor for approval and sign off	3 days	Fri 24 06 22	Tue 28 06 22	9	Co-supervisor, Researcher, Supervisor	0%	R28 800.00	R0.00	R28 800.00
11	Submit approved documents to SBL Ethical clearance committee	1 day	Wed 29 06 22	Wed 29 06 22	10	Researcher,SBL Ethics committee	0%	R9 600.00	R0.00	R9 600.00
12	Ethical clearance	16 days	Wed 29 06 22	Fri 29 07 22	11		0%	R0.00	R0.00	R0.00
13	**Unit 5: Data collection and data analysis**	**29 days**	**Sat 30 07 22**	**Fri 23 09 22**	**11FS+20 days**		**0%**	**R959 400.00**	**R0.00**	R959 400.00
14	Submit SBL ethical clearance outcome to the CSIR for approval to engage selected sample	1 day	Sat 30 07 22	Sat 30 07 22	12	Researcher, CSIR Ethics committee	0%	R8 400.00	R0.00	R8 400.00
15	Engage with selected sample to schedule time for interviews	2 days	Sat 30 07 22	Thu 04 08 22	14	Executive Director, IT Management, Junior IT Technical staff, Researcher, Senior IT Technical staff	0%	R163 400.00	R0.00	R163 400.00
16	Create data collection structure in SharePoint	0.88 days	Thu 04 08 22	Sat 06 08 22	15	Researcher	0%	R16 800.00	R0.00	R16 800.00
17	Conduct Interviews and focus group discussions, to confirm themes derived from Interviews	15 days	Mon 08 08 22	Sat 03 09 22	16	Executive Director, IT Management, Junior IT Technical staff, Researcher, Senior IT Technical staff	0%	R623 200.00	R0.00	R623 200.00
18	Collect, code and structure data	3 days	Mon 05 09 22	Thu 08 09 22	17	Researcher	0%	R42 000.00	R0.00	R42 000.00
19	Organise collected data and match with themes from literature	3 days	Mon 12 09 22	Thu 15 09 22	18	Researcher	0%	R42 000.00	R0.00	R42 000.00
20	Create visual representation of findings, mapped to the adapted TOE framework	2 days	Fri 16 09 22	Mon 19 09 22	19	Researcher	0%	R21 600.00	R0.00	R21 600.00
21	Organise each interview data and quotes for incorporation into the report	2 days	Tue 20 09 22	Fri 23 09 22	20	Researcher	0%	R42 000.00	R0.00	R42 000.00
22	**Unit 6: Writing up research**	**32 days**	**Sat 24 09 22**	**Thu 24 11 22**			**0%**	**R462 000.00**	**R0.00**	R462 000.00
23	Write up findings	20 days	Sat 24 09 22	Tue 01 11 22	21	Researcher	0%	R271 200.00	R0.00	R271 200.00
24	Submit research results to supervisor and co-supervisor for review and guidance	10 days	Tue 01 11 22	Sat 19 11 22	23	Researcher, Co-supervisor, Supervisor	0%	R139 200.00	R0.00	R139 200.00
25	Incorporate recommendations from Supervisor and Co-supervisor	2 days	Sat 19 11 22	Thu 24 11 22	24	Researcher	0%	R51 600.00	R0.00	R51 600.00
26	**Unit 7: Final preparation for assessment**	**1 day**	**Tue 01 02 22**	**Tue 01 02 22**		Researcher	**0%**	**R115 200.00**	**R0.00**	R115 200.00
27	Finalise Integrated research report	2 days	Thu 24 11 22	Mon 28 11 22	25	Researcher	0%	R26 400.00	R0.00	R26 400.00
28	Submit report for Similarity index	2 days	Tue 01 02 22	Fri 04 02 22		Researcher	0%	R42 000.00	R0.00	R42 000.00
29	Submit Integrated research report and similarity index on Moodle for marking	2 days	Sat 26 11 22	Wed 30 11 22	27	Researcher	0%	R38 400.00	R0.00	R38 400.00

1.6 Significance of the research

This study is intended to offer additional insights into the existing body of knowledge on the readiness of South African IT organisations to implement AI successfully towards achieving their business goals. IT managers, as the decision-makers responsible for strategy setting, managing talent and fostering a culture conducive to open innovation, are likely to benefit from the insights drawn. Informed by the theoretical TOE framework and factors impacting readiness, as augmented by subsequent studies. Factors impacting the readiness of staff - both implementors and those affected by the introduction of AI are explored and illuminated in the context of the study. Finally, it is expected that the results will guide the decision-making of IT organisations in the South African context on factors likely to affect their readiness in preparing for implementing AI.

1.6.1 Delineation of research

The context of the study is a research, development and innovation organisation, in the process of embedding 4IR technologies across its value chain. It is envisaged that the introduction of these technologies, will increase the competitiveness of not only the organisation, but also the country, towards the industrialisation of industries like Mining, Health, Manufacturing, Defence and Security, and ICT. Furthermore, the IT organisation is entrusted with the realisation of efficiencies through the digital transformation of business processes and IT activities, by adopting and implementing technologies such as AI. As such the organisation's hub is in Gauteng, where the majority of IT systems are situated, with the remainder being distributed across Durban, Cape Town, Stellenbosch, and Johannesburg (CSIR, 2018).

Therefore, the researcher has delineated the study by selecting participants of the IT organisation, who will manage change, implement, support, and maintain AI-enabled solutions. They will be supported by Executive Management, who will ultimately be responsible for allocating the requisite financial and AI-savvy human capital resources towards interventions. The IT Management team will lead the changes required in the technology, organisation, and environment. In addition, senior technical staff, who traditionally implement innovative solutions, should be

able to provide good insight into the challenges associated with the implementation of AI and how it may enable the business processes of the organisation. Lastly, junior technical staff members who are potentially affected by the implementation of AI will be able to provide insights into awareness, acceptance, and resistance to change. Although the envisaged insights may be forthcoming from all the selected participants, the sample, in organisational assigned roles, would more likely provide meaningful insights into the themes, where it closely relates to their areas of accountability.

The significance of this study is postulated in the literature from which a set of themes were derived, which may impact the readiness of IT organisations to implement Artificial Intelligence to support business processes in Gauteng Province, South Africa. Subsequently, the researcher further delineated the study through open-ended interview questions and focus group discussions to triangulate results against AI readiness themes derived from the literature (Akhtar, Roy & Vishwakarma, 2020). Further, the contribution of this study aims to provide IT organisations with a set of factors to assist in determining their readiness to implement AI and to achieve their business goals, reducing the risk of a failed implementation.

1.7 Structure of dissertation

The dissertation, as outlined in Figure 1, was structured into seven chapters as outlined.

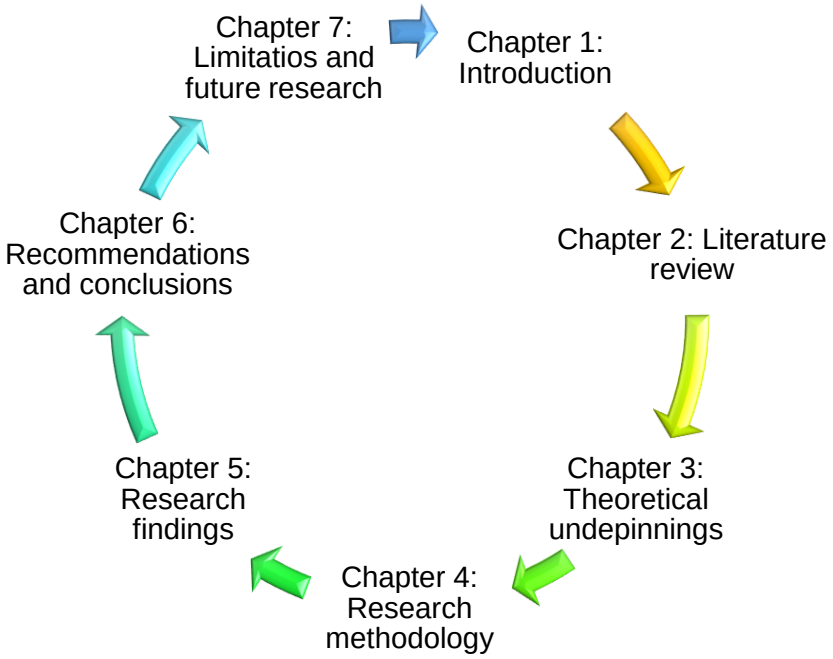

Figure 1: Dissertation structure

1.7.1 Chapter 1

The background serves as an introduction to the Industrial Revolution evolution, 4IR-T, and the field of AI. Emphasis is placed on the factors impacting the implementation of AI in IT organisations, followed by the research problem, research aim and questions this study aims to answer. The research strategy articulates the selected instruments, sampling and theoretical lens used to study the research question. Lastly, the intended contribution as well as delineation of the research - and in particular the ethical considerations - were established for the study.

1.7.2 Chapter 2

A literature review of existing literature in the field of AI and 4IR is presented. The phenomena being studied were investigated as presented in past scientific research. As such, readiness factors impacting organisations, when considering implementing AI, formed the foundation of the research. Similarities and differences are

synthesized between studies and compared to the aim of this study, which focused on the South African setting.

1.7.3 Chapter 3

This chapter examines the theoretical underpinnings and presents the Technology Organisations and Environment (TOE) framework as the theoretical lens to be used during the data collection and analysis process. In addition, the chapter also discusses the different constructs of the TOE framework and its relevance to this study and how it will be applied.

1.7.4 Chapter 4

Chapter four introduces the research design used in this study. Furthermore, it provides an overview of the approach, research strategy, instruments used for data collection and philosophical assumptions used to carry out the study. Also, it describes the data collection processes and how data will be managed and secured. Finally, the chapter articulates the relevant ethical considerations applied as part of the study.

1.7.5 Chapter 5

Chapter five presents the analysis of the study. It discusses the data collection methods, through interviews and focus groups, followed by the thematic analysis. Lastly, it presents the findings from the thematic analysis.

1.7.6 Chapter 6

Chapter six discusses the findings of the study. It presents the findings through the lens of the theoretical TOE framework. Findings are then critiqued and discussed in relation to the TOE theoretical framework and literature consulted in addressing the research problem.

1.7.7 Chapter 7

Chapter seven outlines the improvements and recommendations, based on the research objectives and results. Next, the limitations as well as a reflection on the

research process are stated, followed by a summary of possible future research areas to be included in the dissertation.

1.8 Conclusion to chapter one

This chapter introduces the three industrial revolution phases, dating as far back as the 1750s when the first phase made its debut in England, and presently the 4IR, all aimed at improving production output and employing innovative technologies. Leading up to the technologies associated with 4IR, also known as 4IR-T, like artificial intelligence, IoT, Big Data and Blockchain for example. The advantages brought about AI-spawned implementations, which did not always create the required business values, according to the literature. Also, these disruptive technologies are complex and require businesses to embrace changes and explore how they can improve their readiness to increase their potential for success. Consequently, the TOE framework is used as a theoretical lens supported by several studies regarding the factors impacting organisational readiness, to guide this study in the context of IT companies in South Africa.

The study aims to explore the readiness of IT organisations to implement AI successfully to achieve the benefits associated with 4IR. Thus, a case study approach will be undertaken, by applying open-ended interviews and focus group discussions to triangulate themes arising from the study supported by existing literature. Data collected will be analysed following a thematic analysis approach. Therefore, the findings are expected to enhance the decision-making of IT organisations in the context of South Africa, regarding the factors likely to affect their readiness in preparation for their AI implementation journey.

CHAPTER TWO – LITERATURE REVIEW

2.1 Introduction

The aim of this study, as discussed in the previous chapter, is to explore the readiness of IT organisations to implement AI towards achieving the goals associated with 4IR-T. What was important was to understand how IT managers, staff, and other stakeholders view the barriers and enablers to implementing AI successfully. To this effect, this chapter presents a literature review of organisational factors impacting implementation readiness and 4IR including development in the field of AI.

The phenomenon being studied is described in relation to the concepts, opening with AI in section 2.2, followed by AI in context to AI readiness in section 2.3. Thereafter section 2.4 discusses the relationship between AI and 4IR, which is then followed by a discussion on the risks associated with implementing AI without a readiness assessment in section 2.5. Followed by section 2.6, a discussion is held on AI readiness factors and adoption frameworks relevant to this study. Next, in section 2.7, the conceptual model of the study provides a visual representation of the processes involved in the study and how each of the constructs interrelates and contributes to the findings, and lastly, the conclusion follows in section 2.8.

2.2 Artificial Intelligence (AI)

A study conducted by Kitsios and Kamariotou (2021), investigated the role of Artificial Intelligence (AI) in business strategy and how AI has the potential to solve difficulties the organisation faces. The authors conducted a systematic literature review on eighty-one peer-reviewed articles to develop a theoretical model based on four value-creating sources. These are: AI and machine learning; strategic alignment with IT technologies; decision-making process and knowledge management. The outcomes lead to managerial as well as theoretical viewpoints with distinct possibilities to create new management practices and new types of methods to use AI. Even though the authors conducted a focused overview of AI and how it correlates with the organisational strategy, with specific reference to Machine Learning, their conceptual framework excluded other important AI types like Natural

Language Processing (NLP) and Automatic Speech Recognition (ASR). Consequently, the voices of the potential value these additional AI types can unlock for an IT organisation, are silent.

In 2021 another investigation focused on the value of SOEs in South Africa and how Government adopts 4IR technologies, among others AI, Blockchain and IoT. The use of a literature review revealed the use of TOE as a framework to define adoption in SOEs. Also, the study defined an AI application using intelligent wearables which monitor human behaviour, playing an important role in improving health and dealing with indiscretions. Consequently, data is collected and delivered to an App, providing information and applying machine learning. Nevertheless, they defined three AI types focused on firstly the automation of physical and digital tasks, being robots, and back-office work, secondly, cognitive insight, which focuses on advanced analytics, and thirdly cognitive engagement, like NLP chatbots, machine learning and intelligent agents. Synthesizing the findings from the investigation of Malope, Van der Poll and Ncube (2021), poor quality models and the effect of ethical practices are not clearly emphasised, which can impact the readiness of the organisation to implement AI.

Machine learning utilises algorithms, deep learning networks, and neural networks to find patterns in data, making it easier for organisations to draw predictions and identify threats to business processes such as fraud, waste or cyberattacks (Wellers et al., 2017). Equally, IT organisations deploy artificial intelligence operations (AIOps) based on Machine learning techniques to reduce the mean time to resolve (MTTR) problems and correlate events (Zhaoxue et al., 2022). Contrary to Zhaoxue et al. (2022), Davenport (2018) focused on the AI capabilities of a company as an extension of analytical capabilities and noted that both leverage large data by employing advanced technologies with statistical capabilities. Davenport (2018) argues that ML at its core is predominantly statistical and can be used for different analytical purposes such as identification, prediction, and prescription models. Although the authors provide alignment between how AI technologies contribute to IT capabilities, the potential challenges that hinder implementation are unclear, particularly regarding culture, resistance to change, and awareness.

Laudon (2020) defined NLP as algorithms that enable computer systems to understand human language and summarise and retrieve information. Davenport (2018) highlighted NLP examples to include chatbots, and Gmail's email classification, recognising that emails belong to a specific category based on content. Moreover, Xu et al. (2017) identified examples of NLP to be Chatbots or Q&A agents, used in online websites and IT call centre self-help services, able to converse with online users and answer questions. Also, Stewart, Davis and Igoche (2020) stated that NLP is the processing of actual audio (language) to predict specific outcomes, like happy or sad, based on the type of words used. Synthesizing the respective examples shows that NLP is based on algorithms that understand human language to retrieve information or execute tasks.

2.3 Artificial Intelligence readiness

In a study conducted by Holmström (2021), involving the readiness of organisations to increase the probability of successful AI adoption, the authors conducted qualitative research using in-depth interviews with 25 experts to develop a readiness framework. The results presented 18 factors and 58 descriptive indicators in the framework which organisations can use to assess their readiness and adoption of AI. However, the study does not consider local challenges like the impact of power interruptions and costly broadband, impacting the accessibility of AI-enabled service offerings. Furthermore, hindrances like risk management and lack of regulatory policies and governance about the impact of AI on the organisation are also absent.

A study conducted by Jöhnk, Weißert and Wyrtki (2021) on factors hindering AI readiness consulted 25 experts through in-depth interviews to develop a set of barriers and enablers impacting AI implementations. These factors serve as a guide for organisations to consider with the intent to increase their readiness to implement AI. The authors argued that organisational readiness factors like strategic alignment, knowledge, culture, data, and resources foster AI adoption initiation and implementation decisions.

While these studies can be used as a guide for AI readiness, they are not particularly ideal in contexts like South Africa and other Sub-Saharan African countries

experiencing challenges such as erratic energy supply, high cost of internet broadband, and prevalent socio-economic inequalities.

2.4 AI and the Fourth Industrial Revolution (4IR)

Matsepe and Lingen (2020) conducted a semi-structured interview study on how organisations adopt 4IR emerging technologies, like AI, into their business processes, by consulting seventeen technology experts in South Africa. Participants were consulted on how 4IR technologies can contribute to improving efficiencies and gaining a competitive advantage. Results showed that organisational characteristics, leadership traits, industry characteristics, and technology usability played a part in technology adoption. In another study conducted by Chen et al. (2015), economic benefits associated with the use of AI over the next ten years were estimated to be between $1.49 trillion and $2.95 trillion. These economic benefits stem from the application of ML to potentially identify fraud, and NLP to transcribe notes from physicians. In the IT industry, the economic contribution of AI is estimated at $5 trillion, through the automation of business processes and increased efficiencies (Davoyan, 2021).

Wamba-Taguimdje et al. (2020) found that optimisation of business processes, automation, and performance improvements are the main benefits of AI. These benefits increase business value by reconfiguring business processes through the application of AI capabilities. Tshibanda and Pradhan (2021) demonstrated how companies across different industries adopted IT technologies to gain a competitive advantage and increase the agility of business processes, productivity, and business decision-making. Despite this, it remains unclear how the readiness of organisations to implement AI contributes to the achievement of benefits, which could hamper an organisation's ability to unlock business value. On the other hand, the impact of organisational readiness factors like strategy, culture and leadership is not clearly articulated, which may impact the achievement of business goals.

2.5 Risks of implementing AI without a readiness assessment

In an ethics study, the authors noted that novel methods of implementing AI impact outcomes and if organisations are not ethically ready may run the risk of producing

discriminative results (Dattner et al., 2019). Ideally, human predispositions are formed as we make sense of the complexities of the world, and developers who create algorithms incorporate those bias preferences to analyse datasets, fostering discriminative outcomes. These flawed algorithms impact, for example, recruitment processes and marketing preferences, resulting in discriminative and gender biased responses based on consumer patterns. Groopman (2018) identifies interaction-, personalisation-, conflict of interest-, association-, and cultural bias, as categorised forms of discrimination inscribed into automated practices and algorithms developed by humans to support AI outcomes. Groopman (2018) noted that assessing the protocols to prevent possibly toxic outcomes of biased datasets, may reduce risks.

2.6 AI readiness factors and adoption frameworks

Jöhnk, Weißert and Wyrtki (2021) conducted a study on the readiness of organisations for change, combining research from Management and IT. Results of the study found that organisational readiness is a critical precursor for the organisation's ability to successfully implement AI, the converse being the risk of a failed implementation. In addition, Trocin et al. (2021) noted that the competitive advantage of organisations is at risk if they fail to cultivate awareness and AI expertise as a key component of their strategies. Despite these risks mentioned by the authors, the impact of implementing AI without a readiness assessment on business processes and stakeholder perception is unclear. Then again, Dwivedi et al. (2021) suggested that autonomous AI systems be trained in human values, to not exhibit bias and therefore refrain from social profiling.

According to Dwivedi et al. (2021), who conducted a study on AI readiness factors, financial resources were highlighted as a key influencer of AI readiness. In addition, it is costly and time-consuming for organisations to develop talent and invest in the IT infrastructure required by AI to function properly (Johnk, Weißert & Wyrtki, 2020; AlSheibani, Cheung & Messom, 2018). Whereas Watson et al. (2019), found that AI systems increase quality if processes are repeatable and provide consistent outputs. On the other hand, Lahlali, Berbiche and Alami (2021), noted that AI should not necessarily be applied across all processes, as every process is not AI-ready. Furthermore, organisations must rethink and redefine their business processes, to

increase the harmony between humans and machines, to compensate for weaknesses in one another (Lahlali, Berbiche & Alami, 2021).

In another study conducted on Artificial Intelligence and its role in surgical care in low-income and middle-income countries, the authors identified process challenges as the root cause of false identification of faults in systems, instead of poor decision-making health practitioners (Reddy et al., 2019). However, the Critical analysis of Big Data challenges and analytical methods conducted highlighted the decision of where to apply AI, which should be preceded by the identification of problem areas where AI can solve business problems (Sivarajah et al., 2017). In addition, the organisation also takes into account the maturity of technology compared to the capability maturity of the service provider (Lahlali, Berbiche & Alami, 2021). The authors Aarstad and Saidl (2019) expanded by adding the lack of a clear AI strategy as the most common barrier companies face when implementing AI.

In their book, about how to compete in the age of AI, lansiti and Lakhani (2020) noted that the level of data access granted by administrators to AI is a key contributor to AI readiness, as AI specialists are entrusted with the development of data models that are secure and only accessible to those authorized individuals. On the other hand, an AI conceptual framework study highlighted the availability of data for AI to train on as a key enabler of AI readiness (Agrawal, Sharma & Kumar, 2018; Kruse, Wunderlich & Beck, 2019). Subsequently, Johnk, Weißert and Wyrtki (2020), noted that since data issues are also linked to historical data, organisations need to improve their capabilities to prepare and process data, thus increasing the quality of output (Johnk, Weißert & Wyrtki, 2020).

In a study conducted by Bawack (2019), on the potential of AI in practice, it was noted that AI personnel identified with the most prominent roles and responsibilities are business analysts and AI specialists who can translate business requirements into system requirements, as they can build and develop AI solutions. These roles work in an ecosystem, within the operations of the organisation. Roa (2017), found that the impact of AI on the operating model of the organisation is significant, in that the technology influences the agility of the IT department and the roles and responsibilities of the workforce. Whereas Baslom and Tong (2019) noted that

employees thrive on AI awareness, as it allows staff to realise the versatility of AI within the context of their industry. Therefore, as an outcome of increasing AI awareness, the expectation of AI is formed in the context of its possibilities.

Rao (2017) conducted a study on the critical factors contributing to the adoption of AI in organisations and found that AI governance includes the controls, policies and organisational implementations to govern AI applications, by setting boundaries and rules. Another author noted that the complexity of AI and its potentially diverse portfolio, demands collaboration between IT, the business, statisticians, and industry (Lahlali, Berbiche & Alami, 2021). Gartner (2017) added that an AI strategy, aimed at creating new opportunities for individuals and organisations in the industries within which they operate, is at the top of technological strategic priorities.

2.6.1 Adoption frameworks

Jöhnk, Weißert and Wyrtki (2021) argued that AI adoption necessitates organisational readiness. Lokuge et al. (2019) found that approximately 90% of innovations never convert to advances in product and service offerings due to the lack of organisational readiness. Consequently, the outcome of the study revealed 18 readiness factors, categorised into four main groups: strategic alignment, resources, knowledge, culture, and data. Malope, Van der Poll and Ncube (2021) conducted a study on the digitalisation practices of South African State-Owned Enterprises to develop a framework for the rapid adoption of digital solutions. The study draws from the TOE framework to assess the adoption readiness of the organisations. Incidentally, they also found that collaboration forms a critical part of the synergies required across SOEs to share knowledge, innovations and lessons learned.

Additionally, Lokuge et al. (2019) conducted an empirical study on the readiness of organisations toward digital innovations and constructed the “priori model”. The model describes factors such as resources, culture, strategy, IT, innovation, and partnerships as key contributors to organisational readiness. Organisational culture was identified as a crucial factor to drive innovation, which is evident in organisations like Apple and Google with strong innovation cultures, as required by an ever-

evolving AI (Lee, Raschke & Louis, 2016). Furthermore, a Delphi study conducted by Katjimune and Brown (2021), found that digital transformation requires three critical elements to be considered namely the development of new skills, new organisational capabilities, and new leadership structures. Importantly, Temelkova (2018) found that the development of leadership skills is considered mandatory to facilitate successful digital transformation, synonymous with AI forming part of such an ecosystem. However, it may contribute negatively to organisational readiness if the alignment between organisational processes, leadership and IT capabilities is not clear when adopting AI.

In a study conducted by Alsheiabni, Cheung and Messom (2019), the TOE framework was used to categorise factors across 207 organisations regarding adoption barriers and enablers. Subsequent findings revealed that technological factors included security, privacy, and technological capabilities. Iansiti and Lakhani (2020), highlighted data access management as a key requirement for AI specialists to develop data models while maintaining security. Davenport (2018) noted that AI is often based on analytics evolving rapidly, and unless organisations plan to develop and invest in technology resources to augment internal capability, they may not keep up with the proliferation of AI. Also, people are required to tweak, develop, re-train, and develop cross-functional teams to work together and integrate AI solutions.

While existing literature has identified different factors which contribute to organisational readiness, the key characteristics of what constitutes a conducive culture, and how employee acceptance or resistance to change will impact key business processes, are not clearly articulated. Following this uncertainty, an organisation may still be at risk of not being able to unlock the full value of an AI implementation.

2.7 Conceptual framework

The conceptual model below provides decision-relevant information, which is likely to impact the readiness of IT organisations to implement AI successfully, and in so doing will increase the likelihood to achieve its business goals. Drawn from the literature, the TOE framework covers the broad categories of factors related to

Technology (T), Organisation (O) and Environment (E) which have been found to impact the successful implementation of AI (Malope, Van der Poll & Ncube, 2021). Consequently, Johnk, Weißert and Wyrtki (2020) argued that if an organisation is capable of measuring its readiness and drawing pragmatic conclusions before commencing implementation of AI technologies, the risk of a failed implementation is likely to be reduced. Further, the continuous assessment of AI readiness steers the organisation to create agile strategies, and to develop organisational capabilities, commitment, and assets.

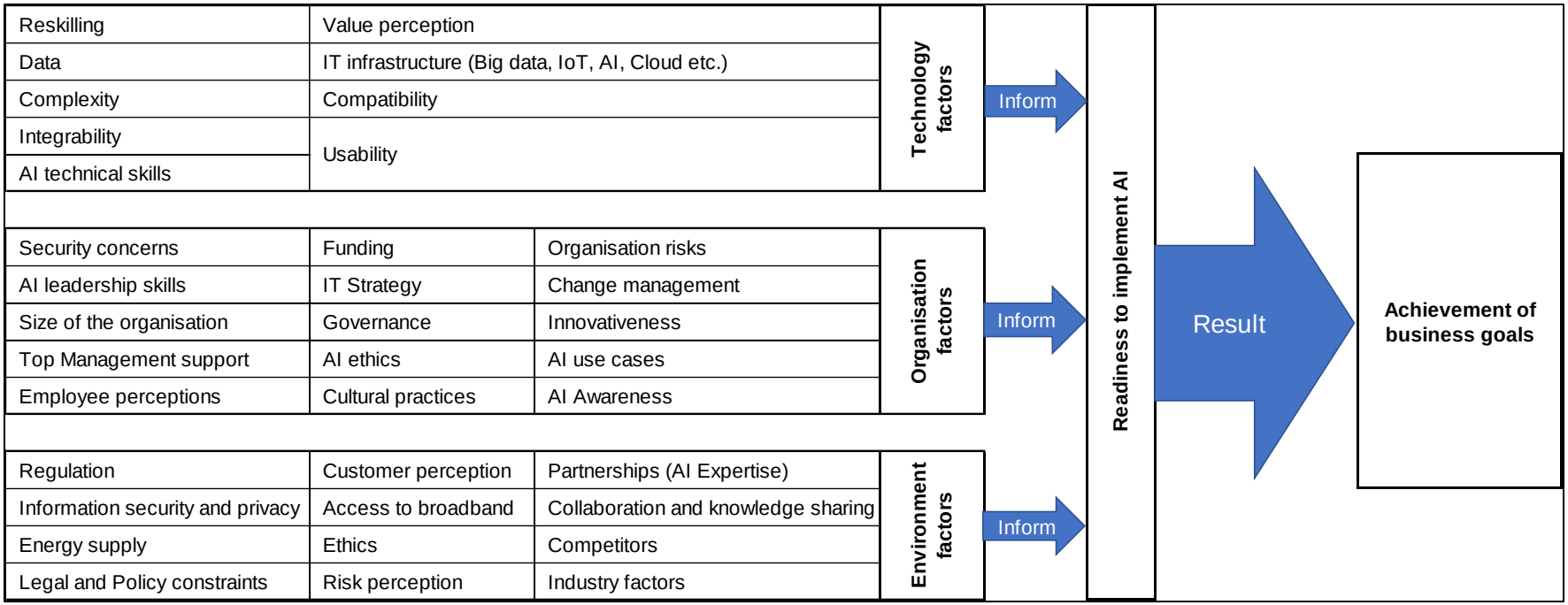

Figure 2: Readiness of IT organisations to implement AI towards achieving business goals

2.8 Conclusion to chapter two

In this dissertation, the aim is to explore the readiness status of IT organisations to implement AI towards realizing their business goals, in line with the benefits of 4IR, and the reasons thereof. Further, it was also important to understand the factors contributing to the AI implementation readiness of IT organisations in the South African context. In addition, although the researcher sought additional insight into the phenomenon of study, it was argued in several contexts from the background of the research problem by emphasizing organisational readiness to implement AI.

While studying the concepts of AI, it was found that ML and NLP featured more often in IT operations processes, for example preventing cyberattacks, reducing mean time to repair (MTTR) and identifying events through correlation (Wellers et al., 2017; Zhaoxue et al., 2022). Further investigations showed that the potential opportunities for organisations on 4IR emerging technologies, like AI, are between $1.49 trillion and $2.95 trillion over the next ten years to reduce fraud, predominantly linked to ML and NLP. Whereas, in the IT industry, the economic contribution of AI is estimated at $5 trillion, through the automation of business processes across multiple sectors (Davoyan, 2021).

However, many studies found organisational readiness as a critical antecedent for the ability of organisations to successfully implement AI. Consequently, it was discovered that factors hindering the implementation of AI include for example lack of, top leadership support, AI skills, ethics, funding, innovation, culture, IT infrastructure, energy supply, broadband access, and security and privacy. Subsequently the TOE framework was identified as the theoretical lens to support the study.

The next chapter will discuss the theoretical underpinnings of AI implementation readiness of IT Organisations in South Africa.

CHAPTER THREE – THEORETICAL UNDERPINNINGS

3.1 Introduction

This chapter aims to identify the theoretical underpinnings that support this study regarding the Readiness of IT Organisations to implement AI towards achieving their business goals. Of particular focus was the TOE framework, developed by Tornatzky and Fleischer (1990) as an adoption framework of technologies in organisations.

To map the theories and constructs of the phenomenon being investigated, the chapter commences with the uses of the TOE theory in research, as outlined in section 3.2. This is followed by the TOE constructs of Technology, Organisation and Environment in section 3.3. Thereafter, section 3.4 identifies similar studies where the TOE frameworks were used to determine organisational readiness to implement AI. Next, section 3.5 outlines how the TOE theory is applied and fits the context of this study and is finally followed by the conclusion of the chapter in section 3.6.

3.2 Uses of Theory in Research

Studies on IT adoption rapidly evolved during the last thirty years, covering a diverse selection of theoretical models, such as the Theory of Planned Behaviour (TBP), the Diffusion of Innovations (DOI), the Electronic Data Interchange model (EDI), and so forth. The most valued of these studies, contributing to IT adaptation is the Technology- Organisation-Environment (TOE) and Technology Acceptance Model (TAM) (Bryan & Zuva, 2021). Broadly, literature focused on IT appropriation, amounts to only a few studies at the level of an individual, such as the Theory of Planned Behaviour (TPB), the Technology Acceptance Model (TAM), and the Unified Theory of Acceptance and Use of Technology (UTAUT). However, even fewer studies are focused on the organisational level (Brandon-Jones & Kauppi ,2018; Isaac, Mutahar & Alrajawy, 2018).

According to Merhi, Merhi and Ahluwalia (2017), the adoption of the technology process extends to technical staff and business leaders, towards the adoption and delivery of innovations by customers inside the organisational context. Alsheiabni, Cheung and Messom (2019) added that the TOE framework covers the manner in which the organisation adopts and executes innovations through the lens of three

contextual components, Technology (T), Organisation (O), and Environment (E). Furthermore, the competitive advantage of an organisations is determined by both the external and internal contextual elements, being organisational strategy, organisational size and environment (Brandon-Jones & Kauppi, 2018).

3.3 Technology, Organisation, and Environment Framework

The popular TOE framework which was developed by Tornatzky and Fleischer (1990), illustrates three motivators, namely Technology, Organisation and Environment, as stimuli to the successful adoption of technologies, such as AI, by IT organisations (Bryan & Zuva, 2021). AlSheibani, Cheung and Messom (2018), highlighted that the barriers and enablers to AI adoption are not only limited to the technical factors, but also cover organisational culture, skills, strategies, structure, and infrastructure. The extensively applied TOE framework focused in many studies on how IT can deliver value and contribute to organisations gaining a competitive advantage and also examining how IT drives value. Van Den Berg and Van Der Lingen (2019), identified 11 factors which transverse the TOE constructs. However, subsequent studies also found other barriers and enablers which impact the readiness of organisations to implement 4IR-T, such as AI, Cloud, IoT, 3D printing, and Big data (Ahmad et al., 2019).

3.3.1 Technology

The technology dimension includes organisation, industry, and individual adoption of innovative technologies such as AI. The author further highlighted that technologies span current practices and infrastructure internal to the organisation, as well as those technologies available external to the organisation. Apart from the innovation variables, other factors such as digestion, system absorption, intricacy, and trail ability were also included in several other studies (Alsheiabni, Cheung & Messom, 2019; Schmitt et al., 2019; Smit, Eybers & Smith, 2021). Further, according to Malope, Van der Poll and Ncube (2021), the Technology factors include a Digitalisation strategy roadmap, for 4IR-T such as Blockchain, Cloud, IoT, and AI, which ought to be evaluated adequately before implementation.

3.3.2 Organisation

Organisational context denotes narrative factors such as the top management structure, legislative brief, innovation capacity, financial capital, knowledge, skills, size, and scope. Particularly, the readiness of organisations to implement technologies such as AI is impacted by these intra-hierarchical components, as mentioned earlier, as well as the operational capability and quality of human capital. The importance of financial resources and technical competency are stressed as being the most significant contributors, according to Bryan and Zuva (2021). Van der Poll and Ncube (2021), further noted that the leadership of the organisation has the accountability to connect with all internal and external stakeholders during its digital transformation journey. Furthermore, Allas et al. (2017) expanded on the required components to develop AI capabilities, to be inclusive of data, tools, and developers.

3.3.3 Environment

The Environmental context refers to the area where the company targets its markets, its competitors, industry, and interactions with the government (Bryan & Zuva, 2021). The environmental contextual categories include regulation, consumer trust, and ethical practices. In the case of AI, it illuminates the methods of mining consumer trends and personal data to predict very personal and sensitive outcomes, which could impact consumer trust (Stone et al., 2016). Subsequently, due to the power of AI to replace certain human tasks by mimicking human intelligence, the ability to manage and achieve sustainable outcomes requires different management skills (Miller, 2022). Yet the lack of adequate laws and governance has not caught up with the proliferation of AI implementations, and therefore organisations must devise ways to implement ethical practices guiding decision-making to create value (Tambe, Cappelli & Yakubovich, 2019).

3.4 Similar studies on the TOE framework application

Hradecky et al. (2022), conducted an exploratory study on organisational readiness to adopt AI and developed a theoretical framework by synthesizing the Technology Readiness Index (TRI), and the Technology-Organisation-Environment (TOE) framework. The selection was made over the widely used technology acceptance

theories such as the Unified Theory of Acceptance and Use of Technology (UTAUT), and the Unified Theory of Acceptance and Use of Technology (UTAUT). The rationale of the authors to apply the TOE framework was that it differs from other models and theories in that it focused specifically on technology acceptance at an organisational level. Furthermore, the framework also considers characteristics of the environment and external business environment as it relates to AI adoption. Therefore, these dimensions contributed to understanding how each dimension influences AI adoption (Hradecky et al., 2022).

In a study conducted by Rao (2017), to determine the factors critical to the organisation's ability to adopt AI technologies, in the South African context, consideration was afforded to the relative immaturity of academic studies and in the TOE context. Technology factors noticeable to AI adoption decisions were readiness and complexity, whereas organisational barriers and enablers included expected benefits, top management support, operational innovativeness, and formalisation. Lastly, salient environmental factors found to influence AI adoption decisions were Support Capability, Normative Pressure, and Mimetic Pressure.

In an interview study of organisational readiness factors, conducted by Iansiti and Lakhani (2020), 25 industry experts were consulted regarding what they deemed barriers and enablers to consider when organisations are embarking on the AI journey. Triangulating results, with practitioner and scientific literature, revealed a set of five AI readiness categories, namely resources, strategic alignment, knowledge, data, and organisational culture. They further denoted the importance of managing access to data, and the infrastructure associated with the storing, analysing, and interpreting of data, requires specific AI skills, to develop the necessary models and algorithms, whilst maintaining privacy and security.

This study is intended to suggest complementary insights into the existing body of knowledge with an emphasis on the AI implementation readiness of IT Organisations in South Africa, to achieve their business goals. Furthermore, the study focused on the roles in the organisation with specific reference to IT managers, as the decision-makers, who set strategy, manage talent, and create a conducive culture and are

more likely to succeed in AI implementation. Technical staff who implement AI technologies will also be consulted and deductions are drawn, triangulating with results from an open-ended interview approach, and the literature. Informed by the theoretical TOE framework, factors impacting AI implementation readiness are explored in the context of the study. Subsequently, it is anticipated that the outcomes will guide the decision-making of IT organisations on factors likely to affect their readiness in preparation for implementing AI.

3.5 The relevance of the TOE framework in the context of this study

The conceptual model of this study, in Figure 2, is based on the TOE model and insights drawn from the literature reviewed (Tornatzky & Fleischer, 1990). The readiness barriers and enablers, articulated in several studies, will be studied in an IT organisation selected, as well as identify possible additions, as part of this study (Jöhnk, Weißert & Wyrtki, 2021; Hradecky et al., 2022).

The TOE framework can be seen as an adoption framework, which highlights factors organisations are likely to encounter when introducing technologies into their business processes. These factors are divided into Technology, Organisation, and Environment factors, which may differ from region to region, the type of company and the industry it operates. However, as uncovered in the literature, the TOE framework has also been used to assess and identify factors that influence the readiness of organisations to implement technologies, and in this case, AI. As such, the TOE framework and literature, will assist the researcher to identify which of these factors are present, or absent, in the phenomenon being investigated, whilst at the same time identifying possible additional factors to augment the body of knowledge. Subsequently, IT organisations may benefit from the study in order to assess or improve their readiness.

IT organisations design, build, implement, support, maintain, and/or enhance technologies, to enable organisations to achieve their business goals. Aarstad and Saidl (2019) identified barriers across the TOE landscape, ranging from current technologies being unable to support AI implementations due to the lack of data infrastructure, to poor integration and incompatibility. Organisational factors included

multiple priorities, dependency on the IT department, financial constraints, insufficient skills and resource constraints, as notable factors. Dwivedi et al. (2021) added ethical dimensions, social challenges and regulatory concerns as critical catalysts to how AI is perceived and used.

The Technology, Organisation and Environmental constructs, revealed factors about the adoption of Technologies in organisations, which will be triangulated with the data collected, through open-ended interviews and focus group discussions (Viljoen, Blaauw & Schenck, 2019). Furthermore, outcomes can assist IT organisations to enhance their business decision-making and the likelihood of successful AI implementation.

3.6 Conclusion to chapter three

This chapter presented models, theories and their applications concerning the IT Industry, in particular, the TOE framework is used as the analytical lens to study the readiness of IT Organisations to implement AI toward achieving their business goals. Also, the objective of this chapter was to present the theory, understand and acquire explicable factors, impacting the readiness of organisations, as seen by IT Managers and technical staff.

Theoretical models such as the Theory of Planned Behavior (TBP), the Diffusion of innovations (DOI), the Electronic Data Interchange model (EDI), and the Technology Acceptance Model (TAM) are a few examples of theories considered for the study. The most valued of these studies, contributing to IT readiness, was the TOE framework and therefore selected as the most suitable, based on the consideration of its holistic view of impacting barriers and enablers.

Key concepts include Technology (data, IT infrastructure), Organisations (AI readiness, leadership, talent, governance, ethics, culture) and Environment (information and security, collaboration), followed by instances of how these concepts are applied in context. Equally, section 3.5 elaborated on how the TOE theoretical framework fits this particular study. The research methodology and data collection techniques used are presented in Chapter 4.

CHAPTER FOUR – RESEARCH METHODOLOGY

4.1 Introduction

This chapter provides the systematic order of research activities employed by the researcher to answer the research question and sub-questions. It further clarifies the choices of strategy and methodology by articulating how the research data will be collected, analysed, and managed.

The chapter introduces the design selected for this research, followed by the research strategy in section 4.2 and methodology in section 4.3, respectively capturing the research approach and techniques selected to achieve the objectives of this study. In section 4.4 the deductive approach and its fit to this study are discussed. Next, section 4.5 provides insight into the sampling technique used to stratify the population of the IT organisation. Section 4.6 touches on the ethical considerations governing the engagement of participants, followed by sections 4.7 and 4.8, which focus on the procedures by which data will be collected, managed, and secured to prevent unauthorized access. Lastly, the chapter concludes with section 4.9.

4.2 Research strategy

The purpose of this study is to explore the readiness of IT organisations to implement AI towards realising their business goals, in line with the benefits of the Fourth Industrial Revolution (4IR). For this reason, the researcher will adopt a case study strategy. Since the context of the research focuses on the setting where AI is not yet implemented in an IT Management organisation (Ebneyamini & Sadeghi Moghadam, 2018). Further to the context, the IT Management organisation is relatively small in size (68) hence a large sample is not possible, increasing the plausibility of a qualitative approach (Blumberg, Cooper & Schindler, 2008). Additionally, the involvement of IT Management, technology implementors, and staff performing business processes activities which will likely be impacted to some degree or the other lend itself more towards an interview approach. Also, internal customers who consume services from the IT Management company will provide

relevant input towards the alignment of IT strategy with business goals, cultural aspects, and readiness.

According to Ebneyamini and Sadeghi Moghadam (2018), a case study is an approach researchers apply to generate in-depth explorations of complex issues manifesting in real-life settings, events, or issues of the phenomenon of interest. Thus, the context of the study lends itself to a more suitable case study design, which will be used to address the sub-research questions highlighted in subsection 3.3. The literature reviewed contributes to the succinct definition of the sample selected in the organisation, the geographic location, areas to be investigated and the types of evidence that will be collected. Therefore, a thorough understanding of the case requires the collection of multiple sources of evidence, in this case, interviews with individuals, with open-ended questioning, commonly used in a qualitative method, supported by focus group discussions. The latter will allow for multiple data sources to assist with data triangulation, drawing similar conclusions from focus group discussions to validate findings (Ebneyamini & Sadeghi Moghadam, 2018).

Case studies are not flawless as qualitative datasets may proliferate to an extent that the sheer data volume inhibits analysis and conclusion with the available resources. Although care will be taken to avoid collecting unnecessary data within a reasonable time to complete the data analysis and interpretations of findings successfully, responders will be requested to verify the interpretation. According to Nowell et al. (2017), qualitative research is a valued method that requires rigorous methodical methods, due to its complexity to create meaningful results. Contrary to quantitative methods, which are predominantly concerned with numbers, qualitative methods use descriptions, videos, images, and as in this case study, interviews, to collect data (Nowell et al., 2017).

4.3 Research method

To conduct this research, qualitative methods will be adopted by the researcher through the application of in-depth interviews with participants who can provide context as to how the IT strategy aligns with the business goals and understand readiness to implement AI. Furthermore, participants will be able to provide feedback

based on their perception of how AI can support business processes. The selected participants will be requested to comment on ideal organisational cultural characteristics conducive to AI implementation and the challenges that may hinder the implementation of AI. In addition, interviews will be followed up with focus group discussions to confirm the contextual factors, across the context of the study, ensuring improved validity of collected data.

According to Schober (2018), personal interviews are face-to-face conversations, which can also be conducted via virtual platforms, where two-way conversations are initiated to obtain information from the subject being interviewed. Interviews are advantageous in the sense that their value lies in the detail and depth of information secured, which far exceeds web surveys; the difference being the presence of the researcher. Also, all participants will be asked the same questions. However, this method also has its disadvantages like misinterpretation, incorrect recording of responses, and biases. Yet these issues can be prevented by recording interviews with a device, transcribing responses, and requesting the participant to verify for correctness, and lastly, the interviewer can probe the participant for additional information to elicit proper responses. In this study, the researcher will conduct interviews via MS Teams, with open-ended questions, allowing the participants to reflect on their perceptions related to readiness to implement AI. Each interview will be recorded to enable the researcher to focus on the discussion, without the distraction of taking notes.

The use of open-ended questions enables immediate data collection compared to a smaller success rate of survey questionnaires, which may find the return rate of survey questionnaires to be low. Interviews and focus group discussions will be conducted and recorded through the MS-Teams platform, and recordings stored on SharePoint, where access is limited to the researcher for analysis and record keeping. To analyse the data, the researcher considered a suitable research approach between abductive, inductive, and deductive reasoning, as discussed in the next section.

4.4 Research approach

A deductive approach is used in the case where the literature about the phenomenon being tested, is adequately researched. Moreover, this approach is used when the researcher has studied the literature and can draw comparisons between the data collected and the literature rather than recreating the theory, whereas in an inductive approach the theory is created (Melnikovas, 2018). In this study, the researcher will aim to explore the readiness of IT organisations through the lens of the TOE framework (Malope, Van der Poll & Ncube, 2021). By applying deductive reasoning, the researcher will be guided to identify how IT organisations can implement AI towards realising their business goals, in line with the benefits of the 4IR.

4.5 Sampling

The sampling process involves selecting a sample size of target participants from amongst the research population. The sampling process can be categorized into probability and non-probability (Ebeto & Babat, 2017). Non-probability sampling also referred to as purposeful sampling, or selective sampling implies that the researcher selects participants based on their in-depth understanding of a specific phenomenon under investigation (Theron & Halloran, 2021). The non-probability technique is highly subjective, as the researcher creates the required qualification criteria which each participant must meet to be considered as part of the study (Sibona, Walczak & Baker, 2020). Unlike non-probability sampling, probability sampling calls for more planning, and repeated call-backs, and is usually more expensive. According to Blumberg, Cooper and Schindler (2008), non-probability sampling often seems to produce acceptable results.

Participants will be selected based on purposive criteria and hence not every individual has an equal chance of being selected. An initial sample size of thirty-one is selected, and interviews will be conducted up to the point where no additional information is forthcoming, which may result in some sampled participants not being interviewed. Contrary to the latter, probability sampling techniques have access to the full population selected as a sample. Therefore, the context of this study has motivated the sample size selected, which the researcher will justify in Table 3.

In the context of this study, IT managers are the decision-makers of the IT Management organisation, entrusted with the accountability of implementing new technologies, like AI. In addition, they are usually entrusted to create the necessary awareness, foster the requisite culture, and manage disruptive changes like AI, and capacities introduced into the organisational processes (Jöhnk, Weißert & Wyrtki, 2021). Subsequently, each manager is responsible for a portfolio that when combined enable the value chain, aligns business processes and capabilities to fulfil the strategy, and is best positioned to articulate the potential challenges which may hinder a successful AI implementation.

Senior IT technical staff are usually entrusted with implementing technologies, and their understanding of AI's applicability across business processes should be where they can provide insight. Similarly, they will be responsible for providing specialist support on AI-implemented technologies. Junior IT technical staff are responsible for the day-to-day administration of networks, and servers, and provide user support. Usually, these repetitive tasks are targeted by AI capabilities to introduce efficiencies, hence they will provide good insight into the awareness, acceptance of or resistance to implementations in support of business processes. Finally, top management support for a successful implementation, as postulated by the theory, is critical, hence good insights will be drawn from such an inclusion in the sample, providing insights across all themes of the study. A pilot interview will be conducted initially to identify any possible calibrations to be made, with the intent to facilitate a successful data collection.

Table 3 below provides an extraction of the population, sample size, and method used, which are linked to the rationale provided earlier.

Table 3: Sample selection

Operational unit	Total population	Sample size	% of population	Sample method
Executive Director	1	1	100%	Purposive sampling
IT Management	6	6	100%	Purposive sampling
Senior IT Technical staff	9	9	100%	Purposive sampling
Junior IT Technical staff	53	15	28%	Purposive sampling
Totals	**68**	**31**	45.6%	

4.6 Theoretical lens

The TOE framework, as developed by Tornatzky and Fleischer (1990), is a popular framework which depicts three stimuli namely Technology, Organisation and Environment, as influencers of the adoption of technologies in organisations (Bryan & Zuva, 2021). As noted by AlSheibani, Cheung and Messom (2018), the AI adoption barriers and enablers are not limited to technology but also include the infrastructure, skills, structures, strategies, and cultures of organisations. The TOE framework has been extensively applied in research to examine how IT delivers value and a create competitive advantage for organisations. Furthermore, the TOE framework identified 11 factors traversing the TOE constructs, however, subsequent studies found additional barriers and enablers impacting the readiness of organisations to implement 4IR-T successfully (Van Den Berg & Van Der Lingen, 2019).

4.6.1 Technology context

The author identified that the technology context influences the industry, organisation, and individual adoption of innovative technologies, spanning five attributes. However, apart from innovation variables, other factors namely, digestion, system absorption, intricacy, and trail ability, have been included in several other studies, Cheung & Messom, 2019; Schmitt et al., 2019; Smit, Eybers & Smith, 2021).

According to Malope, Van der Poll and Ncube (2021), Technology barriers and enablers include a strategy for digitalization roadmap, for 4IR-T such as IoT AI, Blockchain, and Cloud, which ought to be evaluated adequately before implementation, to ensure interdependencies are understood.

4.6.2 Organisation context

The readiness of organisations is impacted by intra-hierarchical components, comprising organisation size, organisation scope, and legislative brief, the most important being the financial resources, innovation capacity, knowledge, operational capability, quality of human capital and organisation readiness. Emphasis is placed on financial resources and technical competency, which is the most significant (Bryan & Zuva, 2021). According to Malope, Van der Poll and Ncube (2021), top management has the responsibility to engage with all stakeholders, both internal and external, to form part of the digital journey. Further, the Board and Executive managers must adopt 4IR-T by making available the required funding and commitment towards capacitating the initiatives, through skills retraining and development, to focus on the implementation of 4IR-T (Chui, Francisco & Manyika, 2017). Likewise, as suggested by Allas et al. (2017), skills required to develop AI capabilities include tools, developers and data.

4.6.3 Environmental context

The environmental barrier categories include consumer trust and regulatory acceptance, which in the case of AI impact consumer trust and data (Stone et al., 2016). Particularly, due to the ability of AI to mimic human intelligence, it creates new management challenges for organisations regarding regulation, ethics and laws governing implementations (Miller, 2022). Yet in the absence of laws and governance, which have not yet caught up with the proliferation of AI implementations, organisations must find ways to adopt ethical practices in guiding decision-making to create value (Tambe, Cappelli & Yakubovich, 2019).

4.7 Ethical considerations

All the necessary ethical considerations, the privacy of information and security will be adhered to. Furthermore, participants will only be engaged once ethical clearance

has been obtained from the ethics committee of the University of South Africa School of Business and Leadership.

Before commencing the engagement with participants to collect data, the requisite ethical clearance applications will be made to the ethics committee of the University of South Africa School of Business and Leadership. Participants will be made aware of the context of the research, inclusive of the collection, data management processes, what data security processes will be applied, and how long data will be retained. Moreover, informed consent will be sought from each participant to freely participate, with the option to cease participating at any time during the interview process (Saunders, Lewis & Thornhill, 2019).

Participants will be protected from mental discomfort when conducting the interview and focus group discussions by not running excessively long data collection sessions, as well as creating an environment that is conducive to eliciting proper responses. Personal information will remain confidential to ensure the right to privacy of all participants is protected (Blumberg, Cooper & Schindler, 2008).

Despite the protection of personal information, and the level of readiness, derived from the interviews, a biased perception may be created towards participants. As such, the researcher will aim to communicate the outcome in a manner that portrays the benefits to all staff and the organisation. Furthermore, these benefits may for example reduce the risk of poor financial investments, as well as point out the AI skills development needs. Likewise, the wider organisation will benefit from the increased readiness, as it is continually assessed, positively contributing to the preparedness to implement AI. However, the wider organisation may not have visibility of the hindering factors, and how it applies to the IT organisation, which may likely be addressed through stakeholder collaboration. Equally, these new insights may increase the possibility of a successful AI implementation.

4.8 Data analysis

Once interview data is collected, it will be transcribed into text and subjected to a coding process known as thematic analysis. According to Nowell et al. (2017), in

thematic analysis, the researcher becomes the instrument of analysis, deciding on the themes, coding, and contextualization of the data. Additionally, a thematic analysis provides high flexibility in approach, which is usually helpful when researchers are early in their careers. The researcher can examine the perspectives of participants to highlight similarities and differences and generate insights, and finally, it is useful to summarise key features of large data.

In the context of this study, a thematic approach will be used to identify patterns, which relate to the readiness of IT organisations to implement AI towards realising their goals, in line with the benefits of 4IR. Subsequently, the identified patterns will undergo a coding process in order to group factors related to the readiness to implement AI. The TOE framework will be used to elaborate on the findings as it relates to existing literature. The thematic analysis will be conducted by the following six-phased approach:

Phase 1: The researcher will familiarise himself with the collected data, to identify common themes. Notes will be captured in Microsoft Excel and Microsoft Word, to summarise the responses from participants. Also, the researcher will identify possible codes to group themes, guided by the theoretical perspectives gained in the literature review.

Phase 2: Codes will be created, and a framework established in Microsoft Excel to capture similarities and group responses against codes, representing theoretical themes. An audit trail will be created by adopting a similar folder structure for each respondent, to ease reference and finding data. Notes captured during the MS Teams interviews will also be saved in SharePoint.

Phase 3: Themes will become more evident with the use of the coding, which will necessitate it to be rechecked against the raw data. The researcher will perform further triangulation making sense of data connections to the themes. The themes and responses will be captured on the adapted TOE framework against the theoretical constructs.

Phase 4: During this phase, further triangulation will be done, themes will be vetted for inclusiveness, and referential adequacy will be verified by revisiting the interview data.

Phase 5: The researcher will conduct a focus group interview to confirm themes and validate responses. Themes will be documented, named, and saved in MS Excel. Aspects of the data will be analysed to determine the themes of interest, followed by a detailed analysis to ensure the recording of the storyline of each theme.

Phase 6: During this phase, the researcher will complete the analysis and commence with the report writing of the findings. The write-up of the thematic analysis will be logical, coherent, concise and an account of the data. Also, the logical process followed during the study will be captured in the report to create trustworthiness regarding the claims made about the data and its relation to the themes of the study. Lastly, participants will be quoted verbatim to aid the understanding of specific interpretations drawn.

4.9 Data management plan

A data management plan, according to Gajbe et al. (2021) consists of three components which include: data, management and the plan to manage the data. Raw “data” in the case of this study refers to the records which will be a combination of audio and text. Notes taken will be transcribed into Microsoft Word files, coded and mapped to the themes with the use of Microsoft Excel. Charts, as well as metadata, will be captured in MS Excel and stored as an Excel file type. Microsoft Visio and Microsoft PowerPoint will be used to create visual representations of the TOE framework and denote how the themes of the literature feature throughout the interviews and focus group discussions.

Smale et al. (2021) further elaborated that “management” applies to the strategies deployed by the researcher to organise all data effectively, minimise efforts and work more productively. The interviews and focus group discussions data will be stored in a secure password-protected folder and structured to ensure ease of reference and searching of data. By applying metadata sources the ease of reference will be

increased and the possibility of not finding records or loss of time to locate entries will decrease.

Gupta and Müller-Birn (2018) noted that “the plan” is a systematic course of action to achieve a specific goal, including the necessary steps and measures to manage all data collected through its life cycle. Moreover, it includes the identification, collection, organising, preparation, analysis, storage, and reuse of data entries. Unquestionably, data collected through interviews and focus group discussions will be used to test the research problem, and data entries will be referred to throughout the thematic analysis phases. Therefore, the schedule for the interviews will be created once ethical clearance has been obtained and following a pilot test of the data collection instruments. Next, the interviews will be conducted and recorded using MS Teams recordings in an MP4 file format. In addition to this, Microsoft office will be used to conceptualise data.

Access management of the data will be organised, and data back-ups will form part of the cloud offering of Microsoft SharePoint, which is automatic. Subsequently, data entries will be revisited as part of the triangulation process, during the phased thematic analysis. Importantly, data access will be restricted to only those with authorised access, along with the protection of the identities of those interviewed. No personal or private information will be collected to ensure compliance with POPIA (POPIA, 2019). Lastly, data will be retained for the duration specified by the University of South Africa School of Business and Leadership.

4.10 Conclusion to chapter four

Chapter four presented the research methodology adopted by the researcher to collect, analyse and interpret data. The chapter further explained the research approach used to investigate the phenomenon of the study, whilst answer the research questions and objectives of the study. This was followed by a research approach, best suited to perform this study, and the sampling method used to support a valid outcome. The researcher further elaborated on the socially constructed nature of the research problem, where human nature and experiences

motivate for a case study. The data collection techniques were interviews and focus group discussions. Subsequently, details of the analysis processes and methods used to clarify the factors and themes were provided as posited in the literature. The next chapter presents the description of the research findings as drawn from the analysis of the qualitative data collected.

CHAPTER FIVE – ANALYSIS

5.1 Introduction

This chapter presents the findings of the research questions and objectives discussed in Chapter 1. Also, it covers the data collection and analysis research activities employed by the researcher in the form of interviews and focuses on group discussions. Next, the thematic analysis process deployed in this study, as discussed in Chapter 4, is discussed, followed by the findings. Chapter 5 introduces the context of the study in section 5.2, which shares with the reader how the pilot interview and other interviewees were selected and approached. In addition, information is shared about the interviewee's role in the IT organisation, and the duration of the interviews, followed by section 5.3, which captures how the collected interview data was analysed. Next, the Thematic data analysis and focus group discussions are discussed in sections 5.4 and 5.5, followed by section 5.6, where findings are presented on the research objectives. Finally, a summary of the findings is presented in section 5.7, followed by the conclusion of the chapter in section 5.8.

5.2 Context of Study

The IT Organisation is part of a South African-based research, development and innovation council. IT is entrusted with providing modernised IT services to support the organisation’s business processes. The IT organisation employs 68 and the larger organisation consists of approximately 2500 staff members. A variety of 4IR technologies, such as Cloud, Big Data, and IoT devices, are already in use. Recently, the IT strategy was developed and launched in 2021, with the intent to introduce modernised IT services, and strengthen the competitiveness of the organisation. As such, the new strategy attracts significant investment, and current efforts are focussed towards producing efficiencies through a Cloud-centric strategy. Consequently, these interventions are expected to address some of the existing constraints about lack of infrastructure, skills and organisational processes.

Participants selected by the researcher included managers, senior technical staff, and junior technical staff, to draw on their insights concerning the IT organisation’s readiness to implement AI towards achieving business goals. Management is usually

involved in setting strategy, creating the requisite culture and required organisational capacity. Whereas senior technical staff are likely to be responsible for the implementation of new technologies and must deal with challenges like developing new skills, integration of business processes and technologies across the enterprise. Junior staff will likely be affected by the implementation of AI, which may be resisted, due to a lack of understanding, negative perception, or fear of job loss. After ethical clearance was obtained from the University of South Africa Ethics Review Committee, the researcher engaged with participants to schedule and conduct interviews, followed by focus group discussions.

During the build-up to the interviews, the researcher prepared an interview guide containing a background, aim and research questions. In addition, an initial interview schedule was prepared as a guide to plan the duration of interviews, also considering the availability of each of the participants. Subsequently, Microsoft Outlook was used to schedule the interviews, making use of the scheduler and identifying the most suitable time for the participants.

The researcher planned to conduct 31 interviews, followed by three focus group discussions, as part of the data-gathering process. However, a saturation point was reached during the interview Int_28_JT, as no new insights were forthcoming. Therefore, 23 interviews (including a pilot interview) and 3 focus group discussions were completed.

5.2.1 Pilot Interview

A pilot interview was conducted with the intent to improve the reliability of the data collection process. The pilot interview aimed to assess whether the initial questionnaire, in terms of questions, planned duration, and interview setting, was sufficient to deduce reliable and meaningful responses from the interviewee. In addition, the questions were assessed to establish whether they effectively drew relevant insights from participants to answer the research questions and objectives. Equally the responses to questions were evaluated in the context of the research objectives. The quality of the audio recording was tested through the MS Teams

platform. In addition, each recording was transcribed to quote the interviewee's responses verbatim.

The audio quality turned out to be excellent and allowed for initial coding using a combination of the notes taken in the interview guide matched with the audio and captured into MS Excel. Responses to the initial questions proved to be valuable. However, three questions attracted similar responses, resulting in two being removed, and another question was simplified to elicit more reliable responses. Subsequently, the interview guide was amended to reflect these changes (See Annexures A and B).

The pilot interview allowed the researcher the opportunity to test the validity of the interview process, by zooming into the guide (Annexure A: Pilot interview guide), approach and questions. Attached to each interview booking, the following documents were attached: ethical approval, organisational permission letter, and informed consent for individuals. This was followed by the email content covering the background to the study, ethical clearance, expectations, interview questions and next steps. Each meeting invite contained a unique link to the MS Teams channel for the interview.

Since the questions were adapted, the duration of the estimated interview was also reduced to within the planned range of 35-45 minutes. Finally, the interview guide was adjusted to reflect the updated questions, and the remainder of the interviews scheduled, as per Table 4 below. The participant code, or pseudonyms, are categorised into Pilot_01, as one pilot interview was conducted, Int_01_ST- Int_09_ST, referring to the senior technical staff, Int_10_Man- Int_16_Man, the management team, and lastly Int_18_JT, Int_19_JT, Int_20_JT, Int_26_JT, Int_27_JT, and Int_28_JT, the junior technical staff.

Table 4: Schedule of interviews

#	Participant code	Role	Interview length
1	Pilot_01	Business Support Specialist	43 min, and 26 sec

#	Participant code	Role	Interview length
2	Int_01_ST	Solutions Engineer: Information Security	46 min, and 25 sec
3	Int_02_ST	Senior Analyst: BI Systems	53 min, and 50 sec
4	Int_03_ST	Solutions Engineer: Systems	48 min, and 28 sec
5	Int_04_ST	Solutions Engineer: Networks	49 min, and 29 sec
6	Int_05_ST	Senior Specialist: End-user support	50 min, and 55 sec
7	Int_06_ST	Team Leader: System Operations	55 min, and 8 sec
8	Int_07_ST	Team Leader: Databases	58 min, and 18 sec
9	Int_08_ST	Senior Analyst: ERP Systems	54 min, and 48 sec
10	Int_09_ST	Senior Analyst: ERP Systems	32 min, and 46 sec
11	Int_10_Man	Chief Information Security Officer	55 min, and 30 sec
12	Int_11_Man	Applications Manager	1h, 12 min, and 51 sec
13	Int_12_Man	Chief Information Officer	43 min, and 48 sec
14	Int_13_Man	ICT Service Management Manager	49 min, and 57 sec
15	Int_14_Man	Enterprise and Solutions Architecture Manager	48 min, and 6 sec
16	Int_15_Man	Project Management Office Manager	57 min
17	Int_16_Man	CFO	50 min, and 33 sec
18	Int_17_JT	Systems Administrator	Cancelled
19	Int_18_JT	Systems Administrator	39 min, and 13 sec
20	Int_19_JT	Service Desk Agent	49 min, and 11 sec
21	Int_20_JT	Service Desk Agent	47 min, and 55 sec
20	Int_21_JT	Network Administrator	Cancelled
21	Int_22_JT	Network Administrator	Cancelled
22	Int_23_JT	Network Administrator	Cancelled
24	Int_24_JT	Systems Administrator	Interview cancelled
25	Int_25_JT	Incident Co-ordinator	Interview cancelled
26	Int_26_JT	Web developer	45 min, and 51 min

#	Participant code	Role	Interview length
27	Int_27_JT	Field Support Engineer	57 min, and 25 sec
29	Int_28_JT	Field Support Engineer	46 min, and 22 sec
30	Int_29_JT	Web Developer	Saturation point
31	Int_30_JT	Field Support Engineer	Saturation point
32	Int_31_JT	Field Support Engineer	Saturation point

Table 4 contains information on the planned number of interviews (32) inclusive of the pilot interview. The participant code is a pseudonym used for each participant, to protect their identity, followed by the role of each participant in the IT organisation. Next, the planned interview date is reflected, based on the original planning, which had to be adjusted based on the availability of participants. Adobe sign was used to route the Informed Consent forms of participants, which proved to be highly successful, as only one electronically routed form was not returned. Refer to Annexure C**: Informed consent**, for examples of the 25 informed consent forms signed by participants.

5.3 Data analysis process

After the data collection of each interview, in the form of an MS Teams transcription and MP4 audio file recording, the researcher commenced with the thematic analysis to code responses (Nowell et al., 2017). The researcher examined the transcriptions, highlighting the relevant perspectives of each participant. Furthermore, comparisons were drawn, differences were noted, and where possible patterns in the data were explored. Grouping of the data was done using sub-themes, themes, research categories, and ultimately, TOE dimensions. Data collected was organised and stored in an online encrypted OneDrive folder, in a uniform structure, referenced in a coding handbook to ensure referential integrity. Furthermore, access to the data was restricted to only the researcher.

5.4 Thematic Analysis of Interviews

The analysis process enabled the researcher to familiarise himself with the data by conducting a quality review of the output of the transcriptions, and also listening to

the audio. A folder structure for each interview was created, and files were stored in OneDrive, as per Figure 3 below, to ensure audit trial, and support referential integrity.

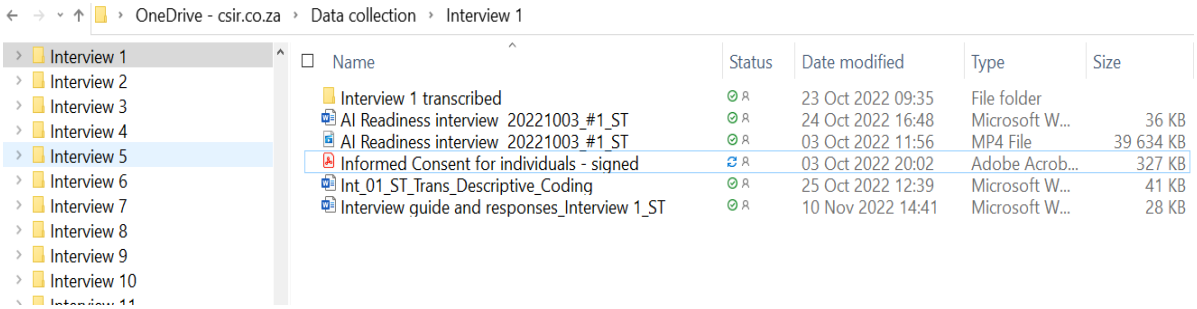

Figure 3: Thematic analysis OneDrive folder structure

During phases 2 and 3, the research further refined the sub-themes and continued to categorize themes aligned with research objectives. Phase 4 of the analysis included the vetting of data for inclusiveness, by verification against the interview data. File structures were also confirmed to support referential adequacy. For example, if the quote *"… wellness meter can decline certain work, to assist individual staff members to balance work-life, keeping them healthy…",* needs to be referenced, it can be found under the codebook reference #38, linked to the sub-theme AI Perspectives, recorded as part of the interviewee code ***Int_01_ST***, saved under OneDrive, as the file ***Interview guide and responses_Interview 1_ST***.

Figure 4: Referential integrity example

During phase 5, the focus group discussions were conducted, with the intent to confirm the themes and validate responses obtained from the interviews. Themes were presented in an Excel pivot table and presented to the focus groups. After confirmation of the themes, the researcher commenced a detailed capture of the storyline of each theme.

The coding process allowed data to be grouped into similar responses logically. Through the process of coding, the researcher was able to identify themes which could potentially contribute to or hinder the readiness of IT organisations to implement AI towards achieving their business goals. For example, code words like learning, innovation, and empowerment, were mentioned concerning research objective 4, which were grouped into themes of change management and learning and innovation. Both themes are aimed at assessing the organisational practices which would influence the implementation of AI.

Code words applied to support research objective 3 are, for example, understanding of strategy, which informed sub-theme and theme; lack of common understanding of strategy (sub-theme), and unclear strategic priorities and/or use case (theme). Whereas the code word job loss, informed fear of job loss as a sub-theme, and negative AI perspectives, as a theme. Lastly, the code word power supply, informed sub-theme lack of power supply, and theme load shedding. All of these infer the potential challenges that may hinder AI implementation.

5.5 Thematic Analysis of Focus group

After the completion of all interviews, 3 focus group sessions were booked, informed by the sample groups management, senior technical- and junior technical staff. Each of the three focus group discussions was scheduled, by affording consideration to each invitee's schedule, with the assistance of MS Outlook schedule assist. Refer to Table 5 for focus group discussion participants and durations.

Table 5: Focus group discussions participants

Focus group	Participant codes	Duration
Focus_Int_01_Man	Int_10_Man, Int_11_Man, Int_14_Man, Int_15_Man	61 min, and 23 sec
Focus_Int_02_ST	Pilot_01,Int_01_ST, Int_02_ST, Int_05_ST,Int_06_ST, Int_07_ST, Int_08_ST	57 min, and 25 sec
Focus_Int_02_JT	Int_18_JT,Int_26_JT,Int_27_JT, Int_28_JT	64 min, and 31 sec

The researcher presented the themes and sub-themes which emerged during the data analysis process. Furthermore, context to the process followed was provided, which led to the sub-themes and themes, and how they relate to each of the research questions and objectives. During the focus groups, all themes but one was validated for inclusion. No other themes were added. The focus group participants further agreed that the presented themes were relevant to how IT organisations can determine their readiness to implement AI towards achieving their business goals. Subsequently, the researcher considered the sub-themes and themes to be reliable and valid. Refer to Table 6 below for sample responses.

Table 6: Focus group sample responses

Research objectives	Sample responses
Objective 1: To understand how IT organisations currently align their business processes and IT capabilities.	**Int_14_Man** - *"…When you take a 360-degree view on what environment really means to the individual responsible for implementing a said strategy, that such environment takes into account both economic, socioeconomic, politics and all of that. Considering that we are a parastatal into account, so environment is a huge factor into how AI is implemented…"*

Research objectives	Sample responses
	Int_06_ST - *"…every organisation wants to do things quicker, faster and more efficient and you can't necessarily do it with humans. You're going to need machines and AI to help you tabulate all data because there's a lot, we have terabytes and petabytes of information. It's hard for people to sift through it. But in AI technology can do that…"*
Objective 2: To gain insights into the awareness of employees on the acceptance of or resistance to AI implementation to support business processes.	**Int_14_Man** - *"…The science of technology, then weather patterns and climatic change and geometry of your environment is important and your understanding of how you can implement AI…"* **Int_18_JT** – *"…Yeah, because in the initial stage, you need to understand how you collect the data, and how you use the data. There are more important factors at the beginning than just the speed, because what's the use of collecting data with speed but you don't know how to use it..."* **Int_14_Man** - *"…The technology that introduces change..."*
Objective 3: To identify the potential challenges that may hinder AI implementation.	**Int_11_Man** – *"…Yeah, it looks very complete. Well done, Leon…"* **Int_28_JT** – "…*Uh, employment as well. It will definitely be affected. So, it's going to hinder the process of implementation..."* **Int_18_JT** – *"…Because obviously, whatever we will implement might have to go through the procurement process…"*

Research objectives	Sample responses
	Int_10_Man – "…*So obviously race is one of the types of challenges. But I mean for us in security, we also are biased towards traffic coming from China and Russia for example, you generally find yourself blocking certain things from there..."*
Objective 4: To determine the organisational culture requirements to enable the successful implementation of AI.	**Int_15_Man** – *"…Nothing missing. I think you've got too much…"* **Int_14_Man** - *"…To embrace culture and familiarity, to introduce technology which is such a huge change to a lot of our different cultures in our society, to say that indeed technology can help us. But do we know how to use it effectively from an AI perspective? Yep, sometimes you just need to speak to a robot. Other times you need to speak to a person…"*

5.6 Presentation of Findings

In this section, the researcher will present the insights of the interviewees, in respect of the readiness of IT organisations to implement AI in line with their business goals, employee perceptions, challenges, and organisational culture. The sub-themes and major themes concerning the research objectives are presented in Tables 7, 8 and 9. Each sub-theme and theme is supported by the literature review and conceptual framework, presented in Chapter 2. The researcher will interpret the data and themes, looking through the theoretical lens of the TOE framework, discussed in Chapter 3.

5.6.1 Objective 1: To understand how IT organisations currently align their business processes and IT capabilities.

This objective and research questions are intended to understand how IT organisations align their business processes and IT capabilities towards increasing

their readiness to implement AI successfully. Therefore, when the researcher asked interview questions 1, 2, and 3, in support of objective 1 and research sub-question 1, a total of 83 response quotes were recorded. Furthermore, the questions were intended to determine the views of participants on the status of the IT strategy, the type of interventions included which relate to AI, and how AI will support the respective business processes. During the thematic analysis, six themes as well as five sub-themes emerged. Table 7 below serves as an extract of the strategy and business goals themes and sub-themes.

Table 7: Strategy and business goals themes

Themes and sub-themes	TOE category	Frequency of occurrence
Business process automation and integration		
AI-process fit	Organisation	2
AI Technology ecosystem boundaries	Organisation	4
Data-driven decision making	**Technology**	13
Industry factors	**Environment**	4
IT department AI capability	**Organisation**	6
Strategic alignment		
AI ecosystem technologies	Organisation	5
AI-business potentials	Organisation	16
Change management		
Understanding of IT Strategy	Organisation	16

5.6.1.1 Business process automation and integration

The IT organisation has a newly developed strategy. As per the participants during the interviews and focus groups, business process automation and integration is core to the IT strategy to achieve the digital transformation goal of the organisation.

During the interview, six out of the 23 participants indicated that business process automation and integration of systems like ERP, Information Security, and Call

Centre, forms part of the IT strategy, which is aimed at achieving business goals associated with AI. In addition, the focus group participants validated the theme to apply to how IT will achieve their business goals. During the thematic analysis, two sub-themes emerged, namely ***AI-process fit***, and ***AI Technology ecosystem boundaries***. AI-process fit is used to describe the IT business processes that are fit to apply AI capability to, like Business decision-making, and Anti-malware, as a subset of Information security. On the other hand, technology ecosystem boundaries refer to the technology boundaries of AI, which means that AI cannot be applied to everything.

During the interviews and focus group discussions one manager, Int_13_Man, confirmed that AI can enhance specific IT processes, and that "*...AI is necessary today, and makes it easier to manage our IT processes…"*. They continued to note that AI interventions included in the IT strategy include a focus on performance improvement *"…to improve our performance and processes..."* Four participants mentioned that IT ecosystem boundaries are important to consider when we implement AI. Participant Pilot_01 mentioned that: "*...AI will help us a lot, to automate and save time. It's a good technology to have, improve learning experience of our organisation and processes, with minimal human intervention..."* In addition, participant Int_08_ST added that our ecosystem includes *"…data from our ERP system, which is still being handled by humans. AI can help us reduce the effort, and therefore becoming more efficient, through AI rules and methods..."*

Therefore, it can be deduced that IT organisations perceive the importance of business process automation and system integration as important strategic interventions to align their business processes and IT capabilities. In addition, there are also specific processes mentioned where AI will be applied, like ERP, information security, and business decision-making, aimed at reducing the amount of manual intervention from staff. Therefore, AI is likely to support the achievement of the business goals of IT organisations, with a specific focus placed on the process where AI will fit, and by defining the technology boundaries.

5.6.1.2 Data-driven decision-making (DDDM)

DDDM does not only improve the performance of business operations but also improves the readiness for AI-enabled decision-making. DDDM needs information - enabled by AI learning - by consolidating and identifying patterns and trends, relevant to for example Network equipment, and predicting failures before they occur. As such, it allows proactive maintenance to be conducted, reducing unplanned service downtime for business users, and thereby increasing their productivity.

During the interviews and focus group discussions, thirteen out of 23 participants indicated that Data-driven decision-making forms part of the IT strategy, towards supporting business goals. In addition, the focus group participants validated the theme to apply to how IT will achieve their business goals. Int_07_ST responded by saying "… *always look at relevant data when making decisions, to ensure decisions are based on current facts and trends*…". In addition, the manager Int_13_Man indicated that *"...AI can make the decision to improve workflows where needed...".* Finally, participant Int_06_ST said that *"…every organisation wants to do things quicker, faster and more efficiently and you can't necessarily do it with humans. You're going to need machines and AI to help you tabulate all data because there's a lot, we have terabytes and petabytes of information. It's hard for people to sift through it. But AI technology can do that…"*

Clearly, data is required to inform business decisions. Furthermore, data-driven decision-making forms a key part of the organisation's strategic interventions and is expected to contribute positively towards the achievement of business goals, through enhanced decision-making. The dearth of which may result in an incorrect decision being made, potentially increasing reputational and financial risk to the business.

5.6.1.3 Industry factors

Industry factors cover for example factors like competition, markets, and the competitive advantage of the organisation. During the interviews, five out of the 23 participants reflected on industry factors, by indicating that AI can increase IT

organisations' competitiveness and agility to adapt to market changes. In addition, the focus group participants validated the theme to apply to how IT will achieve their business goals. Participant Int_07_ST indicated that AI can *"...improve relevance and competitiveness of IT to the organisation and market…".* On the other hand, senior technical participant Int_05_ST said that it is important to show *"…adaptability towards industry and markets...",* to know how to increase their *"…Competitiveness…"* by knowing their *"…Competition.."*

The strategy of the IT organisation is perceived to include the industry factors necessary to align its operations towards increasing its competitiveness and market share. Therefore, AI is perceived to increase their competitiveness and contribute positively towards the achievement of their business goals.

5.6.1.4 IT department AI capability

IT department AI capability refers to the ability of the IT department to implement and maintain AI-enabled technologies. Such capabilities include for example technical and managerial skills and experience required for a successful implementation.

During the interview and focus group discussion process, six out of 23 participants indicated that the IT department's capabilities required to implement AI form part of the IT strategy. This is evident in the interventions like ERP replacement, Information Security enhancements, and Network replacement. In addition, the focus group participants validated the theme to apply to how IT will achieve their business goals. However, specific AI skills development interventions are included in the strategy. Senior technical staff member Int_05_ST noted that the organisation is "*…embarking on Digital transformation, which IT can provide AI enabled capabilities…"*, and followed on by saying we must *"…understand how the IT department can assist the organisation to achieve its goals...".* Subsequently, junior technical staff member Int_19_JT added that there are *"…limited capabilities in the organisation…"* related to AI.

Reflecting on the outcome of the analysis, it can be noted that participants perceive the IT department's capability as an important contributor towards the

implementation of AI. Participants echoed the limitations in IT capabilities. As such, the lack of focus on developing AI capabilities (apart from data and specific technologies, with AI-capable features) may potentially impact the readiness of IT organisations negatively. Therefore, likely to detract from the achievement of their business goals, and stifle competitive advantage.

5.6.1.5 Strategic alignment

The alignment of IT organisation strategy towards AI innovations implies the examination of the possibilities associated with AI-based systems. Thus, it necessitates the identification of their relative advantage to implementing solutions that would contribute positively to the achievement of business goals, like improved customer services and efficiencies. As such the introduction of chatbots, for example in the customer services department, will allow users an opportunity to interact with AI technology, reducing the need for human intervention, and therefore contributing to improved customer services.

During the thematic data analysis, strategic alignment as the main theme presented itself, which was then supported by two sub-themes which also emerged, namely ***AI ecosystem technologies***, and ***AI-business potentials***. Five out of the 23 participants acknowledged that having access to technologies which supplement the outcomes of AI, is part of the IT strategy. Furthermore, 16 of the 23 participants were positive about the potential of AI.

Participant Int_12_Man noted the importance of *"…Integrated technology and service ecosystem – Cloud being a major conduit for it...",* towards achieving strategic alignment. In addition, the manager Int_10_Man indicated that *"…a number of interventions like leveraging AI to help the business to become closer to the Org 4IRT ambitions, like the Centre of Innovation, bringing together data and information, drawing insights to become more proactive…"*. Senior technical participant Int_01_ST reflected on the potential of AI, saying that *"…From a user side, finding support for various problems, will be much faster like a chatbot. One of the business goals is the efficient use of time, reducing the reliance on support staff, freeing them up to focus on more complex work..."* Participant Int_18_JT added that *"…for IT to*

excel in service delivery, we have to be able to track requests from our customer, to automate responses and rendering services, as to achieve shorter downtime…" Int_10_Man noted that it is *"...Important to understand which applications are going to be used for AI. Like medical, or flights. If something goes wrong, there will be casualties. We need to be getting to the fine discipline of engineering it right the first time. It should work and not require updating all the time…"* Manager Int_15_Man added *"...When AI is introduced, it must be done with the specific use case in mind. Some activities will remain, like replacing an enterprise service, with a digital..."* . Also, Int_08_ST continued to say the organisation must *"…have clear roles and responsibilities throughout this AI journey. Make people involve having a role to play..."*

Especially, the finding infers that to achieve the potential required from AI interventions, an IT organisation should consider specific use cases to be included in their strategy, so as to align with business requirements and goals. In addition, consideration should be given to the ecosystem of technologies, like access to the cloud, and data infrastructure. Because interventions like these are incorporated into the strategy, alignment between organisational processes and AI capabilities can contribute positively to achieving business goals, such as improved customer services. Furthermore, most participants- were positive about the potential associated with AI for achieving the business goals of IT organisations.

5.6.1.6 Change management

Change management as a transformation initiative is aimed at preparing the organisation's stakeholders, like employees, business users, customers, and partners, for changes in products and services. Furthermore, it raises awareness of what it implies to each stakeholder. For example, how processes will change for support staff, what new features are available to users and what regulatory and compliance requirements are addressed by the change.

During the change management interventions, all stakeholders become more aligned with the strategic goals, and business processes of the IT organisation. For

example the implementation of AI to enhance operational efficiencies in networking services, by making use of deep learning networks to predict network failures.

The thematic analysis highlighted that 16 out of the 23 participants reflected on the status of the IT organisation strategy and the sub-theme ***Understanding of IT strategy*** emerged, indicating that with organisational change it is important to communicate the strategy, which will increase awareness. Participant Int_12_Man mentioned that *"…AI is technology, and all other technology is an Organisational change management process…"* Participant Int_06_ST elaborated that the strategy is *"…in the Implementation stage: A roadmap was developed, and currently, some aspects have been implemented…".* On the other hand, Int_07_ST shared that the *"...IT strategy was presented and being talked about, so it is in the process of being adopted. However, it is progressing very slowly..."* However, Int_09_ST said that the strategy *"… it is in motion, in execution. IT structure being implemented..:."* Yet Int_11_Man noted that *"…it was approved but is in the process of being adopted. However, there is a lack of awareness. So it must filter down to the staff. The latter is an iterative process…."*

The finding above reveals that awareness and a common understanding are necessary to align resources working together towards achieving business goals. Change management can be the vehicle to increase awareness and create a common understanding, which may contribute positively to the achievement of the IT organisational goals, by aligning processes and IT capabilities.

5.6.2 Objective 2: To gain insights into the awareness of employees on the acceptance of or resistance to AI implementation to support business processes.

This objective and research questions are intended to gain insights into how employees perceive AI. In addition, eliciting whether they accept or resist its implementation to support business processes, towards increasing their readiness to implement AI successfully. Therefore, when the researcher asked the interview questions 4, 5 and 6, in support of objective 2 and research sub-question 2, a total of 41 response quotes were recorded. The questions were aimed at eliciting the

perceptions of employees on AI implementations and whether they may support business processes. During the thematic analysis, two themes emerged as well as nine sub-themes. Table 8 below serves as an extract of the perception and awareness themes and sub-themes.

Table 8: Perception and awareness

Themes and sub-themes	TOE category	Frequency of occurrence
AI Perspectives		
AI technology decisions	Organisation	2
AI Implementations to support Organisational values	Organisation	1
Risk management	Organisation	4
Value perception	Organisation	9
Trust in AI	Organisation	13
Data and AI		
Data accessibility	Technology	1
Data availability	Technology	4
Data quality	Technology	3
Data-driven decision making	Technology	9

5.6.2.1 AI Perspectives

AI perspectives include the sub-themes: AI technology decisions, AI implementations to support organisational values, risk management, value perception, and trust in AI, which will be discussed in a bit more detail below.

Organisations make ***AI technology decisions*** when embarking on the journey of AI implementation. They can benefit from this by considering the inclusion of technology decisions that supports AI functionality. Furthermore, it will increase the possibility of supporting their business processes, through the implementation of AI-capable technologies like Enterprise Resource Planning, Information Security, and Service management. Technologies which can showcase the intelligence of AI, like chatbots, will likely facilitate interactive engagement, whereas data-intensive

information security technologies require infrastructure to store and learn from data. According to the perceptions of employees, IT organisations will benefit from making AI-related technology decisions, which expands the AI capability across the enterprise. In addition, technology investment decisions should preferably include a human aspect, to increase the uptake of AI by employees and users. Lastly, participants noted that if AI technologies are scalable, they would likely support additional business processes, as they are prioritised for automation.

During the interviews and focus group discussions participant Int_11_Man said that *"…when we build applications, we should do so with the intent to make them available to AI applications to make it useful…"* In addition, participant Int_03_ST added that their perception of AI is that *"…It cannot express satisfaction when solving problems, which is something humans thrive on… and ...AI can be boring to interact with. Create an experience that is human-like…".* Furthermore, Int_05_ST, noted the uncertainty of *"…what dangers will come from AI, and perhaps are not known at this point...".* Int_11_Man elaborated that you must *"…understand your customer first, to tailor your services. In other words, expose your AI to the area where you operate…"* Manager Int_11_Man, said that *"...when people realise they talk to a robot, they stop engaging. People prefer engaging with a human being. If we then create AI attendants, to be more like humans as per our environment, will increase receptiveness. Manners and culture to be incorporated..."*

Junior staff member Int_19_JT commented that *"...because the system must scale for current and future needs...",* AI technology scalability is important. Lastly, participant Int_28_JT reflected on their perception of the value that *"...AI is good, it's something we've always been moving to, It's something we cannot live without"*, and that it *"Improves the quality of life a lot…"*

Reflecting on the responses it is evident that technology decisions about AI will likely be less resisted if it is more human-centric. In addition, to increase the realisation of benefits, AI technologies should be scalable to include additional business processes, as they are prioritised.

AI Implementations to support organisational values refer to the IT organisation with a strong set of values, perceived to form the foundation against which business

decisions are based. For example, a decision to implement AI with the intent to reduce staff numbers will likely be resisted, as it impeded the values of the organisation.

During the interviews and focus group discussions participant Int_28_JT commented on how AI implementation should be done in support of the organisational values, in that *"...All must be aware of our IT strategy, and it should not infringe on our values..."*. Also, the manager Int_12_Man indicated that making technology decisions with AI in mind, will support *"…human intelligence and problem solving, creating a symbiotic relationship, by using AI..."*.

From the participant responses, it can be inferred that the employees are likely to support AI initiatives more if AI implementations are more human-centric and complementary to the values of the organisation. Furthermore, AI technologies that are more scalable to include additional business processes will increase the support for AI implementations.

Risk management as a sub-theme includes the identification and management of risks associated with the output of AI technologies.

During the interviews and focus group discussions the manager Int_10_Man provided an example of how AI can assist with risk management, by indicating *"…imagine business continuity planning and disaster recovery, if AI can anticipate the combination of issues, to warn you of such a scenario…"*.Participant Int_10_Man added that *"…risk management and in Cybersecurity, heuristics are incorporated into the tools. One of the benefits…"*

In summary, it can be noted as perceived by participants, that AI enables the organisational business processes like the management of risk, through technologies such as cybersecurity, or business continuity technologies. Furthermore, IT organisations with a high-risk propensity will likely engage more often in new innovative solutions like AI.

During the interviews and focus group discussions, the sub-theme ***value perception*** of AI, which can positively contribute to the reduction of cost, increase in efficiency and increase in quality was recorded. This is made possible as AI tends to automate

several activities and reduce manual intervention. Subsequently, it may result in an increase in customer experience and improve decision-making. Therefore, participant Int_08_ST said that *"… AI can handle the boring parts of your work…",* which they perceive as a value. They added, *"…show how AI will assist us with performing better and increase our competitive edge and make more money..."*. Participant Int_05_ST added that AI can *"…Reduce report creation and decision-making time…"*

Participants therefore acknowledged the positive value contribution of AI to the organisational business processes in the form of increased competitive edge, reduction of boring work and reduced time to facilitate decision-making.

Trust in AI is fostered by for example high awareness of what AI can provide to the organisation, and whether employees and the organisation are better off in terms of opportunities and skills. The way AI is applied by management a level of trust is fostered with employees.

Participants noted during the interviews and focus group discussions that trust levels play a significant part in the acceptance of AI implementations. Participant Int_16_Man said that we should *"…create an environment of trust, which will reduce the resistance to change..."* On the other hand, Int_01_ST indicated that *"…people may think that something is going to replace my job...",* and may end up resisting change, which was echoed by Int_11_Man, who said that *"…If people perceive AI as a threat, they will resist changes…"*

In particular, where trust levels are high, AI implementation will likely be supported, however, if trust levels are low, the implementation may likely be resisted. Should AI implementations be resisted, AI implementations may likely not be able to support business processes effectively.

5.6.2.2 Data and AI

Data and AI refer to the perception of employees regarding the implementation of AI to support business processes and the notion that without data, AI's value is limited. In the absence of data, AI cannot learn, and the less it learns, the lower the likelihood of quality output. In addition, access rights of AI technologies to data should also be

managed to ensure data is accessible. Furthermore, where data quality is high, outcomes of AI tend to be more trustworthy. Depending on the type of AI application, decision-making processes are also impacted by the speed at which AI produces accurate output. There are four sub-themes related to data and AI, which will be discussed below. The sub-themes are data accessibility, data availability, data quality, and data-driven decision-making.

Data accessibility refers to authorized access to sources of data across the organisation, and therefore AI specialists are entrusted with the development of data models that are secure and only accessible to those authorized individuals.
During the interviews and focus group discussions participant Int_13_Man noted that AI is more effective by *"…having access to the correct data..."*, whereas, participant Int_07_ST noted that *"...AI can only be built on a solid data foundation (making data accessible to AI, to improve future processes)…"* Manager Int_12_Man showed awareness towards the importance of data and AI to effectively support business "*…Assess to be gained more proactively to the data we have…".* Manager Int_11_Man further showed awareness regarding the close relationship between data and AI, in that *"… It needs data. As learning is to a human being, data is to AI…"*

In addition, the finding derived from the interviews and focus group discussions highlights that AI needs access to data to learn. IT staff should therefore grant AI technologies access to data sources. Without learning, AI will likely not be able to support business processes, such as business decision-making properly.

Data availability encompasses the amount of relevant data available to AI to train and produce accurate outcomes. This includes for example the data storage areas like databases, data lakes and data warehouses. Furthermore, it includes structured and unstructured data, for example, employee information in an ERP system is structured and log files produced by cybersecurity systems are unstructured.

During the interviews and focus group discussions participant Int_27_JT noted that *"...AI need vast amounts of data to learn from...".* Furthermore, the manager

Int_12_Man said that "*… the larger the quantity of data the better decisions we can make..."*

From the responses and literature above, it can be suggested that AI needs access to vast amounts of data to increase its learning and output quality. As such, the more data is made available the better AI technologies will learn, and as a result, support business processes better.

Data quality includes the dimensions required to increase the suitability of data to be used by data users. Further, it implies an increase in quality output, which in turn increases the readiness towards successful implementation, based on the completeness and quality of data.

During the interviews and focus group discussions, senior technical participant Int_05_ST reflected on the need for *"…accuracy of data, where bad data, will impact output negatively…".* Manager Int_11_Man continued by adding that AI requires *"…quality of data to support quality outputs...",* and *"…good data sets: For example, an AI must know the preferences of customers, e.g., language and accents..."* Next, participant Int_05_ST shared their view that data quality is important by indicating AI relies on *"…how accurate the data is…".* Finally, the manager Int_12_Man said that for AI to support our business processes effectively, *"…access is to be gained more proactively to the data we have…".*

It can therefore be concluded that data quality supports the output of AI technologies. Poor data will likely produce poor quality output. High quality data will therefore support business processes more affectively.

Data-driven decision-making is enabled by a combination of Machine Learning, Deep Learning and Neural networks, incorporated into AI-enabled technologies. Furthermore, it increases pattern recognition and supports data analysis, improving predictability, and thus resulting in more accurate and timely information to support decision-making. Therefore data-driven decision-making does not only improve the performance of business operations but also improves the readiness for AI-enabled decision-making.

Thirteen out of 23 participants indicated that Data-driven decision-making forms part of the IT strategy, towards supporting business goals. Int_07_ST responded by saying "… *always look at relevant data when making decisions, to ensure decisions are based on current facts and trends*…". In addition, the manager Int_13_Man indicated that *"...AI can make the decision to improve workflows where needed..."* Furthermore, participant Int_18_JT said "…*Yeah, because in the initial stage, you need to understand how you collect the data, and how you use the data. There are more important factors in the beginning than just the speed, because what's the use of collecting data with speed but you don't know how to use it..."*

Data-driven decision-making is highlighted as key to the organisation's decision-making business processes, which can contribute positively to a successful AI implementation.

5.6.3 Objective 3: To identify the potential challenges that may hinder AI implementation.

This objective and research questions are intended to identify the challenges, as perceived by participants, that might potentially hinder a successful AI implementation. Therefore, when the researcher asked interview question 7 in support of objective 3 and research sub-question 3, a total of 123 response quotes were received. Thereafter, 4 themes emerged, and 10 sub-themes. Table 9 below serves as an extract of the themes, which are potential challenges.

Table 9: Potential challenges which could hinder a successful AI implementation

Themes and sub-themes	TEO Category	Frequency of occurrence
Collaborator and partner challenges	Environment	5
Ecosystem challenges		
Lack of access to AI talent And upskilling	Organisation	17
Lack of leadership and understanding of AI	Organisation	7

Themes and sub-themes	TEO Category	Frequency of occurrence
Incompatibility or lack of integration of legacy systems or Business processes with AI	Technology	11
Lack of ethical practices	Organisation	5
Poor Algorithm quality	Technology	6
Resource constraints		
Inadequate IT infrastructure	Technology	5
Financial resource constraints	Organisation	12
Load shedding	Environment	3
Lack of AI governance		
Legal, policy and governance constraints	Environment	9
Lack of information security And privacy	Organisation	11

5.6.3.1 Collaborator and partner challenges

AI collaborators and partners refer to institutions, stakeholders, and third-party providers the IT department collaborates with to increase the potential of a successful implementation. Such collaboration with a specialist in the field of AI will allow the organisation to grow their understanding, equipping management and implementors of the IT organisation with the necessary knowledge to increase the possibility of a successful AI implementation.

During the interview and focus group discussions process, 5 out of 23 participants noted that collaboration and partner challenges may hinder the successful implementation of AI in an IT organisation. Manager Int_14_Man noted that the IT organisation should know *"…how and who do we partner with….our providers (3rd parties) and Collaborators like universities and science councils…"* Senior technical staff member Int_07_ST also supports that *"…collaboration with other*

institutions/partners, to share ideas and learn lessons on the possibilities of AI..." is a challenge that may hinder the implementation of AI.

At this time, access to partners and collaborators, with the intent to learn from and share ideas on the implementation of AI, is a challenge that IT organisations may face. The lack of knowledge, in the absence of partners and collaborators, will deprive organisations of the opportunity to avoid mistakes, which could negatively impact and hinder the successful implementation of AI. Furthermore, the finding is in line with the literature review conducted in sections 2.5 and 2.6, on the readiness of IT organisations to implement AI.

5.6.3.2 Ecosystem challenges

The ecosystem of AI includes, for example, leadership who are entrusted with the setting of strategy, establishing a conducive culture and applying AI ethically. Furthermore, AI algorithms require interconnected systems which integrate algorithms, data, processes, software and people skills. The paradox is the increasingly ubiquitous nature of AI, and at the same time, it becomes less visible as it makes decisions and performs tasks. During the interviews and focus group discussion, participant responses were summarized into the sub-themes, which will be discussed below namely: lack of access to AI talent and upskilling, lack of leadership and understanding of AI, incompatibility or lack of integration of legacy systems or business processes with AI, lack of ethical practices, and poor algorithm quality.

Lack of access to AI talent and upskilling refers to the lack of AI speciality skills, both internal and external to the organisation. A close relationship exists between AI skills and data scientists, due to the ecosystem within which it operated. Another notion is that AI is a tool for data science providing actionable insights into specific use cases or problems. During the interviews and focus group discussions, 10 out of 23 participants provided insights towards the lack of access to skilled talent as a possible challenge that may hinder the successful implementation of AI.

Participant Int_15_Man said that a*"...Concern with AI is that it will require a more capable worker to manage it, compared to having a lower-skilled worker…".* Another

participant Int_01_ST added that *"…skilled staff to install and manage... and developers in AI…"* are required to implement AI. In addition, participant Int_02_ST mentioned that *"…AI is fairly new, so proper skills are required…"*. Furthermore, participant Int_11_Man provided insights on the challenges being *"...training and awareness of staff on AI, so they can also identify what is available to ease their work. People must go to conferences and learn more. Knowledge of staff on AI, to reduce fear. People must feel part of the contribution to the 4IRT and economy, through..."*. Also, Int_04_ST noted that *"…people are still going to be required to maintain and operate AI implementation, which creates opportunities for staff…"* to be upskilled.

Although most participants noted the importance of having access to AI talent, one participant mentioned that it is worrying that AI would require highly skilled workers, which may be difficult to source. Therefore, a lack of skills will likely result in the incorrect implementation of AI, resulting in the detraction of benefits realised, increasing the risk of a failed implementation. Also, the lack of upskilling programs for affected staff may further impact the negative perceptions about AI, hindering the successful implementation thereof.

Lack of leadership and understanding *of AI* includes the support from top management to initiate AI initiatives from the top down. Considering the range of factors associated with the introduction of AI, leadership support is a critical determinant of readiness to implement AI. Before embarking on the journey to implement AI, organisations must make every effort to ensure they have an in-depth understanding of AI, to distinctly differentiate from different paradigms and its potential for creating value. Participants noted that leadership in the IT organisation plays a critical enabling role, to ensure alignment between the strategic objectives, AI expected value, and employees who are entrusted with realizing the benefit. Their role includes driving the strategy managing change throughout the implementation and making the necessary adjustments when industry and organisational factors would demand such.

Consequently, during the interviews and focus group discussions, 7 out of 23 participants indicated that a lack of leadership and understanding of AI may likely cause the organisation to run the risk of unsuccessful implementation. One of the challenges that may hinder a successful AI implementation, was noted by Int_16_Man to be *"…support from management…*, which was supported by Int_20_JT by saying *"…management to also talk about AI and the interventions…"*. Also, participant Int_07_ST said that *"…leadership, someone who is strategic. Someone to lead the AI initiatives..."* is a potential challenge which may hinder the successful implementation of AI.

The finding deduced highlights that leadership support and an understanding of AI, are important for the success of an AI implementation. The finding is in support of the literature reviewed in chapter 2, sections 2.5 and 2.6.

Incompatibility or lack of integration of legacy systems or business processes with AI implies that external and internal points or integration into databases and information systems warranted consideration by IT organisations, as it decreases complexity when implementing AI. On the contrary, if AI is unable to integrate with legacy systems or business processes, its value will likely diminish. In addition, various participants (11 out of 23) perceived the lack of integration of legacy systems, or its incompatibility with business processes, as a possible challenge faced by IT organisations, which may hinder the successful implementation of AI.

Participant Int_01_ST noted a challenge to be *"…integrating AI into current systems, which may also attract addition funding…".* Moreover, Int_11_Man noted that *"…integration across systems. ESB type of integration or APIs, as agents will have to connect to systems and data. Service orientation and integration..."* In addition, participant Int_15_Man said they perceive potential challenges to be *"... Cloud options vs On-Premises. At the current level of maturity, the largest threat is the unintegrated nature of our toolsets. Networking tools and Service Management, CMDB will impact our ability to increase the effectiveness of AI...".* Finally, participant Int_13_Man said that *"…we have to understand our processes, e.g. Customer acquisitions…"* are important business processes.

Manager Int_14_Man said that *"…Some technologies are a lot more robust than others and lends itself more favourably towards AI…",* which supports the notion that the ecosystem in which AI is going to be implemented, if not conducive, may likely hinder the implementation. Participant Int_02_ST added that between AI and humans, *"…Mutual learning should exist, to co-exist…"*

Importantly, it can be deduced that incompatibility or lack of integration of legacy systems or business processes with AI is a challenge IT organisation faces, which will likely impact their readiness to implement AI successfully.

The lack of ethical practices considered when developing AI algorithms may expose organisations to the risk of producing output that may be biased, due to incorrect AI learning. This includes for example outcomes that are discriminating against gender, religion, and race. Quite often project concerns pertain to the limitation in ethical responsibilities, in the absence of which decisions are made by machines based on algorithms. As an example, business decisions taken by humans, consider emotions, whereas machines are unable to apply the same understanding.

During the interviews and focus group discussions, five out of 23 participants noted that the lack of ethical practices incorporated in an IT organisation may hinder the implementation of AI. Senior technical staff member Int_01_ST said that challenges they believe may hinder a successful implementation, includes the "*…ethical application of AI, to not take away the human rights of people, but to support staff..."* In support, the manager Int_16_Man added the "…*Initial set-up of the machine requiring human intervention, post that, it will then continue to learn by itself. The use of AI in self-driving cars. It gets to a point where it needs to make ethical decisions. Biasness' becomes relevant in the way AI then responds to challenges, as it learns based on how…."*

The deduction from the above responses indicates that if the ethical aspect of AI is not considered and planned for before the implementation, the organisation runs the risk of an unsuccessful AI implementation. As such, it will be exposed to a decrease in trust levels among stakeholders.

Poor Algorithm quality is a consequence of the complex nature of AI. Machine Learning code should be created by specialists with the requisite knowledge and understanding of the possible expected outcomes. For example, e-mail spam filtering technology comes natively with algorithms that learn incoming and outgoing e-mail patterns to identify spam. Informed by a general set of rules at the outset of implementation, several false assessments are made of spam by the technology.

During the interviews and focus group discussions, 13 out of 23 participants noted that poor algorithm quality is a key challenge which could hinder the implementation of IA. Senior technical staff member Int_08_ST highlighted that *"some algorithms are still too immature to apply. When exposed to data, it will grow into other area..."*. Whereby, Int_07_ST added that *"...AI can only be built on a solid data foundation (making data available to AI, to improve future processes)…"* In addition, Int_19_JT added that the *"…constant influx of data..."*, and Int_11_Man, the *"…quality of data to support quality outputs..."* are challenges which may hinder the implementation of AI. Finally, the manager Int_10_Man added that "…*So obviously race is one of the types of challenges. But I mean for us in security, we also are biased towards a traffic coming from China and Russia for example, you generally find yourself blocking certain things from there..."*

The responses highlighted that poor algorithm quality may potentially hinder a successful AI implementation and is therefore a challenge. Furthermore, the finding is aligned with sections 2.5 and 2.6 in chapter two, which explored studies and their findings related to the challenges organisations face when embarking on the implementing of AI.

5.6.3.3 Resource constraints

Resource constraints IT organisations face include data and computing infrastructure. In addition, financial constraints impact the ability of IT organisations to procure the tools, skills, capacity and infrastructure required to implement AI successfully. Finally the lack of consistent and reliable power supply, in the form of load shedding, placed severe constraints on the IT organisations to support their customers remotely and at all geographic locations, which negatively impacts the

potential of AI. For example, in enterprise systems like Microsoft Cloud solutions, Information security controls reside in the cloud, however, ERP systems are still on-premise. Although all enterprise services are protected by uninterrupted power supplies (UPS) and generators, the location from where customers require access is nearly always impacted by load shedding. During the data analysis, these three sub-themes emerged: Inadequate IT infrastructure, Financial resource constraints, and Load shedding, which will be discussed in a bit more detail below.

Inadequate IT infrastructure

Facilitating successful integration, AI requires three underlying IT infrastructure capabilities, namely Data storage to store large volumes of generated data, computing capabilities to scale and add computing power as and when required by AI technologies and managing high workloads. Many IT organisations are deprived of modernised and adequate infrastructure, whereas others have migrated their infrastructure to the cloud to scale up as and when capacity is required, negating the need for on-premise infrastructure.

During the interviews and focus group discussions, five out of 23 participants noted that the lack of access to AI-required infrastructures, like storage and computing power can hinder the successful implementation of AI. Participant Int_11_Man said that *"…storage infrastructure is required... and.. data infrastructure and collection*" for AI to function properly. Int_27_JT added that *"…lots of computing power is required to host and work data…".* In addition, a senior technical staff member Int_02_ST indicated that the *"…Lack of tools/technologies – AI enabled to automate…"* are challenges IT organisation face in preparation for AI implementations.

The above finding infers that AI cannot achieve its full potential if access to infrastructures like data storage and computing power is inadequate. Such limited infrastructure capacity will reduce the ability of AI technology to learn and function properly. Therefore, a challenge that may hinder the successful implementation of AI, includes Inadequate infrastructure.

Financial resource constraints have been listed in several studies as one of the key barriers to AI readiness. Access to financial resources is required not only during implementation, but throughout the life cycle of AI to maintain, support, and enhance.

During the interviews and focus group discussions, 12 out of 23 participants mentioned that adequate financial resources are key to the implementation of AI. Some argued that the initial investment costs are high, while others indicated a shortage of funding allocated to AI initiatives as a key challenge. Manager Int_16_Man said that *"…we don't have unlimited resources, however, in the long run, AI will be more efficient, but in the long term we have to invest in technology, which costs money..."* Participant Int_19_JT added that *"…high costs to implement and maintain…"*

The deduction made from the interviews highlights that financial resource constraints are a challenge which may hinder the successful implementation of AI.

Load shedding prevents the creation of a suitable foundation on which AI capabilities can be built. Businesses and public areas where the IT organisation operate, and make AI-enabled services available, should be protected by a stable energy supply, to increase access to AI-enabled services.

During the interviews and focus group discussions, three out of 23 participants noted that load shedding is a potential challenge which may hinder the successful implementation of AI. Int_09_ST elaborated on the challenges which could hinder a successful AI implementation, to include *"…load shedding – Power outages hinder our economy, our country and relying on this will hamper our ability. So we either need to look at alternative mechanisms...*" Furthermore, a senior technical staff member Int_06_ST added that a lack of power supply is evident in *"...Eskom's power supply..."*

Therefore, the finding above infers that the lack of power supply, or load shedding as a potential challenge, will limit the benefits of AI to be realised, which can negatively impact the successful implementation of AI.

5.6.3.4 Lack of AI Governance

IT organisations are governed by regulatory requirements such as POPIA (2019), which provides clear requirements on how private and sensitive data should be managed by providers. However, policies related to AI have not evolved in line with the proliferation of AI. Consequently, some organisations have not implemented AI, whereas others have attempted but have not succeeded. During the thematic analysis, two sub-themes emerged, namely, legal, policy and governance constraints, and lack of information security and privacy, which will be discussed in more detail below.

Legal, policy and governance constraints refer to the legal challenges connected to AI applications when errors occur during their use. Due to the rapid evolution of AI, governments require a more holistic understanding of the impact and range of AI applications. Furthermore, being responsible to provide regulatory services, governments will be among the largest implementers of AI. As such, public policy is facing the uncertainty that is unprecedented, in this dynamically changing AI world, as the velocity of changes, does not allow for public opinion to be recorded in time before recent changes are released. Therefore, governments may need to place a hold on future developments, which may be infringing on human rights.

During the interviews and focus group discussions, nine out of 23 participants highlighted a potential challenge to be related to legal, policy, and government constraints which could hinder the implementation of AI in an IT organisation. Senior technical staff member Int_02_ST indicated that the organisation should *"…consider adopting a policy pertaining to AI..."*. On the other hand, Int_16_Man said that *"…South Africa is not that ready for technological advances, as we have other priorities, requiring investments..."*, and Int_15_Man added that some priorities are *"…national challenges like unemployment, which may slow down the process..."*

The conclusion made from the responses is that the lack of AI-specific legal, policy and governance can hinder the successful implementation of AI as some organisations may apply a risk-averse strategy in the absence of such regulation, whereas others may steer blindly in implementing AI.

Lack of information security and privacy includes security and privacy as key challenges to consider when implementing AI tools in any IT organisational setting. This is exacerbated by the lack of resources IT organisations face, as private and sensitive data is collected. As such this data is vulnerable to cyber-attack. Given the respective industries the company operates in, as well as the role of the IT organisation to support these efforts, privacy and security considerations are perceived as key factors to consider in preparation for AI implementations.

During the interviews and focus group discussions, 11 out of 23 participants responded positively towards the need for security and privacy controls to increase the possibility of a successful AI implementation. Consequently, junior technical staff participant Int_28_JT noted that one of the challenges that may hinder a successful implementation of AI, is *"…information security, as there are a lot of cybercrimes, and to fight this, we need a lot of security..."*. Participant Int_11_Man further elaborated that *"...data privacy and security: What will AI be exposed to, and who will have access to the information? So it is critical to building this into the AI. The AI must recognise that it is personal. AI must be able to identify that indeed it is the correct individual it is talking to..."*

In addition, the finding infers that IT organisations are required by law to apply the necessary information security and privacy controls. The lack thereof may hinder the successful implementation of AI, due to, for example, an information leakage, caused by a vulnerable legacy system. As such this finding is in support of the literature review conducted in Chapter 2, sections 2.5 and 2.6.

5.6.4 Objective 4: To determine the organisational culture requirements to enable the successful implementation of AI.

This objective and research questions are intended to identify the cultural characteristics conducive to the implementation of AI. Therefore, when the researcher asked interview questions 8 and 9, in support of objective 4 and research sub-question 4, a total of 50 response quotes were recorded. Thereafter, four themes emerged, and Table 10 below serves as an extract of the themes which relate to organisational culture.

Table 10: Organisational culture themes

Organisational culture	TOE category	Frequency of occurrence
Empowerment of staff in the use of AI	Organisation	4
Digital fitness	Organisation	5
Diversity and social considerations	Organisation	4
Learning and Innovation	Organisation	10

5.6.4.1 Empowerment of staff in the use of AI

Empowerment of staff in the use of AI implies exposing staff to digital technologies, making available the necessary tools and investing in the requisite training and development. Consequently, such empowerment investments by management can increase the knowledge and skills of staff required to implement AI successfully.

During the interviews and focus group discussions, four out of 23 participants indicated that they believe empowerment in the use of AI technologies is a key characteristic of the IT organisation culture, to be fostered by management. Manager Int_14_Man said that our organisational culture should speak to *"…how we empower people to make use of AI..."*, and participant Int_06_ST followed on by saying we should be *"…People-centric, empower staff with new tools and hardware)…"*

The notion is supported that empowerment of staff towards the use of AI technologies, can positively contribute to the successful implementation of AI, and is an IT organisational culture characteristic worth inculcating. As such, a culture with the elements of empowerment acknowledges the contribution of staff towards increasing the readiness of IT organisations to implement AI successfully.

5.6.4.2 Digital fitness

Organisations traditionally created internal focus on culture, financials, transitional design, and performance management. In the era of disruptive digital transformation, organisation digital fitness implies responsiveness and adaptiveness, towards digital transformation (Dwivedi et al., 2021). In this case, digital fitness refers to the ability and speed of embracing disruptive technological changes like AI.

During the interviews and focus group discussions, five out of 23 participants referred to the concept of digital fitness as a key organisational culture characteristic to enable successful implementations of AI. On the other hand, participant Int_10_Man elaborated that culture is *"…important, as researchers are technology hungry. The line between personal and organisation use of technology is blurred all the time. Our user base is more open to using technology…".* Subsequently, the manager further elaborated by saying that it is "…u*seful to understand the adoption culture of technology in the organisation. The openness to accepting technology will also improve possible success…"*.

Finally, the manager Int_16_Man responded by saying organisational culture *"…has a big role to play, as we want to embark on AI. Bringing it closer to home, we have a very conservative workforce, especially in the research space. Their ability and willingness to change are not as high as some of the other organisations I have encountered. So resistance to change is quite high. My take on it is that people are resistant to change, or they have had a negative experience…"*

Additionally, participants acknowledged digital fitness as a key characteristic and requirement of an IT organisational culture. Moreover, an increasingly high level of digital fitness of staff is likely to increase the readiness of IT organisations to implement AI successfully.

5.6.4.3 Diversity and social considerations

The proliferation of AI is likely to challenge social and cultural norms within certain population sectors. Social challenges include AI expectations that may be unrealistic and inadequate knowledge of the values and benefits of AI technologies.

During the interviews and focus group discussions, participants noted that diversity and social considerations require a level of sensitivity to be applied by management and implementors when planning an AI implementation approach. This would foster trust with staff in support of AI initiatives, which on the other hand increases the readiness of IT organisations, and the likelihood of a successful AI implementation. Four out of 23 participants mentioned that the diversity in the organisation and social

considerations as part of the existing culture are important aspects to be aware of when planning the implementation of AI.

Senior technical staff member Int_03_ST said that *"…different groups exist in the organisations, which resist certain changes…".* Furthermore, Int_02_ST added that *"…We are diverse and dealing with how different people see things are important to define your culture…"* Lastly, manager Int_14_Man mentioned that *"…To embrace culture and familiarity, to introduce technology which is such a huge change to a lot of our different cultures in our society, to say that indeed technology can help us. But do we know how to use it effectively from an AI perspective? Yep, sometimes you just need to speak to a robot. Other times you need to speak to a person. "…*Manager, Int_14_Man, mentioned that *"…for implementing a said strategy, such environment takes into account, socioeconomic, politics and all of that. The environment is a huge factor into how AI is implemented…"*

The result supposes that diversity and social considerations are key factors when planning for AI implementation. As such, it supports the notion reflected in Chapter 2, sections 2.5 and 2.6, that organisational culture and its characteristics are important to incorporate into the planning when embarking on an AI implementation. Furthermore, these social aspects and diverse cultural characteristics, when included in the organisational practices, can improve the readiness of IT organisations to implement AI successfully.

5.6.4.4 Learning and Innovation

IT organisations that practice learning and innovation, a process of iterative learning, experimentation and failing often, are more agile to adopt and implement AI technologies. As part of organisational cultural practices, learning and innovation are evident in the multinational organisations Google and Apple - where strong learning and innovation cultures exist - as required by evolving AI capabilities.

During the interviews and focus group discussions, participants noted that a culture of continuous learning and innovation is required to keep up with the speed at which AI evolves. Moreover, these cultural characteristics are evident in successful implementors of AI, like Google and Apple, which emphasizes its positive

contribution towards the readiness of IT organisations to successfully implement AI. Ten out of 23 participants indicated that innovation and learning are important organisational culture characteristics to support a dynamic AI technology implementation. Firstly manager Int_11_Man said that *"…we must create opportunities for new jobs and create a culture for continuous learning…"*. In addition, the Manager Int_02_ST added that *"…continues learning must be incorporated into the culture and approach to innovation…".*

The dynamic nature of AI requires a culture that supports learning and innovation. As such, the IT organisation will likely benefit from increasing its readiness for successful AI implementation by incorporating cultural characteristics like learning and innovation.

5.7 Summary of Findings

The study aimed to explore the readiness of IT organisations to implement AI towards realizing their business goals, in line with the Fourth Industrial Revolution. Therefore, the findings from the open-ended interviews and focus group discussions support the research questions and objectives as described in sections 5.6.1 - 5.6.4. Each of these sections shows how the themes and sub-themes emerged. Table 11 is an extraction of the findings relevant to the research objectives and questions.

5.7.1 Findings from Interviews and Focus Groups

Table 11: Findings derived from interviews and focus group discussions to support objectives

Research objective	***Key findings***
To understand how IT organisations currently align their business processes and IT capabilities.	• Business process automation and integration are perceived as important strategic interventions to align business processes and IT capabilities, towards increasing readiness to implement Ai successfully. • AI is likely to support the readiness of IT organisations and the achievement of

Research objective	*Key findings*
	business goals when the focus is placed on specific processes and defined boundaries, as perceived by employees. • Data-driven decision-making is perceived as a key value expected from AI implementation, which contributes positively towards the achievement of business goals. As such this capability contributes positively to the readiness of IT organisations to implement AI. • An IT organisation perceives industry factors as a determinant to increase their competitiveness and contribute positively towards their readiness to implement AI towards realizing their business goals. • Due to the potential value expected from AI, an IT organisation perceives capability in AI, change management, and strategic alignment as positive contributors to the readiness to implement AI successfully.
To gain insights into the awareness of employees on the acceptance of or resistance to AI implementation to support business processes.	• IT organisations perceive AI implementations that include human-centric technology decisions and implementations that uphold the values of the organisation, to reduce the potential for resistance. • Where awareness and trust levels are high, AI value is more frequently perceived as positive, and contributory toward business goals among employees.

Research objective	***Key findings***
	• Data and scalable AI technology are perceived to contribute towards the effectiveness of AI and organisational readiness.
To identify the potential use challenges that may hinder AI implementations.	Challenges identified in the study which are perceived to potentially hinder the successful implementation of AI, and suppress the achievement of business goals include: • Collaborator and partner challenges • Ecosystem challenges o Lack of access to AI talent and upskilling o Lack of leadership and understanding of AI o Incompatibility or lack of integration of legacy systems or Business processes with AI o Lack of ethical practices o Poor Algorithm quality • Resource constraints o Inadequate IT infrastructure o Financial resource constraints o Load shedding • Lack of AI governance o Legal, policy and governance constraints o Lack of information security and privacy
To determine the organisational culture requirements to enable the	• Empowering staff in the use of AI technologies as an organisational culture characteristic is perceived to increase innovation, and

Research objective	*Key findings*
successful implementation of AI.	contribute positively toward a successful AI implementation. • The fitness of staff in the use of digital technologies is perceived as a cultural characteristic which increases the readiness of IT organisations to successfully implementation of AI. • Respecting diversity and social considerations as organisational culture characteristics are perceived as important to incorporate into the planning when embarking on an AI implementation, and as such contributes positively to the readiness of IT organisations to implement AI. • Learning and innovation are perceived to positively support the dynamic nature of AI and increase the potential for a successful AI implementation.

5.8 Conclusion to chapter five

The chapter presented the findings deduced from the focus groups and interviews conducted by the researcher, in line with the provisions of the Ethics review committee of the University of South Africa. In section 5.2, the context of the study reflected on the case study setting, participants, and thematic analysis method used. Furthermore, the approach to the interviews and focus groups was discussed, including but not limited to the interview questions derived from research questions and objectives. Twenty-three participants were interviewed, out of a potential 31, as no further meaningful insights were recorded. The first four phases of the thematic analysis were completed, where themes and sub-themes emerged. Thereafter, three focus group discussions ensued to validate the themes, derived from the interviews, further contributing to the reliability of the themes.

Section 5.6 presents the findings derived from the thematic analysis of the research objectives and questions. During each of the sections, themes and sub-themes supporting the research objectives were discussed in detail as to how they contributed to the readiness of IT organisations towards achieving their business goals. Finally, the summary of findings was presented in section 5.7. The next chapter will cover the discussion of findings through the lens of the theoretical TOE framework.

CHAPTER SIX – DISCUSSION OF FINDINGS

6.1 Introduction

In this chapter, the findings from Chapter 5 will be interpreted through the theoretical lens of the TOE framework and correlated with the research problem (Tornatzky & Fleischer, 1990). The section which follows will be focused on the findings related to the readiness of IT organisations to implement AI towards realising their business goals, in line with the benefits of the 4IR. Consequently, this will include interpretations of the Technology factors in section 6.2, followed by section 6.3, the Organisational factors, and then the Environmental factors in 6.4. Lastly, the chapter will conclude in section 6.5.

6.1.1 Grouping of themes into logical categories and within the TOE Framework

Since the TOE framework was selected as a theoretical lens to present the findings, they are categorised under Technology-, Organisation-, and Environment perspectives, where their context is singular (Aarstad & Saidl, 2019). The researcher arranged the themes within each context dimension and logical categories associated with the research objectives in Table 1. Figure 2 was updated with the themes and sub-themes from the thematic analysis, which are presented in Figure 5 below. Those themes marked in italics are sub-themes. Certain themes, originally noted in Figure 2, did not emerge in this study and were therefore removed. In ***Technology characteristics***, the themes of *complexity* and *usability* did not emerge, although the theme of incompatibility or lack of integration of legacy systems or business processes with AI, discussed the complex nature of AI.

From the ***Organisation perspective***, *organisation size* and *innovativeness* were not mentioned, however, the cultural characteristics acknowledged as themes to be influential towards the readiness for AI, included learning and innovation. Furthermore, *AI use cases*, are included under strategy alignment, as it is informed by the strategic priorities. On the other hand, *AI Awareness* is included under change management, as a holistic theme. Then, under ***Environmental considerations***, Customer perception did not emerge as a separate theme, although it was

acknowledged under change management interventions, and strategy alignment, to be an important consideration towards AI readiness. Also, *access to broadband* was not validated during the focus group discussions, as it did not present itself as a key challenge, given the contextual setting of the organisation. *Risk perception* and *competition* did not present themselves in the thematic analysis. However, reference to the management of AI output risk emerged under the organisation perspective, and competition was covered as part of the industry factors.

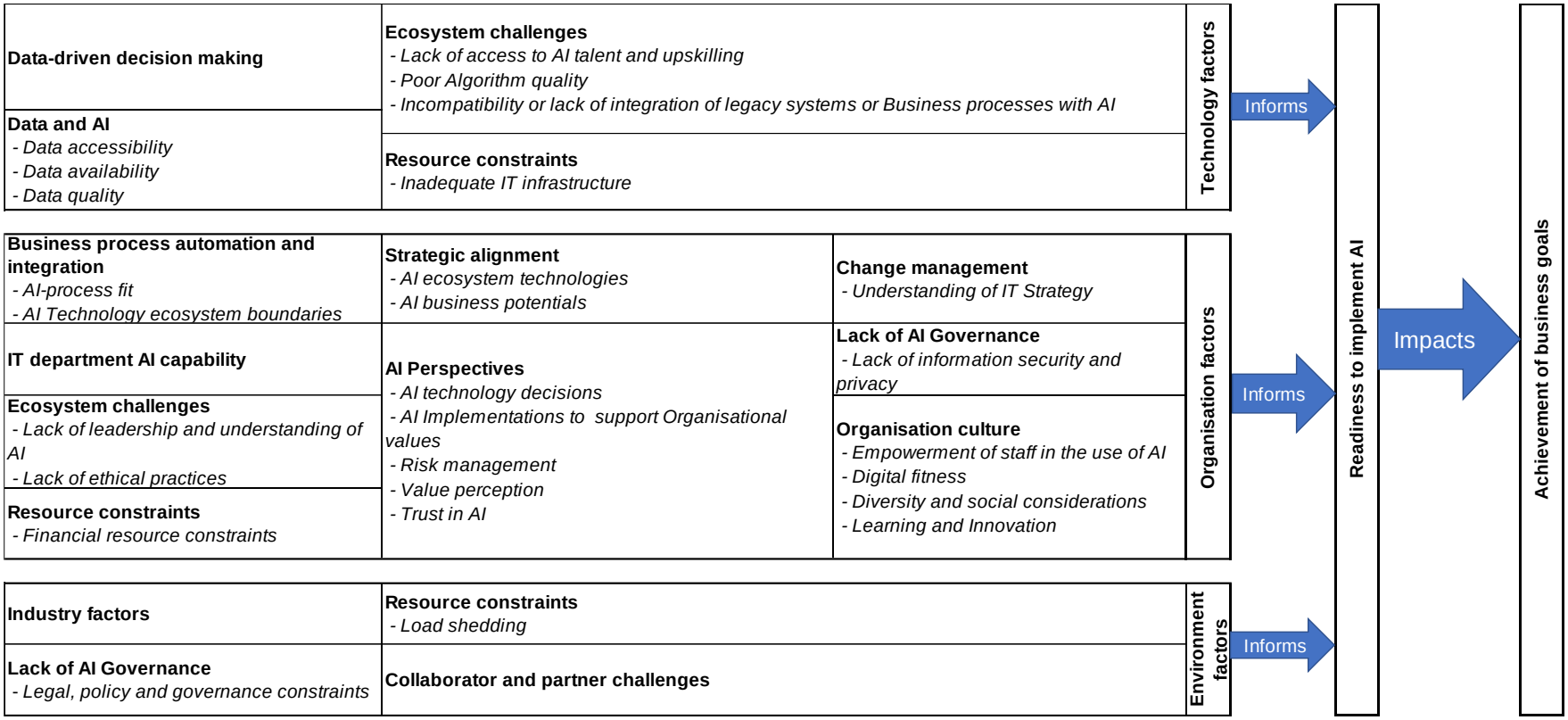

Figure 5: Themes mapped to the conceptual framework: Readiness of IT organisations to implement AI towards achieving their business goals

6.2 Technology characteristics towards AI implementation readiness

According to the TOE framework, *technology characteristics* include internal and external technology relevant to the organisation, individual adoption, as well as implementation inclusive of innovative technologies. External and internal include current and future planned technologies available in the marketplace. Furthermore, processes, equipment, and processes solutions, complexity, perceived benefits, compatibility, usability, complexity and technological competence are included as technology characteristics (Alsheiabni, Cheung & Messom, 2019). The findings from section 5.7 with technology characteristics will be discussed below.

The finding indicates that *data-driven decision*-making (DDDM) is perceived as a key value expected from AI implementation. In addition, DDDM contributes positively towards the achievement of business goals such as performance improvements. However, it also improved AI readiness, as it proposes an introductory AI practice (Dwivedi et al., 2021; Jöhnk, Weißert & Wyrtki,2021). In other words, data-driven decision-making can be seen as a conscious strategic decision to use AI applications like DL, ML and NN to achieve business goals, through improved data-driven decision-making. Furthermore, it increases AI readiness, as it serves as a preliminary AI-driven practice.

The findings show that data and scalable AI technology are perceived to contribute towards the effectiveness of AI and organisational readiness. Consequently, AI specialists are entrusted to develop AI data models, and therefore require *access to data* and infrastructure where data is m*ade available*. As such, increasing the potential for *higher data quality* output was argued to contribute significantly towards the readiness of an AI implementation according to Pumplun, Tauchert & Heidt (2019). In other words, if AI does not have access to data, or reliable data is not available, algorithm learning is negatively impacted, and therefore is likely to produce poor quality output, as such hindering the readiness to implement AI successfully.

The findings show that challenges identified in the study, perceived to potentially hinder the successful implementation of AI, include incompatibility or lack of integration of legacy systems or business processes with AI, poor algorithm quality, lack of access to AI talent and upskilling, and inadequate IT infrastructure. Dwivedi et al.(2021) indicated that an AI *ecosystem* includes for example *IT infrastructure*, data ecosystem, *skills*, and ethical practices. Systems integration requires IT infrastructure capabilities, like *computing capabilities*, to scale as and when required

by AI technologies (Groopman, 2018). Furthermore, Rao (2017), noted that AI technology integration with legacy systems has the propensity to impact AI implementation decisions.

Subsequently, Davenport (2018) noted that a set of interdisciplinary skills like data analytics and data management are necessary for the successful implementation of AI projects. Therefore upskilling employees to master these skills will be beneficial toward AI readiness. In other words, AI success is hindered if legacy systems are not integrated or not AI-enabled. With limited infrastructure, AI algorithms produce poor quality output, and as such also impacts trust in AI. As such, the readiness to implement AI successfully is hindered.

6.3 Organisation perspective toward AI implementation readiness

According to the TOE framework**,** organisational perspectives consider characteristics of the organisation to include, employees, communication and collaboration. In addition, the organisational context also includes policies, governance, operating environment, management structure, human capital, and financial resources. Furthermore, it also includes the lack of resources, organisation size, scope, legislative brief, innovation capacity, knowledge, operational capability, and quality of human capital (Kruse, Wunderlich & Beck, 2019). Findings from section 5.7 which presents organisation perspectives toward AI implementation readiness characteristics will be discussed below

The findings note that *business process automation and integration* are perceived as important strategic interventions to align business processes and IT capabilities in, towards increasing readiness to implement AI successfully. In a study conducted by Wamba-Taguimdje et al. (2020) it was found that optimisation of business processes, automation, and performance improvements are the main benefits of AI. Jöhnk, Weißert and Wyrtki (2021) argued the link between the AI strategy of the organisation and its processes is necessary to increase AI readiness. AI implementations will always affect the processes of the organisation. Tshibanda and Pradhan (2021) demonstrated how companies across different industries adopted IT technologies to gain a competitive advantage and increase the agility of business processes, productivity, and business decision-making. In other words, if business processes are integrated and ready for automation, organisations are likely to achieve greater success when implementing AI.

The findings show that AI is likely to support the readiness of IT organisations and the achievement of business goals when the focus is placed on specific processes and defined boundaries. Holmström (2021) found that ecosystem boundary changes may arise form new products and services enhanced by IoT devices and Big Data technologies. Furthermore, the potential exists for *technology ecosystem boundaries* between humans and AI, and as complexity increases, so does the importance of sharing information between humans and AI (Dwivedi et al., 2021). Therefore, AI is likely to support the achievement of the business goals of IT organisations, with a specific focus placed on the *process where AI will fit*, and by enhancing the AI technology ecosystem with for example Cloud, IoT, and Big Data technologies. These factors will potentially contribute positively towards the readiness to implement AI successfully.

The findings show that due to the potential value expected from AI, an IT organisation perceives capability in AI, change management, and strategic alignment as positive contributors to the readiness to implement AI successfully. According to Jöhnk, Weißert and Wyrtki (2021), *change management* includes activities associated with the *understanding of the IT strategy* and management of stakeholder expectations through *awareness*. The *alignment of IT organisation* strategy towards AI innovations requires the examination of the possibilities associated with AI-based systems. AI's contribution to organisational value chains necessitates organisations, based on its wide applicability, to identify *specific use cases* (Jöhnk, Weißert & Wyrtki, 2021). In other words, change management helps prepare the organisation, and therefore increases its readiness to implement AI successfully.

IT organisations perceive AI implementations to potentially be less resisted if they are human-centric and uphold the values of the organisation. Dwivedi et al. (2021) found that *human-centric AI technology decisions* are aimed at enhancing softer goals, instead of efficiency and economic productivity. Consequently, human interactions with AI will become increasingly *human-centric like* since opportunities reside in the design and development of new personas. In the case study conducted, the IT organisation felt strongly about their organisational values, which are to be amplified, rather than dampened, with the implementation of AI. In other words, AI technology decisions will likely be less resisted if it is more *human-centric* and *uphold the values of the organisation*. As such, trust in leadership and AI will likely be fostered, thereby increasing the readiness of the organisation towards AI.

High trust and AI value are more frequently perceived to contribute positively to AI readiness and the achievement of business goals where awareness is high. For example, a decision to implement AI with the intent to reduce staff numbers will likely be resisted, resulting in lower trust levels (Dwivedi et al., 2021). Furthermore, *Trust* is fostered by for example high *awareness* of what AI can provide to the organisation, and whether employees and the organisation are better off in terms of opportunities and skills. The way AI is applied and *value derived* also contributed to the level of trust fostered by management with employees (Siau & Wang, 2018). In other words, awareness and good quality algorithm output increase trust levels, and triggers retraction in the potential for resistance, thereby increasing AI readiness.

Challenges perceived as hindering the successful implementation of AI: Collaborator and partner challenges, ecosystem challenges, Lack of access to AI talent and upskilling, lack of leadership and understanding of AI, and incompatibility or lack of integration of legacy systems. Followed by other challenges like business processes with AI, lack of ethical practices, resource constraints, inadequate IT infrastructure, financial resource constraints, lack of AI governance, and lack of information security and privacy

Particularly, the results show that *collaborator and partner challenges* are perceived to hinder the successful implementation of AI. In addition, the l*ack of access to AI talent and upskilling, lack of leadership understanding of AI*, and *lack of ethical practices* are also challenges which could hinder the implementation of AI. AI *collaborators and partners* equip management and implementors of the IT organisation with the necessary knowledge, lending itself to an integrated, approach, and promoting different skill levels to complement one another (Davenport, 2018). According to McKinsey and Company (2018), a lack of *AI speciality skills* was one of the main challenges for organisations, which obligates organisations to invest in the *upskilling* of employees in AI (Davenport, 2018).

Considering the range of factors associated with the introduction of AI, *leadership support* is a critical determinant of readiness to implement AI, and such commitment would reveal integration with the larger IT strategy (Jöhnk, Weißert & Wyrtki, 2021). Before embarking on the journey to implement AI, organisations must make every effort to ensure they have an *in-depth understanding of AI*, to distinctly differentiate from different paradigms and its potential for creating value. Furthermore, AI algorithms run the risk of producing output that may be biased and ethical, for example, discriminating against gender, religion, and race (Jöhnk, Weißert &

Wyrtki, 2021; Dattner et al., 2019). Also, *partners and collaborators* together with the requisite AI skills, will positively contribute to AI readiness. The lack of upskilling programs for affected staff may further impact the negative perceptions about AI, and foster resistance, hindering the successful implementation of AI.

Moreover, *financial constraints* and *lack of lack of information security and privacy* are perceived to hinder the successful implementation of AI. *Financial constraints* refer to the lack of required financial resources to achieve value from AI throughout its life cycle (AlSheibani, Cheung & Messom, 2018). Also, *regulatory requirements* like POPIA (2019), provide clear requirements on how private and sensitive data should be managed by IT organisations. However, *policies* related to AI have not evolved in line with the proliferation of AI, and are constantly struggling to keep up, according to Holmström (2021). Furthermore, inadequate *security and privacy* controls are exacerbated by the lack of resources IT organisations face, as private and sensitive data is collected (Dwivedi et al., 2021). In other words, the lack of AI governance in the form of policies, can potentially, together with a lack of resources, due to financial constraints, contribute to a l*ack of information security and privacy*.

Notably, the findings reveal that empowerment of staff in the use of AI technologies linked with digital fitness, as an organisational culture characteristic, is perceived to increase innovation and contribute positively toward a successful AI implementation. Researchers investigated factors contributing to success and failure and found that the relationship between the manager and the level of *empowerment* is informed by the degree of management commitment towards employee empowerment for success (Rodgers, Anthony & Cudney, 2021). Organisations traditionally created internal focus on for example performance management, however, in the era of disruptive digital transformation, agility is required towards digital transformation and the AI revolution (Dwivedi et al., 2021). A different level of *digital fitness* is required to achieve progress and business outcomes (Dwivedi et al., 2021). In other words, the dynamic nature of AI demands a culture that supports learning and innovation and digital fitness to improve the readiness towards a successful AI implementation.

As postulated in the literature, organisations that practice *learning and innovation*, which entails a process of iterative learning, experimentation and failing often, are more agile to adopt and implement AI technologies, as AI offerings are tailored to suit specific value propositions (Rao,

2017). Furthermore, research showed that a crucial factor to drive innovation, evident in Google and Apple, is where strong cultures exist, as required by evolving AI capabilities (Lee, Raschke & Louis, 2016). Rao (2017) also substantiates his view by positing that transitional cultures that are mature, enable the organisation's continuous learning capabilities, to be agile towards changing market demands and changing customers. In other words, the dynamic nature of AI requires a culture that supports learning and innovation to improve the readiness towards a successful AI implementation.

It should be noted that respecting diversity and social considerations as organisational culture characteristics are perceived as important to incorporate into the planning when embarking on an AI implementation, and as such contributes positively to the readiness of IT organisations to implement AI. Dwivedi et al. (2021) highlighted *social challenges* including AI expectations that are unrealistic and inadequate knowledge of the values and benefits of AI technologies. Added to these challenges, includes the media hype on potential job losses, which impacts the nature of work taken on by citizens, influencing their societal status (Livingston & Risse, 2019). In other words, diversity and social considerations are key aspects to be taken into account in preparation for AI implementations. As such, organisational culture and its characteristics are important to incorporate into the planning when embarking on an AI implementation. Should these social aspects and diversity be ignored, it could potentially hamper the implementation of AI.

6.4 Environment considerations for AI implementation readiness

Environmental considerations include the factors about the industry, assessment of the risk marketplace, external barriers and factors, availability of pressures, technology providers, and regulatory landscape. Further, consumer trust and regulatory acceptance, which in the case of AI impact consumer trust and data, are also included (Aarstad & Saidl, 2019). Findings from section 5.7 which presents environment considerations for AI implementation readiness will now be discussed.

Importantly, an IT organisation perceive industry factors as a determinant to increase their competitiveness and contribute positively towards their readiness to implement AI towards realizing their business goals. According to Gartner and Criteo (2017), a well-defined IT strategy is at the top of the priority list for IT companies. The strategy captures for example the service offerings, value proposition, and the industry within which they operate. Furthermore, industry

factors cover, for example, competition, markets, and competitive advantage. In other words, if the strategy of the IT organisation does not include the industry factors, the organisation may not be able to position itself with the correct AI offerings to the market, which may result in a negative impact on its competitive advantage. Therefore, industry factors are key to the AI readiness of the IT organisation.

The outcomes infer that load shedding and legal, policy and governance constraints are challenges which may hinder the successful implementation of AI. As part of creating a suitable foundation on which AI capabilities can be built, AI-enabled services of the IT organisation operations, should be *protected by a stable energy supply* (Hilb, 2020). On the other hand, Dwivedi et al. (2021), discussed *the legal challenges* connected to AI applications, when errors occur. The author elaborated that due to the dynamic nature of AI, current legal frameworks require adjustment. Consequently, governments may place a hold on future developments, where AI impedes human rights. In other words the lack of AI-specific legal, policy and governance may result in poor algorithm output, resulting in legal claims against the firm. Also, load shedding will limit the benefits of AI to be realised, as customers struggle to gain access to AI-enabled services, which has a negative impact on AI readiness.

6.5 Conclusion to chapter six

Chapter 6 presented the discussion of findings, through the theoretical TEO framework. In addition, the theoretical lens of Technology characteristics, Organisation perspective, and Environment considerations for AI implementation readiness, were used to discuss the findings. The chapter started with the introduction of the TOE framework by Tornatzky and Fleischer (1990) in section 6.1, followed by the T, O and E categorised finding discussions, in sections 6.2 - 6.4. Finally, the chapter concludes with section 6.5. Chapter 7 presents the limitations and future research.

CHAPTER SEVEN – LIMITATIONS AND FUTURE RESEARCH

7.1 Introduction

This chapter will discuss the limitations and future research. In section 7.2, the researcher will elaborate on how the findings of the study have addressed the research problem. Followed by section 7.3, where the limitation of the research will be discussed. Then section 7.4 will elaborate on the contribution of the research to the body of knowledge. Subsequently, section 7.5 will cover the recommendations for managers, government and IT staff. The chapter will conclude with section 7.6.

7.2 Addressing the research aim

The research aim was to explore the readiness of IT organisations to implement AI technologies towards realizing their business goals. Therefore, the literature review covered aspects of AI concepts, AI readiness, and theoretical frameworks. Subsequently, the TOE theoretical framework was identified as the lens to support the study. Chapter 3 presented the theoretical underpinnings and their applications, concerning the IT Industry and explainable factors impacting readiness to be considered, as seen by IT Managers and technical staff. Chapter 4 followed, which explained the research methodology and data collection techniques in the form of interviews and focus groups. Moreover, Chapter 5 presented the findings from the interviews and focus groups, in the context of the case study setting, participants, and thematic analysis method used. Thereafter, Chapter 6 presented and discussed findings with specific emphasis on the lens of Technology characteristics, Organisation perspective, and Environment considerations, for AI implementation readiness.

Reflecting on the readiness of the IT organisation pertaining to *data-driven decision*-making (DDDM) is that although it is perceived key value expected from AI implementation, systems are not integrated which affects the plausibility of DDDM processes. In addition, DDDM, contribute positively towards the achievement of business goals, such as performance improvements. Furthermore, the organisation values d*ata and scalable AI technology* to contribute positively towards the effectiveness of AI and organisational readiness. However, a clear strategy exists covering data, it is silent on AI technologies. Conversely, challenges identified in the study, perceived to potentially hinder the successful implementation of AI, include *incompatibility or lack of integration of legacy systems or business processes with AI*, *poor algorithm quality*, *lack*

of access to AI talent and upskilling, and *inadequate IT infrastructure*. While the findings note these challenges are not addressed, some plans exist to migrate to the cloud. Furthermore, *business process automation and integration* are perceived as important strategic interventions to align business processes and IT capabilities, and indications are that these interventions are present in the strategy of the organisation. Consequently, these strategic interventions are likely to support the AI readiness of the IT organisation.

Outcomes revealed that due to the potential value expected from AI, an IT organisation perceives *capability in AI*, *change management*, and *strategic alignment* as positive contributors to the readiness to implement AI successfully. Yet IT organisations perceive AI implementations that include *human-centric technology decisions* and implementations that *uphold the values of the organisation*, to reduce the potential for resistance. Moreover, high *trust* and *AI value* are more frequently perceived to contribute positively to AI readiness and the achievement of business goals, where *awareness* is high. For example, a decision to implement AI with the intent to reduce staff numbers will likely be resisted, resulting in lower trust levels. It can be concluded that although these themes are valued, specific plans for implementing AI human-centric technologies and creating awareness of the value of AI, are absent.

Challenges discovered as hindering the successful implementation of AI, and are not addressed in the IT strategy, are: *collaborator and partner challenges; ecosystem challenges; lack of access to AI talent and upskilling; lack of leadership and understanding of AI; incompatibility or lack of integration of legacy systems and business processes with AI*. This is followed by other challenges like *lack of ethical practices*, *poor algorithm quality*, *resource constraints*, *inadequate IT infrastructure*, *financial resource constraints*, *lack of AI governance*, and *lack of information security and privacy.* Nonetheless, some interventions are focused on decreasing duplication and increasing integration, to ensure alignment between IT capabilities and business goals not necessarily focused on AI but other digital technologies.

In addition, findings also encompassed that *empowerment of staff* in the use of AI technologies linked with *digital fitness*, as organisational culture characteristics, is perceived to *increase innovation*, and contribute positively toward a successful AI implementation. Furthermore, respecting *diversity and social considerations* as organisational culture characteristics are perceived as important to incorporate into the planning when embarking on an AI

implementation, and as such contributes positively to the readiness of IT organisations to implement AI. Despite this perception, the IT organisation has not incorporated these cultural characteristics into their value system. While the findings show that IT organisations perceive *industry factors* as a determinant to increase their competitiveness contributing positively towards their readiness to implement AI, *load shedding*, *legal, policy and governance constraints* are perceived as challenges which may hinder the successful implementation of AI. Apart from this, the organisation has not made strides into incorporating plans pertaining to governance or industry related factors into its strategy.

7.3 Limitations of the research

The outcome of this study is subjected to limitations and is intended to stimulate future research. According to purposive interview sampling within a Gauteng-based IT organisation, the researchers' findings preliminary reflect that of IT management and senior and junior technical staff. Future research is encouraged to address the following limitations: firstly, sampling across other IT organisations, providing services to a variety of industries such as Financial, Manufacturing, Transportation, Telecommunications, and Utilities, to broaden the perspectives and insights into AI readiness. Secondly, the researcher proposes a further examination of the organisation's AI readiness factors through in-depth case studies, and pre- and post-AI technology implementations. Furthermore, to synthesize the difference in perspectives of IT management, customers, technical implementation teams, and affected employees. This might also help discern AI readiness factors per varying organisational contexts and particular AI implementation readiness purposes.

7.4 Research contributions

This study has practically contributed to the body of knowledge in three ways. Firstly, it addresses a lack of industry-specific research on IT organisational readiness to implement AI successfully. While assisting with filling this gap in the IT organisation literature, this study also produced transferrable knowledge for other parts of the IT industry sharing similar characteristics. In addition, it elaborated on salient factors across main categories, strategy, perception and awareness, challenges, and organisational culture (within the TOE context) which impact the readiness of IT organisations to implement AI.

Particularly, the researcher offered insights into the different interrelationships of AI readiness themes, centered around his interpretation and discussion of AI implementation readiness themes, presented though the theoretical lens of the TOE framework. As such, the framework assisted the researcher to present the salient AI readiness factors grouped under technology characteristics, for example, integration, IT infrastructure, and data. Furthermore, organisational perspectives included, inter alia, leadership support, business process automation and integration, and the IT department AI capability. Lastly, environment considerations include reference to industry factors impacting the competitiveness of organisations, the regulatory landscape, collaborator and partner challenges and load shedding impacting the availability of AI enabled services. However, the researcher did not reveal the themes in a prioritised and weighted manner, concerning the predominant AI readiness purpose and existing contingencies adopted by the IT organisation.

The methodological approach undertaken in the study was a case study in the setting of an IT organisation, based in Gauteng South Africa. As a relatively small sized organisation, the researcher selected a purposive sampling technique to draw insights from IT managers, senior technical and junior technical staff. The rationale is that IT leaders lead the formulation and implementation of strategy, whereas senior technical staff will implement AI and ecosystem technologies in support of business processes. Whereas, junior IT staff will likely be impacted by AI implementations therefore their combined insights were to provide valuable perspectives. Also, the data collection methods combined open ended interviews and fucus group discussions, followed by the thematic analysis to interpret the findings. In sum whilst the researcher proposes certain AI implementation readiness challenges, the researcher further acknowledges potential synergies extending to other 4IR technologies, which may exist.

7.5 Recommendations

The recommendations suggested by the researcher are based on the research findings and are divided into three areas, namely, management, IT staff, and government. All of these will be discussed in more detail in sections 7.5.1 - 7.5.3.

7.5.1 Implications for Management

Implications based on the outcomes of this study for IT management, in the context of IT organisations based in Gauteng, South Africa, include the facilitation of AI readiness assessment

decisions within the context of their organisations. IT management will be able to focus on the salient themes identified and presented in section 5.7.1, and summarised in the conceptual framework Figure 5, about the readiness of IT organisations to implement AI towards achieving business goals. The significance of these themes is in their contribution towards exploring the readiness of IT organisations to implement AI towards realising their business goals, in line with the benefits of 4IR. These factors include, for example, creating a conducive culture, to support constantly evolving AI technologies, which includes characteristics like digital fitness, innovation and empowerment of staff, to increase the AI readiness of the organisation and staff.

Furthermore, management should familiarise themselves with the limitations and possibilities of AI, also aligning strategy with the business requirements and deciding on the best-suited processes to fit AI. Next, technology decisions should be made with due consideration of AI, to expand the scope and reach of AI's potential benefit. Additionally, leadership should identify the most appropriate collaborators and partners to engage and partner with during the AI journey, to avoid costly mistakes and to share ideas on the ethical application of AI in the absence of legal and government regulation. Next, leadership may want to establish a change management program, to drive awareness amongst staff, customers and other stakeholders, to increase trust and value perception. Investments should be made into infrastructure, AI skills development and upskilling of staff, also to support AI projects, through their life cycle. Moreover, decision-makers should position the IT organisation with the requisite focus on what its target market requires, and the competition offerings to align its strategy and strategic assets accordingly. Management should also ensure that in the absence of legislation, the requisite policies are developed to include the ethical aspects of AI, including the required controls for security and privacy.

Management should oversee AI implementations and start small, by following an iterative approach to increase learning and minimise possible negative impact, as changes related to AI may be extremely disruptive. Lastly, management should also invest the requisite funds to increase AI capability in the form of skills and capacity.

7.5.2 Implications for IT staff

IT staff should upskill themselves by acquiring the requisite AI and ecosystem skills. Ecosystem skills are in the form of data analysis, IoT, and Cloud infrastructure, to prepare for the journey. AI skills cover, for example, statistical modelling, ML, ASR, DL, NN, and other AI development

skills required to support the specific use cases. System and business process integration limitations must be highlighted to management, emphasizing the prioritisation of the most applicable business processes and systems, and where to apply AI. In addition, staff should monitor the output of AI algorithms for possible defects, and act swiftly to calibrate data input as well as a possible output. Furthermore, access is granted to data infrastructure, enabling AI applications to learn. Moreover, data volumes should be made available to AI to increase its learning capability, with the intent to increase the quality of output.

7.5.3 Implications for Government and Policy makers

The government may find it valuable to establish a 4IR-T ethics working group, to advise the government on the ethical aspects and regulatory requirements to develop and implement, applicable to public and private sectors, including individuals. Consequently, it will be beneficial to constitute the working group to include AI industry leaders, research institutions, academia, and private and public sector representation to assist policy makers in developing the requisite legislation. Furthermore, compliance regulators should be established to monitor compliance and act where necessary. Training and awareness programs will also be beneficial to increase the value perception of AI, fostering buy-in, and countering the likelihood of false media, by an increased understanding of AI and its business potentials, inclusive of dangers and limitations.

7.6 Conclusion to chapter seven

This deductive case study research was aimed at exploring the readiness of IT organisations based in Gauteng, South Africa, to implement AI towards realising their business goals, in line with the benefits of 4IR. The research has pointed out that although participants have some knowledge of AI, their knowledge and experience of AI implementations are rather reserved and limited, which supports previous studies on the readiness of organisations to implement AI. IT organisations are largely on the journey towards implementing AI in some form or another. Their AI investments are visible in for example ERP-, Cloud-, Networking-, Business decision enhancing-, Information Security-, and other technologies. Their IT infrastructure or skills are not entirely integrated or ready for AI implementation. Even though participants believe that AI will reduce costs, increase efficiencies, and improve customer services, the state of the IT strategy seems to suggest a lack of change management and awareness regarding AI and AI-related strategic interventions.

As such, a lack of understanding further exacerbates the fear of the unknown impact AI will have on jobs, manifesting into mistrust and negative perceptions, rather than the belief in co-existence and enhancement of tasks. Furthermore, this study revealed 14 themes and 28 sub-themes (See: Figure 5) about the readiness of IT organisations. These are presented broadly into T, O, and E contexts and categorised in the research objective categories being strategy, perception and awareness, challenges, and organisational culture. In this study, the researcher discovered that the fear of job loss, lack of access to AI talent and upskilling, change management, and strategic alignment, to be enabling or hindering factors towards AI implementation readiness of the IT organisation. This research has shown that an AI readiness assessment could contribute to the readiness of IT organisations to successfully implement AI, towards achieving their business goals, in line with the benefits of 4IR.

This study contributed to the literature in three ways. Firstly, it addresses a lack of industry-specific research on IT organisational readiness to implement AI successfully. While assisting with filling this gap in the IT organisation literature, this study also produced transferrable knowledge for other parts of the IT industry sharing similar characteristics. In addition, it elaborated on salient factors across main categories - strategy, perception and awareness, challenges, and organisational culture, within the TOE context, which can be explored for other related industry settings. As a result of research at the organisational level of AI readiness still in its infancy stage, the next contribution of studies could benefit from the deductive exploration of how IT decision-makers, implementors, and those staff potentially affected by AI implementations, reflected on their readiness to enable or hinder AI implementations.

Finally, due to the open-ended deductive and synthesis of the TOE contexts, the study further contributes to the body of knowledge by emphasizing the complexity of understanding organisational implementation readiness for AI technologies, within the context of strategy, perception and awareness, challenges, and organisational culture.

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ANNEXURES

Annexure A: Pilot interview guide

Guidelines for Interviews
Preliminary information for the interviewee - 5 min

• Introduce yourself
  ○ I am a student at UNISA, School for Business Leadership, and selected to conduct research in how IT organisations can determine their readiness to implement Artificial Intelligence (AI) towards realising their business goals
• **Provide** some background on the study: In my research I have found that many organisations have failed to implement AI successfully, due to several factors, which impacted their readiness These factors will be explored during the interviews and focus groups, and whether they are present in this organisation. Furthermore, the researcher believe this research can contribute positively to the body of knowledge and assist organisations such as CSIR to achieve their strategic goals
• Explain the **process** of the interview, data collection and privacy.
  ○ Conduct open-ended interviews and focus group discussions, to explore the insights from participants into the context of readiness to implement AI
  ○ The interview duration is expected to be between 30-45 minutes, and the platform I will be using to conduct the interview is MS Teams (audio only).
  ○ Confirmation if the Informed consent for individuals.pdf, have been signed. (https://csircoza.na2.echosign.com/account/homeJS).
  ○ Interviews and collected data will be treated as confidential. Reports, emanating from this research, will be recorded by concealing your identity
  ○ The session will be recorded for the purposes of transcribing
  ○ Individual Interview sessions will be followed up with focus group discussions
• Briefly explain the **topic and aim** of the research:
  ○ **Titled:** Readiness of IT organisations to implement Artificial Intelligence to support business processes in Gauteng Province, South Africa

- **Goal:** The research aims to explore the readiness of IT organisations to implement AI towards realising their business goals, in line with the benefits of the Fourth Industrial Revolution (4IR)
  - **IoT, Cloud, Big Data, Nanotechnologies, 3d printing, AI, Cybersecurity, Virtual reality, Robots**

- Explain briefly what the researcher mean by using AI
  - Cognitive human human-likely to observe, think learn, and make decisions
  - adoption of AI – conscious decision to implement AI, whereas
  - AI readiness, explain whether you are ready in all aspects to implement AI
  - Readiness barriers/factors
- In order to decrease the abstract nature of the discussion, potential AI scenarios were included:
  - Neural networks and Deep Learning: Biometrics, facial recognition
  - Business decision making: Machine learning
  - ERP Systems: Machine learning
  - Networking technologies: Neural networks and Deep Learning
  - Cybersecurity systems: Neural networks and Deep Learning
  - Service Management systems (Self-help, Chatbots, Natural Language processing-recognise speech, and automatic speech recognition: Transcribe voice into text – self-logging of calls)

Questions derived from literature review concepts

Theme	**Question(s)**	**Refined or probing Questions**
1. Strategy	**Question 1**:What AI interventions are incorporated into the IT strategy? **Response**: **Question 2**:How will AI contribute to the achievement of business goals? **Response**: **Question 3**: What is the status of the IT strategy?	• Describe • Why? • How? • Do you believe AI will require a redesign of your organisation • Is the strategy currently being developed, approved, adopted,

		executed, or implemented?
2. Perception and awareness	**Question 4**:What is your perception of AI? **Response**: **Question 5**:Do you think AI can support business processes? If yes, how? If not, why not? **Response**: **Question 6**:What AI applications do you believe will assist the organisation, and how? **Response**:	• Describe • Why? • How? • ML, NN, DL, NLP, ASR, RPA
3. Challenges	**Question 7**:~~For AI to be implemented successfully, what challenges do you believe should be overcome?~~ Reword: What challenges do you believe may hinder an IT organisation to successfully implement AI? **Response**: ~~**Question 8**:Which of these challenges do you believe your organisation faces?~~ Remove, as it attracts a similar response to Question 7 **Response**: ~~**Question 9**:How do you believe can these challenges be overcome?~~ - Remove, as it is not the purpose of this study to determine how to overcome the challenges, and could rather be deduced from the findings	• Describe • Why? • How? • Is AI a fit for organisational processes? If yes, where? If not, why not? • As a guideline use the TOE framework
4. Culture	**Question 10**:Do you believe culture is important when considering an AI implementation? If yes, why? If not, why not? **Response**: **Question 11**:Which cultural characteristics do you believe will increase the potential for a successful AI implementation? **Response**:	• Describe • Why? • How? • Do you believe there will be resistance to change when implementing AI? If yes, why? If no, why not?

Total duration: 55 Min

Annexure B: Final interview guide

Guidelines for Interviews
Preliminary information for the interviewee - 5 min

• Introduce yourself
  ○ I am a student at UNISA, School for Business Leadership, and selected to conduct research in how IT organisations can determine their readiness to implement Artificial Intelligence (AI) towards realising their business goals
• **Provide** some background on the study: In my research, I have found that many organisations have failed to implement AI successfully, due to several factors, which impacted their readiness These factors will be explored during the interviews and focus groups, and whether they are present in this organisation. Furthermore, the researcher believe this research can contribute positively to the body of knowledge and assist organisations such as CSIR to achieve their strategic goals.
• Explain the **process** of the interview, data collection and privacy.
  ○ Conduct open-ended interviews and focus group discussions, to explore the insights from participants into the context of readiness to implement AI
  ○ The interview duration is expected to be between 30-45 minutes, and the platform I will be using to conduct the interview is MS Teams (audio only).
  ○ Confirmation if the Informed consent for individuals.pdf, has been signed. (https://csircoza.na2.echosign.com/account/homeJS).
  ○ Interviews and collected data will be treated as confidential. Reports, emanating from this research, will be recorded by concealing your identity
  ○ The session will be recorded for the purposes of transcribing
  ○ Individual Interview sessions will be followed up with focus group discussions
• Briefly explain the **topic and aim** of the research:
  ○ **Titled:** Readiness of IT organisations to implement Artificial Intelligence to support business processes in Gauteng Province, South Africa

- **Goal:** The research aims to explore the readiness of IT organisations to implement AI towards realising their business goals, in line with the benefits of the Fourth Industrial Revolution (4IR)
  - **IoT, Cloud, Big Data, Nanotechnologies, 3d printing, AI, Cybersecurity, Virtual reality, Robots**

- Explain briefly what the researcher mean by using AI
  - Cognitive human like ability, observe, think, learn, and make decisions
  - Adoption of AI – conscious decision to implement, or make AI, whereas
  - AI readiness, indicates whether you are ready to implement AI, in line with the TOE framework
  - Readiness barriers/factors
- In order to decrease the abstract nature of the discussion, potential AI scenarios were included:
  - Neural networks and Deep Learning: Biometrics, facial recognition
  - AIOps: IT organisations deploy artificial intelligence operations (AIOps) based on **Machine learning** techniques, to reduce the mean time to resolve (MTTR) of problems and correlate events.
  - Business decision making: Machine learning
  - ERP Systems: Machine learning
  - Networking technologies: Neural networks and Deep Learning
  - Cybersecurity systems: Neural networks and Deep Learning
  - Service Management systems (Self-help, Chatbots, Natural Language processing-recognise speech, and automatic speech recognition: Transcribe voice into text – self-logging of calls)

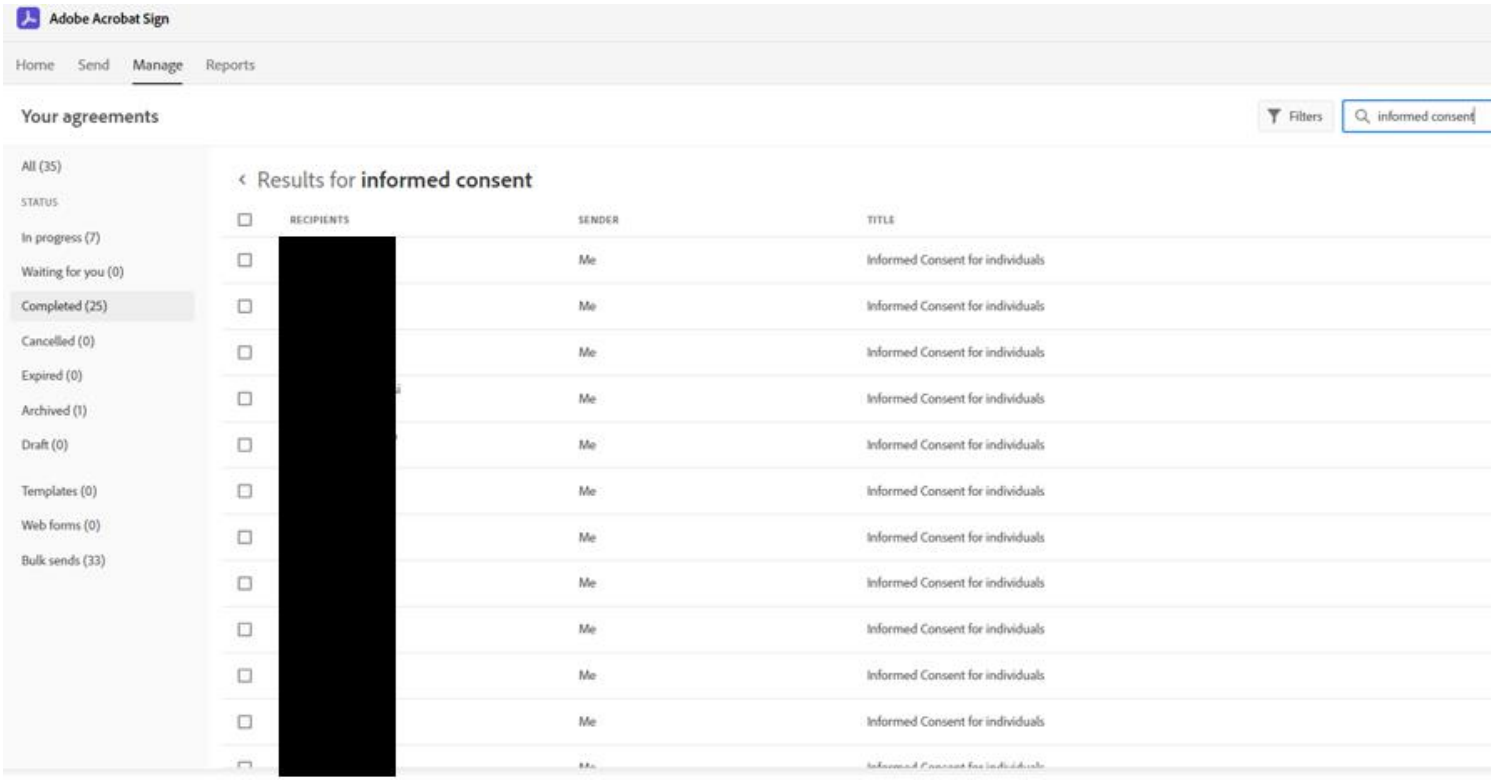
Questions derived from literature review concepts

Theme	**Question(s)**	**Refined or probing Questions**
1. Strategy	**Question 1**:What AI interventions are incorporated into the IT strategy? **Response**:	• Describe • Why? • How?

	Question 2:How will AI contribute to the achievement of business goals? **Response**: **Question 3**: What is the status of the IT strategy? **Response:**	• Do you believe AI will require a redesign of your organisation Is the strategy currently being developed, approved, adopted, executed, or implemented?
2. Perception and awareness	**Question 4**:What is your perception of AI? **Response:** **Question 5**:Do you think AI can support business processes? If yes, how? If not, why not? **Response**: **Question 6**:What AI applications do you believe will assist the organisation, and how? **Response**:	• Describe • Why? • How? ML, NN, DL, NLP, ASR, RPA
3. Challenges	**Question 7**: What challenges do you believe, if not addressed, may hinder an IT organisation from successfully implementing AI? **Response**:	• Describe • Why? • How? • Is AI a fit for organisational processes? If yes, where? If not, why not? • As a guideline use the TOE framework
4. Culture (organisational culture)	**Question 8**: Do you believe the organisation's culture is important when considering an AI implementation? If yes, why? If not, why not? **Response**: **Question 9**: Which cultural **characteristics** do you believe will increase the potential for a successful AI implementation? **Response**:	• Describe • Why? • How? • Do you believe there will be resistance to change when implementing AI? If yes, why? If no, why not?

Total duration: min

Annexure C: Informed consent



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Informed consent for participation in an academic research project on Artificial Intelligence (AI)

Dear Respondent

You are herewith invited to participate in an academic research study conducted by Leon du Preez, a student in the Master of Business Administration at UNISA's Graduate School of Business Leadership (SBL).

The purpose of the study is to investigate the Readiness of IT organisations to implement Artificial Intelligence to support business processes in Gauteng Province, South Africa.

All your answers will be treated as confidential, and you will not be identified in any of the research reports emanating from this research.

Your participation in this study is very important to us. You may however choose not to participate and you may also withdraw from the study at any time without any negative consequences.

An interview and focus group discussion will be scheduled with you. However, each of these sessions will not exceed the duration of between 30-45 minutes.

The results of the study will be used for academic purposes only and may be published in an academic journal. We will provide you with a summary of our findings on request.

Please contact my supervisor, Dr Ogundaini Oluwamayowa, at ogundoo@unisa.ac.za, if you have any questions or comments regarding the study. Please sign below to indicate your willingness to participate in the study.

Yours sincerely

Leon du Preez

I, [redacted] herewith give my consent to participate in the study. I have read the letter and understand my rights with regard to participating in the research.

_____ 03/10/2022

Respondent's signature **Date**

Annexure D: Sample from transcripts

Research objectives	Quotes/responses	Participants
To understand how IT organisations currently align their business processes and IT capabilities.	• …My personal view is that there are areas where AI can benefit the organisation, e.g. a Researcher requires to read through tons of info to get to specific and relevant info, whereas with the use of AI you can save time and focus on what is more relevant. Similarly, law firms working on a particular case, are required to go through the case law, summarising the specific, to focus on what is important. Use of Chatbots and the like to provide information to users. In Finance, it's difficult to separate, but RPA. Basic AI where not a lot of AI is involved, compared to deep learning. An App is used to for instance apply for leave, book travel requests, or send a request via WhatsApp. Where AI can assist, the historical information will make certain suggestions for instance in the case of travel, making certain recommendations on the routes to take… • …No specific AI interventions were incorporated… • …It is currently left open, with the intent that the teams on the ground through their experience can assist in identifying which areas are… • …ecosystem where our services are aligned to the organisation's strategy... • ..AI is going to be one of those new capabilities to address the efficiency challenges... • ...business planning is manual. Reflecting on what I did this year, last year, and whether you must do next year. Data points and history combined with AI can assist us in this business planning… • ..in terms of reporting, reduce human intervention, which introduces human error... • …time determines a lot more than people understand. AI does a lot more calculations, and extrapolations, a lot faster... • ...AI can contribute a lot to being agile... • …for It to excess in service delivery, we must be able to track requests from our customers, automate responses and render services, as to achieve shorter downtime... • …we do things manually, and AI, will reduce delays in services provided to clients... • ...AI is necessary today, more so easier to manage our IT processes… • …business intelligence in the Data organisation and applications...	Pilot_01, Int_01_ST, Int_02_ST, Int_03_ST, Int_04_ST, Int_05_ST, Int_06_ST, Int_07_ST, Int_08_ST, Int_09_ST, Int_10_Man, Int_11_Man, Int_12_Man, Int_13_Man, Int_14_Man, Int_15_Man, Int_16_Man, Int_18_JT, Int_19_JT, Int_20_JT, Int_26_JT, Int_27_JT, Int_28_JT, Focus_Int_01_Man, Focus_Int_02_ST, Focus_Int_03_JT

	• …predictive and Prescriptive analysis... • ...AI can decide to improve workflows where needed... • ...AI could enable us to harness a variety of information sources (training data sets) to improve our decision-making and analytics... • …real-time information is available... • ...to improve business processes, and address constraints, but still using human intervention... • ...improve relevance and competitiveness of IT to the organisation and market… • …adaptability towards industry and markets...	
To gain insights into the awareness of employees on the acceptance of or resistance to AI implementation to support business processes.	• ...Yes, it is important when wanting to implement AI. Based on our values, which we must keep in mind when we place AI... • ...All must be aware of our IT strategy, and it should not infringe on our values... • …human intelligence and solving problems, creating a symbiotic relationship, by using AI... • …data gathering – the larger the data the better decisions we can make... • ...Deal with fake information... • ...because the system must scale for current and future needs... • ...AI is good, it's something we've always been moving to, It's something we cannot live without. Improving the quality of life a lot… • ... show how AI will assist with performing better and increase our competitive edge and make more money...	Pilot_01, Int_01_ST, Int_02_ST, Int_03_ST, Int_04_ST, Int_05_ST, Int_06_ST, Int_07_ST, Int_08_ST, Int_09_ST, Int_10_Man, Int_11_Man, Int_12_Man, Int_13_Man, Int_14_Man, Int_15_Man, Int_16_Man, Int_18_JT, Int_19_JT, Int_20_JT, Int_26_JT, Int_27_JT, Int_28_JT, Focus_Int_01_Man, Focus_Int_02_ST, Focus_Int_03_JT
To identify the potential challenges that may hinder AI implementation.	• …We don't have unlimited resources, however, in the long run, AI will be more efficient, but in the long term, we must invest in technology, which costs money ... • …Certain things will provide us with quick wins and gain a lot of goodwill… • …Implementation on and adoption, taking our users along, making sure we buy into the process… • …Support from management… • …Initial set-up of the machine requiring human intervention, post that, it will then continue to learn by itself. The use of AI in self-driving cars. It gets to a point	Pilot_01, Int_01_ST, Int_02_ST, Int_03_ST, Int_04_ST, Int_05_ST, Int_06_ST, Int_07_ST, Int_08_ST, Int_09_ST, Int_10_Man, Int_11_Man, Int_12_Man, Int_13_Man,

	where it needs to make ethical decisions. Biasness becomes relevant in the way AI then responds to challenges, as it learns based on how… • …South Africa is not that ready for technological advances, as we have other priorities, requiring investments... • …The prevalence of **fake technologies** which don't necessarily work, cause more harm than good and sometimes are cheaper than real technologies, and we must be on the lookout for those. So control and regulation around this must be effective… • The ability of technology becomes so advanced, that it starts doing more than what we want it to do. • ...AI can be boring to interact with. Create a human-like experience… • …Product life cycle management... • …automated call centre, due to lack of capacity. AI bots can play a role... • …robotic process automation (RPA), was unclear where it will be applied, which use case... • …as part of the networking technologies, as part of the network refresh: Devices which are about to fail can be notified... • ...ERP and automation… • …moving away from manual capturing data, followed by automated processes, then routing it to individuals for reporting and or payment... • …robotic process automation is included and will be used to provide support to businesses. Like calls and service requests... • …integration requirement. Say there is an increase in laptops in certain buildings, so AI should generate certain notifications, through learning... • ...AI will be incorporated in all new systems like the ERP replacement. More prevalent in the reporting, which levers data and a bot recommending certain directions, based on trends... • …also where applications are self-healing... • …greater process automation. RPA, Bots – ordering processes, and self-help services... • …as well as systems monitoring tools. Real-time monitoring through machine learning... • ...IT systems helping us with logging calls and interacting with clients... • ...ML: applied to monitoring and audit, like the SIEM solution, enhance detection and response procedures... • …not all things can be automated...	Int_14_Man, Int_15_Man, Int_16_Man, Int_18_JT, Int_19_JT, Int_20_JT, Int_26_JT, Int_27_JT, Int_28_JT, Focus_Int_01_Man, Focus_Int_02_ST, Focus_Int_03_JT

	• …networking technologies provide access to a software type of network engineer, to guide the remediation process, troubleshooting – deploying features like self-healing... • …addresses capacity shortages... • ...the key is that whenever you improve technology it must assist with efficiency, replacing manual activities, streaming functions and business processes… • …perception of IT systems. If we employ AI in the new systems., it will show we are on top of our game. With AI ML built-in… • …should our approach be to have AI part of every project consideration, so we can leapfrog?... • …monitoring can be done Realtime all hours of the day... • …when reporting on endpoints, information can be derived tom respective repositories... • …contribute to HR or Call centre to improve the onboarding process and provide answers to questions, posed to an AI attendant... • …further opportunities are underway: ERP/Payroll, PPPM, Contract Management, etc... • …whatever we automate will improve our ability to go to market and increase the products to support us... • …source control is incorporated into AI functions. AI assesses your code against the evolving standards... • …inform sec: Advanced threat management. Parsing log files, to limit the amount of human time... • "...AI can support business processes. Process automation and the use of RPA • Improving greater productivity by ensuring more efficient processes…" • ...Call centre: NLP Find information/assistance much faster... • ...Defining/deciding the most appropriate use case to apply AI... • ...Actual implementation, or what is possible. Identify those instances where AI can be applied more effectively... • ...Create focus on specific use cases where AI will play a part... • ...Decide where AI will play a role and see who will be affected... • ...Important to understand which applications are going to be used for AI. Like Medical, or Flights. If something goes wrong, there will be casualties. We need to be getting to the fine discipline of engineering, it right the first time. It should work and not require updating all the time.. • ...Social media brought the Internet as one of the conduits to share information... • ...The use of AI in WHAT? Be clear on where Ai will be used...	

	• ...MS Word already has different accents, like South African... • ...When AI is introduced, it must be done with the specific use case in mind. Some activities will remain, like replacing an Enterprise service, with a digital... • ...AI makes our lives more efficient. Doing everyday things. Like uber, smart homes, home systems etc… • …awareness with the IT department regarding systems we are deploying. We keep on reminding users of what is being deployed... • …we must make people aware of the advantages of AI, let's broaden our training and education to create new skills... • …collaboration with other institutions/partners, to share ideas and learn lessons on the possibilities of AI... • …collaborate with other companies and institutions... • …as we are moving towards Cloud technology, if we don't implement AI, it will be more difficult to manage systems in the cloud... • …consider adopting a policy pertaining to AI... • …procedures policies, processes... • …ability of technology becomes so advanced, that it starts doing more than what we want it to do... • …have clear roles and responsibilities throughout this AI journey. Make people involve by having a role to play... • …clarity of roles and responsibilities to ensure we align what the future of AI requires... • ...Concern with AI is that it will require a more capable worker to manage it, compared to having a lower-skilled worker… • …skilled staff to install and manage... • …resources to have the necessary skills to implement it successfully... • …people digging in their heels not wanting to adopt AI in their work, as the message... • …what dangers will come from AI, and perhaps are not known at this point... • …when we build applications, we should do so with the intent to make them available to AI applications to make it useful... • …some algorithms are still too immature to apply. When exposed to data, it will grow into another area... • ...AI can still make mistakes, so people must still monitor the outputs of AI, and calibrate them now... • ...AI output must be well monitored to produce the quality that is required... • …gender inequality. Algorithms, but use cases...	

	• …we must encourage buy-in and how it can benefit the organisation... • …change the mindset of staff, to accept, everyone, to understand the role of AI and theirs... • …organisational change management and communication are important... • …a challenge to have people appreciate the output of AI, and not feel threatened, Organisational change management is critical... • … I like it when preferences are used to present new music for instance. Must happen silently in the background... • …having access to the correct data... • ...AI can only be built on a solid data foundation (making data available to AI, to improve future processes)… • ...AI need vast amounts of data to learn from... • …quality of data to support quality outputs... • …good data sets: For example, an AI must know the preferences of customers, e.g. language and accents... • …constant influx of data... • …what emotional aspects we must consider, as part of such a journey... • "...worrying, because in the wrong hands, the use of AI can result in major catastrophes • The challenges of self-changing software code • o Machines that have human-like abilities • o A lot of it sounds far-fetched unless you have experienced code that brings out the unintended results..." • …ultimately, with the right regulatory environments and accountabilities, the benefits far outweigh the problems... • …ethical application of AI, to not take away the human rights of people, but to support staff... • …ethical dilemma, like self-driving cars making decisions to protect for instance the driver or the people on the road... • …racial biases... • Initial set-up of the machine requiring human intervention, post that, it will then continue to learn by itself. The use of AI in self-driving cars. It gets to a point where it needs to make ethical decisions. Biasness becomes relevant in the way AI then responds to challenges, as it learns based on how... • …at first I thought it is a system coming to take over people's work. Robots will let people lose their jobs... • …people may think that something is going to replace my job...	

	• …staff may feel insecure about their job and resist change... • …perception of AI replacing human beings. People want to know that AI is not going to take over my work... • …possible disadvantages: the biggest threat is the replacement of human resources... • …budget allocation to acquire AI technologies... • …we don't have unlimited resources, however, in the long run, AI will be more efficient, but in the long term, we must invest in technology, which costs money... • …from a South African context, the government needs taxes, so the Government must find ways to create new jobs... • …regulatory frameworks/aspects, If not, issues can out way the benefits... • …South Africa is not that ready for technological • …load shedding – Power outages hinder our economy, and our country and relying on this will hamper our ability. So we either need to look at alternative mechanisms... • …management should portray an understanding of AI, communicating to and leading changes involving staff...	
To determine the organisational culture requirements to enable the successful implementation of AI.	• …Yes, it has a big role to play, as we want to embark on AI. Bringing it closer to home, we have a very conservative workforce, especially in the research space. Their ability and willingness to change are not as high as some of the other organisations I have encountered. So resistance to change is quite high. My take on it is that people are resistant to change, or they have had a negative experience… • …Don't believe our people are quite ready to embrace AI, however, we must create a balance, to drive awareness, showing people the benefits through practical examples. He must work through the initial resistance, by making people aware… • Create an environment of trust, which will reduce the resistance to change… • …If we can do this, it will help us a great deal to be successful… • …important, as researchers are technology hungry. The line between personal and organisation use of technology. The line blurred all the time. Our user base is more open to using technology… • …However, the older generation compared to Generation x, are a bit more reserved. Where those interested in tech. Org has a general culture of compliance… • …useful to understand the adoption culture of technology in the organisation. The openness to accepting technology will also improve possible success…	Pilot_01, Int_01_ST, Int_02_ST, Int_03_ST, Int_04_ST, Int_05_ST, Int_06_ST, Int_07_ST, Int_08_ST, Int_09_ST, Int_10_Man, Int_11_Man, Int_12_Man, Int_13_Man, Int_14_Man, Int_15_Man, Int_16_Man, Int_18_JT, Int_19_JT, Int_20_JT, Int_26_JT, Int_27_JT, Int_28_JT, Focus_Int_01_Man, Focus_Int_02_ST, Focus_Int_03_JT •

	• Some people are faster and some slower, so we must consider all of this into the mix.- Inclusiveness and divergence across age groups. • ...ICT have innovation as part of the strategy, and a CSF, which allows for AI to be used...	

Annexure E: Sample from code book

Codebook ref	Descriptive codes (derived from Interview transcriptions) - "QUOTES"	Sub-Themes from literature	Themes	Interviewee code	Interview file reference
#118	...AI can be boring to interact with. Create an experience that is human-like…	AI and Human co-existence	Negative AI perspectives	Int_03_ST	Interview guide and responses_Interview 4_ST
#93	…automated call centre, due to lack of capacity. AI bots can play a role...	Business process automation and integration	Unclear strategic priorities and/or use case	Int_03_ST	Interview guide and responses_Interview 3_ST
#95	…robotic process automation (RPA), was unclear where it will be applied, which use case...	Business process automation and integration	Unclear strategic priorities and/or use case	Int_03_ST	Interview guide and responses_Interview 3_ST
#379	...AI will be incorporated in all new systems like the ERP replacement. More prevalent in the reporting, which levers data and a bot recommending certain directions, based on trends...	Enhance business decision making	Unclear strategic priorities and/or use case	Int_11_Man	Interview guide and responses_Interview 11_Man
#572	...my own personal view is that there are areas where AI can benefit the organisation, e.g. a Researcher requires to read through tons of info to get to specific and relevant info, whereas with the use of AI you can save time and focus on what is more relevant. Similarly law firms working on a particular case, are required to go through the case law, summarising the specifics, to focus on what is important. The use of Chatbots and the like to provide information to users. In Finance, it's difficult to separate, but RPA can assist. Basic AI where not a lot of AI is involved, compared to deep learning. An App is used to for instance apply for leave, book travel requests, or send a request via WhatsApp. Where AI can assist,	Enhance business decision making	Unclear strategic priorities and/or use case	Int_16_Man	Interview guide and responses_Interview 16_Man

Codebook ref	Descriptive codes (derived from Interview transcriptions) - "QUOTES"	Sub-Themes from literature	Themes	Interviewee code	Interview file reference
	the historical information, will make certain suggestions for instance in the case of travel, making certain recommendations on the routes to take...				
#603	…as well as systems monitoring tools. Real-time monitoring through machine learning...	Enhance business decision making	Unclear strategic priorities and/or use case	Int_19_JT	Interview guide and responses_Interview 19_Man
#129	…networking technologies provide access to a software type of network engineer, to guide the remediation process, troubleshooting – deploying features like self-healing...	Business process automation and integration	Unclear strategic priorities and/or use case	Int_04_ST	Interview guide and responses_Interview 4_ST
#346	...the key is that whenever you improve technology it must assist with efficiency, replacing manual activities, streaming functions and business processes…	Increase efficiencies	Unclear strategic priorities and/or use case	Int_10_Man	Interview guide and responses_Interview 10_Man
#312	...Actual implementation, or what is possible. Identify those instances where AI can be applied more effectively...	Lack of common understanding of strategy	Unclear strategic priorities and/or use case	Int_08_ST	Interview guide and responses_Interview 8_ST
#633	…awareness with IT department regarding systems we are deploying. We keep on reminding users of what is being deployed...	AI Awareness	Inadequate awareness and Change management	Int_20_JT	Interview guide and responses_Interview 20_Man
#674	…as we are moving towards Cloud technology, if we don't implement AI, it will be more difficult to manage systems in the cloud...	AI ecosystem technologies	Unclear strategic priorities and/or use case	Int_28_JT	Interview guide and responses_Interview 28_Man

Codebook ref	Descriptive codes (derived from Interview transcriptions) - "QUOTES"	Sub-Themes from literature	Themes	Interviewee code	Interview file reference
#594	…resources to have the necessary skills to implement it successfully...	AI talent access	Lack of human capital management	Int_18_JT	Interview guide and responses_Interview 18_Man
#309	…some algorithms are still too immature to apply. When exposed to data, it will grow into other area...	Algorithm quality	Inadequate data management	Int_08_ST	Interview guide and responses_Interview 8_ST
#550	…a challenge to have people appreciate the output of AI, and not feel threatened, Organisational change management is critical...	Change management	Inadequate awareness and Change management	Int_15_Man	Interview guide and responses_Interview 15_Man
#656	...AI need vast amounts of data to learn from...	Data availability	Inadequate data management	Int_27_JT	Interview guide and responses_Interview 27_Man
#462	...worrying, because in the wrong hands, the use of AI can result in major catastrophes The challenges of self-changing software code o Machines that have human-like abilities o A lot of it sounds far-fetched unless you have experienced code that brings out the unintended results...	Ethical considerations	Lack of ethical practices	Int_12_Man	Interview guide and responses_Interview 12_Man
#581	Initial set-up of the machine requiring human intervention, post that, it will then continue to learn by itself. The use of AI in self-driving cars. It gets to a point where it needs to make ethical decisions. Biasness' becomes relevant in the way AI then responds to challenges, as it learns based on how...	Ethical considerations	Lack of ethical practices	Int_16_Man	Interview guide and responses_Interview 16_Man
#582	…South Africa is not that ready for technological advances, as we have other priorities, requiring investments...	Government policy and regulation	Legal, policy and governance constraints	Int_16_Man	Interview guide and responses_Interview 16_Man
#87	Mutual learning should exist, to co-exist	Human-centric AI	Ecosystem challenges	Int_02_ST	Interview guide and responses_Interview 2_ST

Codebook ref	Descriptive codes (derived from Interview transcriptions) - "QUOTES"	Sub-Themes from literature	Themes	Interviewee code	Interview file reference
#365	…starting small and then growing, augment...	Implementation approach	Unclear strategic priorities and/or use case	Int_10_Man	Interview guide and responses_Interview 10_Man
#567	...infrastructure: Organisation and Environmental: Cloud options vs On-Premises. At the current level of maturity, the largest threat is the unintegrated nature of our toolsets. Networking tools and Service Management, CMDB will impact our ability to increase the effectiveness of AI...	Incompatibility or lack of integration of legacy systems or business processes with AI	Incompatibility or lack of integration of legacy systems or business processes with AI	Int_15_Man	Interview guide and responses_Interview 15_Man
#333	…load shedding – Power outages hinder our economy, our country and relying on this will hamper our ability. So we either need to look at alternative mechanisms...	Lack of power supply	Load shedding	Int_09_ST	Interview guide and responses_Interview 9_ST
#283	…leadership, someone who is strategic. Someone to lead the AI initiatives...	Leadership understanding of AI	Lack of leadership and understanding of AI	Int_07_ST	Interview guide and responses_Interview 7_ST
#269	…at this stage it is still pie in the sky, unclear where AI can play a role in our business...	Strategic priorities	Unclear strategic priorities and/or use case	Int_07_ST	Interview guide and responses_Interview 7_ST
#78	...Reskilling of staff, exposed to automation or AI...	Upskilling of staff	Lack of AI skills, and upskilling	Int_02_ST	Interview guide and responses_Interview 2_ST
#403	...training and awareness of staff on AI, so they can also identify what is available to ease their work. People have to go to conferences and learn more. Knowledge of staff on AI, to reduce fear. People must t feel part of the contribution to the 4IRT and economy, through...	Upskilling of staff	Lack of AI skills, and upskilling	Int_11_Man	Interview guide and responses_Interview 11_Man

Codebook ref	Descriptive codes (derived from Interview transcriptions) - "QUOTES"	Sub-Themes from literature	Themes	Interviewee code	Interview file reference
#348	...business planning is manual. Reflecting on what I did this year, last year, and whether you must do next year. Data points and history combined with AI can assist us in this business planning…	AI-Business Potentials	Strategic alignment	Int_10_Man	Interview guide and responses_Interview 10_Man
#453	...AI could enable us to harness the variety of information sources (training data sets) to improve our decision-making and analytics...	Data-driven decision making	Data-driven decision making	Int_12_Man	Interview guide and responses_Interview 12_Man