Exploring the implications of Robotic Process Automation (RPA) on operational efficiency in public health care in South Africa.

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ABSTRACT

According to the constitution, access to healthcare is a fundamental right for all citizens in South Africa. More than 25 years since South Africa became a republic, majority of its citizens still do not enjoy their rights as enshrined in the constitution due to the dire conditions of public health institutions. Systems in public health institutions are still outdated, manual and paper-based, leading to high operational inefficiencies and worse cases death of South African citizens.

The research purpose was to explore adoption of Robotic Process Automation (RPA) in the South African public healthcare sector and its implications to operational efficiency. The Technology-Organisation-Environment model, a technology adoption framework was adopted in this study. A qualitative study was conducted with insights obtained through semi-structured interviews with medical practitioners in both the private and public sector, senior management administrative personnel in both public and private healthcare and RPA Industry Experts.

The Technology-Organisation-Environment (TOE) framework was adapted to highlight the main research findings on adoption of RPA in the South African public healthcare, namely, stakeholders aspects (environment context), Processes (technology context) and People (Organisation context). This RPA adoption model could be used as a guide to public healthcare sector on aspects to consider for adopting RPA.

KEYWORDS

DECLARATION

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

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ACRONYMS

AI - Artificial Intelligence

BRICS - Brazil Russia India China South Africa

BPA - Business Process Automation

CoE - Centre of Excellence

ERP – Enterprise Resource Planning

FTE – Full Time Employee

GDP – Gross Domestic Product

HPCSA - Health Professions Council of South Africa

ICU – Intensive Care Unit

ML - Machine Learning

NDP - National Development Plan

OCR – Optical Character Recognition

POC – Proof of Concept

POPIA - Protection of Personal Information Act

RPA - Robotic Process Automation

SA - South Africa

SAHRC - South African Human Rights Commission

TAM – Technology Acceptance Model

TOE - Technology Organisation Environment Framework

WHO - World Health Organisation

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CHAPTER 1: PROBLEM DEFINITION AND RESEARCH PURPOSE

1.1 Background

The South African healthcare can be categorised as fragmented and faced with many challenges and according to Maphumulo and Bhengu (2019), the cracks can be traced back to the apartheid regime and the inequality and divisions it caused. Baker (2010) agreed with this view, noting that the current national ruling government inherited a failing healthcare system and one of its promises to South Africans was to improve healthcare and ensure access to all citizens. Kelly, Mrengqwa and Geffen (2019) refer to healthcare in South Africa as a *"stressed institution"*, with many challenges, particularly lack of skilled personnel, shortage of human resources, poor manual processes, and outdated technology.

According to the National Treasury (2021) medical specialists have decreased between 2017 and 2020. There is a fondness for living in urban areas as opposed to rural areas, and this affects the provision of healthcare in rural areas (National Treasury, 2021). The study compared South Africa with other countries with regards to the number of doctors per 10 000 people, in 2017 South Africa was 9.1 and reduced to 4.1 in 2019. Other countries that are part of BRICS results were as follows, China 17.9, Brazil 21.5 and Russia 40.1. This indicates serious challenges for South Africa's healthcare and how dire it is compared to its peers.

The South African government spent in excess of R200 billion during the 2019/2020 financial year (National Treasury, 2021). In 2018, the World Health Organisation (WHO) ranked South Africa 49th compared to other countries in terms of government expenditure on healthcare expenditure, with healthcare expenditure accounting for 13.3% of total government expenditure (Statistics South Africa, 2021). Malakoane, Heunis, Chikobvu, Kigozi and Kruger (2020) argue that the amount of expenditure in South Africa does not equate to the condition of health care in the country. This is as a result of declining service levels such as patients waiting longer for service, unclean and contaminated facilities all leading to higher deaths reported by the Health Department (Maphumulo & Bhengu, 2019).

Robotic Process Automation (RPA) has become more prevalent, with corporate organisations in South Africa having started to adopt and embrace it in their operations (Davenport & Kalakota, 2019). Davenport and Kalakota (2019) indicate that RPA has already been introduced in healthcare to perform repetitive administrative tasks. South Africa is lagging in terms of introducing and implementing leading technology, especially in healthcare (Maphumulo & Bhengu, 2019). Considering the challenges faced by healthcare in South Africa, this study considers RPA and its implications in the sector. There is also a dearth in

terms of studies conducted on RPA in healthcare in South Africa and this exploratory study will contribute to the body of knowledge.

1.2 South African public hospitals

According to the South African constitution, all citizens have a right to access healthcare. South Africa's health system is governed by the department of health. It has two concurrent healthcare systems: one is public and the other is private. 80% of South Africa's population rely on the public healthcare system (International Citizens Insurance, 2022). The public system receives subsidies from the government. The system is not funded adequately and is not run efficiently. There are over 400 public hospitals in South Africa. Provincial health departments are in charge of managing large regional hospitals. Municipal governments are responsible for smaller hospitals and medical facilities, such as primary care clinics (International Citizens Insurance, 2022).

The private system, where an estimated 80% of doctors work, serves 20% of the population, primarily upper-class and middle-class families as well as expats (International Citizens Insurance, 2022). As a result, while the private system is quite strong, the public system constantly lacks resources. Taxes and contributions collected at the point of service by patients help the South African government finance public healthcare. In South Africa, public healthcare is subsidized by up to 40% (International Citizens Insurance, 2022).

Public hospitals in South Africa are understaffed and underfunded. Patients get frustrated by lengthy wait times, a lack of privacy, and severe crowding. One of the main causes of the problems is that public hospitals do not receive enough financing. They are consequently unable to update their machinery, pay the best local doctors a reasonable salary, or even resupply their pharmacies. To say that the staff at public hospitals is overworked is an understatement. The problem has gotten worse due to corruption and inadequate management (International Citizens Insurance, 2022).

The healthcare sector in South Africa is about to undergo some significant changes. The government is attempting to set up a universal health insurance program. This approach aims to resolve disparities between various socioeconomic groups and enhance the country's health while also making healthcare more accessible to everyone. The debate about putting such a system into place, however, is still in its early stages and will take a while to evolve.

1.3 Research problem and Purpose Statement

According to the National Development Plan (NDP) of South Africa, one of the objectives of the South African government is to provide access to quality healthcare for all citizens (Gordon, Booysen, & Mbonigaba, 2020). This is further strengthened by section 27 of the South African Constitution, which stipulates that all persons have a right and are entitled to access to healthcare services and that no human should be denied emergency treatment (South African Human Rights Commission, 2019). The Department of Health is the custodian and responsible department for ensuring there is a requisite policies and legislation in place that foster section 27 of the Constitution (Section 27, 2010).

According to Statistics South Africa (Stats SA), in 2021 South Africa's population was estimated to be over 60 million people, all of whom have a right to healthcare (Statistics South Africa, Stats SA, 2022). The South African Human Rights Commission (SAHRC) argued that due to South Africa's history, availability and access to healthcare in South Africa is dependent on socio-economic status and not on the need for it and this is highlighted by the structure of healthcare in the country (South African Human Rights Commission, 2019). Accordingly, South Africa has a two-tiered, and highly unequal healthcare system, being the public and private sectors (Rensburg, 2021). The public sector is supported by the government and serves 71% of the population (Rensburg, 2021). The rest of the population is served by the private sector, which is generally supported by individual payments to medical aid systems or health insurance (Rensburg, 2021).

There is a growing discussion on the failures of the South African healthcare system, and it is believed to be as a result of various factor, some of which are the high inequality in the country, shortage of skilled personnel in South Africa and the high reliance on manual processes with outdated technology. According to a study conducted by Baker (2010), it suggests that South Africa's political and socio-economic history are important factors to consider to fully what has crippled healthcare in South Africa. Baker (2010) notes that apartheid created a major division and inequality in South Africa. Due to the division, majority of citizens, being the black community were without key infrastructure, especially healthcare facilities. Kelly, Mrengqwa and Geffen (2019) hold similar sentiments that access to quality healthcare was dependent on levels of income and race. The inequality has led to major disparities between public and private healthcare, with the less fortunate utilising public healthcare. Due the majority of the population being serviced in public healthcare, the public healthcare system is plagued by staff shortages, long waiting times and dysfunctional filing systems (Daily Maverick, 2021).

Healthcare in South African has been described as a failing sector that continues to fail the citizens of South Africa (Baker, 2010). It is experiencing operational challenges, supply chain issues, skills shortages, poor record keeping, outdated technology and manual processes. Other challenges facing the sector are weak healthcare systems and inefficient distribution of resources (Cline & Luiz, 2013). The lack of human resources and inadequate healthcare systems result in high wait times (Maphumulo & Bhengu, 2019), poor record keeping due to patient records being paper based, and health statistics being recorded in logbooks, which are sent infrequently to a regional office for data capturing of metrics into a centralized database (Cline & Luiz, 2013). This increases the chances for the patients' folders going missing or lost and this contravenes the Protection of Personal Information Act (POPIA). In worst scenarios, the medical history of the patient is lost, which can create further complications and incorrect diagnosis and in some cases death of patients (Maphumulo & Bhengu, 2019). As a result, the Gauteng Department of Health has paid out more than R1bn to settle 185 medical negligence cases since January 2015 (News 24, 2017). This raises a question of finding other means to manage and address these challenges in healthcare sector in South Africa, and one possibility is the utilisation of Robotic Process Automation (RPA).

According to Davenport and Kalakota (2019), RPA has become prevalent in more industries and businesses and the suggest that its growth will transform healthcare in the future. Syed, et al. (2020) define RPA as *"a relatively new technology comprising software agents called 'bots' that mimic the manual path taken by a human through a range of computer applications when performing certain tasks in a business process"*. There are studies and information on the use of RPA in corporate, however, limited information or studies on the use of RPA in the healthcare system in South Africa.

Other sectors have introduced RPA to address some of these challenges, however, there is not much studies or information conducted on the South African healthcare adopting RPA and this study will therefore consider the growing utilisation of RPA and explore its use in the South African public healthcare. Studies conducted by Radke, Dang and Tan (2020) and Maphumulo and Bhengu (2019) indicate the limited implementation of RPA in public healthcare in South Africa. Radke, Dang and Tan (2020) highlighted that on a global scale, RPA had been implemented in healthcare, however, not the same can be said regarding South Africa according to Maphumulo and Bhengu (2019). Studies conducted on public healthcare in South Africa within the past five years are still reflecting challenges of patients files getting lost, longer waiting times and failing manual process indicate the limited research conducted for this sector when comparing to the global context.

Research questions were developed based on literature review conducted to explore the implications of RPA on the public healthcare in South Africa. Literature review is documented in the next chapter followed by a comprehensive methodology for this study. The research questions developed for the objectives of this study are as follows;

    1. What is the value of RPA and how does it translate to operational efficiency?

    2. What is the extent of adoption of RPA in the South African context and how has it been embraced?

    3. What is the extent of implementation of RPA in the public healthcare of South Africa?

1.4 Importance of research

This purpose of the research is to understand the implications of Robotic Process Automation (RPA) on operational efficiency in public health care in South Africa. The contribution of the research will be to help the South African public and private healthcare sector understand the implications of adopting RPA, the value of implementing RPA, and the potential effects of adoption by analysing issues in the healthcare context and areas of application. There is not enough research on the value of RPA in the healthcare sector, despite the fact that the effectiveness of automation has been documented in previous studies relating to other forms of automation and industries. The study also intends to advance understanding and add to the body of knowledge by presenting more cases of the implications of RPA in the healthcare sector.

1.5 Research limitations

There is not a lot of research on RPA, therefore, there aren't many examples of how the technology can be applied broadly in the corpus of knowledge. One of the driving forces for the qualitative technique used was to ensure that the technology could be investigated in-depth and contribute to the body of knowledge for future researchers to construct a frame of reference. The absence of generally applicable cases in the current research made it difficult to test theoretical models or frameworks. Therefore, rather than testing the concepts of a theoretical framework, a framework was utilized to steer the research.

The sample used for the research were doctors who have worked both in public and private healthcare, hospital managers and experts in RPA who have worked in various sectors in South Africa.

1.6 Research overview

In order to understand the implications of RPA on operational efficiency in public healthcare in South Africa, the Technology-Organisation-Environment (TOE) paradigm was employed to both define the structure of the research and serve as the research framework.

1.7 Research overview

There are 7 chapters in this research study. Below are each chapters' description:

Chapter 1: Background

-   The significance of studying the implications of RPA on operational efficiency in public healthcare in South Africa
-   The research study's contextual background information, describing its focus
-   The research problem statement
-   The study's importance and relevance to academia and both public and private healthcare sectors

Chapter 2: Literature review

Provides a review of what operational efficiency is and the impact it has in public healthcare. The relevant literature for RPA that discusses the the advantages and disadvantages of the technology and the impact it has had on industries that have adopted it. Additionally, it presents the TOE framework that will direct the study.

Chapter 3: Research questions

The proposed research hypotheses that form the study's focus are explained in great depth in this chapter.

Chapter 4: Research methodology

-   Explains the research design and methods used
-   The methods for population and sampling as well as the research instruments applied
-   A review of the ethical issues, the validity, and the reliability of this study, the data collecting processes, data analysis tools, and methodologies related to this study have been presented.

Chapter 5: Research results

Provides the results of the analysis done on the interview material that was transcribed and leverages some of the findings to make connections with the literature to address the research questions.

Chapter 6: Interpretation of results

This chapter interprets the data analysis findings in order to develop deductions and conclusions that will help this research study objective

Chapter 7: Conclusion

The research study's findings are highlighted in this chapter, which also summarizes the key concerns and areas that need more investigation and offers specific recommendations to upcoming researchers.

CHAPTER 2: LITERATURE REVIEW

2.1 Operational Efficiency

Operational efficiency, in its broadest sense, refers to an organization's capacity to provide high-quality services while using less resources (Viter, 2021). The greater the quantity of output an organization can generate from a given amount of input, the more effective its activities are likely to be. The effectiveness of an entity's operations and its operational costs are the main determinants of this (Viter, 2021).

Gillis (2022) on the other hand refers to operational efficiency as an organization's capacity to minimize waste in terms of time, effort, and materials while still delivering high-quality services or goods. Operational efficiency is measured in terms of the ratio between the input needed to maintain an organization's operations and the output it produces. The difference between input and output is what goes into a business to make it run efficiently, such as expenses, labour, and time, and what comes out or is gained, such as quick development times, quality, revenue, customer acquisition, and customer retention (Gillis, 2022).

Operational efficiency in administration also fits the same definitions provided by Viter (2021) and Gillis (2022), that refers to providing a high-quality administrative service whilst using less resources through either improving time to complete tasks and/or using less personnel in the process. In public healthcare, it is necessary to consider the administration process of onboarding patients for treatment. The reason from this consideration is the fact that majority of administrative processes in public healthcare are those that are patient facing and operations in healthcare facilities are to assist treat patients.

In order to better manage operational efficiency in public healthcare institution in South Africa, the National Department of Health adopted a national policy on management of patient waiting time in out-patient departments (National Department of Health, 2015). The policy had defined and prescribed measures to (1) measure patient waiting time, (2) manage patient waiting time, and (3) improve patient waiting time (National Department of Health, 2015).

The success of the national policy on management of patient waiting time in out-patient departments is questionable considering the indications by Ngobeni, Breitenbach and Aye (2020) that a large number of public healthcare institutions were in very bad states, due to mismanagement, underfunding, poor systems and poor infrastructire. These public institutions are in the brink of collapsing and policy implemention is arguably not one of their primary focus. Ngobeni, Breitenbach and Aye (2020) posit that in 2018, these facilities were providing healthcare to 83% of the uninsured South African citizens.

During literature review, it was apparent that one of the tenets contributing to poor operational efficiencies in public healthcare facilities in South Africa was the systems and processes still being maintained in these facilities. Figure … below depicts that information systems in public healthcare in South Africa are still very much manual and paper-based (Meyer, et al., 2017).

	South African Healthcare System	
	Public Healthcare	**Private Healthcare**
Funding	Government	Individuals or medical insurance
Hospital capacity	±87,141 beds	±34,600 beds
Population served	82.5–84% (42 million); each public healthcare clinic providing care for on average 13,718 patients	17.5% (8.2 million)
Expenditure per capita on health in 2013 (current US$PPP)	US$543	US$578
Total health expenditure (current US$PPP and million constant 2005US$)	US$28,000	US$31,320
Health information system	Mostly paper-based systems; currently changing	Electronic based system

Figure 1: South African healthcare system (Meyer, et al., 2017)

This is contradictory to the Department of Health's 10 point plan, that was strategic outlook of the department developed in 2010 (Department of Health, 2010). The 10 point plan considered technology and health systems as one of the most critical factors to be addressed (Department of Health, 2010) and yet twelve years later we still find the same issues within the department.

The ramifications of poor operational efficiency are costly. Maphumulo and Bhengu (2019) posit that operational efficiency contribute to poor record keeping and patient files going missing. Poor operational efficiency contributes to long waiting times for patients and some end up not receiving healthcare due to inefficiencies in public hospitals (National Department of Health, 2015). The worst case of poor operational efficiency in public healthcare facilities is death of patients, due to incorrect diagnosis or not getting assistance (Maphumulo & Bhengu (2019).

2.3 Robotic Process Automation

Ansari, Diya, Patil and Patil (2019) suggest that automated process will become value adding for businesses in the future. According to Ansari, et al. (2019) utilisation of machines to carry out tasks that ordinarily would have been performed by a human is known as automation. RPA is thus the automation of manual processes performed by humans through programming of robots (Ansari, et al., 2019). There is a growing discussion and research on the technologies

that can utilised to automate processes such as Artificial Intelligence (AI), Robotic Process Automation (RPA), Business Process Automation (BPA), and Machine Learning (ML) (Ansari, et al., 2019). Even though the focus for this research will be on RPA to explore how its introduction may contribute to healthcare in South Africa, however it would be useful to consider some of the implications of RPA and some of the industries that have started to utilise it within their operations.

A handful of industries have already began embracing RPA in their operations, table 1 below illustrates industries that have adopted RPA and some of the functions automated using the technology (Radke, Dang, & Tan, 2020). It is imperative to note that the on a global context, the healthcare sector has started to utilise RPA (Radke, Dang, & Tan, 2020).

Table 1: Industries that have adopted RPA and the specific functions

Industry/Sector	Industry specific functions
Banking and Financial Services	- Cards activation - Frauds claims discovery
Insurance	- Claims processing - New business preparation
Healthcare	- Reports automation - System reconciliation
Manufacturing	- Bill of Material (BoM) - Generation
High Tech and Telecoms	- Service order management - Quality reporting
Energy Utilities	- Account setup - Meter reading validation

Source: adapted from (Radke, Dang, & Tan, 2020)

Santos, Pereira and Vasconcelos (2020) align with the notion that RPA has been implemented by many industries to conduct functions such as filing of forms, extracting information from different file types, accessing other systems and conducting checks, which are regarded as routing and repetitive tasks. As with table 1 indicated, Santos, Pereira and Vasconcelos (2020) add to say RPA is also utilised in departments such as human resources, information technology and the insurance sector.

In their study Radke, Dang and Tan (2020) considered some of the benefits of utilising RPA as depicted in table 2.

Table 2: Studies on benefits of RPA

Study	Processing time reduction	Productivity increase	Compliance levels improvement	Data accuracy improvement	Cost reduction
Anagnoste 2018	✔	✔	✔	✔	
Bloem et al. 2014	✔	✔	✔		
Friedman 2006			✔		
Fung 2014	✔	✔	✔	✔	✔
Institute for Robotic Process Automation 2015	✔	✔	✔	✔	✔
Wald 2017	✔	✔		✔	✔
Kedziora & Kiviranta 2018	✔	✔		✔	✔
Lacity & Willcocks 2016	✔	✔	✔	✔	
Fersht & Slaby 2012	✔	✔	✔		✔
Fersht & Snowdon 2018	✔	✔	✔		✔
Rajesh, Ramesh & Rao 2018	✔	✔	✔	✔	
Sibalija, Jovanović & Đurić 2019	✔	✔	✔	✔	✔
Willcocks, Lacity & Craig 2015A	✔	✔	✔	✔	✔
Willcocks, Lacity & Craig 2015B	✔	✔	✔	✔	✔
Willcocks, Lacity & Craig 2017	✔	✔			
Zhang & Liu 2019	✔	✔			

Source: adapted from (Radke, Dang, & Tan, 2020)

Jovanovic, Duric and Sibalija (2018) suggest that companies that have implemented RPA have reported internal savings of approximately 30% and customers indicating their happiness due to improved service. Santos, Pereira and Vasconcelos (2020) also indicate that more technical jobs are created through the implementation of RPA, such as data analytics and robot management functions.

Accordingly, there are some challenges to implementing RPA, these include explaining the human versus robot dilemma. Santos, Pereira and Vasconcelos (2020) note that replacing of

humans with a robot is still a major challenge, one which is perceived negatively by many employees as it is seen as job losses. Many people are therefore still dismissive towards the implementation of technologies as cost of implementation is validated by replacing a human resource in the future (Ratia, Myllarniemi, & Helander, 2018) .

Hoffmann, Samp & Urbach (2020) also argue that implementing RPA does cause governance to become more complex and organisations that are considering RPA need to factor this element.

2.4 Robotic Process Automation in South Africa

Digitalization is being used to an ever-increasing number of various organizational activities by businesses. Healthcare is likewise evolving and continuously exploring new ways to improve performance (NHS Trust, 2021).

RPA is a catch-all phrase for tools that act on other computer systems' user interfaces in the same manner that a human would (Van der Aalst, Bichler, & Heinzl, 2018). The word refers to the automation of traditionally human-performed service functions. RPA is most typically used to describe the process of setting software to do tasks formerly performed by people (Madakam, Holmukhe, & Jaiswal, 2019).

RPA is being used throughout the world both in the healthcare industry as well as other industries. It has proven to be valuable when the process is routine and needs a large number of human resources, as well as when utilizing human resources is either too expensive, inefficient, or the volume of data to be processed is massive. Organizations are looking for solutions that may help them improve the quality of their deliverables, increase efficiency, satisfy regulatory needs, become more agile, and improve customer experience. RPA has the potential to be a digital enabler.

RPA is gradually being introduced in South Africa in industries such as banking, telecommunications, insurance and call centres (Creamer Media's Engineering News, 2019). UiPath, Automation Anywhere, and Blue Prism have been acknowledged as the market leaders in RPA systems (Osman, 2019) and South African companies like as Vodacom and Nedbank, to mention a few, have embraced RPA in their business strategy. Vodacom has adopted RPA digital technologies to improve customer experience (Vodacom, 2020), whereas Nedbank has established a CoE to research RPA and automation. They released their first two robots in 2017, and since the covid shutdown, they've been able to ramp up the deployment of additional robots because people were at home and batch operations needed to be completed (Gibson, 2020). RPA has the potential to transform the corporate world. While it may alter the makeup of the workforce, it seems as though its advantages will aid South African organisations in increasing productivity and overall output quality.

Despite the fact that the technology is being used in other countries, South Africa has a unique culture and technology infrastructure (Mlambo & Iyamu, 2021). Although RPA's benefits are appealing, some researchers are not convinced RPA is able to produce the desired results (Tew, 2020). It is therefore important to understand the challenges and how they can influence the environment of an organisation from a South African perspective.

Employee resistance

The biggest challenge South Africa faces regarding implementing RPA is the resistance it receives from employees of organisations (Mlambo & Iyamu, 2021). The most common misunderstanding about RPA is that the technology removes human jobs rather than replacing

them (Mlambo & Iyamu, 2021). Mlambo and Iyamu (2021) argue that RPA relieves people of routine tasks, allowing them to focus on tasks that a software robot cannot complete. A contradictory study performed by WHO suggests that a growing number of job losses in developing African countries are due to the implementation of automation (Mlambo & Iyamu, 2021). However, organisations should consider more compelling arguments than cost savings from personnel reductions when considering RPA deployment (Tew, 2020). Companies that use RPA may reallocate people to more engaging tasks even allow bots to collaborate with employees (Tew, 2020).

Infrastructure

According to a study conducted by Mlambo and Iyamu (2021) another challenge faced in introducing RPA is the lack of good infrastructure of South African organisations. A majority of South African businesses still use legacy systems, which according to Alderson and Hanifa (1999) is a system that still uses old computing software and/or hardware that continues to fulfil the requirements for which it was created, but it does not allow for expansion. These systems are highly sluggish and negate the goal of RPA's quick cycle times (Mlambo & Iyamu, 2021).

Resources

RPA has a poor development rate in underdeveloped African countries, according to research, because to a lack of expertise and resources (Mlambo & Iyamu, 2021). Since not all processes should or can be automated, the proper individuals with the necessary skills and knowledge of RPA are required. Relevant processes which are repetitive, subject to a high error rate and with high business value must be automated; otherwise, the entire goal of RPA would be defeated (Mlambo & Iyamu, 2021). Ill-defined processes or activities that are not suitable for automation have an impact on RPA adoption (Tew, 2020). In some instances, external vendors are often brought in to assist set up the RPA Centre of Excellence (CoE), and the vendors then upskill internal workers in the hopes that they will be able to lead their own projects in the future (Tew, 2020). The drawback of this method is that employees are unprepared to handle large projects with complex processes (Tew, 2020). Even though challenges have been covered in this literature review because it is an important angle of understanding RPA, the challenges of implementation will not be the primary focus of this study.

2.5 Robotic Process Automation in South Africa public healthcare

South Africa's public healthcare is overloaded by high expenses, a huge volume of patients, and strict regulations. These demands tend to jeopardize the quality and service line agreements of patient care. The need to continually enhance the patient experience and comply with rules, which frequently entail extensive paperwork and reporting, counteracts the desire to save expenses. RPA has the ability to significantly improve access to treatment, reduce costs, and streamline operational efficiencies in the healthcare system (Cline & Luiz, 2013).

The South African government has implemented a number of initiatives and programs to enhance healthcare, effectiveness, reliability, and standard of care, as well as access for all users (Maphumulo & Bhengu, 2019). However, despite the government's admirable goals for improving the quality-of-service delivery in public healthcare, media and community reports have revealed that public health facilities are still failing to satisfy basic standards of care and patient expectations (Maphumulo & Bhengu, 2019).

Research has shown that the challenges that the public healthcare face are long ques, public healthcare facilities are overcrowded and understaffed (Maphumulo & Bhengu, 2019). According to Maphumulo and Bhengu (2019) Africa has fewer than one health worker per 1000 people, compared to ten in Europe. South Africa still follows a paper-based system which results in poor record keeping (Maphumulo & Bhengu, 2019). These issues are a cause for concern as files go missing which violates the Protection of Personal Information Act (POPIA) and in certain cases leading to patient misdiagnosis. However, evidence is mounting that, at a time of severe budgetary restrictions, the use of digital technology in health care may increase capacity and resource utilization by freeing up other vital inputs (Cline & Luiz, 2013).

Although there aren't many studies on RPA in healthcare from a South African point of view, studies done in various countries where RPA has been adopted show significant benefits in adopting this technology. RPA is employed in healthcare for repetitive operations such as prior authorization, updating patient information, and billing (Davenport & Kalakota, 2019).

RPA has the potential to be a positive factor in the global healthcare business. To ramp up organizational recovery, the COVID-19 pandemic underlined the necessity for evolution and acceleration through digital transformation. Table 3 indicate a few direct and indirect benefits of RPA from a healthcare perspective (Ratia, Myllarniemi, & Helander, 2018):

Table 3: Direct and indirect benefits of RPA in healthcare

Value of RPA	Functions description	Quantification
DIRECT		
Profit	The financial value of efficiency	- Less manual administrative work - Less workforce needed - Expensive workforce, e.g., doctors can concentrate on value creation
Capacity	Number of tasks performed	- Scalability of work - Resource optimization between workforce and RPA - Volume of performed tasks
Safeguard	Better service level	- Better quality performance - Better customer service
INDIRECT		
Enhancement	Refocusing to development	- Allowing to focus on development of process - Developing new ways of work
Innovation	Creating new products and services	- Creating new digital solutions and services internally and externally

Source: adapted from (Ratia, Myllarniemi, & Helander, 2018)

All throughout the world, healthcare organizations, particularly public healthcare institutions, are confronting changes and difficulties, as well as tremendous demand to improve performance and streamline operations (NHS Trust, 2021). Public healthcare institutions must take the lead in digital transformation through proactive communication, partnership, and cooperation. This must be backed up with a strategic vision and alignment with government policies and goals. RPA's ability to improve operational excellence might be a critical part of the digitization of knowledge work in public healthcare. However, there have been few past research that have looked into this topic from a South African perspective.

2.6 Technology adoption model

A number of theoretical models were considered during literature review and with more deeper and detailed reading, two generally utilised theoretical models were contracted in order to apply to this study, namely, the Technology Acceptance Model (TAM) and the Technology-Organisation-Environment Model (TOE). Suffice to note that only one theoretical model was considered for this study, being the TOE. There were two main factors that influenced the decision to utilise TOE.

Firstly, although the TAM is a commonly used model due to its straightforwardness, other studies conducted have highlighted its limitations. One such study is that of Ajibade (2018), who indicated that the TAM is not suited for technology adoption at a corporate or institution level as the factors that influence are not only based on perceived ease of use as suggested by the TAM. Ajibade (2018) argues that TAM assumes that the willingness to utilise or adopt a technology is based on the users perception that the technology is useful and easy to use, and that may be true for personal use and not for corporate institutions. Typically advise on the usefulness and ease of use will be based on validations from friends and colleagues, whereas in a corporate environment, this decision is influenced based on the organisations strategic direction, organisational policies and procedures (Ajibade, 2018).

Further to this and the second consideration of not utilising TAM was that According to Ahuja, Jain, Sawhney and Arif (2016) the TOE model is a tried and tested framework in studying adoption of new innovative technologies. In his study on factors affecting adoption of RPA in the banking industry in South Africa, Tew (2019) supported the claims of Ahuja, Jain, Sawhney and Arif (2016), that TOE was a well adopted framework, that has a strong theoretical foundation.

As a result of these factors, this study considered the TOE framework on the implications of adopting RPA in the South African healthcare operational efficiency.

Tornatzky and Fleischer (1990) describe the Technology Organization Environment (TOE) framework as an organizational level theory that outlines how three major aspects of a firm's context affect adoption choices, namely, the environmental context, the organizational context, and the technical context as illustrated in figure…. below.
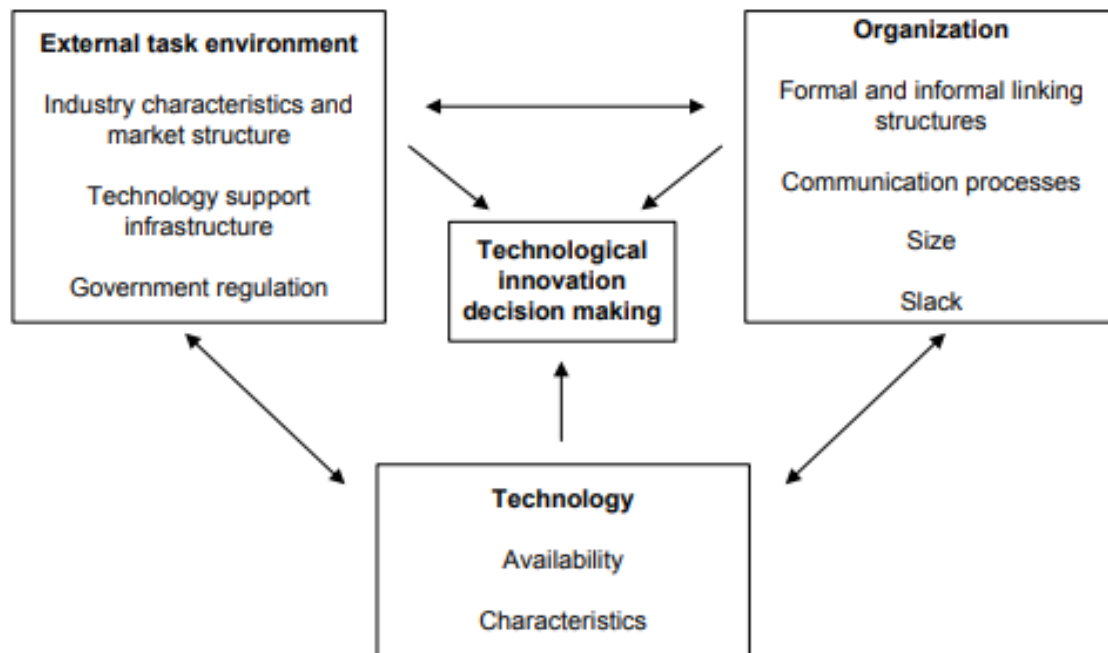
Figure 2: The Technology-Organisation-Environment (TOE) Framework (Tornatzky & Fleischer, 1990)

The framework suggests that an organization should be in sync with its surrounds and environmental requirements and that both internal and external elements, such as the environment, the size of the organization, and organisational strategy, affect an organization's strength (Bryan & Zuva, 2021). Technology, organization, and environment were identified as three crucial factors that affect organizational adoption (Tornatzky & Fleischer, 1990). Three important influencing elements, including technology development organizational conditions, business and organizational re-configuration, and environment of the company, must be taken into account while making a decision (Bryan & Zuva, 2021).

The technologies that are available to an organization are presented by technological development within the T-O-E framework. The organizational context clearly specifies the organizational characteristics, whereas the environmental context depicts the business environment, which is made up of the industry, rivals, laws, and connections to the government (Bryan & Zuva, 2021). Accordingly, these are outside forces that may limit or create chances for technological advancement. The problem with T-O-E is that it assumes that large organizations, where customers are more likely to be satisfied and have fewer complaints, will implement the model than SMEs (Bryan & Zuva, 2021).

Technology context

The technology context considers internal and external aspects that are specific to an institution including its current processes and systems (Schmitt, Mladenow, Strauss, & Schaffhauser-Linzatti, 2019).

As noted in the literature review above, public healthcare is South Africa is still very much paper-based and manual (Maphumulo & Bhengu, 2019). The systems adopted are outdated.

Organisation context

According to Schmitt, Mladenow, Strauss and Schaffhauser-Linzatti (2019) the organisations internal resources speak to the organiational context. This looks at the availability of skills and capabilities with the organisation and management willingness and support.

Environment context

The environment context considers external factors that have influence on the organisation and it technological adoption. In the South African context, this would include political will, labour union views and stakeholders within the industry of the organisation or institution.

2.7 Conclusion

The South African public healthcare sector is in demise due to mismanagement, inefficient processes and operation. This has major ramifications to availability and access to healthcare, which is contravention of the South African constitution.

This study will consider the adoption of RPA in the South African public healthcare and its implications to operations efficiency using the TOE technology adoption model.

In the effort to explore this, the next chapter considers the research questions and the objectives of each, which are fundamental to this study.

CHAPTER 3: RESEARCH QUESTIONS

3.1 Introduction

In order to express the aims of a research study, Agee (2009) notes that research questions assist by provide direction and focus. This study adopted this principle and chapter three covers the research questions that were developed after an intensive literature review and as depicted in chapter 1, these research questions provide the foundation for this study.

3.2 Research Question 1

What is the value of RPA and how does it translate to operational efficiency?

It is imperative to first consider operational efficiency and its meaning in the context of this study. Viter (2021) defined it as an organisation's capability to utilise less resources, whilst providing services at high levels of quality. For this study, it was important to consider the insights of participants and their view of it in the public healthcare sector.

According to Ansari, et al. (2019) in the future manual processes would be replaced by automated processes and this would create value for organisations. Ansari, et al. (2019) went on to define the various technologies that would aid in this automation, one of which would be RPA.

In their study, Radke, Dang and Tan (2020) considered industries that had began the transition to automation and use of RPA. Their study indicated that globally the healthcare sector had began to adopt RPA.

Previous studies suggested that adoption of RPA came with better service to customers and savings to organisations that have implemented RPA due to better operational efficiencies (Jovanovic, Duric & Sibalija, 2018).

The question was therefore to consider whether RPA had any effect on improving operation efficiency considering the suggestions of indicated above in the previous studies on RPA. The aim of this question was therefore to gather deeper insights from participants on their interaction and experience with RPA, particularly its effects to operational efficiency.

In order to gather insights from interview participants their views as to how they viewed operational efficiency and how RPA may add value to operational efficiency, four interview questions were developed;

- *How would you define operational efficiency?*
- *How you define Robotic Process Automation?*
- *What exposure or experience have you had with RPA?*
- *In your experience, has RPA brought any value to operational efficiency? Give me a few examples of how?*

3.3 Research Question 2

What is the extent of adoption of RPA in the South African context and how has it been embraced?

According to Creamer Media's Engineering News (2019) RPA has commenced its transformation journey of adopting RPA in industries such as telecommunications, banking and insurance.

Mlambo and Iyamu (2021) suggest that adoption of RPA in South Africa has not been without challenges, especially considering the social dynamics of inequality in South Africa. According to Mlambo and Iyamu (2021) employee resistance has been one of the challenges in the adoption of this technology.

The aim of this question was to explore the extent of adoption of RPA in South Africa and how the challenges it poses have been navigated.

Four interview questions were developed to gather insights from interview participants on their view on the adoption of RPA in the South African context. The questions honed in on the experience of interview participant to RPA and whether it has been embraced in the country;

- *In your view, has South Africa adopted RPA? Give me a few examples?*
- *What challenges have you experienced with the adoption of RPA?*
- *What factors would need to be addressed to minimise the challenges you mentioned earlier?*
- *In you view, what does the future of RPA look like in South Africa?*

3.4 Research Question 3

What is the extent of implementation of RPA in the public healthcare of South Africa?

There are various studies conducted that illustrate the dreadful state of public healthcare in South African. One such study by Kelly, Mrengqwa and Geffen (2019) indicated that the South African public healthcare was still faced with major challenges such as lack or skill, outdated technology and very poor manual processes. According to Maphumulo and Bhengu (2019) these challenges contribute to the public healthcare facilities being overcrowded and to patients being misdiagnosed.

Literature review conducted indicated that there was limited or no study conducted on RPA as a technology that can address some of the challenges faced by public healthcare in South Africa. Davenport and Kalakota (2019) highlighted benefits of adopting RPA in public healthcare from other countries. The aim of this question was to explore insights from interview participants of the extent of implementation of RPA in their work environments in the public healthcare.

Following on from research question two, research question 3 aimed at honing in on the adoption of RPA in public healthcare in South Africa. Four interview question were developed and posed to interview participants to obtain their insights;

- *Is there a difference between private and public healthcare in SA and why do you think so?*
- *What are some of the challenges faced by the South African public healthcare?*
- *In your view, do you think RPA could address some these challenges and how?*
- *Tell me about what you think would be some of the barriers to implementing RPA in the public healthcare in South Africa?*

3.5 Conclusion

The research questions discussed in this chapter, were developed through the intensive literature review and were developed to gather insights from participants and their experiences on RPA as a technology and what effect it could have in the South African public healthcare.

The next chapter is on the research methodology adopted for this research study and particularly the approach to gather insights on research questions covered in this chapter three.

CHAPTER 4: RESEARCH METHODOLOGY

4.1 Purpose of research design

The objective of the research was to explore the implications of RPA on the South African public healthcare system. As such, the research was exploratory, and Saunders & Lewis (2018) indicate that qualitative methods are exploratory in design. A qualitative study integrates literature review, interviews and observations (Gog, 2015). To explore the implication of RPA, semi-structures interviews were conducted with industry experts in RPA, medical practitioners in the South African private sector, medical practitioners and senior management administrative personnel in the South African public health institutions.

4.2 Philosophy

According to Ryan (2018) interpretivism contends that knowledge is subjective based on experiences and cultural foundations that shape ones thinking. The interpretivist philosophy, according to Alharahsheh and Pius (2020), is a method that allows the researcher to get more insight by exploring experiences and perspectives from a certain social milieu. As such, this research followed an interpretivism philosophy as the insights gained through semi-structured interviews with research participants were based on their experience and exposure to robotic process automation and these were interpreted by the researcher.

Ryan (2018) also contended that it is impossible for researchers to completely divorce themselves from research conducted as their personal views and opinions come through in the manner they collect and interpret data. The research philosophy utilised to explore the implications of RPA in the public healthcare of South Africa was that of interpretivism.

4.2.1 Researcher position

Positioning the researcher is essential while conducting qualitative narrative research. The study's methodology and the data's interpretation are influenced by the researcher's beliefs and opinions. Therefore, positioning the researcher for transparency and acknowledging any bias that might exist in the study is a frequent practice in qualitative research (Sekaran & Bougie, 2016). This section offers a concise summary of the researcher's position with regard to the study that was carried out.

The researcher currently holds a leadership position in the digital and transformation department of one of the biggest telecommunications companies in the country. She is based in Johannesburg and is a principal specialist in RPA and Artificial Intelligence (AI). She has previously worked for one of the big four consulting firms providing insights, recommendations, executing RPA and AI projects for companies in South Africa and abroad. She has extensive

knowledge and experience on the topic and her responsibilities include identifying processes for RPA and AI, developing a healthy pipeline for projects, drawing up a business case, listing benefits, drawing up spec requirements, liaising with clients and the project team and monitoring benefits for the client.

She has gained experience in RPA and AI over the years which has given her great grounding for the topic. Working in various countries has also assisted in giving her understanding of different environments and how they may potentially influence outcomes. Because of the client-facing nature of her position, she continually engages with others to gather the information needed for projects. Having such wide experience was considerably helpful for this research to gather all the necessary data to present findings for this study.

4.3 Approach selected

Deductive reasoning is used to construct theories, which means observations are turned into generalizations or theories (Saunders & Lewis, 2018). According to Thomas (2006) in inductive approach, data is collated from semi-structured interviews, links are developed from the data to the research objectives and findings and finally a framework or theory is developed as an outcome. To explore the possible implications of RPA in public healthcare in South Africa an inductive approach was adopted. Semi-structured interviews were conducted with study participants and the observations and insights were collated, analysed and interpreted.

4.4 Methodological choices

The mono method was utilised for this study due to time restrictions and research objectives, which were exploratory and that lent themselves to a qualitative study. This aligns to Saunders and Lewis (2018) who defined mono method as a study that comprises of only one method, either quantitative or qualitative. Semi-structured interviews, according to Kallio, Pietila, Johnson, and Kangasniemi (2016), are a standard data collection tool in qualitative research because they are adaptive and multi-purpose. Semi-structured interviews provide flexibility for the researcher due to the flow being determined by the reactions of the participants on questions posed (Adhabi & Anozie, 2017). It is for this reason that semi-structured interviews were applied in this research because it was a qualitative study, people were asked for their opinion on the study and semi-structured interviews are typical of that.

4.5 Strategy

The study was explorative in nature and hence a qualitative study. For a qualitative study, semi-structured interviews are the standard data collection tool. Industry experts in RPA, medical practitioners in the South African private sector, medical practitioners and senior

management administrative personnel in the South African public health institutions were interviewed to gain insights of what implications RPA may have for the South African public healthcare sector. Journal articles were also considered as part of literature review and more were reviewed as more insights are obtained from the interviewed participants to reinforce the study. News reports, government reports and data from government and non-government entities were also utilised as secondary data.

4.6 Time horizon

This study was qualitative and due to time constraints, a mono method was employed. The research design was cross-sectional as semi-structured interviews were conducted over a short-time period and final submission of the study findings were within two to three months.

4.7 Population

The study aimed to explore implications of RPA in public healthcare in South Africa, and hence, the population were individuals in public healthcare in South Africa and RPA technology experts. Medical practitioners that run their private practices were also interviewed because of their knowledge and experience of public healthcare, and majority of the medical practitioners operate in both public and private healthcare. It was imperative to interview industry experts in RPA and medical practitioners that have considered automation in the South African private sector, medical practitioners and senior management administrative personnel in the South African public health institutions.

Experts in RPA were interviewed with the aim of soliciting insights of RPA in the South African context and what they considered to be its implications in the public health of South Africa. Senior management administrative personnel included the likes of Hospital/Clinic Managers or Chief Executive Officers and Senior Information Technology Managers employed in both public and private health institutions.

The target participants of this study were individuals across South Africa and no exclusions were applied on the population composition in terms of gender and race.

4.8 Unit of analysis

The unit of analysis was individuals identified in 4.7 above, namely, industry experts in RPA, medical practitioners in the South African private sector, medical practitioners and senior management administrative personnel in the South African public health institutions. The aim was to solicit their insights as to implications of RPA in public healthcare in South Africa.

4.9 Sampling method and size

For this study, purposive sampling method was utilised. Purposive sampling is the process of finding people who are likely to contribute to the issue and have a good comprehension of the research (Creswell & Poth, 2016). The criteria utilised to identity the participants was as follows:

a) Medical practitioners in private healthcare in South Africa registered with The Health Professions Council of South Africa (HPCSA),

b) Medical practitioners in public healthcare in South Africa registered with HPCSA,

c) Robotic Process Automation Industry Experts, and

d) Senior management administrative personnel in public and private healthcare institutions in South Africa

(c) and (d) underwent a further screening to confirm the seniority of their functions;

1. Individuals employed as middle to senior managers in the technology industry.

2. Individuals that occupied the following senior functions, Hospital/Clinic Managers or Chief Executive Officers and Senior Information Technology Managers.

Snowball sampling, which is obtaining participants through recommendations or referrals from other participants (Parker, Scott, & Geddes, 2019), was also employed in this study as a means to increase the participants, specifically those that have an interest in the utilisation of technology in improving processes in public healthcare. It was also in an effort to have sufficient coverage considering the limited time available to conduct the research. According to Abubakar, Etikan and Alkassim (2015) snowball sampling is a widely used sampling method in qualitative research and generally utilised when it is hard to reach the desired participants. As such, individuals in the health sector are not easily accessible and snowball sampling was utilised to improve the reach through the medical practitioners that were accessible to the researcher.

According to DeJonckheere and Vaughn (2019), in qualitative research the sample size is generally between 12 to 15 participants. For this research 15 participants were targeted for semi-structured interviews, however, due to reasons noted on table … below, only 11 participants were able to commit to the interviews. The reasons of their unavailability were beyond the control of the researcher. As such the insights and distribution of their experience

and positions was still effective to provide a balanced view of what they believe to be the implication of RPA in the South African public healthcare.

Table 4: Participants not interviewed

	Position	Reason for not conducting interview
Participant 12	Medical Practitioner	Work related pressures
Participant 13	Hospital CEO	Work related pressures
Participant 14	RPA Specialist	Family related commitments
Participant 15	Medical Practitioner	Last minute cancellation

Saturation was not applied for this study due to the time constraints and availability of participants. Johnson, Adkins and Chauvin (2020) once noted that it is not possible to accurately predict saturation as there are various factors that influence it such as time, availability and resources. It is for this reason that it was not applied in this study. However, as noted above, the insights obtained from the 11 participants were still valuable and will be interpreted in chapters five and six of this study.

4.10 Measurement Instrument

To get perspectives and insights aimed at the study objectives, semi-structured interviews were undertaken as this was a qualitative study. Semi-structured interviews, according to Saunders and Lewis (2018), are a good way for obtaining data on a certain subject since they allow the researcher to learn about the participant's history and viewpoint on issues (DeJonckheere & Vaughn, 2019). They provide flexibility to the researcher during the data gathering procedure (Adhabi & Anozie, 2017).

An interview guide was developed in advance of data collection for semi-structured interviews. The interview guide included a set of interview questions that aided the direction of the interview. According to Kallio et al., (2016), the questions on the interview guide should not be leading and should be open ended in order to enable the participant to offer personal thoughts and insights. This principle was adopted on developing the interview guide. There were not issues noted during the ethical clearance process on the interview questions.

4.11 Data gathering process

There is a dearth of studies conducted on how RPA has been adopted in the public healthcare of South Africa and its implications. As a result, conducting semi-structured interviews was

crucial to gain a better understanding of the situation and accumulating data for theory development.

One on one physical and virtual semi-structured were conducted to obtain the participant's perspective on the study issues. These lasted between 30 to 60 minutes. The researcher used a two-pronged approach to get access to study participants. The first was through the industry and healthcare sector's networks, and the second was through snowball sampling, as it proved useful to obtain interviews from other provinces of the country. Participants were firstly contacted to request they participate in the study and their availability. The study had to undergo two robust ethical clearance processes and participants were informed that interviews would be scheduled on obtain approval on both processes. Interview participants were adequately informed of the research topic and screened accordingly:

1. Medical practitioners in private healthcare in South Africa registered with HPCSA,
2. Medical practitioners in public healthcare in South Africa registered with HPCSA,
3. Robotic Process Automation Industry Experts, and
4. Senior management administrative personnel in both public and private healthcare institutions in South Africa.

On obtaining approval on both ethical clearance processes, interview participates, emailed consent letters informing them that they were not obligated to participate and that they could refuse the interview if they felt uncomfortable. A brief synopsis of the research topic was provided to all participants together with the interview guide prior to the interviews taking place.

Ten participants opted to have the virtually as their preference and one participant opted to provide written responses. This was accommodated as it was convenient for the participants and in line with the recommendations by Saunders and Lewis (2018). The interviews were recorded after obtaining consent from participants and these were used to transcribe the conversations, which were then analysed according to the analysis approach detailed on 4.12 below.

4.12 Analysis approach
According to Saunders and Lewis (2018), qualitative data should be analysed in data form, which means that recordings are transcribed and both sources of data (recordings and transcripts) are then examined. The data was analysed using Braun and Clarke's (2012) six-phase theme analysis technique. The thematic analysis is an approach for categorising and organising data into patterns and themes according to 6 phases as illustrated in the below

figure…. (Braun & Clarke, 2012). It allows a researcher to make sense of data by looking for parallels in viewpoints and experiences (Braun & Clarke, 2012).

PHASE 1	• Research familiarising self with data
PHASE 2	• Researcher generating initial codes
PHASE 3	• Researcher searching for themes
PHASE 4	• Researcher reviewing potential themes
PHASE 5	• Researcher defining and naming themes
PHASE 6	• Reseacher producing the report
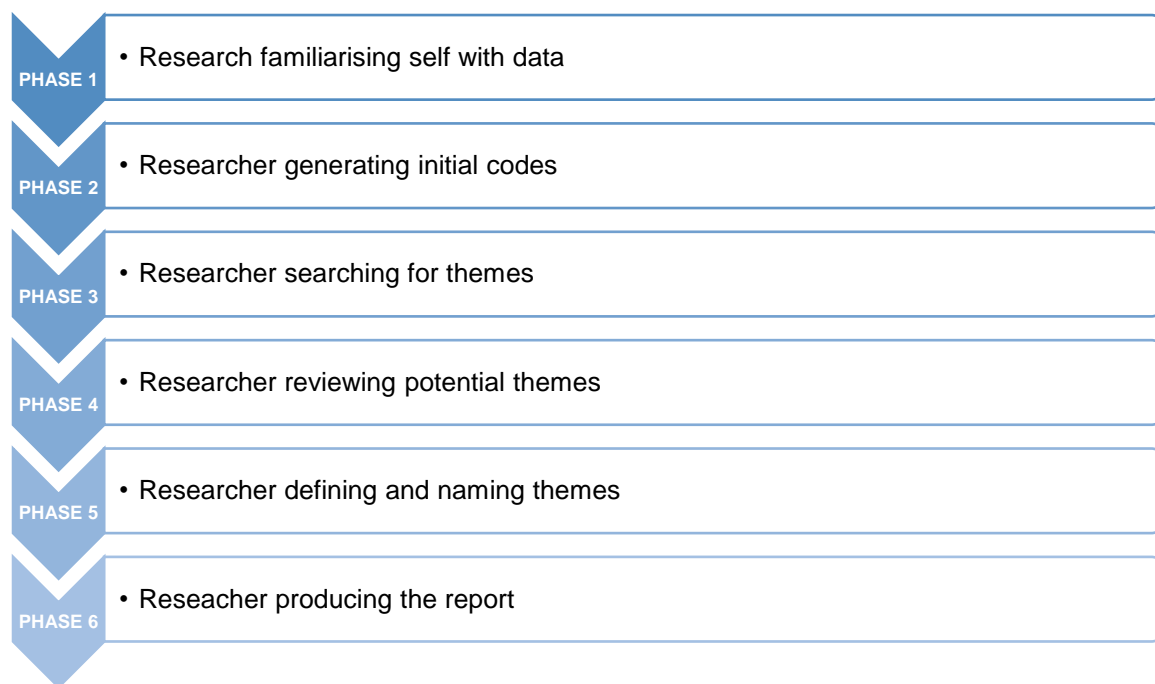
Figure 3: Braun and Clarke (2012) six phase thematic analysis (Braun & Clarke, 2012)

Phase one considers the researcher reviewing the transcripts and listening to the recordings done. This was conducted by developing an Microsoft Excel spreadsheet and aligning transcribed participants responses based on the interview guide. Due to the time pressures, this method of layout of the results was more efficient and still aligned to the recommendations of DeJonckheere and Vaughn (2019), who indicated that utilisation of software to analyse data was plausible and offered means to manage and organise data better.

Phase two of the six phase thematic analysis involved generating codes based on the responses from the participants. Themes were developed thereafter as phase three based on the codes generated.

Phases four and five were confirmaton of the generated themes and the ensuring accuracy based on the insights provided by participants.

And lastly, phase six involved reporting on these themes in chapter five and detailed discussion in chapter six.

4.13 Quality controls

As a quality control mechanism, two pilot interviews were conducted prior the official semi-structured interviews. These were with peers that are knowledgeable with research component and provided input in the manner the researcher conducted interviews.

The research methodology was subjected to an ethical clearance review. The approval obtained indicated that the research methodology and research procedure were sound and reliable. Due to the study having a focus on the healthcare sector, a further robust ethical clearance process was obtained, further attesting the reliability of the research methodology adopted.

Prior to conducting interviews, participants were requested to sign consent letters indicating their desire to participate in the study process. The consent letters highlighted that the participant provided their insights without being coerced and without compensation. The consent letters further attested that confidentiality would be maintained and upheld, meaning no personal information or company details were disclosed.

To ensure that the study's validity and credibility was not jeopardized, the criteria for identifying and sampling participants was strictly adhered to. Interviews were recorded in order to ensure data openness and reliability, and the study findings were purely based on the information gathered through the 11 semi-structured interviews conducted.

Data triangulation was utilised to ensure trustworthiness of the data. Triangulation is regarded as a qualitative research technique to assess validity by bringing together data from many sources (Carter, Bryant-Lukosius, DiCenso, Blythe, & Neville, 2014). To be more specific, method triangulation and data source triangulation were used. Carter, Bryant-Lukosius, DiCenso, Blythe and Neville (2014) define method triangulation as the utilisation of various techniques to collect data on the same phenomenon. In the case of this study, semi-structured interviews were utilised as the primary method of collecting data from participants. Secondary data in the form of government reports, news reports and opinion newspaper pieces from experts were reviewed for as part of contrasting and validating the information obtained from participants.

Carter, Bryant-Lukosius, DiCenso, Blythe and Neville (2014) further defined data source triangulation as utilising different persons, clusters and groupings to gather information and validate data. In the case of this study different sets of individuals were interviewed to gather insights. These included medical practitioners in public healthcare, medical practitioners in

private healthcare, RPA industry experts and senior management administrative personnel. These grouping provided multiple perspectives and insights on implications of RPA on operational efficiency in public healthcare in SA based on their experiences and exposure in the different day to day functions and sector.

4.14 Limitations

The implications of RPA on the public healthcare system of South Africa were investigated using a qualitative study technique. As a result, only a limited sample population was examined, and the opinions of participants may be biased, as is common in qualitative research (Queirós, Faria, & Almeida, 2017).

According to Alharahsheh and Pius (2020), interpretivist studies contain some amount of researcher bias. The researcher analysed the data and reported on the findings, giving rise to the possibility of researcher bias.

Finally, because the study is qualitative, participants were questioned on their experience and exposure to RPA to obtain their insights as to its implications on the South African public healthcare. As a result, the study was susceptible to the biases of the participants.

CHAPTER 5: RESULT

5.1 Introduction

This chapter presents the research's findings, which are organized in accordance with the research questions covered in chapter 3. This chapter aims to investigate how RPA may affect operational efficiency in South African public health care as well as its impact across other industries. Semi-structured interviews with participants who work as doctors in both private and public healthcare, public hospital management, and senior digital transformation managers were undertaken to better understand how it will impact the public health sector. Following a brief summary of the participants, the findings of the qualitative analysis are presented at the chapter's opening.

5.2 Description of sample

Eleven individuals were chosen for the semi-structured interviews using the criteria mentioned in sections above. One interview was a written response to the questions given, and ten (10) of the eleven (11) interviews were conducted via the video conferencing tool Microsoft Teams. Due to the fact that not all participants were based in Johannesburg and because it was a practical method of contact for all parties involved all interviews were conducted electronically. In order to protect their privacy throughout the interview process, the names and companies of the participants have not been disclosed, this was done to assure compliance with ethical standards, particularly the Informed Consent documents, which the researcher highlighted and reaffirmed the participant's anonymity.

The participants included doctors with experience in both private and public healthcare, hospital managers who are in charge of the daily operations of the hospitals they oversee, as well as managers and senior managers who are in charge of driving digital transformation in their organizations and who have used RPA as a tool to improve processes. The sample was diverse as it represented doctors with experience in private and public healthcare and hospital managers from different provinces namely Gauteng, Limpopo and the Free State. It also included experts who have used RPA in various sectors namely banking, insurance, telecommunications and healthcare. Two of my participants are heading the digital transformation for two of the leading private healthcare providers in South Africa and another participant was responsible for leading the project to convert a single private hospital into a digital organization in order to enhance patient care and internal capabilities that underpin its fundamental operations. It was crucial to get perspectives from each of these parties in order to comprehend the dynamics of the health care sector and the impact of RPA in other industries.

Table 5: Summary of research participants

Participants	Industry	Position	Province
1	Healthcare	Doctor	Limpopo
2	Technology	RPA senior manager	Gauteng
3	Healthcare	Digital transformation manager	Gauteng
4	Consulting	Associate Director (Digital transformation)	UK
5	Healthcare	Doctor	Gauteng
6	Healthcare	Doctor	Free State
7	Healthcare	Digital transformation manager	Gauteng
8	Healthcare	Hospital manager	Gauteng - JHB
9	Healthcare	Hospital manager	Gauteng - Tshwane
10	Technology	Chief Information Officer	Gauteng
11	Telecommunications	Intelligent automation lead	Gauteng

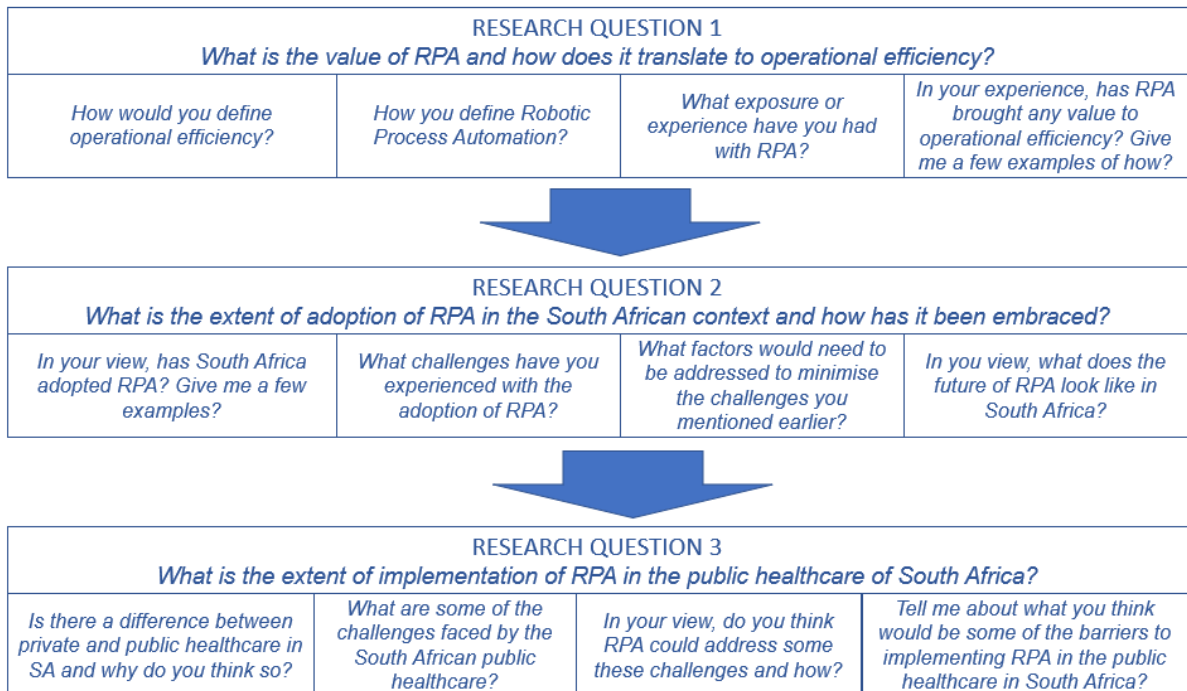Figure 4 below is a representation of how the research's questions correspond to the participant interview questions.

Figure 4: Research questions and related interview questions

5.3 Research Question 1

What is the value of RPA on operational efficiency?

The purpose of this research question was to determine whether RPA had any impact on enhancing operational efficiency. This question was designed to elicit more detailed responses from participants on their interactions and experiences with RPA, particularly in relation to how it affects operational efficiency.

<u>Understanding of operational efficiency</u>

The answers received from the participants showed a good degree of comprehension for the concept of operational efficiency. The majority of participants defined it as an organization's capacity to minimize time and effort waste while still maintaining quality.

Participant 2: *"So in my view operational efficiency is being able to execute your daily business processes, while reducing waste"*

Participant 3: *"I would say that would come down to well speed and accuracy"*

Participant 7: *"I think is basically trying to root out you know challenges within businesses where there are bottlenecks in the value chain, right and what you do is basically just an element of trying to get rid of things that are not adding value in the value chain"*

Participant 8: *"Okay, for me, operational efficiency is being efficient using resources like your time, people, your equipment, your budgets and inventory in an optimised way to solve the day-to-day business in order to become better competitive, agile and leaner"*

Whilst everyone pointed to reducing waste one participant elaborated to say for an organisation to become operationally efficient, you cannot just look at a few processes, but you would need to look at the whole organisation and the factors affect the organisation.

Participant 5*: "I think operational efficiency doesn't only have to do with processes. I think it's something that needs to be looked at holistically, you need to look at the organisation's holistic Target Operating Model. And what that means for me is that you would need to look at three elements, right? So, you need to look at the people, number one, so who makes up that organisation? Number two, what are the processes involved in carrying out the activities of that organisation? And number three, what are the enablers that are used to be able to carry out those activities? And once you have a view, a good view of all those three things, you're able to see where there are gaps in terms of operational efficiency, because if one of those things is not implemented right, or if there are gaps in just one of those components, there's a ripple effect on the other two layers, as well."*

<u>Value of RPA to operational efficiency</u>

Most participants understood what RPA is even though some of them had not been directly exposed to the technology. The general understanding of RPA was that it is an automation software tool that mimics the action of a person to increase outputs for the organisation.

Participant 2: *"Okay so robotic process automation is the use of software applications to mimic the actions of a user on a computer"*

Participant 4: *"It's all about taking processes that are high volume, and that meet a certain criteria, and automating them to reduce the amount of time and the amount of human effort required to execute those activities"*

Participant 5: *"My understanding of robotic process automation, it's a form of business process automation technology based on software robots and AI or digital workers, or machines. It's way of leveraging on technology to increase outputs of a business, according to my understanding."*

Participant 11: *"Various programmatic tools which are able to automate repetitive administrative tasks. Usually those which are high in volume but low in complexity, with some decision making required, but deterministic outcomes."*

<u>Components to describe RPA</u>

The components of RPA that were given the most weight in the interviews were that it is an automated software program and that it mimics human labour, as seen in the perceived components summarized in table 6 below. The fact that there are so many references here does not necessarily imply that the participants' knowledge of RPA is limited to just two elements, but it does show how similarly they perceive the concept. As a result, the participants verified the elements of RPA and found them to be consistent with the literature presented above.

Table 6: Main themes from an RPA perspective

Components	Sources
Software application	10
Replicate human work	8
High volume processes	4
Low complexity processes	4
Repetitive administrative tasks	4

5.3.1 Automated software application

Bots are used by RPA technologies to automate repetitive processes in software applications.

Participant 3: *"So ja, RPA for me is an automation to a software tool"*

Participant 5: *"Okay, my understanding of robotic process automation, it's a form of business process automation technology based on software robots"*

Participant 10: *"Robotic process automation also referred as RPA, to me, it's a digital solution that that can or aims to automate business processes functions"*

5.3.2 Replicate human work

These tasks replicate efforts that a human would do on a daily basis

Participant 2: *"Okay so robotic process automation is the use of software applications to mimic the actions of a user on a computer. So, we are basically taking the human out of the process and allowing a computer to operate itself just as a human would"*

Participant 4: *"processes that meet certain criteria and automating them to reduce the amount of time and the amount of human effort required to execute those activities"*

Participant 9: *"it's a process that allows anyone to define a set of instructions for a robot to undertake or to perform, just mimicking what humans or computers can do. But that should be something that is rule based, instruction based"*

5.3.3 High volume processes

High volume processes describe the processes that have a lot of volume that take up most of the employees' time or process with so much volume that employees are unable to get through all of them on a daily basis.

Participant 3: *"So in a generic sense that is I guess automating the sort of low complexity high volume administrative task."*

Participant 4: *"it's all about taking processes that are high volume, and that meet a certain criteria, and automating them to reduce the amount of time and the amount of human effort required to execute those activities"*

Participant 5: *"Various programmatic tools which are able to automate repetitive administrative tasks. Usually those which are high in volume but low in complexity, with some decision making required, but deterministic outcomes"*

5.3.4 Low complexity process

Low complexity processes speak to simple, easy to follow process that do not need a lot thinking. They are also processes with low exception rates.

Participant 3: *"So in a generic sense that is I guess automating the sort of low complexity high volume administrative task"*

Participant 4: *"obviously, with robotics process automation in that with RPA, it has to be a process that doesn't change all the time"*

Participant 11: *"Usually those which are high in volume but low in complexity, with some decision making required, but deterministic outcomes"*

5.3.5 Repetitive administrative tasks

These are processes that follow the same sequence or steps on a daily basis. They do not require much thinking and can be followed without intervention.

Participant 4: *"obviously, with robotics process automation in that with RPA, it has to be a process that doesn't change all the time. Right. So, it shouldn't require too much judgment thinking. So that's actually one of the rules that it needs to be it needs to be a rules-based type of process, that it doesn't change all the time. There aren't too many exceptions in that in that process, in order for you to be able to automate it"*

Participant 7: *"so I think in the South African context you know you've got your trivial tasks right, things that don't necessarily need a human being to really be sitting there and doing the same thing, is repetitive tasks"*

Participant 10: *"Robotic process automation also referred as RPA, to me, it's a digital solution that that can or aims to automate business processes functions, functions that are rule based, that's repetitive"*

Participant 11: *"various programmatic tools which are able to automate repetitive administrative tasks"*

Whilst all participants described it as a good tool to improve operational efficiency. Only 64% of the participants had been directly exposed to it. Another important point to note is that the public sector is not very prone to these technologies, they are mostly being adopted by the private sector.

Table 7: Split in terms of RPA exposure

Have worked with RPA	Have not been exposed to it
64%	36%

Participant 2: *"I've got experience in various industries, that's your telecommunications industries. I've worked in financial services providers, I've worked for your big four audit and advisory firms, the banking sector, oil and gas, and property management."*

Participant 4: *"So, in my experience, it's mainly been in banking. So, it's been mainly in the onboarding, space."*

Participant 7: *"I've got quite a bit, we've implemented it within healthcare, we've implemented within the finance sector as well, through the ERP processes."*

Participant 10: *"With RPA, I think I've got intense exposure, that I've been working on it on say 2018. And where we are, we've kind of moved a step ahead, taking RPA and integrating it with other additional sort of a solution such as your OCR, your machine learning. So, I've got a vast experience within RPA*

Whilst participants had a fair understanding of RPA, it was also apparent that participants tend to confuse RPA with robotics.

Participant 6: *"Of course when it comes to RPA robotics, they've already started doing that in surgery. I know nowadays in surgery you can do some operations using robotics, you can do some scans using robotics. So those are the kind of robotics in healthcare that I can think of"*

Participant 9: *"last year, when I joined the hospital, we just had an opportunity of seeing Stiffy, the robot in our neighbour hospital that was used to manage ICU patients, but personally, I have not had an experience"*

Participant 1: *"Robotic surgeries, I mean those are very popular overseas. There are some surgeons who's skill is so rare that they are one of a handful in the world that can do something. Now instead of this guying flying from where ever he is to go somewhere to the operation"*

Despite the fact that they appear to be the same because they help people with their day-to-day activities, they operate quite differently. We described RPA above as the automation of manual processes performed by humans through programming of robots (Ansari, et al., 2019). Robotics on the other hand is a subfield of engineering that deals with the creation, design, production, and use of robots (Hanna, 2021). The goal of the area of robotics is to develop smart machines that can help people in a number of ways.

Summary of the findings of Research Question 1

The participants all demonstrated a general comprehension of what operational efficiency and RPA are in response to question one. Even though only slightly more than 60% of them had direct experience with RPA, they all agreed that it is a useful tool. It was also clear that banks have invested and deployed this technology more than other sectors.

5.4 Research Question 2

What is the extent of adoption of RPA in the South African context and how has it been embraced?

This research question sought to determine how widely RPA has been used in South Africa and the methods used to overcome the difficulties it presents.

The adoption of RPA

Participants had a mixed view on the adoption of RPA in South Africa, stating that whilst companies are slowly buying into the idea of RPA, there is still a lot of room for improvement.

Participant 2: *"South Africa as a whole has not adopted RPA to its full potential but there are pockets of automation in organisations that are able to afford the technology and the human capital that is required to build on these processes"*

Participant 5: *"Yes, yes and no. Yes. No, in the sense that we are we are adapting it very slowly, but we are adapting it but in a very slow pace, especially in the public arena"*

Participant 10: *"I would say we're taking a few steps towards adopting RPA"*

Participant 11: *"There has been some adoption, although limited"*

What was evidently clear is that the banking sector and telecommunication sector have fully embraced this technology and are leading in terms of innovation.

Participant 2: *"in your telecommunications sector, we've got two of the largest you know cellphone providers who are actually using robotic process automation as part of driving their*

digital transformation strategies, specifically in their call centres, specifically in their back offices. We also have oil and gas organisations who are making use of RPA in their procurement processes for SAP automation"

Participant 3: *"I think with banks have, again with my sort of limited knowledge, the banks have completely bought into the whole RPA usage, public sector, I don't think so"*

Participant 4: "Oh, yeah, oh definitely, definitely in the in the banking space, I would say that that it has. Obviously, some countries will be more advanced than others. But I think South Africa has adopted RPA within the banking space definitely"

Participant 9: *"it's mostly in the banking industry to improve their turnaround time"*

<u>Adoption challenges</u>

The lack of skill, resistance from the business, and a lack of infrastructure are the three most frequently cited themes in the hurdles of RPA implementation.

Table 8: Main themes based on RPA adoption challenges

Challenges	Sources
Resistance	5
Financial support	3
Infrastructure	5
Skills	6
Selecting incorrect processes	3

5.4.1.1 Resistance

Resistance is seen as a big challenge amongst organisations for the adoption of RPA because of the misconception that RPA is out to replace jobs and that there is no clear understanding of what RPA is and what it can do for the organisation and employees of the organisation.

Participant 1: "There's a lot of resistance, and I think is just the unknown, number one and number two is just the stubbornness of incumbents, you know those matrons that have been there for forty years before you were even born, like "we've been doing this this long and it's been working" you know"

Participant 7: "So the challenges is more of the perception that obviously you coming in to take over our work and therefore I'm going to …, I'm not going to disclose enough information you know which could be detrimental to the success/failure of the RPA solution that you may be trying to deploy"

Participant 9: "I think some years back three or five years ago, when this robotics was introduced as a concept in the country, we had organised labour federation saying, yeah, they're going to take jobs see and all of that. I think, given that there will be a lot of resistance. Given the unemployment level in the country, people will think that robotics are replacing human labour and if they will, that resistance will be there"

Participant 10: "As I said earlier on, I think, for me, the major one, it's one, it's a resistance from the business".

5.4.1.2 Financial support

In order to deploy any type of software financial support is important and the same applies with RPA. RPA does come at a price and any organisation wanting to adopt RPA as a solution would need to invest in it financially too.

Participant 1: "I think I tried but then obviously support and infrastructure, especially financial support to implement the system that we wanted to do"

Participant 2: "Ja, the barrier to entry for RPA is always the higher cost that is associated with adopting RPA"

Participant 5: "There's two main challenges that I've noticed, especially in the public sector, is lack of infrastructure, due to lack of funding".

5.4.1.3 Infrastructure

The majority of the participants also mentioned infrastructure. This theme arose from the information gleaned from the interviews, and it will likely have an effect on how organisations adopt RPA in South Africa.

Participant 1: *"I think I tried but then obviously support and infrastructure, especially financial support to implement the system that we wanted to do"*

Participant 2: *"organisations don't take the time to sort of invest in the technology to bring about the right outcomes of digital transformation using RPA"*

Participant 5: *"There's two main challenges that I've noticed, especially in the public sector, is lack of infrastructure"*

Participant 6: *"then the other one is most of the computers, I remember even during the time when I was still in public sector, we used to have at least one computer in every ward. That computer eish it takes about ten minutes just to switch on, and then slow, I don't think …, the internet connectivity is not good. All those things are frustrating to you as a doctor when you have been working so hard, just entering somebody's (inaudible) that becomes a challenge, that would be the second one in terms of the speed of the devices that you will be using".*

5.4.1.4 Skills

Some of the participants felt we lacked skill in country as technology is always evolving

Participant 2: *"generally a lack of RPA skills as these skills are generally expensive and hard to come by"*

Participant 5: *"lack of skilled labour or training. So, we know that technology increases at an exponential rate. So, it means new means there has to be regular training and update of skills"*

Participant 10: *"the skill that we have, you know, you may think that that's you're doing this correctly, up until you get an expert that we'll do more of a maturity assessment within your area and come up with a number of things that you need to improve on".*

5.4.1.5 Selecting incorrect processes

Some participants emphasized the importance of selecting the right processes for automation as tends to be a hindering factor for the success of RPA in organisations.

Participant 4: *"with robotics process automation in that with RPA, it has to be a process that doesn't change all the time. Right. So, it shouldn't require too much judgment thinking. So that's actually one of the rules that it needs to be it needs to be a rules-based type of process, that it doesn't change all the time. There aren't too many exceptions in that in that process, in order for you to be able to automate it."*

Participant 2: *"Another challenge is incorrect processes being selected for automation, you end up spending more time on developing something that shouldn't necessarily be part of the RPA scope"*

Participant 11: "The largest challenge is in understanding the limits of the RPA suite being employed, and selecting appropriate use cases to automate".

5.4.2 Factors that would need to be addressed to minimise challenges

The adoption of RPA may be observed to be most affected by this section. This segment included recurring themes seen in the literature which relate to stakeholder buy-in, political will, and even education. According to table 9 below, the adoption of RPA in South Africa was thought to be significantly influenced by education.

Table 9: Factor to be considered for RPA adoption

Factors	Sources
Education	7
Stakeholders buy in	2
Proof of concept (POC)	2
Change management	3
Political will	2
Acquiring the right skills	2

5.4.2.1 Education

Participants felt that not a lot of people were educated on RPA and that there was a general lack of understanding of what the technology is and what its affects are on business.

Participant 2: *"I think over and above most of these things is an education thing, people need to be educated on the value of RPA and the fact that RPA is not going to eliminate jobs, but is more here to free you up to doing mundane tasks and leaves you to do jobs that humans are supposed to be doing, which is thinking and engaging with other human beings"*

Participant 7: *"you know so for me is an element of education and to get people to actually buy into the solutions and to get them to do that, you have to let them know what the value actually is …, what do they gain, what do they stand to gain out of it and I don't think we do enough to actually communicate those type of things to them"*

Participant 9: *"I think also creating awareness first, to say, let people be empowered let people know what robotics is all about, what value does it add and services and all of that".*

5.4.2.2 Stakeholder buy in

Some participants also felt for RPA to be adopted, stakeholder buy in would be required

Participant 1: *"Number two is obviously buy in at the top, it needs to be done from the top, it needs to be done in every department, not just one"*

Participant 3: *"like I said buy in from the stakeholders"*

5.4.2.3 Proof of Concept (PoC)

Participants 2 and 3 felt that because there is a lack of investment for the tool, creating a POC for companies would drive adoption within organisations.

Participant 3: *"I think going after low hanging fruit, if you were to go to any sort of random person in the healthcare industry and tell them about RPA, I doubt many of them would be familiar with it. So you would need to have some type of a pilot"*

"a very simple process that's maybe very high volume, that you could implement and then basically publicise and sort of make a fuss of it, to show the use of it. That would kind of show everybody how useful it is and they would kind of buy into the whole concept"

Participant 4: *"So, the investment one would be the POC, one. Demonstrate the value of RPA to the hospitals. Start with the hospitals that are struggling the most"*

"so I would I would say it's mostly the whole demonstrating the value. Because there's no investment. There's lack of investment".

5.4.2.4 Change Management

Effective change management, according to some participants, is a barrier to the success of RPA since staff employees are not brought along on the journey with the business but are instead given technology they do not even understand.

Participant 3: *"So I think like I said, effective change management, this is something that's often very much lacking, doctors, and even treatment teams would kind of you know do their own thing and you have these hospital groups or healthcare companies basically getting a third party consultancy to build let's say an RPA solution and to deploy it without really ever even speaking to the administrators or the doctors or the treatment teams and suddenly they just throw the switch over a week and then the Monday your treatment teams walk in to find*

this new (inaudible) they need to make use of. That is a big …, that wrecks these projects completely"

Participant 7: *"I think education that's number one, so education through change management. I think at times we focus too much on solutioning and forget to educate the people that are going to be impacted by these solutions? So firstly that narrative that it's coming in to change or to take over my work, you know we need to change those narratives, because is coming in to make your work better, you know those are just some of the perspectives that we need to change you know so for me is an element of education and to get people to actually buy into the solutions and to get them to do that, you have to let them know what the value actually is"*

Participant 10: *"One, I think change management is the key one for me. Why I'm saying that is I've seen or I've experienced cases whereby you'll find that a chief or a senior manager within a department will understand what RPA is, and will want that RPA to be implemented in his area, but then forces his team or division to also adopt this tool. And you find that there's a big misalignment between the leadership and also the workforce. So, change management, that's one. And two, make people aware that RPA is not here to steal, or take their job. Look, we are in the new generation of 4IR. And people need to understand that there will be new skills that people need to venture in that were not available in the past".*

5.4.2.5 Political will

Participant 5 spoke about the importance of political will and support from government structures

Participant 5: *"I think to minimise the challenges, first of all, there has to be improved and robust political will. I think it starts with that the government is a key player. In fact, the government is a central player in ensuring prosperity of the nation. So, I think there has to be improved political will. We have to have politicians and leaders who are willing to put their money where their mouth is, sorry, yeah, the money, you know, walk the talk. So there has to be, you have to prioritise RPA. And by prioritising it means they have to have funding programmes for RPA".*

5.4.2.6 Acquiring the right skills

Two participants felt that in South Africa, RPA skills are hard to come by. To develop the skills and capacity needed to create and sustain RPA, organizations must hire subject-matter experts and invest in RPA training.

Participant 2: *"you need to actually engage digital transformation consultants from the get go before you even think of RPA because RPA is just a means to an end. So if you engage digital transformation consultants and you have a digital transformation strategy, you are able to then understand what your vision is for RPA. You are then able to understand you know, how your organisation for RPA will look like, and how it will actually integrate into your greater company"*

Participant 11: *"The implementation and support team who will be responsible for the RPA solution will need to have a better grasp of RPA, and the tool selected, prior to implementing a nominated use case. Analysts from a more technical background will also find it easier to understand the tools"*

Whilst acquiring the right skills is important participant 10 also noted the importance also creating budget for the upskilling of the organisation's current workforce

"I think more budget needs to be forward into RPA mostly the sourcing on change management journey also on training. It won't be cheap, but I do not believe that learning on the job is the best approach in upskilling someone. We would then need to take our resources, our people out on a formal training, let them understand the holistic view of RPA before they go back to their desk, then they can learn from each other and attempt, they would have understood the foundation and what this RPA is all about"

Even with the challenges spoken about above, most participants felt that there is a good future for South Africa with regards to the adoption of RPA

Participant 1: *"I think it's very very bright, I think the nice thing about not having these things i.e that much opens up a world of opportunities. It goes without saying that we need them, I'd say that people are starting to get conscientised and to the powers of technology."*

Participant 8: *"Yeah, the future looks very good. The future looks very good. Actually. I think South Africa is on par with the rest of Africa. I think we are there. I think we are there"*

Participant 10: *"In South Africa as a whole for new organizations that are adopting RPA, the future is great, I will not lie. It's beautiful. And RPA will definitely prevail in terms of improving operational efficiency. It will give individuals within a company some sense of belonging as long as they understand what RPA is and what it can do. For companies that have kind of matured into RPA, I will say they will then need to slowly or fastly move towards instant automation that is looking at integrating RPA with other digital solutions such as your machine learning, your artificial intelligence, your OCR"*

Participant 11: *"In South Africa, we have significant opportunity for RPA – for example to allow for scale operations in BPO outfits, call centres, and similar organisations."*

However, participant 3 did caution that RPA should not be seen as a tool to remove FTE to make financial gain more especially in a country like South Africa where the unemployment rate is so high but companies should rather adopt RPA to improve on quality and productivity.

"there's definitely a need to not reduce, not automate businesses and processes in the sense of reducing FTE and getting rid of staff, I think that is quite a detrimental exercise and is very socially, politically, the only real gain you would get there is from an economic perspective I guess cutting costs. So that is a big challenge for RPA in the South African context, is convincing businesses and people and stakeholders that you don't necessarily have to be cutting FTE and getting rid of people by automating, you could be automating to improve on quality or improving productivity."

Participant 4 also discussed the limits of RPA, including the fact that it complements rather than replaces the systems that are currently in place in the organization. Therefore, in order to fully benefit from RPA, it is crucial for businesses to invest in effective systems.

"RPA comes in, it's got nothing to do with any other technology that you're using. It comes in and it uses whatever solution you've got there already. So if you're trying to put RPA on top of a technology that doesn't work already, then it's not going to do a very good job, right, you're not going to get a good return on investment on it. So maybe that's where we need to start, in my opinion."

Conclusion

The answers to question two indicated a wide range of obstacles and barriers to RPA implementation in public healthcare. Many of the deterrents were centered on domestic issues, such as raising awareness of RPA and its potential to increase operational effectiveness, stakeholder support, and political will. These issues must be resolved for public healthcare providers operating in South Africa's environment to compete on a global scale and remain relevant throughout the fourth industrial revolution.

5.5 Research Question 3

What is the extent of implementation of RPA in the public healthcare of South Africa?

Research question three sought to focus on the adoption of RPA in South African public healthcare, continuing the theme of research question two.

All my participants felt there were major differences between private and public healthcare in South Africa however most it boiled down to operational inefficiencies and the lack of resources.

<u>5.5.1 Challenges that affect public healthcare in South Africa</u>

According to socioeconomic divisions, the South African health system has been characterized as two-tiered. Participants were asked to name the things that they thought were challenges for public healthcare. The issues faced by the public healthcare system were highlighted throughout the interview process in the context of this study. According to the table below, the themes that stood out as challenges for the public health system to the majority of participants were funding, resource allocation and operational inefficiencies.

Table 10: Main themes of challenges affecting public healthcare in SA

Differences	Sources
Allocation of resources	7
Funding	9
Operational inefficiencies	7
Affordability	2
Staff retention	4
Mismanagement	6
Infrastructure	6

5.5.1.1 Allocations of resources

The subject that stood out the most was the distribution of resources, with the majority of participants believing that the public sector, which serves the majority of South Africans, did not receive a fair share of the resources allocated to it.

Participant 1: *"Number one there's this proportionate distribution of resources. So I think 8/9% of the country's GDP goes towards healthcare and the split between that is 50/50 in terms of spend on healthcare, 50% goes to government, 50% goes to private but the issues that private caters for only about 17% of the population, so you can already see the big discrepancy in terms of medical specialists is 2% of them are in the government and the private sector in terms of nursing is 50/50. So resources are absolutely misconstrued, and by virtue of that it just makes sense if you've got 11 guys in a soccer team play against 6 guys in a soccer team.*

The 11 guys are gonna do better because there's more of them, they get less tired and not to run as much and put in as much effort, whilst the 6 guys have to cover a bigger field of grass if they are to remain competitive and that's what's happening."

Participant 2: *"The other thing is that in private sector we are servicing less consumers than we are in the public healthcare, that's most probably the reason why our public healthcare system is unable to cope"*

Participant 4: *"availability of resources. So I'm not just talking about people that are available to help even though that's also the case. But cases where you are not provided with the… I don't want to say the right diagnosis or the right medical"*

"I think it's the issue is more with the enablers in the health system rather than the people in the healthcare system. I think they are trying as much as they can. But they don't have the tools to allow them to do the job properly."

Participant 5: *"The main difference is resource allocation between the two sectors, you know, the public is as grossly under-resourced. Private, some can even say it's over-resourced. But so, there is a difference. And there is world class infrastructure in the private healthcare system."*

Participant 11: *"There is a significant difference in facilities, service and individual care."*

Whilst resourcing may be an issue, what some participants have noted is that the same doctors used in private healthcare are the same doctors used in public healthcare

Participant 8: *"Remember that the same doctors who are in private sector, are the doctors who are also working, are the consultants who are also working in public service yeah"*

Participant 9: *"the same doctor, that you are seeing in private is the same doctor that you will see in a state hospital. The only difference is that in the public sector, the value of service is not there because it is regarded as a cheap service, or it's regarded as services of low quality"*

5.5.1.2 Funding

Participants also shared the same sentiments when it came to state funding

Participant 1: *"we've got a very overloaded system of healthcare, which is underfunded and to compare it with completely opposite whereby it's highly resourced, less overloaded"*

Participant 2: *"The major challenge is access to funding, consistent funding and you know if you don't have the right funding you can't find the right equipment, let alone the right people."*

However, in the same light, participants 3 and 8 shared very contradicting where they believed the public sector is better resourced and funded

Participant 3: *"public sector is …, and this is, I found this quite interesting, is usually better equipped than the private sector, which is quite a …, I think for the average South African is quite a shock, this is apparently quite true, because of the funding. So government provides quite a lot of funding for things"*

Participant 8: *"And then they have exposed them because you know, in private sector, they count each and every material they use on you. When we do that, but then we have the resources in public sector. We will never struggle to have PPE. That is why you see there was so much corruption because we got so much funding"*

"we are on par; we are on par with the private sector"

"So, there's nothing that the private sector is doing that the public sector does not do"

Participant 9: *"Public healthcare is not funded adequately. On the basis that you are treating mostly non-paying patients. The resources are not even equitably shared"*

Participant 10: *"I don't think it's that our government is doing much to improve the state of our public healthcare"*

"as government, you realise that there's a shortage of skills, shortage of hospitals, services are not well, it's not really concerned for its workers, then what are they doing? Okay, and even that some most there are government, or most of them, when they're sick, they go to private sector instead of public sector, public healthcare. So, there is a serious issue with our public healthcare."

5.5.1.3 Operational inefficiencies

Some participants felt operational processes were quite bad in public healthcare, patient files go missing and the waiting period is just too long as compared to the private sector

Participant 3: *"I guess their operational processes etc., are quite bad you know to be quite frank, needs a big overall in the public sector compared to private sector. What else? And I guess speed, the efficiencies, I also touched on that, the speed of treatment, I think there are news articles every now and then that pop up where cancer patients kind of wait for a year or two before they get access to certain treatments."*

"But the biggest challenge I think is the theme of this whole discussion, the operational efficiencies which is you know …, they don't even think about digital transformation or RPA or

these types of things. They still very very old school, ja and getting their processes in management sorted out I would say"

Participant 4: *"it just the processes take a bit longer in the in the public… it's like getting an appointment takes forever. Waiting lines at the hospital"*

"There is also the case of case you know, files getting lost, because the last doctor didn't hand over to the current doctor."

"It's the administrative, the processes, basically inefficient processes being put in place. They're easy to exploit as well, I think when processes don't run properly, they're easy to exploit, isn't it? It's easy for you to go start your own little medical practice, and then sneak out to go make a little extra cash here and there. It's easy to misuse resources, take medications here, and they you know, it, I think it's, it's being paralysed, or it's being impacted by the process inefficiencies that it faces at the moment"

Participant 5*: "We are having challenges with record keeping, because the records are on paper, so they can easily be corrupted."*

Participant 6: *"Issues of operational efficiencies, issues of making sure that the equipment is there, the place is …, when you get there you are helped in an efficient fashion."*

5.5.1.4 Affordability

What stood out from participant 8 and participant 9 who are both hospital managers for two different public hospitals was the affordability of public healthcare which makes it accessible for everyone

Participant 8: *"in my department, I've got the cardiology. There are some of the processes that we do there that one a consumable is around 300,000. And we've limited it now to one patient per month. And it's a lifesaving procedure, but then we do it for free for people. So, if your medical aid finish, you have a chest pain, and you have a clot, you can come back and you can see. So, there's nothing that the private sector is doing that the public sector does not do."*

Participant 9: *"public healthcare is cheap, in terms of affordability compared to private healthcare. In the hospital, you are admitted, excuse me, you are admitted from seven days you only pay 145 rand. In a private healthcare, you are admitted for three days, you pay 200,000. You even pay for the water that you've been drinking in the in the hospital, unlike in the public healthcare sector. So, there is a vast difference based on the value. But I believe*

as a public servant, we have a role to play in changing the narrative. Yes, we are doing our best and it's something that we want to emulate."

5.5.1.5 Staff retention

Public healthcare institutions are struggling to retain staff because of luring opportunities in the private sector and abroad

Participant 1: *"Doctors we graduate in six top universities our doctors, are world class they want it so our nurses they went into England and Australia, every single place in the world, we taking some to China, Cuba, we bringing in a good now two point something thousand doctors every single year, I can't remember the numbers for nurses and these are very high quality because we know they are all sought after. But then you ask yourself then what is wrong, if you've got some of the best doctors, we graduating many of them, what are we doing wrong and that's multifaceted in terms of we are not concentrating them in the right places"*

Participant 2: *"The second challenge is you were not going to necessarily attract the best talent because they all want to go into the private healthcare arena, because that's where they will be taken care of, that's from a career point of view"*

The sector is also starting to detrimental affects of this as public health facilities are over crowded and under resourced

Participant 5: *"the public system, like I've said, is grossly under-resourced, both in infrastructure and human resources, which leads to a multitude of problems, including staff exhaustion, and subsequent attrition or loss of staff members, and subs and a lack of equipment or outdated equipment leads to substandard procedures and poor training of upcoming healthcare workers."*

Participant 8: *"you know, UK, America, they've lost a lot of their healthcare workers. People are rushing there, because maybe they're lured by better salaries. But the South Africa salaries are very much comparable to those salaries they give abroad."*

5.5.1.6 Mismanagement

A lot of participants noted the mismanagement of funds and resources in these institutions which also speaks to a lack of leadership and accountability

Participant 1: *"there's a lot of mismanagement that we know of that's now being exposed by these commissions and so forth. So we've got wrong people running healthcare, I think many*

of them don't have an idea of what it is even though some of them are doctors, they not good administrators, those that are administrators have no real grasp of what's happening on the ground"

Participant 3: *"proper usage of the funding received. I think there's a lot of …, not vanity projects but they kind of …, a lot of the money gets wasted"*

Participant 9: *"is the leadership; in public health care, there's a problem of leadership. You have leaders that do not serve the interests of the patients. One of my main things was, if we had a choice in the country, health and education should not be political, but should be driven for change, because you need health and you need education, that those are the priorities. The other thing that mostly is faced by is the level of the staff that we have. You have people that think that government employment is permanent employment. They're just there to receive salaries and to retire with fat cheques - that's it"*

Participant 11: *"Subjectively, the sector appears poorly managed, and the victim of incompetence in some areas, corruption and maladministration in others. This deters people from contributing or participating"*

5.5.1.7 Infrastructure

Infrastructure has become a problem for public healthcare because they have not been revamped in years, they are running on slow legacy systems, they are still paper based which makes it very difficult to operate efficiently

Participant 1: *"we not investing so much into infrastructure, we buying more consumables, PPE's and so forth instead of listen when last did we build a new hospital from scratch. A new, brand new hospital with all the facilities in the area where people are needed. We haven't built one in years"*

Participant 5: *"so the processes are quite still, like archaic or old, old school, you know. We're still using paper based, we're still you know, writing on pen and paper, you know? So, it's quite old based, we're still doing manual, for example, stock intake. We're still do manual stock intake. paper based this lack; we haven't really transitioned to cloud computing yet. We are having challenges with record keeping, because the records are on paper, so they can easily be corrupted."*

Participant 7: *"the legacies in terms of technology, I think they are way behind"*

Participant 9: *"the infrastructure. All, if not 90% to 95% of our public hospitals, the whole country are dilapidated. The infrastructure does not meet the current demands. Most of the hospitals were built in the apartheid era regime. They have not been refurbished. They have not been met to meet the current demands. COVID has shown that in many of the facilities that they were not compliant with basic Occupational Health and Safety Act standards."*

5.5.2 How RPA could address the challenges faced by public healthcare

Participants were asked if they felt RPA would be a viable tool to address some of the challenges faced by the public healthcare and whilst 10 of the 11 participants agreed, and even went as far as giving a few examples of where this technology could be applied. Participant 11 on the other hand had a completely different view

Participant 11: *"In my view, unlikely. RPA exists to solve for operational efficiency within established and coherent processes. Of course examples of these scenarios will exist in public healthcare, but implementing automation doesn't directly solve for or address the challenges noted."*

The areas where RPA might be used to help with the pressures confronting public health are highlighted in the table below.

Table 11: RPA Opportunities

	RPA opportunities
1.	Administrative processes
2.	Onboarding
3.	Clinical referrals & bookings
4.	Forecasting
5.	Reporting
6.	Procurement

5.5.2.1 Administrative processes

Participant 2: *"Now in our public healthcare you find that there is a lot of backlog cases that are sitting in the back offices, which need physical people to process using digital computer systems and ERP platforms. I think RPA can work well in the back office to assist with things*

like creating repeat prescriptions for specific clients, sending out automated alerts, updating patient records and cleaning patient records"

5.5.2.2 Onboarding

Participant 3: *"where a patient or a customer needs to provide certain information, have it verified, that part of the process, if you can automate that, then you make people's lives so much easier"*

"that initial interaction between a patient and the organization, if you can like I say if a patient just gives and ID number and a thumb print or a picture of their face, that would speed up so much I think in the whole environment"

5.5.2.3 Clinical referrals & bookings

Participant 4: *"So, starting with small things like your clinical referrals and your bookings, to make sure that the hospitals and the clinics are not overwhelmed. And being able to share the load a bit more efficiently, with other hospitals in the area"*

5.5.2.4 Forecasting

Participant 4: "There's better forecasting, as well. So, you're able to tell in advance, if you're going to be overwhelmed at a certain period, like now you guys just hit winter, I'm sure there were a lot of people going into hospitals than in the summer time."

5.5.2.5 Reporting

Participant 4: *"the ability to do reporting on patient data, better reporting on patient data"*

"we talked about financing. We talked about, you know, the fact that at the moment, obviously each the hospitals are all getting an annual budget. But what is that budget actually based on? So, RPA can actually come in to look at the data and run intelligent reports that can show you if that budget that you're allocated is enough for that hospital to handle the influx of patients coming in, including foreign nationals, which is something that obviously, you know, South Africa has been has been struggling with"

"finance, their processes are quite straightforward. Like every month, and you know, what report you need to do you know, which you have to do your general ledger, or whatever it is called your income statement, you know, you need to do your reconciliations, those are things that you can bring in RPA to do for you, and you just, you know, do like a check at the end"

5.5.2.6 Procurement

Participant 4: "managing of resources, we're talking, I'm talking about things like where you're ordering new beds, where you're ordering you, whatever syringes or medication, the procurement"

5.6 Conclusion

High expenditures, an inflow of patients, heavy workloads, and a lack of resources have put too much pressure on public healthcare. The effectiveness and urgency of patient treatment may be hampered by these demands. The requirement to consistently enhance patient experience and adhere to rules, which can need onerous documentation and reporting, negates the desire to cut expenses. Majority of the participants did feel that RPA could play a significant role in assisting with inefficiencies faced in public healthcare.

The advantages of RPA may serve as a motivator for adoption of this technology. These advantages are mostly focused on productivity increases, increased efficiency, and operational improvements for public healthcare. These technologies will enable public healthcare to compete with private healthcare by providing its clients with improved product and service options.

CHAPTER 6: DISCUSSION

6.1 Introduction

This chapter takes into account the literature review that is covered in Chapter 2 as well as the results of the semi-structured interviews that were performed and discussed in Chapter 5. This was crucial in order to evaluate the implications RPA will have on operational efficiency in public healthcare in South Africa. The chapter's structure would be based on the research questions identified in Chapter 3.

6.2 Research Question 1 Discussion

What is the value of RPA and how does it translate to operational efficiency?

The purpose of this research question was to determine whether RPA had any impact on enhancing operational efficiency. This question was designed to elicit more detailed responses from participants on their interactions and experiences with RPA, particularly in relation to how it affects operational efficiency.

Operational efficiency

Viter (2021) describes operational efficiency in its broadest definition as the ability of an organization to offer high-quality services while consuming less resources. An organization's operations are likely to be more effective if it can produce more output from a given amount of input. The primary factors of this are the efficiency of an entity's operations and its operating expenses (Viter, 2021).

On the hand, Gillis (2022) defines operational efficiency as the ability of a company to produce high-quality services or products while minimizing waste in terms of time, effort, and materials. The ratio between the input required to sustain an organization's operations and the output it generates is used to gauge operational efficiency. What enters into a firm to make it work efficiently, such costs, labour, and time, and what comes out or is gained, like short development times, quality, revenue, customer acquisition, and client retention, are known as input and output (Gillis, 2022).

According to Ansari, Diya, Patil, and Patil (2019), automated processes will eventually create value for firms. Several businesses have already started implementing RPA in their daily operations, and it is crucial to highlight that on a global scale, the healthcare industry has already begun doing so (Radke, Dang, & Tan, 2020).

In the literature Ansari, et al. (2019) describe RPA as the programming of robots to automate manual activities carried out by humans. Through the interviews conducted with the participants a majority had a clear understanding of what RPA and how it could drive operational efficiency in organisations, however in the same light a few participants had the tendency of confusing RPA with robotics.

Robotics is a subfield of engineering that deals with the creation, design, production, and use of robots (Hanna, 2021). It is the development and construction of systems that integrate electrical and mechanical "body" components with computer "brains" is at the heart of robotics (Birk, 2011). As a result, the three main disciplines involved in robotics are mechanical engineering, electrical engineering, and computer science.

South Africa has a few robots in different sectors Pepper was the first robot to be introduced in the banking sector in 2018, the South African healthcare welcomed Stevie in 2021 a mobile robot, to aid with patient care during the COVID-19 epidemic and the latest one to be introduced is Spot, a mobile robot with agility and unmatched mobility, automates routine inspection activities and data collection in a safe, accurate, and consistent manner.

Figure 5: Steve Biko Hospital robot – Stevie

(Source: *https://www.cbn.co.za/industry-news/robotics-automation-ai/mobile-robot-lends-a-hand-at-steve-biko-academic-hospital/*)

Figure 6: - Boston Dynamic robot – Spot

(Source: *https://spectrum.ieee.org/boston-dynamics-spot-robot-dog-goes-on-sale*)

Figure 7: Nedbank robot – Pepper

(Source: *https://smesouthafrica.co.za/know-far-nedbanks-software-robots/*)
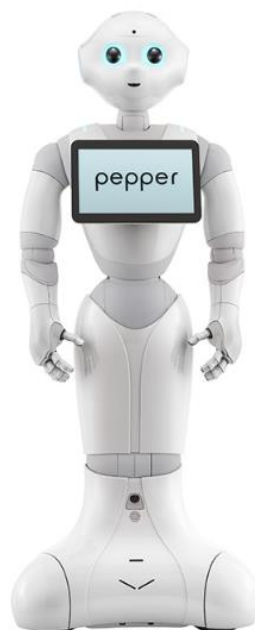
Medical robots are helping healthcare professionals provide smarter, more comprehensive care to their patients. The healing process can be long and emotionally exhausting, especially when nurses and healthcare teams are spread so thin. In particular, when nurses and medical

teams are overworked, the healing process can be emotionally draining and protracted. For both patients and caregivers, medical robots can assist fill in the gaps and revolutionize the healing process. Medical robots are revolutionizing healthcare thanks to some amazing advancements achieved in recent years.

In the interviews it was discovered that as much participants knew about RPA, some of them were not directly exposed to the technology. They all agreed that RPA could bring value to operational efficiency and five themes were identified based on the research findings. These themes speak to what RPA is and the characteristics it succeeds by to drive best results in operational efficiencies.

Table 12: Main themes from an RPA perspective

Components	Sources
Software application	10
Replicate human work	8
High volume processes	4
Low complexity processes	4
Repetitive administrative tasks	4

6.2.1 Software application

Most participants understood that RPA is a software application that mimics the action of a person to increase outputs for the organisation. Whilst this is true, this software application does not replace the current infrastructure of the company but rather enhances the current system found in the organisation and as a result they work side by side. Through the interviews we noted that this could prove to be an advantage as well a disadvantage. It is an advantage in the sense that it an easy to use technology that does not require the organisation to invest in new infrastructure but the technology works alongside the existing technology of the organisation to create efficiencies and reap big benefits. However, in the same light, it could have the opposite effect in that if the organization is still utilizing slow, outdated legacy systems, it won't realize any benefits because it won't produce the outcomes mentioned in the literature. As stated by Dilmegani (2022) the issues with out-of-date apps are not entirely resolved by RPA.

Whilst the software may seem reasonably cheap because of the fact that you will not be investing in new infrastructure. The initial investment in the technology is quite high so the company would need to compile a good business case, this is usually the main barrier that

determines whether a corporation invests in robotic automation or waits till later (Granta, 2017).

6.2.2 Replicate human work

RPA is a tool that mimics what the user or worker would normally do on a daily basis at work. If properly maintained, it can be configured to operate in a repeated cycle and will do so unless instructed otherwise (Granta, 2017). The advantages of this are that it works all day, everyday without taking breaks. An RPA bot does not take breaks or go on leave as opposed to a full-time employee (FTE) who only works 8 hours in a day and needs breaks in between.

This technology could help assist the already strained public healthcare, as they are short staffed and must cater to large crowds of patients. This is due to a lack of skill retention and the inability to train graduates (Business Tech, 2022).

RPA carries the perception that it is a technology that will replace people's jobs which causes resistance in companies. So, whilst this might be true organisations need to take into account the high unemployment rate in the country and not use RPA as a means to reduce head count but rather as a means to enhance operational efficiency. Therefore, this presents an opportunity to upskill workers into areas where they could do more challenging tasks to deliver better customer experience.

6.2.3 High volume processes

RPA poses as the perfect tool for high volume process as it is able to finish tasks rapidly and affordably than humans (Pratt, 2021). Organizations might anticipate increased productivity without experiencing the corresponding rise in expenditures that would have occurred had they recruited new personnel to complete the same amount of work in the same amount of time.

With high volume processes, staff members are prone to make mistakes to try meet the high demand of work. With RPA it only does what you tell it to, therefore, it is less prone to mistakes making it a viable tool for such processes.

6.2.4 Low complexity processes

RPA has its limitations, and one of them is picking processes that do not change all the time. Processes that do not require too much judgment thinking. It needs to be a rules-based

process without a lot of exceptions. A low exception rate means less human interaction with the process. The problem with this is that it may limit the organisations scope of work for digital transformation.

However, to overcome this companies may look into integrating RPA with other available technologies such as Artificial Intelligence (AI), Optical character recognition (OCR), Machine learning (ML) and even chat bots.

6.2.5 Repetitive administrative tasks

RPA works well for activities that require a significant amount of human data processing and adhere to the same process steps. These administrative tasks should have a predefined trigger which will signal your bot to start working. T

Whilst this is good, if a bot discovers an action, it is not familiar with it may cause it to fail and the process to stop completely which may cause a backlog. Which raises the need for good IT structures to be on standby if it were to happen. However, in the same light, a bot is teachable so if it discovers something new, you teach it so knows what to do with the problem the next time it arises.

6.3 Research Question 2 Discussion

What is the extent of adoption of RPA in the South African context and how has it been embraced?

Creamer Media's Engineering News (2019) reported that RPA is slowly being introduced in industries such as banking, telecommunications and insurance. Organisations within these industries have also come out to be great proponents of the technology and its benefits.

Responses from RPA experts also supported this notion as they deal with it on a daily basis. There has been numerous studies conducted by scholars on adoption of RPA in the banking industry (Tew, 2019), all of which are testament to the notion that RPA

A gap still exists on the adoption of RPA within the healthcare fraternity in South Africa. According to Mlambo and Iyamu (2021) the culture in South Africa is a big contributor to the slow adoption and certainly lack of infrastructure as well. Similarly, interview participants made note of the same elements, when it comes to challenges faced in adopting RPA in public healthcare, namely, (1) resistance, (2) infrastructure, and (3) skills availability being the top three.

South African has a long political history, whereby there was segregation of individuals based on the colour of their skin. As such, this period, apartheid era, gave rise to the high unequal society that South African citizens still experience today and has contributed to a society that is majority uneducated and unemployed. According to the latest information from the Statistics South Africa, unemployment in South Africa is currently above 30.0% (Statistics South Africa, 2022). Resistance to change and to adopt more sophisticated automated processes and operations is as a result of these social disparities and unemployment. Interview participants also confirmed that there is a growing tendency that suggests that automation replaces human heads and hence the resistance.

Resistance is therefore two-fold, one from employees internally who do not want to adopt new technology due to fear of being redundant and being replaced by technologies. Labour in South Africa is protected through the mechanism of labour unions and the militance of pushing back on these advances are conducted through labour unions. According to Bhorat, Naidoo and Yu (2014) labour unions have gained power and became the voice of marginalised employees since the 1980s. Largely they oppose these technological innovations due to protecting their members.

The second factor is that certain organisations do not plan or conduct proper change management policies when there are some innovation changes. Employees are left to their own devises to make sense of the disruptions that come with innovative ideas. This leads to the conception that organisations invest in technology at the expense of human resources.

Lack of investments into infrastructure was a common theme amongst the participants. There was a strong sense that spending in public healthcare was not focused on improving infrastructure and this led to slow processes and continuation of manual operations, which have proven to be ineffective and inefficient. Twelve years after the adoption of the Department of Health's ten-point plan, there is not much evidence to prove that it has yielded any result. The argument suggested by Mlambo and Iyamu (2021) still hold true, in that organisations in South Africa are lagging with technological advancements and innovations due to the lack of investment into infrastructure.

Maisiri, Darwish and van Dyk (2019) posit that for successful adoption of new technology, the aviability of skills and capabilities is a major prerequisite. They continue further to note that the quality of skills and qualification also play a role in driving innovation and technological advencements (Maisiri, Darwish, & van Dyk, 2019). This was aligned with the insights provided by interview participants, that there is a serious lack of RPA skills in public healthcare and the technological advancements globally are far ahead to that of South Africa.

Maisiri, Darwish and van Dyk (2019) suggest that a lack of adeqaute skills hinders performance and also hinders the opportunity to grow personnel within an organisation and both these factors contribute to high levels of unemployment. Human resources are therefore not equiped to innovate due to low levels of skills and capabilities.

It is apparent from the literature review and insights provided by interview participants that adoption of RPA in South Africa has started. However, it is still at a slow pace as there is resistance from labour, poor infrastructure to support the technology advancements and lack of RPA skills to drive its implementation and innovation.

Interview participants provided critical insights when it comes to factors that are required to change the low adoption of RPA in South Africa. High on the list was education, followed by change management processes and stakeholder buy-in. Below will be an expansion of these three main insights.

Education

As noted by Maisiri, Darwish and van Dyk (2019), a country without quality skills and capabilities is unable to improve performance, competitiveness and skills development for its human resources.

Investment in human resources was a major item from interview participants, indicating that proper educational programmes must be put in place in order to improve skills in RPA. Technology related qualification are regarded as a scare skill in South Africa and

Change Management

Alqatawenah (2018) defined change management as a method of transforming an organisation from a present state to a new state that is desirable during an period of transition. This process includes many factors and element to ensure alignement across the organisation, namely, communication plan, activations and outreach programmes, and awareness programmes across the organisation.

Interview participants also provided strong insights into organisations needing to adopt proper change management processes, when it comes to adoption of new technologies. This was as

a result of the sentiments that RPA or innovative technologies are introduced in organisations at the expense of human resources.

Interview participants provided insights noting that poor awareness and communication on new technologies was an unnecessary barrier that could be averted if proper change management programmes are put in place.

According to interview participants, particularly those in public healthcare made insights that one of the contributing factors of poor change management processes was that consulting entity are generally engaged to deploy new technologies and often times, there is no proper communication and awareness plan included in the deployment and implementation when it is consulting firms. This isolates internal employees and starts to drive a rift in their understanding of the objectives of innovative technologies to that of the organisation's intentions. This is the same with regards to RPA, senior management are aware of their intentions of introducing RPA into an organisation, however, the personnel whose functions are targeted for improvement are left out and it builds a culture of resistance and rebellion on RPA.

Stakeholder buy in

Certain on a challenging element to address, if the above two elements are not adequately addressed. Stakeholder buy in considers senior management, all employees across the organisation, labour unions, suppliers, government, patients in the case of public healthcare.

Interview participants had solid views on ensuring that there is proper stakeholder buy in to support the adoption of RPA. As noted, that addressing the shortage or skills through education and proper change management were important for enabling buy in from all stakeholders.

One of governments' mandate is to ensure there is employment in the country and the same with labour unions and that people are well compensated for their labour. Perceptions that RPA adoption will take over jobs, is still a major challenge (Santos, Pereira, & Vasconcelos, 2020). Senior Management and technology experts still have a major role to play in ensuring unity and alignment across all stakeholders and proper consultative processes should be adopted and not a top down approach.

Conclusion

This research question sought to determine how widely RPA has been used in South Africa and the methods used to overcome the difficulties it presents and based on the feedback and literature review conducted, there is a willingness to adopt RPA. The benefits of adopting it are well understood and in some organisations that have implemented RPA, they are ripping those benefits.

The challenges of skills shortages, resistance and poor infrastructure need to be addressed through proper change management processes, education of employees and inclusion of all stakeholders in an effort to build alignment and a common roadmap for RPA adoption.

6.4 Research Question 3 Discussion

What is the extent of implementation of RPA in the public healthcare of South Africa?

Research question three sought to focus on the adoption of RPA in South African public healthcare, continuing the theme of research question two.

There is substantial evidence that several issues that have a detrimental influence on healthcare quality have impacted the quality of care in South Africa. Low error rate, fewer delays in care delivery, higher efficiency, a larger market share, and lower costs are all indicators of better care quality. The public has lost faith in the South African healthcare system as a result of the decline in healthcare quality (Maphumulo & Bhengu, 2019).

There are a number of challenges that face the public healthcare system in South Africa that may possibly hinder the adoption of RPA and below are the themes that stood out as challenges for the public health system to the majority of participants were funding, resource allocation and operational inefficiencies.

Table 13: Main themes of challenges affecting public healthcare in SA

Differences	Sources
Allocation of resources	7
Funding	9
Operational inefficiencies	7
Affordability	2
Staff retention	4
Mismanagement	6
Infrastructure	6

6.4.1 Allocation of resources

Up to 80% of all people rely on the public healthcare system for their medical care (International Citizens Insurance, 2022). The public system receives subsidies from the government; however, the public healthcare system is poorly funded and managed. Taxes and contributions collected at the point of service by patients help the South African government finance public healthcare. In South Africa, public healthcare is subsidized by up to 40%. (International Citizens Insurance, 2022). However, even with the subsidy, public healthcare facilities are strained whilst private healthcare get to enjoy the benefits of a strong healthcare system.

As a result of this, the South Africa's healthcare system is going to go through some major adjustments. Attempts are being made by the government to implement a national health insurance system. This strategy seeks to eliminate health inequalities among various socioeconomic categories, improve the nation's health, and increase universal access to healthcare. Important to note is that whilst the resources are a problem, the quality or standard in regard to the doctors they hire are completely the same in private as well as public because they utilise the same doctors

6.4.2 Funding

Over R200 billion was spent by the South African government in the 2019–2020 fiscal year (National Treasury, 2021). In terms of government spending on healthcare, the World Health Organization (WHO) rated South Africa 49th among other nations in 2018. Healthcare spending made up 13.3% of all government spending (Statistics South Africa, 2021). Malakoane, Heunis, Chikobvu, Kigozi, and Kruger (2020) contend that South Africa's expenditure levels do not correspond to the quality of the nation's healthcare system. This is due to worsening service levels, including longer wait times for patients to receive care and dirty, contaminated facilities, all of which are contributing to an increase in mortality as recorded by the Health Department (Maphumulo & Bhengu, 2019).

Whilst South Africa is voted 49th for the amount of spending on healthcare, participants interviewed also do not believe it is enough and feel government needs to do more to support public healthcare. If government goes ahead with the national health insurance (NHI), they will need to increase funding to get these hospitals close to the level of private hospitals. Again if RPA is going to be a tool they look into in future, Government will need to invest money into it, because the initial investment in the technology is quite high (Granta, 2017). They will also

need to make sure they acquire the right skill to help them build a digital transformation strategy that they will scale out to other hospitals across the country. However, in the case of our hospitals that have not been revamped in years, government will also need to invest money into infrastructure and good systems.

6.4.3 Operational inefficiencies

Public hospitals in South Africa are operationally inefficient. On a daily basis patients are forced to deal with long queues that could take up the whole day in a bid to seek medical help. Queues are usually slow because processes are still manual. The public health system is still very paper based and as a result medical files go missing and there is just poor record keeping.

As a result of poor operational systems, processes are easy to exploit. Staff employees can easily abuse resources and steal medications for their own use without anybody noticing, paralyzing the healthcare system.

All the efficiencies spoken about above are things that could be solved by adopting RPA. However, before the department of health even considers RPA, they will need to do good planning and hire digital transformation consultants from the beginning because RPA is just a tool that enables organisations to be more efficient by improving quality because of the low error rate, improving productivity because it works long hours at a fast pace, therefore it is able to free up the capacity of staff. It is a good tool for reporting and instead of having admin clerks working on reporting, the bot can do it instead. In procurement it could assist with forecasting how much medication you will need and how much stock you have left. The department can even go as far as getting RPA to do reporting for all hospitals and compile a report on average spend and forecasts for provinces for the next fiscal year.

If public healthcare facilities are to understand their vision for RPA, they must first engage digital transformation consultants and develop a digital transformation strategy. They will subsequently be able to comprehend how RPA will look like in their organization, how it will function and how it will actually fit into the larger organisation.

6.4.4 Affordability

Due to inequality, there are significant differences between public and private healthcare, with the less affluent using the latter. The public healthcare system is burdened with employee shortages, lengthy wait times, and broken filing systems because the bulk of the population is served by it (Daily Maverick, 2021). However, what was key to note in this study was the

affordability of public healthcare in South Africa, the South African public health is able to service its citizens at a cheaper rate and at times for free.

Access to high-quality healthcare for all citizens is one of the goals of the South African government, according to the country's National Development Plan (NDP) (Gordon, Booysen, & Mbonigaba, 2020). Section 27 of the South African Constitution, which states that everyone has a right to and is entitled to access to healthcare services and that no individual should be denied emergency treatment, strengthens this even more (South African Human Rights Commission, 2019)

6.4.5 Staff Retention

According to Health Minister Joe Phaahla, South African health systems are under jeopardy due to a lack of qualified healthcare professionals (Xulu, 2022). According to a recent study, 40% of the doctors who participated in the research were thinking of moving abroad (Xulu, 2022). The research discovered that roughly 71% of South African medical professionals who leave, do so because they are unhappy with management. Doctors were also impacted by working beyond normal hours, poor pay, being under-resourced, and having inadequate personal protection in place (Xulu, 2022).

Participants also reiterated the same sentiments that the public health system, like is grossly under-resourced, both in infrastructure and human resources, which leads to a multitude of problems, including staff exhaustion, and subsequent attrition or loss of staff members, and subs and a lack of equipment or outdated equipment leads to substandard procedures and poor training of upcoming healthcare workers

6.4.6 Mismanagement

During the 2019–2020 fiscal year, the South African government spent more than R200 billion (National Treasury, 2021). Malakoane, Heunis, Chikobvu, Kigozi, and Kruger (2020) contend that South Africa's expenditure levels do not correspond to the quality of the nation's healthcare system.

A study done by Rispel, Jager and Fonn (2015) claimed that corruption had a detrimental impact on medical staff morale and patient treatment. The bulk of print media reports on corruption included provincial health agencies (45%) and the public health sector (63%) respectively.

Interviews also revealed that this was a big concern for participants, and they put the blame on a lack of leadership. Stating that leaders that do not serve the interests of the patients. They even went as far as saying if given a choice, health and education should not be political, but should be driven for change, because both health and education are necessities. The other issue they are faced with is the incompetence of staff members who refuse to work but want to get paid.

6.4.7 Infrastructure

According to Baker (2010), apartheid significantly exacerbated inequality and divisiveness in South Africa. The black community, who made up the majority of the population, was left without essential infrastructure, including healthcare facilities. According to Kelly, Mrengqwa, and Geffen (2019), access to high-quality healthcare was based on racial and socioeconomic status. Due to the disparity, there are significant differences between public and private healthcare, with the less affluent using the latter.

Government has still not invested in rebuilding, renewing or enhancing infrastructure. Buildings are dilapidated and falling apart, processes are still paper based and systems put in place are legacy systems, which are slow and hardly work themselves. A hospital manager even went as far as mentioning that 90%-95% if not all infrastructure in public hospitals are dilapidated. The infrastructure does not meet the current demands. Most of the hospitals were built in the apartheid era regime. They have not been refurbished. They have not been met to meet the current demands. COVID has shown that in many of the facilities that they were not compliant with basic Occupational Health and Safety Act standards.

This does put a hindrance on systems and procedures, it also puts a hinderance on the ability to introduce RPA. For RPA to work it needs a system to work off and if the system is slow and freezes from time to time, it will cause issues for this technology and make it very difficult to adopt. The public healthcare system is also very paper based which also makes it hard to work off, because again, for RPA to work it needs the patient records to be electronic. This could be assisted by a technology called OCR which takes an image of text and converts into machine-readable text, it does the same for hand written information.

6.5 Conclusion

Through the interviews' conducted RPA was seen to be a viable technology to enhance operational efficiencies, participants identified areas below as viable areas where RPA could

be used to help with the pressures confronting public health. Most of these processes are repetitive, have high volumes data and are low in complexity.

Table 14: RPA Opportunities

	RPA opportunities
1.	Administrative processes
2.	Onboarding
3.	Clinical referrals & bookings
4.	Forecasting
5.	Reporting
6.	Procurement

CHAPTER 7: CONCLUSION AND RECOMMENDATIONS

7.1 Introduction

The previous chapter (chapter 6) considered the research findings in relation to literature review for the research question posed in chapter 3.

In this chapter, the study findings will be summarised in relation to the objectives specified in the first chapter. The chapter will be formulated according to the research findings of study, implications for business, limitations and future research recommendations.

7.2 Research Findings

The research revealed that RPA as a technology has valuable benefits for organisations, however the adoption of it in South Africa has been far less when compared to other developed and developing countries.

64% of the participants interviewed had been directly exposed to RPA and are well versed on the benefits. Interview participants highlighted that for RPA to be fully adopted in public healthcare, there are aspects that are required to be addressed. The TOE model was considered to explore these aspects and was adapted for the development of a model that the South African public healthcare sector may utilise in considering RPA adoption in future. Figure 8 illustrates the RPA adoption model adapted from the TOE framework.
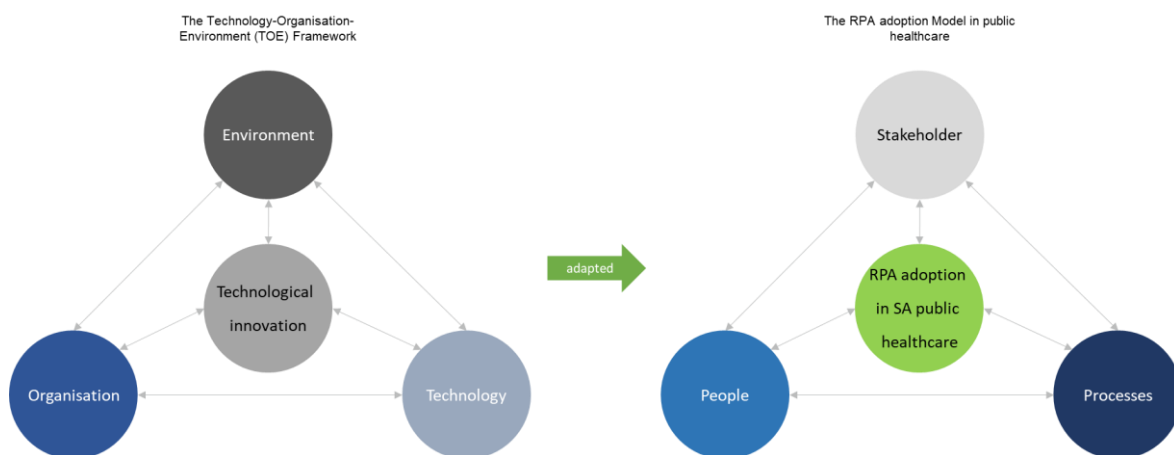

Figure 8: RPA adoption model

RPA adoption model

Through literature review conducted and the insights from interview participants, three main aspects were highlighted as critical to consider for RPA adoption in public healthcare;

(1) Stakeholder aspect

Similar to the environment context of the TOE framework, the stakeholder aspect *considers role players that are required for buy in to adopt RPA;*

o *Government*

Government would be the custodian of the project as it is a government department and financial investment and resources would be made by government.

One of government's mandate is to increase employment and the current perceptions that RPA replaces human resource would need to be lobbied correctly. An education and awareness programme to launch and bring awareness of RPA would be required for government buy in.

o *Labour unions*

Similar to government, labour unions look after the interests of employees and a narrative that suggests that less people would be employed would not get the requisite buy in. As with government, an education and awareness programme to launch and bring awareness of RPA would be required for labour union as well.

(2) People

People play a crucial role in the adoption of technology, in this case RPA. People tend to show resistance to adopting new technologies when they are not engaged and decisions are made utilising a top-down approach. Two main requirements were made to ensure employee engagement on RPA adoption for the public healthcare sector;

o *Change Management*

Change management as a method of transforming an organisation from a present state to a new state that is desirable during an period of transition (Alqatawenah, 2018). This has been recommended as a future research topic. Government adopts numerous structural orientations, namely, national, provincial and regional. This is the case with the Department of Health as well. The need for proper communication and awareness in a change management process would need to be considered with this level of organisational structure.

o *Skill shortages*

The second factor that was highlighted was the scarcity of skills and capabilities in the public healthcare sector. Any technology implemented would need maintenance and without proper skills and capabilities, the likelihood of adoption was low.

This aspect also spoke to the requirement of improving skills in public healthcare in order to realise performance and development of human resources currently employed.

(3) Processes

RPA is an enabler to operational efficiency, however, correct adoption would require that management of public healthcare to standardise processes, and select high volume – low complexity processes that are repetitive. This will ensure that value is created far quicker.

Considering the high demand for healthcare, patient onboarding processes, administrative processes, clinical bookings, referrals, procurement and reporting process would need to be considered first for automation.

7.3 Implications for Business

South Africa's healthcare system is in disarray and is failing its people (Baker, 2010). It faces operational difficulties, problems with the supply chain, a lack of skilled workers, inadequate recordkeeping, antiquated technology, and manual operations. Long waiting times, paper-based patient records, and poor record keeping are all effects of a lack of human resources and inadequate healthcare systems (Maphumulo & Bhengu, 2019). Health statistics are recorded in logbooks, which are infrequently sent to a regional office for data collection of metrics into a centralized database (Cline & Luiz, 2013).

In order to adopt RPA into their organizations, South African public health care must make sure that they are in line with the demands of the unions. They have a duty to ensure that they are not utilizing RPA as a way to reduce headcount in order to minimize expenses given the degree of unemployment in the country.

It is important to implement an engaging change management program that will inform health care workers about the goals of RPA and what the organization hopes to gain from it. Public healthcare organisations should work with an experienced digital transformation specialists to set up digital transformation strategy that will document the organisations RPA implementation

roadmap. Processes must be carefully chosen to guarantee that they can be automated to protect the program's credibility.

7.4 Study Limitations

The explorative study was on the implications of RPA to operational efficiency in the South African public healthcare. The exploratory nature of this study prevents broad generalization of the findings, and its applicability is constrained.

An additional limitation on the study is that it was only conducted by interviewing senior technology specialists, hospital managers, and medical professionals. There was insufficient representation of all provinces in the sample size.

The study offers no conclusions regarding the strategic purpose of organizations to embrace RPA technology because the opinions expressed by study participants are not those of the organizations to which they belong.

Qualitative research is often subjective, and the researcher's conscious or unconscious biases may have an impact on the findings.

7.5 Future Research suggestions

Proposed future research could look at effective change management processes/ policies in government institutions for technology adoption. in private institutions which report to a head office such processes are easily managed through relevant departments however in government institutions particularly public healthcare, they adopt a tiered structure being national, provincial and regional. They have the same mandate to provide health care however priorities may be different due spatial locations. This could impact the successful implementation of a change management process.

The second proposal for future research practicalities of rolling out RPA in public healthcare in rural areas. Whilst RPA may be a viable option in urban areas, it may be different in rural areas where they are faced with issues of no electricity, low connectivity and technology constraints.

7.6 Conclusion

It cannot be doubted that the state of the South African public healthcare sector is not to the levels expected after more 25 years of democracy. Democracy for South African citizens came with a promise to provide for their healthcare and it was not been the case due to the dire state of these institutions.

Public healthcare in South Africa has deteriorated in terms of offering high quality service to South African citizens due to poor management, outdated systems, manual processes and paper-based administrative processes that have led to poor operational efficiency. This study was to redress this through exploring the adoption of RPA technology and its implications to operational efficiency.

There are studies and practical case studies that have shown the benefits provided by adopting RPA in organisations. These include productivity, fast cycle times, error free reporting and reduction is costs.

Adoption of new technology does come with challenges and these were covered in this chapter and a model was developed, the RPA adoption model, to act as a guide for public healthcare sector on aspect to be considered for adopting RPA in the future.

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00%20nurses%20and%201%20300%20doctors

9. APPENDICES

9.1 Consistency Matrix

Title: Exploring the implications of Robotic Process Automation (RPA) on operational efficiency in public health care in South Africa.

Research Question	Literature Review	Data Collection Tool	Analysis
What is the value of RPA and how does it translate to operational efficiency?	(Viter, 2021), Gillis (2022), (National Department of Health, 2015), (Ngobeni, Breitenbach, & Aye, 2020), (Meyer, et al., 2017), (Ansari, Diya, Patil, & Patil, 2019), (Hofmann, Samp, & Urbach, 2020), (Jovanovic, Duric, & Sibalija, 2018), (Radke, Dang, & Tan, 2020), (Ratia, Myllarniemi, & Helander, 2018), (Santos, Pereira, & Vasconcelos, 2020)	Interview guide Questions: 1, 2, 3 and 4	Thematic analysis and Frequency analysis
What is the extent of adoption of RPA in the South African context and how has it been embraced?	(Van der Aalst, Bichler, & Heinzl, 2018), (Madakam, Holmukhe, & Jaiswal, 2019), (Mlambo & Iyamu, 2021), (Osman, 2019), (Tew, 2020),	Interview guide Questions: 5, 6, 7, and 8	Thematic analysis and Frequency analysis
What is the extent of implementation of RPA in the public healthcare of South Africa?	(Cline & Luiz, 2013), (Maphumulo & Bhengu, 2019), (Davenport & Kalakota, 2019)	Interview guide Questions: 9, 10, 11, 12 and 13	Thematic analysis and Frequency analysis

9.2 Ethical Clearance (GIBS)

Gordon Institute of Business Science
University of Pretoria

Ethical Clearance Conditionally Approved

Dear Ayanda Nxumalo,

Please be advised that your application for Ethical Clearance has been approved subject to the following conditions.

Thank you Ayanda, you will need Department of Health permission to work with hospital managers in the public sector. There is a research unit that gives permission, as far as I know. the one way you could get around this is only interview hospital managers in the private sector - but you would still need permission from their administration. The health ethics submissions to UP need to be sent early because they meet every second week. Please follow up with Jenn. I provisionally approve this for submission to UP for health ethics. If you need to chat with Jenn about the process, please arrange for it soon.

Once you have made this minor amendment and kindly resubmit your application

We wish you everything of the best for the rest of the project.

Ethical Clearance Form

Kind Regards

9.3 Ethical Clearance (University of Pretoria)

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Health Sciences

Faculty of Health Sciences Research Ethics Committee

27 October 2022

Approval Certificate
New Application

Dear Miss AP Nxumalo

Ethics Reference No.: 525/2022
Title: Exploring the implications of Robotic Process Automation (RPA) on operational efficiency in public health care in South Africa

The **New Application** as supported by documents received between 2022-08-25 and 2022-10-25 for your research, was approved by the Faculty of Health Sciences Research Ethics Committee on 2022-10-25 as resolved by its quorate meeting.

Please note the following about your ethics approval:
- Ethics Approval is valid for 1 year and needs to be renewed annually by 2023-10-27.
- Please remember to use your protocol number (525/2022) on any documents or correspondence with the Research Ethics Committee regarding your research.
- Please note that the Research Ethics Committee may ask further questions, seek additional information, require further modification, monitor the conduct of your research, or suspend or withdraw ethics approval.

Ethics approval is subject to the following:
- The ethics approval is conditional on the research being conducted as stipulated by the details of all documents submitted to the Committee. In the event that a further need arises to change who the investigators are, the methods or any other aspect, such changes must be submitted as an Amendment for approval by the Committee.

We wish you the best with your research.

Yours sincerely

_____

On behalf of the FHS REC, Dr R Sommers
MBChB, MMed (Int), MPharmMed, PhD
Deputy Chairperson of the Faculty of Health Sciences Research Ethics Committee, University of Pretoria

The Faculty of Health Sciences Research Ethics Committee complies with the SA National Act 61 of 2003 as it pertains to health research and the United States Code of Federal Regulations Title 45 and 46. This committee abides by the ethical norms and principles for research, established by the Declaration of Helsinki, the South African Medical Research Council Guidelines as well as the Guidelines for Ethical Research: Principles Structures and Processes, Second Edition 2015 (Department of Health)

9.4 Final Consent Letter

Gordon Institute of Business Science
University of Pretoria

Study title: Exploring the implications of Robotic Process Automation (RPA) on operational efficiency in public health care in South Africa

Researcher: Ayanda Nxumalo

Supervisor: Suzanne Myburgh

Institution: Gordon Institute of Business Science (GIBS)

DAYTIME AND AFTER HOURS TELEPHONE NUMBER(S):

Daytime number/s: 0664848486

Afterhours number: 0664848486

DATE AND TIME OF FIRST INFORMED CONSENT DISCUSSION:

Day	Month	Year		Time
				:

Page 1 of 5

9.4 Final Consent Letter (continued)

Dear Mr. / Mrs. ....………………………………

1) INTRODUCTION

I am currently a student at the University of Pretoria's Gordon Institute of Business Science and completing my research in partial fulfilment of an MBA. I am conducting research on exploring the implications of Robotic Process Automation (RPA) on operational efficiency in public health care in South Africa. Our interview is expected to last about an hour and will help me understand your insights on my topic.

Before you agree to take part in this study, you should fully understand what is involved. If you have any questions, which are not fully explained in this document, do not hesitate to ask the researcher. You should not agree to take part unless you are completely happy about what we will be discussing during the interview. Please note that your participation is voluntary, and you can withdraw at any time without penalty. All data will be kept confidential and will be reported without identifiers ensuring your confidentiality.

2) THE NATURE AND PURPOSE OF THIS STUDY

The aim of this study is to explore the implications of Robotic Process Automation (RPA) on operational efficiency in public health care in South Africa. Your participation will assist me gain your insights on this topic.

You will be interviewed by the researcher at a place that is private and easy for you to reach or alternatively on a virtual platform (Zoom or Microsoft Teams) for your convenience.

3) EXPLANATION OF PROCEDURES AND WHAT WILL BE EXPECTED FROM THE PARTICIPANTS

If you agree to participate, you will be asked to participate in an individual interview which will take about an hour. The individual interview will be a one-on-one meeting between the two of us. I will ask you several questions about the research topic.

With your permission, the interview will be recorded on a recording device or virtual platform to ensure that no information is missed.

9.4 Final Consent Letter (continued)

4)   RISKS AND DISCOMFORTS INVOLVED?

We do not think that taking part in the study will cause any physical or emotional discomfort or risk.

5)   POSSIBLE BENEFITS OF THE STUDY

You will not benefit directly by being part of this study. But your participation is important for the researcher gain your insights pertaining their study.

6)   COMPENSATION

You will not be paid to take part in the study. There are no costs involved for you to be part of the study.

7)   VOLUNTARY PARTICIPATION

The decision to take part in the study is yours and yours alone. You do not have to take part if you do not want to. You can also stop at any time during the interview without giving a reason. If you refuse to take part in the study, this will not affect you in any way.

8)   ETHICAL APPROVAL

This study was submitted to the Research Ethics Committee of the Faculty of Health Sciences at the University of Pretoria, Medical Campus, Tswelopele Building, Level 4-59, telephone numbers 012 356 3084 / 012 356 3085 and written approval has been given by that committee. The study will follow the Declaration of Helsinki (last update: October 2013), which guides doctors on how to do research in people. The researcher can give you a copy of the Declaration if you wish to read it.

9)   INFORMATION ON WHO TO CONTACT

 If you have any questions about this study, you should contact me (researcher) or my supervisor on the contact details below;

Researcher name: Ayanda Nxumalo   **Supervisor name:** Suzanne Myburgh

Email: 21828866@mygibs.co.za   **Email:** Suzanne.myburgh@hotmail.com

Phone: 066 484 8486   **Phone:** 072 406 9191

9.4 Final Consent Letter (continued)

10)   CONFIDENTIALITY

We will not record your name anywhere and no one will be able to connect you to the answers you give. Your answers will be linked to a fictitious code number or a pseudonym (another name) and we will refer to you in this way in the data, any publication, report or other research output.

All records from this study will be regarded as confidential. Results will be published in medical journals or presented at conferences in such a way that it will not possible for people to know that you were part of the study.

The records from your participation may be reviewed by people responsible for making sure that research is done properly, including members of the Research Ethics Committee. All of these people are required to keep your identity confidential. Otherwise, records that identify you will be available only to people working on the study, unless you give permission for other people to see the records.

All hard copy information will be kept in a locked facility at the University of Pretoria, for a minimum of 5 years and only the research team will have access to this information.

11)   CONSENT TO PARTICIPATE IN THIS STUDY

- I confirm that the person requesting my consent to take part in this study has told me about the nature and process, any risks or discomforts, and the benefits of the study.
- I have also received, read and understood the above written information about the study.
- I have had adequate time to ask questions and I have no objections to participate in this study.
- I am aware that the information obtained in the study, including personal details, will be anonymously processed and presented in the reporting of results.
- I understand that I will not be penalised in any way should I wish to stop taking part in the study and my withdrawal will not affect my treatment and care.
- If photos or videos are taken it may only be used after I have seen it and agreed that it may be used.
- I am participating willingly.
- I have received a signed copy of this informed consent agreement.

9.4 Final Consent Letter (continued)

_____

Participant's name (Please print)

_____   _____

Participant's signature   Date

_____

Researcher's name (Please print)

_____   _____

Researcher's signature   Date

AFFIRMATION OF INFORMED CONSENT BY AN ILLITERATE PARTICIPANT (if suitable)

I, the undersigned, Ayanda Nxumalo, have read and have explained fully to the person named ...., the participant informed consent document, which describes the nature and purpose of the study in which I have asked the person to participate. The explanation I have given has mentioned both the possible risks and benefits of the study and the alternative treatments available for his/her illness. The person indicated that they understand that they will be free to withdraw from the study at any time for any reason and without jeopardizing their standard care.

I hereby certify that the person has agreed to participate in this study.

Signature of participant: _____ Date: _____

Signature of researcher: _____ Date: _____

9.5 Final Interview Guide

RESEARCH QUESTIONS		SEMI-STRUCTURED INTERVIEW QUESTIONS	
1	What is the value of RPA and how does it translate to operational efficiency?	**1**	How would you define operational efficiency?
		2	How you define Robotic Process Automation?
		3	What exposure or experience have you had with RPA?
		4	In your experience, has RPA brought any value to operational efficiency? Give me a few examples of how?
2	What is the extent of adoption of RPA in the South African context and how has it been embraced?	**5**	In your view, has South Africa adopted RPA? Give me a few examples?
		6	What challenges have you experienced with the adoption of RPA?
		7	What factors would need to be addressed to minimise the challenges you mentioned earlier?
		8	In you view, what does the future of RPA look like in South Africa?
3	What is the extent of implementation of RPA in the public healthcare of South Africa?	**9**	Is there a difference between private and public healthcare in SA and why do you think so?
		10	What are some of the challenges faced by the South African public healthcare?
		11	In your view, do you think RPA could address some these challenges and how?
		12	Tell me about what you think would be some of the barriers to implementing RPA in the public healthcare in South Africa?
		13	How would these barriers be addressed?
General		**14**	Is there any other concern or point you would want to talk about on RPA in public healthcare, that we have not addressed?