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Implementation of Robotics Process Automation (RPA) and its impact on unemployment in South Africa

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Implementation of Robotics Process Automation (RPA) and its impact on unemployment in South Africa

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

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ABSTRACT

The concept of automation is one that can be traced back to primitive man and the notion of humans being displaced from one industry to another is not a new phenomenon. If our evolutionary history is anything to go by, we as humans have little to concern ourselves about with the introduction of new technologies like RPA. This research focused primarily on defining what RPA is and establishing if its implementation will have an impact on the South African unemployment levels. The research further looked at the roles that have a high degree of automation and the new roles that have been and will be created by the implementation of RPA. The research did not focus on companies but its main focus was to highlight the vast industries that RPA is being implemented in, thus depicting the possible reach of its impact. The data was collected through a series of face-to-face semi-structured interviews with different individuals who have participated in the implementation of RPA.

The interview findings were summarised, contrasted and compared to literature. The main themes that arose out of the research included the unified definition and understanding of RPA is which was greatly supported by literature. The research further highlighted the ability for RPA to de-risk multiple back office processes that are currently processed by humans. The pace of automation was also discussed in detail, where the research findings concluded that the pace of automation is greatly influenced by the complexity of the process and the number of systems that are involved.

One of the key findings of the research is that history is not a great indicator of future events. Previous waves of automation occurred over prolonged periods and affected a few industries and firms at a time. This type and rapid pace of automation is one that cannot be ignorantly be grouped, as its impacts may have a largely negative influence on employment levels in South Africa.

DECLARATION

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

ATENKOSI NGUBEVANA

Signed at …Johannesburg……

On the ……13th…….. day of …August…… 2018

DEDICATION

I would like to dedicate this research to my mother, Funeka Cynthia Siwisa.

As a single parent, I know, more than ever appreciate the strength you had to have raised us to be the independent adults that we are today.

Through your actions and teachings, I have learned that no obstacle in life is big enough for one not to educate themselves. I can only hope to be half the mother that you were to us. For every sacrifice that you have made, I thank you from the bottom of my heart.

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I would firstly like to thank my husband for being my main support structure both academically and emotionally. You are literally the reason why I made it through this last mile of my research. Through the distance and all, you were literally by my side and I will forever be grateful.

To the “early birds and the worm”, thank you for being the support structure that I needed throughout the MBA. The long study sessions that carried us through many nights have resulted in lifelong friendships that I will cherish forever.

My supervisor, Antony Soicher, your guidance during this research is highly appreciated.

Last but not least, I would like to thank all the participants in my research. Through all your busy schedules, you made time to sit with me and share your experiences and learning, which not only assisted in my research, but also in my career.

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CHAPTER 1: INTRODUCTION

1.1 Purpose of the study

The purpose of this study was to highlight the relatively fast pace at which automation can be, and is implemented in business operational areas within South Africa using RPA. The research will also evaluate the impact this implementation may have on unemployment levels. Additionally, the purpose was to identify the types of jobs that are susceptible to automation and conversely those jobs that are not susceptible to automation in South Africa.

Since the Industrial revolution, mankind has had a fear that with automation, comes a great deal of change and unemployment (Datta, 1990). Drawing parallels with a study conducted by (Frey & Osborne, 2013), that investigated numerous occupations and their susceptibility to automation in the United States of America; this study focused on identifying similar occupations/roles in the South African context, that have low degrees/probability of automation. These said roles are future roles that might prevent massive increases in unemployment that is perceived with automation.

1.2 Context of the study

History of Automation

The history of automation can be traced back to when primitive man created the first tools. The agricultural revolution followed, which then evolved to advancing to the development of the wheel and motor car vehicles; whereby the functional ability of the human race multiplied and it is at this point that machines started replacing human beings and productivity was no longer limited to human strength and ability (Datta, 1990).

Toffler and Alvin (1981) also talk about the timing of the various revolutions. Whereas the agricultural revolution took over thousands of years to reach its peak,

the industrial revolution took three hundred years, and the third revolution took a few decades to complete itself.

Datta (1990) describes the three stages of evolution of society. The first stage began with the individual being responsible for creating the total product from raw material to the finished product. During this stage, the products being manufactured differed slightly and that was attributed to the skill of the craftsman.

The second stage, which is the first industrial revolution, was galvanised by mechanisation, where the methods of production were characterised by the analysis of standardised goods. Toffler and Alvin (1981) also stated that the first industrial revolution came with mass distribution of goods instead of the customised production and distribution.

With the third stage of the development of the industrial society; production employees were no longer needed in high numbers but instead, a few individuals were required to monitor and maintain the machines and take control only in the case of a system breakdown or malfunction (Datta, 1990).

Research approach

This study first focused on the evolution of automation and the impact that it had on the unemployment levels. Secondly, the research highlighted how a variety of South African companies from different industries require their business processes to be constantly re-engineered and the provision of customer services that needs to occur in the most cost- efficient manner; as argued in the study by Nikolaidou, Anagnostopoulos, and Tsalgatidou (2001),

Nikolaidou et al. (2001) highlight that historically, the success and efficiency of these business processes had a strong dependency on a human operator. With the automation of processes and the direction that new technology is moving in and considering an earlier argument by O'Neill and Sohal (1999), that this high dependency on human intervention for the success of operational areas is expected to decrease and that the successful organisations will achieve these

gains in process reengineering through the use of technology. It is clearly a necessity that we get to build an understanding of the impact this may have on future job creation.

The majority of previous studies in this field however seem to have focused mainly on the automation of manual mechanical operational roles that are generally associated with the blue-collar worker. Since many industries operate in non-mechanical operational environments, the business processes that enable the provision of services to clients still have a level of human intervention.

As described by Nikolaidou et al. (2001), a Business Process is a collection of various activities that have a common objective that includes fulfilling a business contract or fulfilling a customer need. It is through co-ordinated operational functions, supported by human intervention, that the majority of operational departments are able to fulfil their customer demands (Nikolaidou et al., 2001).

Focus on operational efficiency

Several organisations have recently increased their focus on improving their efficiency in their operational areas. These efficiencies are driven by the organisations critically assessing their internal processes and assessing the levels of automation that can be implemented to reduce operating costs and improve customer experience.

Research done by Frey & Osborne (2013) and Holmes et al. (2016) investigated the likelihood of computerisation of 703 occupations in the United States and 40 countries. According to their estimates, 47% of the occupations in the United States have a high degree of automation that can be implemented, but they have varying probabilities of computerisation (Frey & Osborne, 2013) . Holmes et al. (2016)'s research further indicates that countries like India and China have sixty-nine and seventy-seven percent respectively.

With increased focus on improving efficiency in operational areas, has come increase in investments in IT infrastructure; and as a result, newer and better

technologies have come into existence and these are increasingly affecting various operations functions in businesses. These technologies can be retrofitted into existing technology infrastructure to eliminate manual, redundant and repetitive functions that are currently being performed by humans and as a result, creating a virtual work force (Lacity & Willcocks, 2015a).

South African context

The effects that were associated with automation had a dramatic and traumatic effect on the role of the individual, their skills level and their ability to be productive (Datta, 1990) and in the South African context, this automation is happening against the backdrop of high unemployment, inequality and poor levels of education in the workforce. According to Statistics South Africa (2016b) from a report that was released in February 2016; as of the last quarter of 2015, the unemployment rate was at 24,5%.

In South Africa, the concept of analysing poverty and the levels of inequality was first introduced by the First Carnegie Inquiry but that focused only on the “poor white” problem (May & Govender, 1998). It was only in 1983 that the Second Carnegie Conference held that focus was given to the black population in South Africa. May and Govender (1998) highlight that in 1993, more focus was given to the poverty line and inequality that existed in the country; this was indicated in the SALDRU report that highlighted the national living standards.

During this transition period, as stated in the May and Govender (1998) report, the policy makers were of the strong belief that government was seemingly constrained in terms of the decisions and actions that it could take regarding the promotion and the distribution of that growth. An inherent belief was that, by freeing up the markets and remove/ reduce state controls, the benefits would organically reach the poor through a trickledown effect (Banerjee, Galiani, Levinsohn, McLaren, & Woolard, 2008).

However, given the fact that the underlying institutional context has remained unchanged, the poor in South Africans have not benefited from the existing market-oriented macroeconomic policies (May & Govender, 1998). Considering

the high unemployment rate of 24.5%, South Africa has a need to increase the population's economic participation (Altman, 2015). South Africa is a middle-class income economy and in order for the structural mismatches to be reduced, the creation of wealth would require the maximum absorption of labour into higher skills and productivity sectors (Altman, 2015). A possible solution would be to rapidly up skill the population or increase the creation of new jobs that are aimed at low-skilled workers (Altman, 2015).

Through building an understanding of the dynamics of unemployment and inequality that exist in South Africa, this study aims to identify the various occupations that could possibly be eliminated in the near future due to automation, and the possible alternatives that these low skilled individuals could be up skilled to. By doing this analysis, the study sought to develop a basis for suggestions on how management can better prepare for future occupations.

1.3 Problem statement

1.3.1 Main problem

Due to the relative fast pace of implementing RPA, the main problem of the research is to understand the kind of impact that RPA will have on unemployment levels in South Africa. To assess and understand existing roles that have a relatively high degree of automation; how using RPA may impact those roles and the new roles that have been created from implementing RPA

1.3.2 Significance of the study

The gap in literature that this research sought to address is the focus of automation of white-collar workers as a topic that is perceived to be a futuristic activity, yet it is not. This is clearly highlighted by Autor (2015) where the research shows that such conversations have gained prominence from 2014 where certain MIT scholars discuss the unsettling image, and effect of automation on employment. Scholars such as Autor (2015) argue that the fast pace of digitisation will bring about major disruption. They contend that this disruption will be

influenced by the ever-increasing power of computers and the reduced need for human labour Autor (2015). Research previously conducted by Walker (2014) also argued that there has never been a better time in the history of evolution to be a worker with the right skill or education. In the same breath, there has never been a better time to have a generalist or ordinary skill; because computers and other digital technologies are acquiring some technical skills at an extraordinary rate (Autor, 2015).

The kind of occupations that could possibly be wiped out or augmented, present a dynamic in the South African economy that policy makers might not be able to handle; especially considering the current unemployment levels that they are struggling to control.

This study may give guidance to management for their strategic resource management process, as it will indicate the kind of future roles that have longevity due to their low level of computerisation.

The work by Goos, Konings, and Vandeweyer (2015) lends support to earlier work done by Nedelkoska (2013) that concluded that numerous individuals whose roles were automated ended up being re-integrated into employment but at roles that earned them at least 33% less than what they earned before the automation. This shows the thought process for management being generally focused on the retrenchment management process during the automation process, and not the up-skilling of the individuals. Considering the unequal distribution of income that exists in South Africa, the individuals that could be impacted by the automation can ill-afford to have further income cuts.

This study also looked to highlight the relative speed at which RPA can occur and therefore how agile companies need to be, to keep up with the pace of change.

1.4 Delimitations of the study

Due to the nature of the RPA technology, this research gives attention to industries that have high volume of back office operational activities that are supported by high numbers of activities with repetitive rules-based functions.

This included:

- Analysis of some operational areas in industries such as Shared Services, Banking and Insurance
- Roles that have a high probability of automation
- How the roles that had RPA implemented were augmented
- Rate of implementation of RPA in the different industries

The research excluded:

- Operational areas that require the application of cognitive judgement in the execution of tasks

1.5 Definition of terms

RPA	**Robotic Processing Automation** "Robotic process automation (RPA) is the application of technology that allows employees in a company to configure computer software or a "robot" to capture and interpret existing applications for processing a transaction, manipulating data, triggering responses and communicating with other digital systems" (Institute for Robotic Process Automation, 2016)
ML	**Machine Learning** A form of Artificial Intelligence that enables computer programmes to teach themselves to grow or successfully predict future activities based on historic events and change

	when exposed to new data (Baştanlar & Özuysal, 2014).
MR	**Mobile Robotics** A mechanical system that has the capability to move around in its environment in an autonomous manner and requires sensors that will assist it in its movement and learning about its surroundings (Jaulin, 2015)
FTE	**Full Time Employees** The number of individuals that would be required to successfully perform a function within an organisation (Institute for Robotic Process Automation, 2016).
BPR	**Business Process Redesign** The concurrent redesign of organisational processes and supporting IT systems to achieve radical improvement in time, cost and quality

Table 1: Definition of terms

1.6 Assumptions

The data collected included processes that have been successfully implemented and the benefits have been realised by the organisation. There was an assumption that the resources that would be included in the research have participated in projects that have successfully implemented RPA.

It is worth mentioning that at the time of this study, the levels of automation that has occurred in the South African context were limited, so the sample size for the study was limited. The researcher had to extrapolate from research and draw reasonable conclusions on the impact of automation.

CHAPTER 2: LITERATURE REVIEW

2.1 Background

This literature review sought to unpack the history of automation and the impact this has had on employment over time. The review also looked at painting a picture of the structure of unemployment in South Africa. Furthermore, the literature review looked to highlight what Robotics Process Automaton is and indicate the type of roles that have a high degree of automation.

Due to the long tail of technology, that Hurt et al. (2015) describe as the residual processes that have required human intervention; highly digital organisations have a high level of human facilitation that is currently being utilised in various operational areas to bridge this technology gap. This study explored the level of role augmentation that is likely to take place, which could either lead to job losses; reduction of certain functions in certain roles or result in the creation of completely new roles.

With the limited implementation that has taken place in the South African landscape, this research highlights the benefits that have been experienced through RPA implementation in other countries and \ indicates the type of roles that were impacted and the manner in which the automation has affected the selected operations areas.

2.2 History of Automation

Since the 19th century, there has been numerous indications and warnings that new technologies will wipe out a vast number of middle class occupations (Autor, 2015). One well known example is the Luddite movement where numerous English artisans objected to the automation of the textile production and attempted to destroy the machines that had been developed (Autor, 2015). The various stages of evolution impacted different industries at different paces and Lindsay, Downs, and Lunn (2003) articulate the history of automation by indicating that:

- the industrial revolution in the 60's, had a concentration on how to produce more (quantity);
- the 70’s the focused on the ability to produce the same goods at a cheaper price (cost)
- during the 80’s, an increased focus was on producing goods better (quality)
- the 90’s looked more into producing goods faster (lead time) and
- the 21st century has changed its focus to finding ways to offer more (service)

2.3 Introduction to Robotics Process Automation

2.3.1 What is Business Process Automation?

Having given the historical context of Automation, but before delving into what Robotic Process Automation is; it is important to first clearly articulate what Business Process Automation is, and the historical technological advances that have taken place in the industry.

Various scholars have defined the business process in different and sometimes contradictory ways. Jacobsen, Ericsson, and Jacobson (1995) describe business processes as activities that cut across traditional hierarchies and their successes are based on collaboration between groups or individuals, and do not focus on the product or service. They describe the customer-orientated process as focussing on meeting an individual customer need and no focus is given to the operations that arrive to the outcome (Jacobsen et al., 1995). This view is supported by Eriksson and Penker (2000) who state that a business process should focus more on how the work is performed as opposed to emphasising the product or service that is produced as a result of the activities.

There are however dissenting voices to this view of the business process, such as the more traditional meaning of a business process that is well-defined from the

Workflow Management Coalition (WfMC, 1999); where it is stated that a business process is one or more procedures that are linked to collectively achieve a business objective or goal.

WfMC (1999) further elaborates by highlighting that the business process is generally within the structure of the organisation with defined functional relationships and roles. This view is supported by Havey (2005) as well as Vergidis, Turner, and Tiwari (2008) who highlight that although there isn't a single universal definition of what a business process is; they view business processes as the distinctive step by step activities that are performed by an organisation to address a specific business problem.

In the field of Business Process Management, Lindsay et al. (2003) contend that during the last 20 years, there has been an increased focus to understand the business's key mechanisms to improve and sometimes change the performance of the company. ter Hofstede, van der Aalst, Adams, and Russell (2009) also add to this by highlighting that Business Process Management has increased productivity and savings significantly.

In the Jarrar et al. (2000) research, through the use of BPM, multiple industries were able to get a maximum of 66% automation. This high percentage of automation was experienced mainly in the banking sector where the public sector and universities experienced a 30% benefit.

The processes that have not been automated still required human intervention for the full processes to have the desired outcome (Jarrar et al., 2000). These processes that are managed through BPM have a reliance on human intervention in such a way that escalations are built into the system to monitor the built-in task deadlines (ter Hofstede et al., 2009). It is quite evident that through the use of Information Technology (IT), organisations have been able to further improve their business processes; resulting in improvements in the products or services that they provide to the customers (Surdak, 2016).

2.3.2 What is Robotics Process Automation (RPA)

It is worthy to note first up, that the recent increase in interest in service automation has been a key driver and has increased the uptake of RPA and Cognitive Intelligence (CI) tools. Jarrar et al. (2000), stated that many operational areas have long deployed enabling technologies like Enterprise Resource Planning (ERP's) to Business Process Management; and that the concept of automating processes is not a novel idea.

It is an oddity then that as late as 2016, the most common understanding of the term "robot" is Mobile Robotics; which are mechanical systems that have the capability to move around their environment in an autonomous manner and require sensors that will assist in movement and learning about the surroundings (Parker, 2016). Another understanding is the robots that participate in the manufacturing assembly line or loading of cargo from ships etc. (Brown, Roehrig, & Malhotra, 2015).

Brown et al. (2015) add that there are new technologies, where office bound workers are beginning to work smarter with sophisticated automation technologies that perform business processes as the human would. When these business processes are automated, it results in rich process data that enables management to acquire meaningful insights and value for their organisations (Brown et al., 2015). This type of software automation technology comes in the form of RPA. For ease of reference for this research, the reference to of the term "Robot" refers to one software licence.

In its simplest from, RPA is software that enables non-engineers to configure enterprise-safe business process automation that was previously performed by people. Slaby (2012) together with Surdak (2016) argue that RPA automates the steps that are between already-automated processes; these steps were historically performed by humans. Chandu (2016) in agreement with Brown et al. (2015), further defines RPA as the process of automating clerical processes using software technology that can replicate/"mimic" the desktop processes that are performed by office workers. The configuration of the automation is performed

within the end-user environment to capture and interprit existing application data to execute manual, repetitive tasks.

Surdak (2016) agrees with Chandu (2016) where the research further elaborates that businesses are looking into possibly replacing the low-value adding jobs with RPA software with the goal of improving the quality and speed of the organisational outcome. A simplistic example used by the research performed by Lacity and Willcocks (2015b), is one of a human resource specialist who is incharge of onboarding new employees. This HR function generally involves logging on and off multiple systems to setup a new employee with benefits , payroll, parking,business cards etc. If one were to multiple that function by hundreds on onboarded employees, the role can be tedious due to its repetitive nature. By implamenting RPA, the software can be configured to perform all this work that the HR specialist did Lacity and Willcocks (2015b),.

Figure 1 below is a depiction of where the human would be placed and where the software robot could potentially teplace the reprtitive work performed:



Figure 1: Process ideal for RPA (Lacity and Willcocks (2015b)

RPA has three distinct features:

1. <u>RPA is software that can be easily configured:</u>

Using a definition by Stall (2008), who states that coding requires knowledge in one or another programming language like C#, JavaScript, SQL etc. yet configuration implies using institutional knowledge of an organisation and domain/software to alter an application to achieve the desired results.

Slaby (2012) , Lacity and Willcocks (2015b) say that RPA technology is software can be **easily configured** to replicate the functions and activities that were previously performed by humans with no prior development or technical experience.

If one looks at the distinction highlighted by Stall (2008), between Coding and Configuration; it is clear why Troy (2016) disputes this notion of business independently deploying RPA without collaborating with the respective IT departments as it will create chaos. Case in point; Troy (2016) highlights that even writing a macro on excel is not that simple.

Table 2 below shows the difference between implementing RPA software compared to using Business Process Management software. Some of the key differences as shown on Table 2 is that Component re-use is very high in RPA, with modest development skills required; whereas IT Development via Business Process Management (BPM) require extensive development skills and the component re-use is hampered by high costs. Lacity and Willcocks (2015b) clarify that RPA does not replace BPM but rather be used a complementary software as the two technologies are utilised to automate different types pf processes.

Issue	Robotic Automation	IT Development via SOA and BPM
Development skills required to address new business unit requirements	Modest; can be done by process modelers and analysts with a few months of training with robotic automation tools	Extensive; requires software architects and engineers with years of experience with relevant programming languages, BPM tools, and enterprise application suites
Development methodology	Lightweight; takes advantage of the presentation layer of existing applications and their underlying logic and security	Heavyweight; requires complex application-layer integration or potentially brittle data-layer integration
Component re-use	High; functions can be reused to develop new robots	High, though comparatively expensive to develop

Table 2: HfS Research 1

2. <u>RPA software is non-invasive:</u>

Due to the nature of the configuration, Lacity and Willcocks (2015b) together with Troy (2016) conclude that RPA software **is non-invasive.** Another term that can be used to describe RPA is “lightweight” IT. This is a description used by Lacity and Willcocks (2015b) to aptly describe the software as it is a front-end, commercially avaialble software that can support processes that is generally adopted outside the control of the existing IT department. It is merely a presentation layer that is placed on top of current business systems. It can access other software in the same manner as a human would, with user ID’s and passwords.

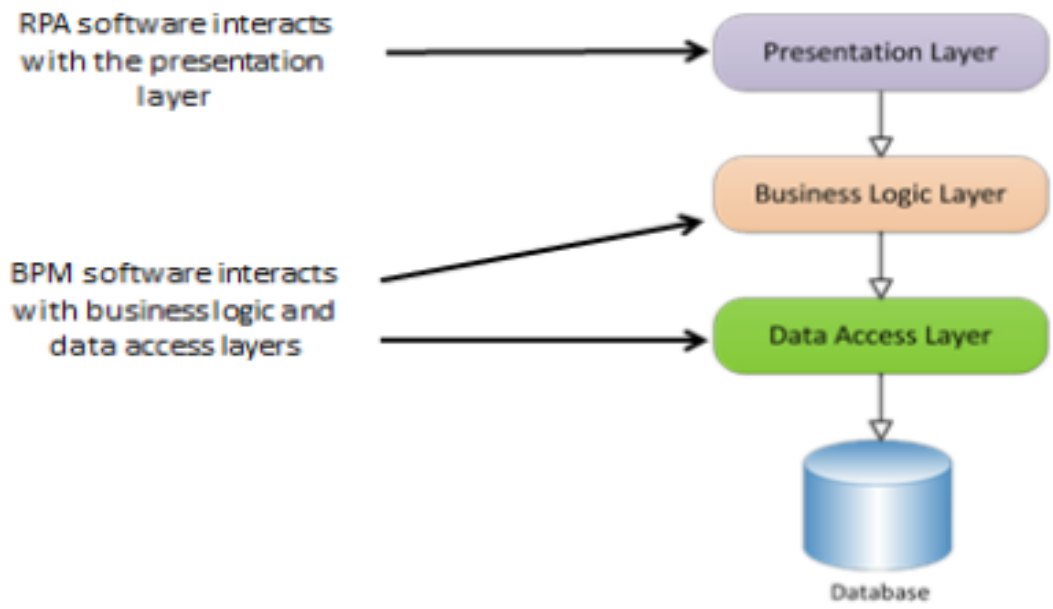


Figure 2 RPA as "lightweight IT"(Lacity and Willcocks (2015b)

3. Enterprise-safe:

RPA technology is **enterprise-safe,** as it is a platform that has been designed to meet enterprise IT requirements for scalability, security, change management and auditability (Institute for Robotic Process Automation, 2016). The RPA “robots” are centrally monitored, deployed and scheduled using an interconnected security models (Slaby, 2012). This is one of the fundamental differences between RPA and the dated scripting functionality that is locally deployed using local desktops.

As indicated by Lacity and Willcocks (2015b), there are currently many products that have been in the market that resemble the functionality of RPA technology; these include the use of **macros, scripting and screen-scraping**. Hartmann, Doorley, and Klemmer (2008) previously described these products as ones that can record what the user is doing on their computer and capture the mouse clicks and keystrokes and playing them back by simulating the mouse and keyboard events.

Macros and the like, however have one fundamental flaw in that they can only simulate input and cannot read the application display or condition their behaviour based on the state of the application (Hartmann et al., 2008). Hartmann et al. (2008) state that a big drawback to this is that interpretation of the data from the desktop application is quite hard. The Institute for Robotic Process Automation (2016) agree with this assertion and further state that as the product is running in the business process, the organisation is unable to track where in the process the program is running and the programs cannot be deployed in large business processes. Jerry Luftman and Frank Casale (2014) together with the Institute for Robotic Process Automation (2016) argue that these technologies do not offer the functionality to re-purpose for other processes like RPA technology and are best utilised as desktop assistants.

Another type of software that is similar to RPA technology are **Software Development Kits (SDK)**. Catuhe (2012) defines SDK as a set of software tools that allows developers to create applications for a certain software package. SDKs allow opportunities to develop localised “robots” that have a main focus in individual scripts that provide localised transaction support. When configuring, experienced development teams create profiles that are linked to roles and users. SDK’s unfortunately do not offer the opportunity for multi-purposing, multi-configuring, load balancing, management information and audit trails that are associated with RPA technology (Thoughtonomy, 2016). Chandu (2016) argues that RPA is also not an alternative solution for Enterprise Architecture (EA). However, it can be used to bridge the existing gap between the technological Enterprise Architecture and the End User.

2.3.3 Establishing a competitive advantage

In as far back as 1985, Porter and Millar (1985) stressed the importance of investing capital in technology; as executives realised that the technology could no longer be exclusively taken care of by Information Systems departments and the use of information can be a form of competitive advantage. Porter and Millar (1985) further stated that the information revolution affects industry structure and

alters the rules of competition as it created a competitive advantage that gives companies new ways to outperform their competitors.

Another manner in which competitive advantage can be created is by improving the manner in which organisations design their business processes (O'Neill & Sohal, 1999). As an extension from the Porter and Millar (1985) research on competitive advantage; O'Neill and Sohal (1999) say that customers are segmented and very diverse in their needs and require more consultative services and this has resulted in an intensified competition to meet those needs. O'Neill and Sohal (1999) argue that because of this, organisations need to increase their flexibility in the processes to create and maintain that competitive advantage. The concept of unearned brand loyalty is a concept of the past and O'Neill and Sohal (1999) contend that companies can no longer pass operational expenses on to the consumer.

Bergeron (2002) highlighted that organisations have for a long time been under tremendous pressure to improve their organisational performance and many managers are grasping for ways to improve their bottom line while simultaneously increasing their competitiveness. Managers also need to be cognisant of the fact that revenue and economic success has to be achieved through applying appropriate business models and not simply though smoke and mirrors that come packaged in innovative business plans (Bergeron, 2002).

Managers have also been forced to analyse their business practices and evaluate where business process standardisation can be achieved (Bergeron, 2002). Some have tried strategies such as outsourcing but due to the limited benefits that have been associated with the implementation of outsourcing, some organisations centralise their functions and services (Bergeron, 2002). With increasing volumes through the growth of organisations and centralisation of functions and services; Surdak (2016) highlights that the humans that have been tasked to perform the business enabling activities have increasingly become a limiting factor to the improvement of the processes that they perform.

Some organisations have appreciated that through the use of Information Technology (IT), organisations have changed what they do or even how they do it.

One of the business components that Ward and Peppard (2016) pick out as having been heavily transformed is Business Process redesign. This has allowed organisations to realign their activities to achieve performance breakthroughs.

The concept of process automation is not new, from the use of Kaizen to outsourcing; organisations have tried to make their business more efficient and less expensive. Bergeron (2002) and Surdak (2016) state that the introduction of service automation in the business operations has allowed businesses to have control over the automation; and in the case of RPA, without fully relying on IT resources for the deployment.

With the existence of RPA enabling technology, Ward and Peppard (2016) emphasise that organisations can ill afford to not have the right Information Technology and Information Systems strategy. Organisations need to analyse where they are with their IT/IS capabilities in the context of the current economic climate and business environment (Ward & Peppard, 2016). Apart from creating and assessing the strategy, they need to ensure that it will create new strategic options and direction (Ward & Peppard, 2016).

Ward and Peppard (2016) highlight that there are several factors that affect the pace and effectiveness of progress in using IT/IS and these factors ultimately affect the delivery of operational and strategic objectives. The factors include:

> The capabilities of the technology and the applications that are feasible,
> The economics of acquiring provisioning, deploying and maintaining the technology: application, service and infrastructure;
> The skills and abilities available, whether in-house or from external sources, to design and implement applications and
> The skills and competences within the organisation to use the application and information (Ward & Peppard, 2016, p. p.2)

Surdak (2016) further adds that the systems that are currently used to process data have grown so powerful that the processing of data takes little to no time, yet these steps are performed by humans and this has a great effect on the organisational process in using IT.

By implementing RPA, organisations change the manner in which they perform their processes. In a case study observed by Slaby (2012), a business that focused on citizens applying for national government insurance successfully implemented RPA where 12 Full Time Employees who took an average of 15 minutes to complete a process had the process automated which resulted in a new handling time of 4 minutes. The payback period for implementing that RPA solution was six months. This kind of change in the business processes almost inevitably results in “business network redesign” efficiency.

Ward and Peppard (2016) point to the fact that organisations are now changing the way that they use information which results in a change in how they carry out the value adding processes. One of the outcomes of running an organisational process through RPA is the availability of data that was not easily retrievable in the minds of the individuals who were involved in the processes.

In Table 3 below, Ward and Peppard (2016) refer to the augmentation of human cognitive processes in order to support strategic decision making. Historically, the objective of deploying IT has always been to support the decision-making process.

Purpose / Focus	Operational efficiency	Management effectiveness	Knowledge discovery	Business advantage through change
Internal	Data processing—automation of business tasks and processes	Management Information Systems (and ‘Executive Information Systems’)	Generating new knowledge and understanding about existing business	Internal business integration by process, job and organization redesign
External	Electronic links between organizations automating data exchanges and interaction	Sharing information by direct access from one company to another's information resource	Generating new knowledge and understanding from/ combining with external data	External business integration, changing the roles of the firms in the industry

Table 3: The augmentation of human cognitive processes to support strategic decision-making

Further analysis of Ward and Peppard (2016) indicates that the success of an IS/IT strategy is linked to adding value to the clients, and not only reducing the

cost of doing business or the product. This strengthens the argument by Surdak (2016) that by implementing RPA, organisations have experienced a competitive advantage over their competitors due to the improved service levels which resulted in improved pricing.

The work done by Slaby (2012) and Ward & Peppard, 2016, shows that even though IT was historically seen as a mechanism of increasing efficiency which resulted in reducing costs (doing the same thing but cheaper), it is not the only way to succeed. Their work has shown that digital strategies in the 21st century need to be able to fuse business knowledge with IS/IT knowledge. The key is to have strategies that are flexible and reusable and have effective processes for implementing them. The implementation of RPA technology needs to be imbedded in the organisational IS/IT strategy to have the full effects of implementation.

Through the introduction of these technologies, organisations have been able to attain higher levels of process efficiency. This has resulted in reduced operational costs of 20% to 25%, accuracy, speed and an increase in throughput volume, with one of the key features of the RPA technology being its scalability (Chandu, 2016). The Institute for Robotic Process Automation (2016) argues that the early adopters of RPA technology are doing a better job at handling complex process opportunities.

In several case studies done by Slaby (2012) and later by Craig, Lacity, and Willcocks (2015d), they also observed that early adopters of RPA achieved multi-faceted organisational results which includes:

- reduction of Full Time Employee`s (FTE) - organisations can do more work with fewer resources;
- the quality of service that is provided increased, as the RPA technology will execute a task in the exact sequence that it is configured in;
- the speed in which the service is provided increased exponentially and
- The remaining FTE experienced an increase in job satisfaction as their responsibilities were refocused to tasks that required judgement and social interactions.

This notion of refocusing humans was further supported by Casale (2014) that shows that organisations that employ RPA tend to re-allocate and redeploy people to high-value adding roles that require the ability to empathise and apply value judgement.

Some of the observed organisations were able to deliver 24-hour service to their clients and improved compliance (Institute for Robotic Process Automation, 2016).

Chandu (2016) further lists the benefits of implementing Robotics Process Automation by showing that RPA can streamline the processes that are performed by the various users which results in improved efficiency. The time that it takes to process a transaction is then decreased, without the skipping of process steps.

These benefits that have been identified by the early adopters indicate that it won`t be the strongest, biggest or most intelligent organisations that will survive this 4th industrial revolution, but those who have the highest ability to adapt to change.

2.3.4 Impact on IT systems

Slaby (2012) pointed out that the one the major benefits of RPA being a presentation layer, is that it eliminates the costs generally associated with IT deployment projects.

Lacity and Willcocks (2015b) highlight that it is worth noting that the benefits of early adoption of RPA technology can only be achieved when:

1. the strategy of service automation is driven from an executive level;
2. it needs to be controlled by the business operations (not an IT function),
3. there needs to be efficient talent redeployment and
4. Effective change management to prepare the organisation with the changes that are associated with automation.

As previously stated, an RPA robot is not a physical robot but virtual employee that can be infinitely scalable. These robots are then taught the software rules and can mimic the way a human would have interacted with the underlying software Lacity and Willcocks (2015b).

In what is somewhat a bit of a contradiction about the involvement of IT; Troy (2016) states that IT needs to responsible for the provisioning of servers; ensure that the safety of the technology is maintained and make sure that the solutions are well designed from an architectural point of view.

One of the fundamental reasons around the high benefit that is associated with RPA deployment, is the universal enterprise challenge that faces most if not all large organisations (Institute for Robotic Process Automation, 2016). Figure 3 below illustrates the current need for humans to intervene between multiple technologies that are utilised by the organisation. Figure 3 shows how Institutional data is moved from one system to another to ensure that service delivery occurs (Lacity & Willcocks, 2015b).

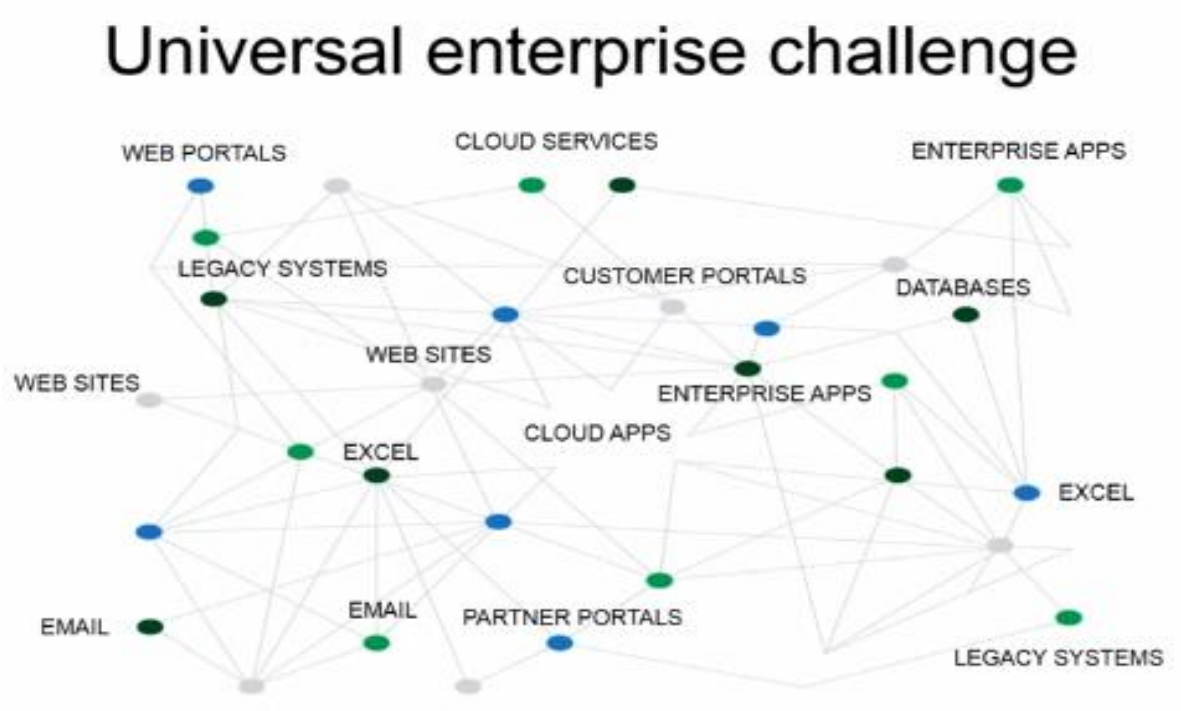


Figure 3: The Universal Enterprise Challenge (Institute for Robotic Process Automation, 2016)

Digital transformation

About 115 organisations that were interviewed by Lacity and Willcocks (2015b) put forward the primary reason behind adopting new technologies as the need to enhance the integration of business operations across functional restrictions. Troy

(2016) explains that one of the reasons why most companies failed to completely digitise their organisations was due the high costs that existed at the time or that the processes were either too complex and time-consuming. Lacity and Willcocks (2015b) and Troy (2016) agree that RPA is the next transformation lever in process automation and efficiency.

2.4 Effects of RPA on Unemployment levels

2.4.1 South African Unemployment

One of the most pressing issues that face South Africa is the absence of sustainable job-creating economic growth, which is essential to reduce the poverty and improve living conditions (Lewis, 2001). The low investments rates coupled with increased outflows of FDI has resulted in South Africa finding itself at a disadvantage in the increasing competitive global environment (Lewis, 2001). To excarcebate the situation even further, due to the low skilled labour surplus available and a capital-orientated investment need, South Africa is faced with a challenge of high unemployment, slow employment growth and high earnings inequalities (Altman, 2015)..

Both May and Govender (1998) and Altman (2015) agree that South Africa is a middle-class income economy in terms of per capita income. But due to the prevailing high levels of inequality, most South African households experience abject poverty (May & Govender, 1998).

Since the 1980's, informal and unskilled labour was absorbed by the mining and agricultural sector. But since the 1990's, there has been a large uptake of unskilled to semi-skilled labour into the services industries Altman (2015) and this has been a major contributor to growth and employment. Despite South Africa`s macroeconomic success, one of South Africa's socio economic challenges is reducing the unemployment levels, as South Africa has one of the highest rates of unemployment in the world (Altman, 2015).

Through the 1990's, formal employment rates have gradually dropped and Lewis (2001) even though South Africa is a middle-income economy, the vast majority of

the population does not have the skills that are needed.. The fact that 96% of the unemployed population have been reported to have a high school education or less is concerning (Altman, 2015). Coupled with that, 60% of the working population do not have a matric (Altman, 2015).

One other structural feature that exists in South Africa is where one end of the country is highly urbanised while the other half is rural with a relatively small rural sector and informal sector (Lewis, 2001). This means that South Africa lacks two standard labour “shock absorbers” that come into effect in other economies during times of adjustment.

In order for the structural mismatches to be reduced, the creation of wealth would require the maximum absorption of labour into higher skills and productivity sectors (Altman, 2015). A possible solution would be to rapidly up skill the population or increase the creation of new jobs that are aimed at low-skilled workers (Altman, 2015).

The below table was extracted from Statistics South Africa (2016b) Quarterly Labour Force survey where a study of the the industries that could possibly be impacted by the implementation of RPA was conducted. This busines service industry includes Financial intermediation, insurance, real estate and business services (Statistics South Africa, 2016b) and accounts for 22.7% of the employed population in 2016. This is the industry that this reearch has found to be ripe for RPA implementation and success.

Industry	Dec-2015	Sep-2016	Dec-2016	Q/Q Change	Q/Q Change	Y/Y Change	Y/Y Change
					%		%
Mining	459	458	455	-3	-0.7	-4	-0.9
Manufacturing	1185	1178	1191	13	1.1	6	0.5
Electricity	61	61	61	0	0.0	0	0.0
Construction	585	610	599	-11	-1.8	14	2.4
Trade	2062	2051	2119	68	3.3	57	2.8
Transport	472	458	457	-1	-0.2	-15	-3.2
Business Services	2181	2164	2197	33	1.5	16	0.7
Community Services	2595	2692	2611	-81	-3.0	16	0.6
Total	**9600**	**9672**	**9690**	**18**	**0.2**	**90**	**0.9**

Table 4 Employment by Industry (Statistics South Africa, 2016b)

2.4.2 Man vs Machines

Historic supporters of the free market economy like Mill (1864) have questioned the notion that mechanical inventions at the time; really lightened up the day's work load of human beings or whether it created fertile ground for more exploitation and unemployment. This is bolstered by more recent research such as that by Noble (1995) and Campa (2014), who argue that decades after the "information revolution", humans are working longer hours under worsening conditions with less skills, less benefits and less pay.

The work by Campa (2014) seems to highlight that the development of Information Technology has managed to deskill and displace humans. Campa (2014) also adds however, that even though many scholars have admitted to many workers being expelled from a sector due to automation, they soon get rehired or absorbed into other sectors.

The main competitive advantage that humans had was their muscles and brains and Walker (2014)'s research highlights how history has evolved in such a manner the competitive advantage of "muscle" that humans had, has diminished and point to the current evolution of intelligent "office" work is being replaced by artificial

intelligence. New jobs that have not yet been thought of will arise; the requirement of human intelligence will also diminish Walker (2014).

Walker (2014) further highlights that the existence of Moore's law that talks to how computers get more powerful and cheaper every year. The evolution of technology, together with its decreasing cost, will result in the reduced need for human mental capacity as this appears to be increasing in its costs (Walker, 2014). This then places the cost advantage with computers and automation, which could result in a deceased demand for human mental labour. Furthermore, M. C. Lacity and Willcocks (2015a) also add that 50 years after the term of "knowledge workers" was established, it is quite astonishing how little of their knowledge is utilised.

Large organisations have taken the responsibility to think away from the workers to technologies, resulting in individuals spending a substantial amount of time focusing on the semantics of the technology. This includes users being trained on various Enterprise Resource Planning (ERP) systems, Customer Relationship Management (CRM) and e-commerce solutions. Brown et al. (2015) indicate that at the time of doing their research, RPA technology had been implemented in 537 organisations in North America and Europe, in industries ranging from insurance and banking to healthcare.

There was an underlying trend that Brown et al. (2015) established, which includes the capability to materially automate what people can do, where the potential to unlock the meaning of data through the use of process analytics was unearthed. Brown et al. (2015) go on to argue that the type of automation that is performed by RPA technology will result in process data that enables organisations to derive rich and meaningful insights into their business.

It would appear that through the implementation of RPA, there will be an increase in the utilisation of the knowledge from the "knowledge workers" that (M. C. Lacity & Willcocks, 2015a) referred to. Rifkin (1995) had earlier argued however, that it would be naïve to believe that these "knowledge workers" will naturally qualify for these limited higher order occupations like data/ computer scientists and computer programmers.

To illustrate this conundrum on the utility of “knowledge workers” in the 21st century; it is in the use of the term “robot”, which is used to emphasise the utility of a machine that replicates/ replaces the activities of a human. Thoughtonomy (2016) add that 1 “robot” equals to 1 software licence in a RPA platform that can execute tasks that are equivalent to two to five humans, depending on the process being replicated, this could be more.

Figure 4 below illustrates how the software robots could possibly work alongside humans:



Figure 4: How humans will work could work with RPA (Institute of Robotics Process Automation, 2016)

A previous study conducted by Frey & Osborne (2013) argues that it is possible to automate almost any tasks provided that enough data is gathered to recognise any kind of pattern. This study also highlighted current limitations to automation and in the main; these limitations are in the form of social intelligence. The bottlenecks that exist in the 21st century will certainly influence the pace that automation can be implemented. This work is supported by Holmes et al. (2016) who conducted research that further confirmed the existence of bottlenecks in the form of perception and creative intelligence.

The research by Holmes et al. (2016) highlights the importance of understanding which type of roles have a high or low probability of automation, and until these bottlenecks are reduced or eliminated, there are jobs that simply cannot be automated in the near future. By understanding that, we can then build an understanding of the possible impact that RPA might have on the unemployment levels.

Frey & Osborne (2013) also say that history has shown that, in the process of technology substituting labour, the destruction effect requires workers to shift their labour supply. This leads to more companies entering industries that have high productivity which results in those industries expanding (Holmes et al., 2016). This may be seen as one other positive impact of automation.

2.4.3 Evolving Labour

An earlier case study by M. C. Lacity and Willcocks (2015a) showed that some organisations deployed over 300 robots that could process 3 million transactions per quarter, for work that that was traditionally performed by 600 people. In that particular case study, only two humans were required to manage the robots. This was also evident in Brown et al. (2015), where it was shown that automation has empowered business to be able to “work smarter” while utilising less employees.

The main take away from the various case studies is that as the capital expenses of investing in RPA technology decreases, organisations will increase the number of robot to human interactions that will enhance the service offering of the company. This is something previously highlighted by Walker (2014).

From the face of it, it would appear that the implementation of RPA technology might result in mass reduction of employment. The concern around technological unemployment however is not a new phenomenon. Over the past decades, the concept of creative destruction which was followed by technological inventions has resulted in an increase in wealth but also came with undesired disruptions (Frey & Osborne, 2013).

Frey & Osborne (2013) contend that these occupations that have experienced high levels of automation include jobs that follow a well-defined process and routine steps that can be replicated by sophisticated algorithms. This type of computerisation of occupations has resulted in workers being reallocated from middle-income manufacturing occupations to lower level (lower income) service occupations (Frey & Osborne, 2013). This stance is also supported by Smith and Anderson (2014) when they state that industries will adapt, resulting in the invention of new types of work that will take advantage of uniquely human functionalities.

The concept of positions not being created by existing organisations was discussed by Walker (2014) in research that highlighted the need for double digit economic growth, which is greater than what is currently experienced, in order to prevent an increase in unemployment. Based on the Statistics South Africa (2016a) report, South Africa's economy has expanded by 0.7% year-on-year in the last quarter of 2016, where the real domestic product decreased by 0,3%.

Figure 5 below depicts the growth patterns year-on-year in South Africa from 2014 to 2016.

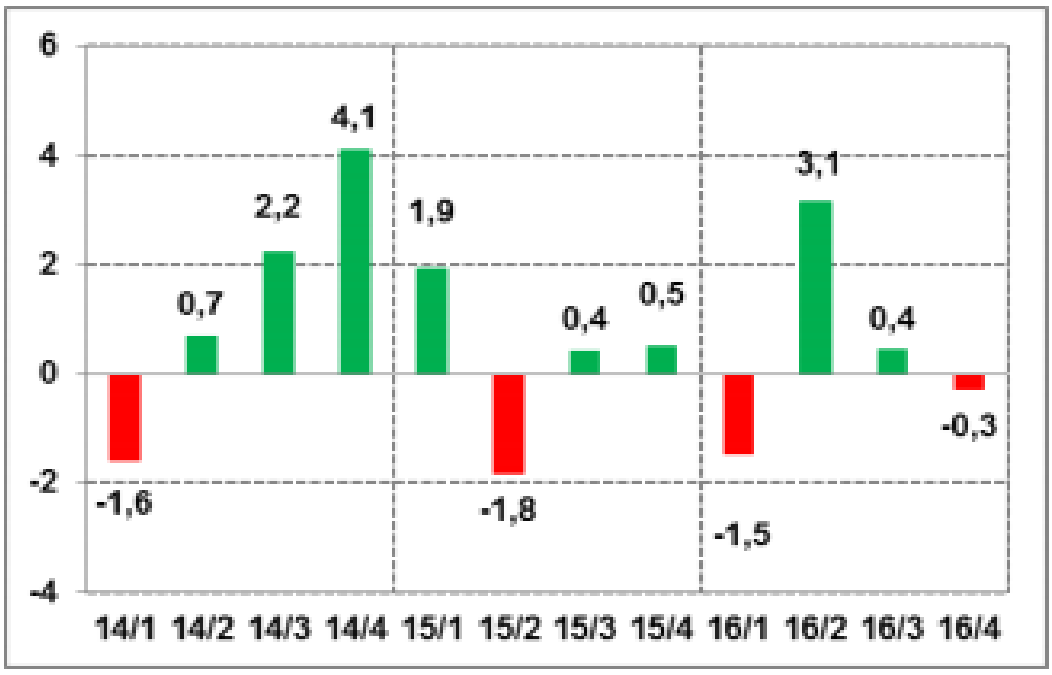


Figure 5: South Africa's GDP growth Statistics South Africa (2016a)

Apart from the low economic growth experienced in South Africa, there is another issue of concern that was raised earlier by Smith and Anderson (2014), such as the fact that certain highly skilled workers naturally succeed in new economic environments, but far more people will be displaced into lower paying service industries at best and poorly skilled individuals will become “permanently unemployed” at worst.

This is in agreement with Frey & Osborne (2013) who say that this shift in the labour market will result in an increase in the employment of high-income cognitive occupations and low-income manual occupations. They argue that this leaves a substantial gap in the middle income of routine occupations and with the vast number of the current jobs being displaced by 2025.

Smith and Anderson (2014) add that the future of robotics and artificial intelligence will result in an increased income inequality, which could lead to breakdowns in social order.

Troy (2016) argues that in the case of RPA implementation, business employees can be upskilled by virtue of the organisation utilising RPA technology; and that the automation of these jobs that Smith and Anderson (2014) refers to, will require someone to code and build the new tools which will lead to a new wave of innovative jobs. His argument is that; not only will these employees need to learn the technology but will be required to follow the same delivery methods that are followed by their IT department.

Though history informs us that there is little to concern us about the increase in automation, Frey & Osborne (2013) found in their study, that the demand for skill over the past decade has decreased even with the increase in supply of skilled and educated labour. The skilled labourers are seen to take on more occupations that are associated with low skilled labour and this has resulted in low skilled labour being pushed down even further on the occupation ladder and sometimes even out of the labour force (Nedelkoska, 2013).

One of the biggest reasons as to why this current wave of automation is of particular concern is that in addition to the availability of big data, which has led to an increased development in technologies that have high capabilities of substituting humans; the costs of technology and computers continues to fall and the costs of labour is continuously increasing (Frey & Osborne, 2013). Apart from cost, Smith and Anderson (2014) argue that the previous waves of technology occurred at a slower pace and unskilled labour had the opportunity to naturally gravitate to new skills.

The adoption of technology in previous waves was experienced in stages, and at different times in different industries (Smith & Anderson, 2014). The current uptake of white collar automation is being experienced in various industries at the same time, and Smith and Anderson (2014) state that the concept that we define as "work" may change significantly in the coming years.

The World Economic Forum (2016) report cites automation as a risk (of unemployment or underemployment) for doing business, as it has the ability to hold back job creating economic growth and threaten social stability. The report indicates that the expected growth is largely concentrated in occupations that today's population is not adequately equipped to participate in.

In 2016, there was a high mismatch between the skills required by our fast changing jobs market and the World Economic Forum (2016) report shows that structural unemployment has remained a major issue since the 2008 world economic crisis; and that even where some countries have experienced economic growth, it has largely remained jobless growth.

With the technological advancements moving towards automation, the World Economic Forum (2016) report projects that by the year 2020, nearly 50% of all current occupations will be affected by the advances of Robotics and Machine Learning.

2.4.4 Roles that could potentially be impacted by RPA

The relevance of RPA range across multiple systems, processes and operating models (Prangnell & Wright, 2016). The more mature an operational area, the higher the benefits that can be achieved through implementing RPA.

Research conducted by Prangnell and Wright (2016) can be summarised in Figure 6 below:

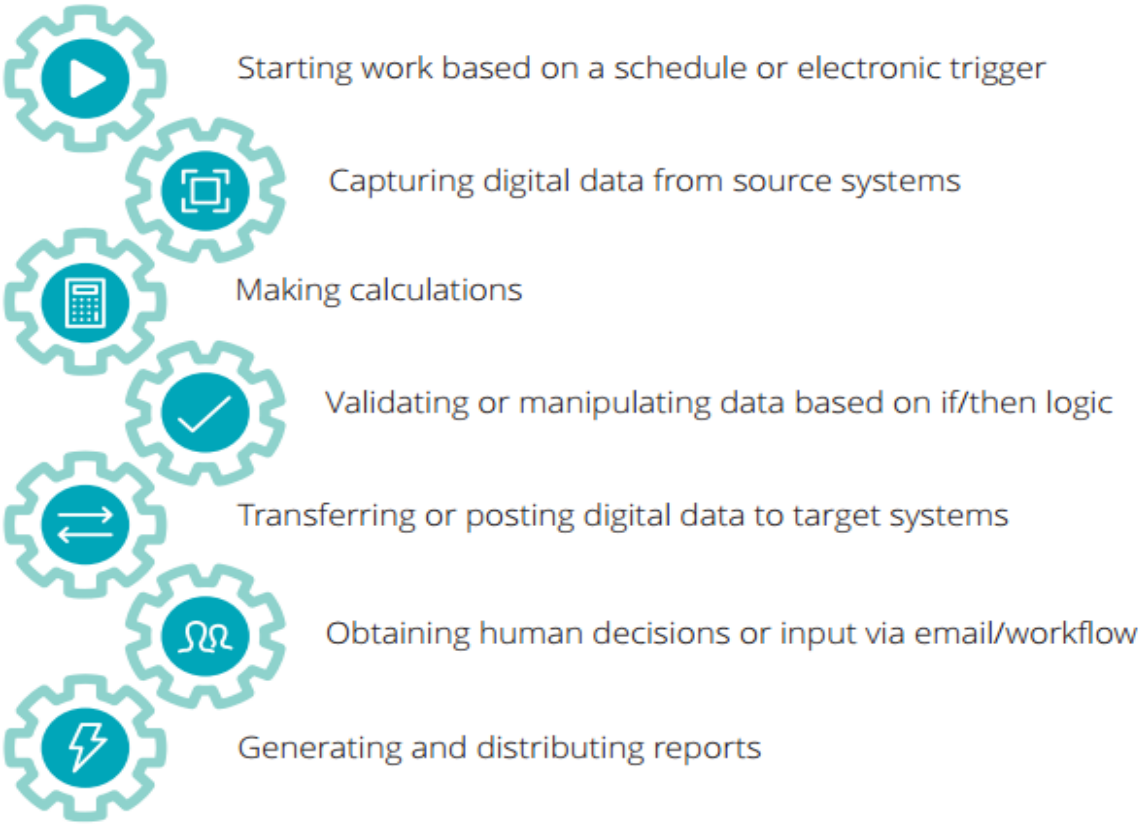


Figure 6: Roles that could potentially be impacted by RPA: Prangnell and Wright (2016)

Figure 6 only highlights the type of operational environment that is ripe for RPA implementation. Frey & Osborne (2013) conducted a study on the probability of computerisation of 702 occupations in the US. The study estimated the impact of future automation by analysing the relationship between an occupation`s probability of computerisation, the wages linked to that occupation and education attainment. From that study, an estimated 47% of current US jobs are at risk of being obsolete.

Frey & Osborne (2013) and a study that was conducted by Holmes et al. (2016) using data from the World Bank, showed that the susceptibility of automation in other countries is much higher than the US. These numbers range from 69% to 77% in India and China respectively.

Later research by Chui, Manyika, and Miremadi (2017), that performed a detailed investigation at 46 countries which represent 80% of the global workforce. Their research looked into the potential of automation of work individual work activities as opposed to looking into the occupation as a whole. Chui et al. (2017) indicate that 1.2 billion full time employees with $14.6 trillion wages that are associated with those activities are automatable with current technologies.

The Institute for Robotic Process Automation (2016) concluded that the computerisation of non-routine occupations like legal writing to medical diagnosis can be automated and the process that involves persuading another individual will have a low possibility of automation. This was further validated by Holmes et al. (2016) and their research further highlighted that the increasing advances of Artificial Intelligence which includes Machine Learning, has increased the possibilities of automating non-routine work. The automation of non-routine work is achieved through software that can monitor office workers and learns from them (Holmes et al., 2016).

The rapid advances in RPA has contributed to the managerial mantra of reducing expenses through driving process improvement. Now that the “Robots have arrived”, the use of intelligent automation through RPA technology seems to be the next wave in gaining efficiencies through automation (Brown et al., 2015). Yet the executives that were part of the study that was conducted by Brown et al. (2015) predicted that the number of processes that will require direct, daily interaction will contract significantly.

Figure 7 shows the landscape of automation in 2015 based on 102 healthcare payers, 115 PC & L Insurers and 153 banks (Robert Hoyle Brown, 2015). Figure 7 highlights the potential that RPA has to automate existing occupations.

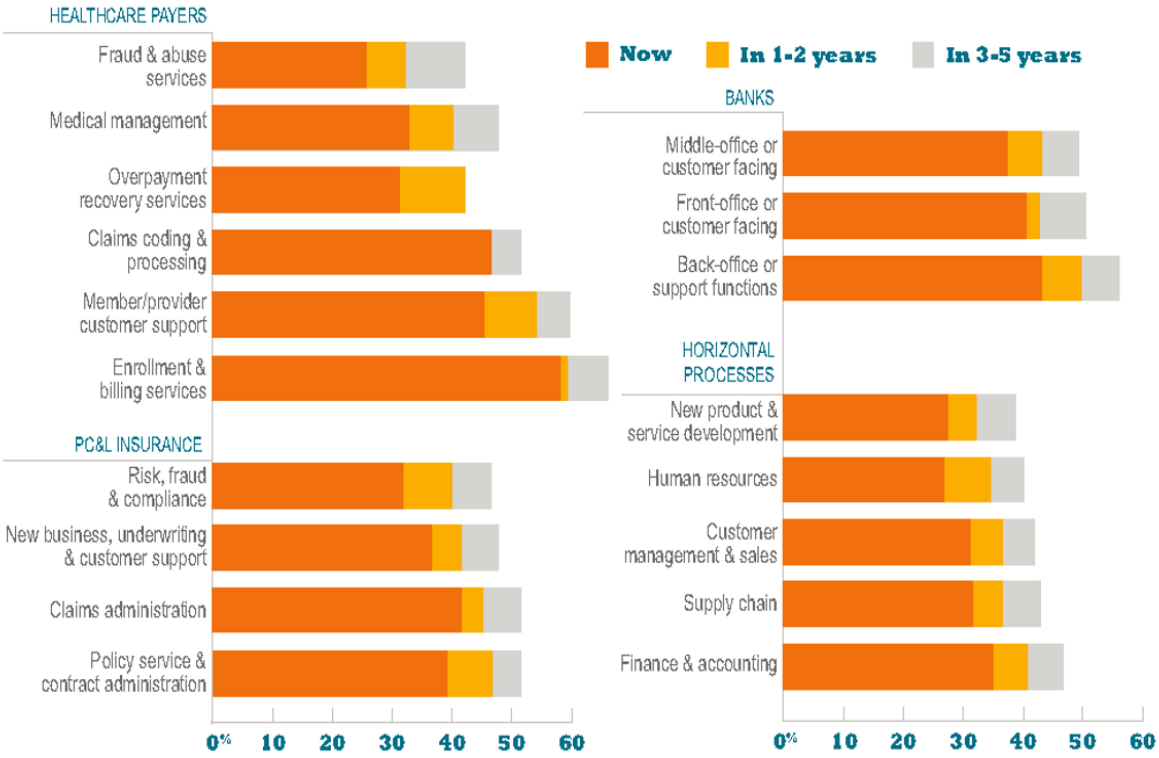


Figure 7: landscape of automation in 2015 (Brown et al., 2015)

Though many companies still invest heavily in Enterprise Resource Management (ERP) and Business Process Management (BPM), none of these technologies can increase automation that mimics human interactions like humans do, like RPA technology (Brown et al., 2015). There is the long tail of process activities that has not been automated by core business systems. Brown et al. (2015) indicate that through the deployments of such technologies; workarounds were developed which entailed manual inputs, to enable to systems/processes to process. These types of workarounds are generally routine in their nature and can be replaced by "robots" (Brown et al., 2015).

2.4.5 Making the swivel chair obsolete

Many processes in organisations are already technology-rich, yet they are still people-intensive (Brown et al., 2015). Users tend to move from one system to another to achieve that last-mile, to integrate data. Troy (2016) states that many

organisations are built on these processes where humans click multiple systems, getting data from one source and putting it into another.

This type of work is eliminated by RPA technology as the process will be converted into a straight-through process (Brown et al., 2015). Due to the scalability of this technology, the need for people-based processes is further reduced by the value- and rule-based logic of machine learning and artificial intelligence (Brown et al., 2015).

Among industry veterans, it is suspected that the highest levels of reduction in head count will be experienced in the banks; and Brown et al. (2015) say that the banking industry has increased their need to automate their processes so as to improve their customer service. The banks will see a standardisation of their processes; they will manage their risk more efficiently, amp their turnaround times through improved efficiencies and offer differentiated products and services to their clients (Brown et al., 2015).

The study conducted by (Brown et al., 2015) also found that there are variations in staff reductions across various industries and that the speed at which the automation is happening is limited by the underlying systems. This adds to the bottleneck that slows the pace of automation, as previously identified by Frey & Osborne (2013) where they highlighted numerous bottlenecks that need to be overcome before full automation of occupations can occur.

Both Frey & Osborne (2013) and Holmes et al. (2016) confirm that these bottlenecks also include the automation of social intelligent tasks. Their research has highlighted that roles that involve complex perception, with creative intelligent tasks that require manipulation of tasks and social intelligence, are unlikely to be automated, for now.

Figure 8 highlights the probability of automation that can vary as a function of the bottleneck variables.

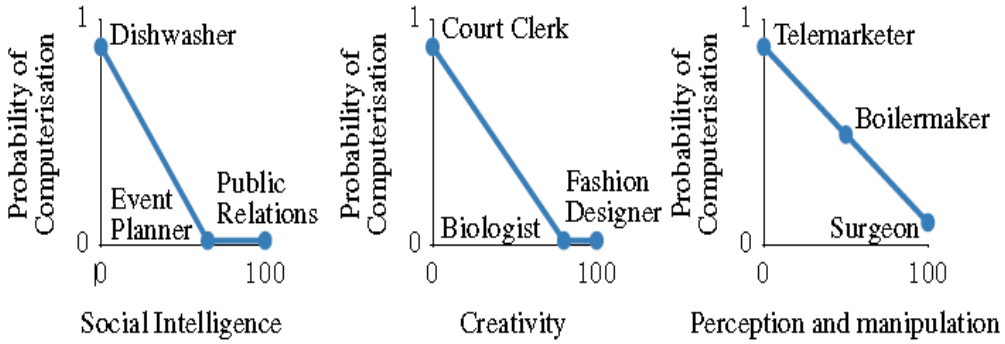


Figure 8: Bottleneck variables (Frey & Osborne, 2013)

Holmes et al. (2016) identified the type of roles that currently have the least probability of automation, these types of roles have the below characteristics:

> **Originality and Creativity**: These would-be roles that require unconventional and smart ideas to solve for existing situation or developing innovative ways to solve problems;
>
> **Service Orientation:** Any role that requires direct interactions with complex human emotions that require empathy and ways to solve problems;

A further assessment that was performed by Holmes et al. (2016) highlighted that roles that:

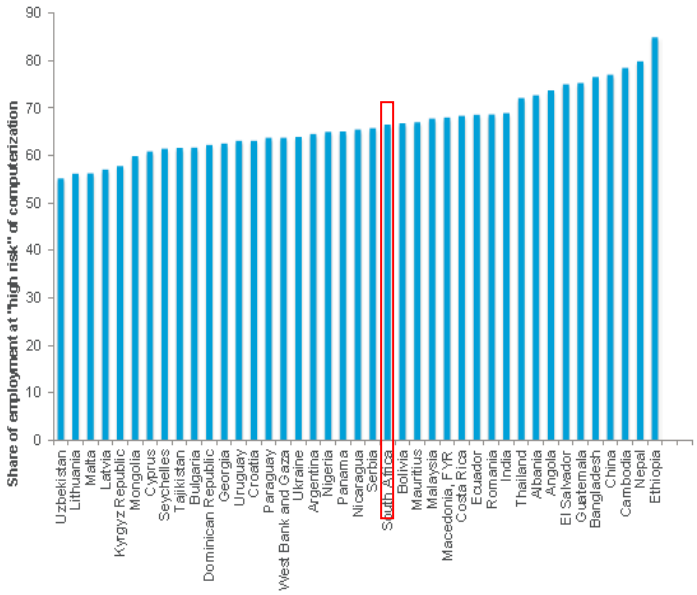
> Largely involved management and business occupations;
>
> Arts and media;
>
> Education and healthcare including;
>
> Engineering and science occupations are on the low-risk category for automation due to their high requirements of social skills and creativity.

Walker (2014) had previously argued that the cost of human labour will increase the uptake of automation, meaning that the developing countries that would have

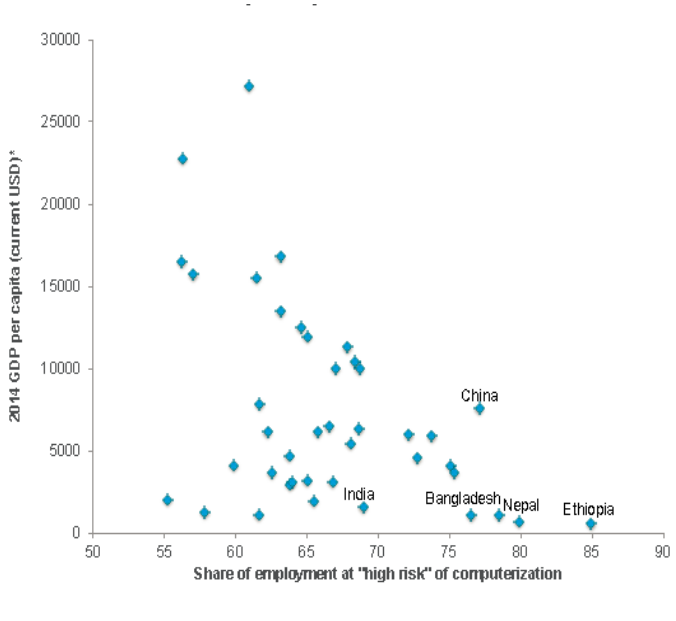
had a human labour cost benefit will not benefit from the industries that are migrating away from countries like China and India. Holmes et al. (2016) agree, saying that emerging economies need to find new growth models that will create sustainable jobs.

Using the research from Frey & Osborne (2013) and findings from the The World Bank (2016); Holmes et al. (2016) highlights that countries like China and Ethiopia have occupations that have a high risk of automation due to their high levels of low-income jobs that have been created by manufacturing and service industries.

Figure 9 below further highlights the link between the susceptibility of automation to the GDP per capita of a country. Extracted from Holmes et al. (2016), Figure 9 shows how developing countries are highly vulnerable to the expanding scope of automation due to the high labour costs. The countries with the high risk exhibit lower levels of GDP per capita. The main reason why the automation has not yet come into effect is that the current capital costs associated with the automation technology, thus, the effect will be felt when these costs reduce (Holmes et al., 2016).



Source: World Bank Development Report 2016; based on Frey and Osborne (2013) methodology, Citi Research



Source: World Bank Development Report 2016; World Bank national accounts data. Note: For Angola and Malta 2013 GDP per capita figures were used, Citi Research

Figure 9: Link between susceptibility to automation and GDP per capita

Many of the back office occupations that fit the criterion for automation are roles that were historically off-shored to countries like China and India (M. C. Lacity & Willcocks, 2015a). If the same countries are also on the high-risk list of automation, this would mean that instead of those jobs moving to places like South Africa, which is number 22 based on the Holmes et al. (2016) report; these roles will cease to exist resulting in less jobs being off-shored ot South Africa.

Figure 10 lists the ranking of countries based on their susceptability to automation.

South Africa is ranked number 11 by Tholons Top Outsourcing Destination; ranked 20 by the Towers Watson Service in 2014 and 47 by AT Kearney Global Service location index.

	Tholons Top Outsourcing Destination (2015)	Towers Watson Services Offshore Ranking (2014)	AT Kearney Global Services Location Index (2014)	Average Rank
India	1	2	1	1.33
China	4	1	2	2.33
Philippines	2	4	7	4.33
Malaysia	10	9	3	7.33
Vietnam	9	3	12	8.00
Brazil	12	5	8	8.33
Poland	3	16	11	10.00
Mexico	21	11	4	12.00
Sri Lanka	8	**	16	12.00
Indonesia	30	6	5	13.67
Chile	15	19	13	15.67
Czech	7	8	33	16.00
Lithuania	**	17	15	16.00
Costa Rica	5	21	24	16.67
Russia	18	14	21	17.67
Hungary	13	12	31	18.67
Thailand	44	7	6	19.00
Bulgaria	27	22	9	19.33
Estonia	28	13	22	21.00
Egypt	39	18	10	22.33
Taiwan	37	10	**	23.50
South Africa	11	20	47	26.00
Ukraine	**	15	41	28.00
Singapore	14	**	48	31.00

Source: Tholons, Towers Watson, AT Kearney, Citi Research; Note: **Not mentioned in the ranking

Figure 10: Country ranking for automation susceptibility

Chui et al. (2017) further supports the research by Holmes et al. (2016) where India and China account for the largest potential employment impact due to their relative size of the employed population. By comparing varous countries occupations based on their demographic trends, Chui et al. (2017) state that emerging economies like South Africa have a growth in the working-age population and increasing aspiration of economic growth requires measures to be implemented to sustain their economic growth.

Policy-makers in most economies have the same universal challenge regarding automation. Chui et al. (2017) highlights that new economic policies need to be embraced to help workers and institutions adapt to the potential imapct on employment.

Figure 11 highlights the activities that can be automated in the various countries investigated by (Chui et al., 2017)



AFRICA		ASIA/AUSTRALIA		EUROPE		NORTH AMERICA		SOUTH AMERICA	
Kenya	51.9%	Japan	55.7	Czech Rep.	52.2	Mexico	51.8	Peru	53.2
Morocco	50.5	Thailand	54.6	Turkey	50.4	Costa Rica	51.7	Colombia	53.0
Egypt	48.7	Qatar	52.0	Italy	50.3	Barbados	48.7	Brazil	50.1
Nigeria	45.7	South Korea	51.9	Poland	49.5	Canada	47.0	Chile	48.9
South Africa	41.0	Indonesia	51.8	Spain	48.5	U.S.	45.8	Argentina	48.2
		India	51.8	Germany	47.9				
		Malaysia	51.4	Greece	47.8				
		China	51.2	Austria	47.4				
		Russia	50.3	Switzerland	46.7				
		Philippines	47.9	Sweden	46.0				
		U.A.E.	47.3	Netherlands	45.4				
		Oman	46.8	France	43.1				
		Bahrain	46.1	U.K.	42.8				
		Saudi Arabia	46.0	Norway	42.4				
		Australia	44.9						
		Singapore	44.2						
		Kuwait	41.1						

Figure 11: McKinsey Research Institute

2.5 Conclusion of Literature Review

In the literature review, the researcher focused on three key concepts that formed the cornerstone of the study. The researcher started by focusing on what RPA is. The aim for this clarification was to introduce this relatively new technology to the reader and set the context to as to how it can create a competitive advantage for organisations who decide to invest in the technology.

The researcher then went on to assess the impact that RPA has on organisational IT systems. By understanding the impact on the organisational IT systems, the researcher then analysed the impact that the implementation of RPA has on IT systems. Through literature, the researcher looked at the history of automation that highlighted that unskilled labour gained an opportunity be upskilled, but literature indicates that the pace of the current wave of automation over multiple industries might yield different results as compared to previous industrial revolutions.

The literature review found that there is a difference in the current wave of automation that was not previously experienced. The uptake of technology in multiple industries at the same time and the pace of the implementation is a cause for concern for the current employment levels in the world, South Africa included. The research conducted by Walker (2014) research points to the fact that, unlike the first, second and third industrial revolution, where humans migrated away from brawn to brain type of occupations, in the current industrial revolution, there doesn’t appear to another category that human labour can migrate to in large numbers .

It is the economies that increase their investment in education and technology that will be least affected by the wave of automation, as the current automation is likely to displace many manual jobs. There is no actual economic law that states that jobs eliminated by new technology will be automatically replaced by new jobs. All these changes are coming need political and economic will.

2.6 Research Proposition:

To understand whether implementation of RPA could have an impact on unemployment levels is South Africa, the researcher looked at the following factors:

1. Suitability of processes for automation

By fully understanding what RPA is, further analysis needed to be performed into the factors that could result in the swivel chair being obsolete. The researcher needed to assess if there are any components within the swivel chair roles that have a higher probability of being replaced by RPA because not all role activities are the same.

2. Impact of digitisation of RPA success

The main trigger to the successful implementation of RPA is a digital trigger to the process. An analysis into the types of operational areas that are paper based could be another bottle neck that is unique to South Africa which has not been considered by the literature. An analysis on how the existing IT landscape can impact the pace of implementation and success of RPA. The levels of digitisation in South Africa operational processes could reduce the impact that RPA has on unemployment levels.

3. New roles that have emerged out of RPA implementation

The literature review has noted that there is no economic rule that states that new roles have to be created with every automation wave. Thus, the researcher further assessed which roles were automated and what types of roles have since been created in the organisations that have implemented RPA. The researcher is of the belief that this current wave of automation will have an impact on the levels of unemployment in South Africa.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Research methodology

Golafshani (2003) references Strauss and Corbin (1990) when broadly defining qualitative research as a type research that produces results that have been observed from real life settings and not derived from statistical methods or other approaches of quantification. Due to the nature of the research and the relative maturity of the RPA technology, no statistical data is broadly available for one to assess the impact of RPA technology on the unemployment levels in South Africa. So unlike quantitative researchers, who seek the underlying factors, the researcher will extrapolate and make generalisations on the findings. Hoepfl (1997) indicates that qualitative researchers seek enlightenment and understanding of certain situations, and this is a typical situation where this type of research is appropriate.

Strauss and Corbin (1990) make the assertion that qualitative methods can be utilised to have a better understanding of any phenomenon about which little is yet known. In South Africa, there are currently only a handful of organisations that have embarked in the implementation of RPA technology; most of whom have yet to realise the benefits and implications that are associated with the technology.

The research method utilised was a constructivist or interpretivist qualitative. This is owing to the fact that the conclusion of the effect of RPA in South African unemployment levels was established through the interpretations of the researcher and the participants in the study and therefore the effects of RPA on unemployment was based on educated speculations and previous experience of the subjects interviewed.

3.2 Research Design-

The research design that was utilised in the research is cross sectional. Based on Bryman (2015), a cross sectional research design entails the collection of data on

more than one case. For this research, the individuals that were interviewed are from various industries, occupations and varying employment levels. A second feature about a cross sectional research design focuses on the timing of data collection.

The data for the research was collected at a single point in time through face-to-face interviews. The interviews were semi-structured as this enabled the researcher to gain valuable information using the interview techniques that were recommended by Leedy P. D (1997).

One of the weaknesses with cross-sectional design that is mentioned by Bryman (2015) is the possibility of examining patterns and relationships only between identified variables. This could present a problem if the relationships that are found cannot draw a causal relationship between them (Bryman, 2015)

With cross sectional design, by using patterns of association, the researcher was able to examine the possible relationship between RPA Implementation with the Unemployment levels in South Africa. Bryman (2015) indicates that there is no time ordering to the variables as they were all collected simultaneously.

3.3 Population and sample

3.3.1 Population

Walliman (2010) indicates that in research, when the term of “population” is used, it does not necessary refer to the actual number of people but relates to the collective term that is used to describe the total quantity that is the subject of the research. This can include objects, people or organizations (Walliman, 2010).

For the sake of this research, the chosen population included individuals that have participated in the implementation of RPA technology, this includes South Africans and other respondents based in USA, UK and India.

Their roles include Business Analysts, IT Architects, and Consultants - from the major consulting firms, Program Managers, Head of departments that have

implemented RPA and Sales executives from the two leading RPA software providers (Automation Anywhere and Blue Prism).

3.3.2 Sample and sampling method

Within a particular population, the researcher can choose to limit the scope of the research to a select few, this is referred to as the sampling frame (Walliman, 2010). The respondents chosen was based on the individuals that agreed to participate in the research, though some are internationally based, the interviews were conducted via Skype and face-to-face.

Description of respondent type	Number of respondents
Barclays IT Architect	2
EY Associate Director	1
Manager centralised reconciliation	1
Senior Vice President of Sales (Blue Prism)	1
RPA Program Manager	3
Product manager (one of the four major banks in SA)	1
People advisory service, change and communications manager	1

Table 5: Research sample

The samples were spread between developers and all the way to decision makers, the level of understanding of the sample size was broad enough to cover the research questions. The selected sample allowed the researcher to reveal the way the current technology landscape will be impacted; the pace that RPA technology can be implemented and the impact that has been observed in various companies that the interviewees have been involved in.

Due to the location of most of the interviewees, the researcher had an hour face-to-face / Skype interview that was recorded and was be broken down into two, depending on the availability of the interviewee.

3.4 The research instrument

As a result, the face-to-face semi-structured data collection method was used. Opdenakker (2006) defines a semi-structured research method to be an interview with a purpose of gathering life-world descriptions of the interviewee with respect to the interpretation of the described phenomena.

The concept of a semi-structured qualitative study involves interviews and observation that have some unambiguous structure regarding theory and method but are not completely structured (Blandford, 2013). Hove and Anda (2005) add to what Blandford (2013) said, by highlighting the fact that a semi-structured data collection process includes specific questions that will bring forth foreseen information and open-ended questions that will stimulate unexpected and impromptu discussions around the topic of discussion.

Apart from face-to-face interviews, due to the distance of some of the interviewees, interviews over the internet were also utilised which are referred to as computer mediated communication (CMC). Opdenakker (2006) describes CMC's to be messages that are electronically transferred from one sender to another.

The benefit of performing a face-to-face interview is the experience of social cues that the interviewer experiences with the interviewee. These include the reading of

the body language of the respondent and the tone that a question is being answered (Opdenakker, 2006). The value of these social cues are only of value depending on what the interviewer wants out of the interviewee. Opdenakker (2006) indicates that when an interviewee is an expert in a particular subject and not the subject of the interview, then social cue`s become less important.

The subjects that took part in the research are specialists in the RPA field and the researcher felt that their physical presence would be of no consequence during the information gathering process. Since there was not a predetermined list of questions that were formulated, the researcher formulated questions based on the interactive nature of the interview.

With the permission of the interviewee, the use of a recording devise was added as an advantage of conducting face-to-face interviews and Opdenakker (2006) indicates that this allows the interviewer to get more accurate notes but warns that a recording comes with the danger on the researcher not taking any notes at all during the interview. Opdenakker (2006) highlights the importance of taking notes during the interview and is further supported by Stockdale (2002) when they indicate that some tape recording in some interviews can be so bad that transcribers in some universities cannot even transcribe at all.

The disadvantages associated with conducting a semi-structured research method is the general high costs associated with the method and Hove and Anda (2005) indicates that researchers should also be aware of the fact that the quality of the data collected is linked to how the interviews are conducted. The planning component of the data collection is of vital importance, Hove and Anda (2005) indicates that interviews are relatively resource-demanding as it involves a high level of planning, and the conducting of the interviews themselves requires a lot of analysis of the content and mannerisms of the interviewee. The interviewee needs to feel comfortable enough to share their experiences with the researcher (Hove & Anda, 2005).

The agenda would be to gather more information and Blandford (2013) indicates that in the interpretive semi-structured research methodology, it is important for other researchers to be able to inspect the methodology and interpretations so that

they can understand the process from the interview step all the way to the conclusion and be able to assess the validity of the data.

The semi-structured approach that was utilised by the researcher gives an allowance for some structure and a base from which the interviews can be conducted. Exploratory and open-ended questions were asked, which allowed for the conversation to a more natural approach.

One set of interview questions was prepared for the respondents. These questions are the base of questions that set the tone for the information gathering process. They were based on the research questions that were established in chapter one and also stemmed from the literature review. Review Appendix A for the list of questions.

3.5 Procedure for data collection

The researcher contacted the respondents and sent an email found in Appendix B; a formal meeting was setup based on the respondent's availability and the face-to-face/ Skype interview was conducted. With the approval from the interviewee, the interviews were recorded and saved on a cloud drive and during the interview; the researcher made handwritten notes.

The list of questions was sent to the respondents to prepare them for the session and enabled the interview process to have more open-ended question, which allowed the researcher to get more information on the topic at hand.

3.6 Data analysis and interpretation

The purpose of analysing the data is to answer the research questions that were posed and determine if there are any trends or relationships between the variables in question (Bryman, 2015). In qualitative research, content analysis is widely used as a research technique to show three distinct approaches, which include:

- Conventional: when the categories from the coding are directly derived from the text data;
- Directed: this begins with theory as a guidance for the codes and
- Summative approaches: which involves the comparing and counting of keywords, which is followed by the clarification of the underlying context. (Hsieh & Shannon, 2005).

A general inductive approach then follows the data analysis and interpretation method. Thomas (2006) states that the logic behind utilising a general inductive approach is because this approach can condense raw text data into a summary format. This approach allowed the researcher to determine clear links between the objectives of the research and the summary of the findings.

Thomas (2006) highlights that the general inductive approach also includes:

- Developing of framework of the underlying structure of experiences which is then followed by the five steps shown in the Table 12
- Cleaning of the raw data files – which involve the transcribing of the audio data from the interviews
- Attentive reading of the text to develop the coding framework
- Creating of categories by identifying themes and categories
- Perform content analysis by refining and revising of the data that has been categorised by summarising and interpreting the categories within the context and elements of the research questions
- Legitimising the drawn conclusions by contacting some of the participants to verify the trustworthiness of the data collected.

The Coding Process in Inductive Analysis

Initial reading of text data	Identify specific text segments related to objectives	Label the segments of text to create catergories	Reduce overlap and redundancy among the categories	Create a model incorporating most important categories
	→	→	→	
Many pages of text	Many segments of text	30 to 40 categories	15 to 20 categories	3 to 8 categories

Source: Adapted from Creswell (2002, p. 266, Figure 9.4) by permission of Pearson Education, Inc. (© 2002, Upper Saddle River, NJ).

Figure 12: The Coding Process in Inductive Analysis (Thomas, 2006)

The responses from the interviews were placed into various categories in the way they presented themselves. This process was driven by the collected data itself in what is called inductive thematic analysis where the categories are reduced to a few important groupings (Boyatzis, 1998). This method was utilised to gather all the various opinions from the participants and reduce any bias in the process.

3.7 Limitations of the study

As previously mentioned by Bryman (2015), one of the weaknesses with cross-sectional design is the possibility of examining patterns and relationships only between identified variables. This could present a problem if the relationships that are found cannot draw a causal relationship between them (Bryman, 2015).
In purposive sampling, Blankenship (2010) noted that the researcher's judgement when selecting the sample can be biased or flawed. Johnson and Christensen (2008) also adds that selective sampling methods have a limitation in that they do not allow for the generalisation of results to a population.

Considering that at the time that this research was conducted; RPA technology was still relatively new to the country; the study will be limited to these sectors:

- Banking
- Shared Services
- Insurance

The weakness in the study is around the possible low sample size that might not be a true representation on the effects on the unemployment levels.

3.8 Validity and reliability

Validity of the research process ensures that the means utilised to measure are accurate and that they measure what the researcher intends to measure (Golafshani, 2003). This concept is described using various terms in qualitative research because Golafshani (2003) highlights that validity not a single, fixed or universal concept.

Tichapondwa (2013) makes an explicit distinction between internal and external validity in his statement that “internal validity is the extent to which research results can be accurately interpreted while external validity is the extent to which the research results can be generalized to populations and conditions”. Due to the limited sample size of this research, the extrapolation and generalisation of the findings cannot explicitly be applied to all industries.

Tichapondwa (2013) states that “in qualitative research the researcher must always seek a useful balance between internal validity (ability to interpret the result with reasonable certainty) and external validity (ability to generalize information obtain”. Bryman (2015) says that “although reliability and validity are analytically distinguishable, they are related because validity presumes reliability”. It is then safe to assume that if the researcher can prove that the study conducted has validity, in the manner that the data was collected, it is then implied that the research process is reliable.

3.8.1 External validity

McDermott (2011) states that external validity is the extent to which the results of a study can be generalized. Considering that at the time of this study, there were

limited organisations that had implemented RPA technology; the data collection process included the analysis of industries that could be affected in South Africa, which include the banking, insurance and healthcare sector. The effects of RPA in the international sphere is expected to have a similar microcosm effect in the South African unemployment levels but cannot easily claim the ability of generalisation.

3.8.2 Internal validity

McDermott (2011) indicates that what is paramount to internal reliability is to test or measure what is intended to measure. To guarantee the internal validity of the research, the researcher ensured that the participants of the research participate sincerely in the interviews and the selection criterion was based on the experience of the respondents in the industry and the current occupations that the hold. With the permission of the participants, an audio recording was utilised to ensure that the data was a representation of the responses from the interviewees. Lastly, to ensure internal validity is achieved; the researcher then sent the transcripts to the participants who then confirmed that the data was accurate.

Due to the nature of data gathering methodology, in order increase the validity and reliability of the research, the researcher engaged in multiple data gathering activities that included recording and interviews with the specialists in the RPA industry.

Though the terms of reliability and validity appear to synonymous, Bryman (2015) explicitly highlights reliability to be the fundamental concern of consistency of the measures that have been practiced in the conducting of the research.

3.8.3 Reliability

Reliability relates to the degree to which the outcome of the research is consistent over time and Golafshani (2003) highlights that not only does the outcome need to be consistent, but the results should be reproduced under similar conditions. Since Lincoln and Guba (1985) indicate that “since there can be no validity without reliability, a demonstration of the former [validity] is sufficient to establish the latter [reliability]”. It is safe for the researcher to argue that the study is then reliable. By Tichapondwa (2013) stating that “in qualitative research reliability is measured in terms of dependability, confirmability and observer agreement”, the researcher has confirmed that these are achieved by adhering to internal validity.

3.9 Ethical Considerations

The topic requires management to consider the possible unintended consequences of automation. South Africa already has a high inequality divide and the research highlights the possible increase in the income inequality that is associated with automation, especially considering the current jobless economic growth that is occurring.

CHAPTER 4. PRESENTATION OF RESULTS

4.1. Introduction

This chapter is a detailed summary of the results from the research that was conducted. During the research, the interviews determined what RPA is and established how its implementation has impacted the daily operation of back office activities. The interviews further established how the impacted full-time employees were managed during and after the implementation of the RPA technology.

After conducting the interviews, the researcher then transcribed the audio data and read through the text. The researcher then created a coding frame where categories and themes were identified and have been presented below:

4.2 Suitability of processes for automation

4.2.1. Understanding what RPA is as a tool

During the interview, the participants were asked to define their understanding of RPA. The general theme was centred around RPA being a technology that can replicate or mimic repetitive, routine business processes performed on digital platforms with structured data. The interviewees simplified their definitions to likening RPA to “excel Macro’s on steroids” that can navigate through multiple systems and run on a virtual machine.

4.2.2. RPA Impact on back office operational processes

For a process to be suitable for automation using RPA, the interviewees highlighted that the activities performed by the humans need to be rules based and repetitive in nature. They also highlighted that there will be an increase in end-to-end processes due to the “link” that will be created by implementing RPA in back-office operations. Most of the interviewees also noted that the higher the number of Full Time Employees (FTE) that perform the process that is to be automated, the higher the Return on Investment. In operational areas where RPA

had been successfully implemented, the organisation was able to re-allocate the resources to focus on higher order work that they did not have adequate time for. In some operational instances, the FTE were able reduce query backlogs that resulted in customer complaints.

A theme also rose where the interviewees highlighted the ability for RPA to de-risk processes that might not have high FTE numbers, but are prone to errors which could lead to financial loss. The operational processes that have low FTE numbers are not being ignored, as an element of risk is a factor that is being considered. This has seen an increase on the use cases that are being considered for automation. Another example that was used by the respondents related to the ability to process purchase orders at a faster rate through RPA than what the humans could. This resulted in the services that are required by the business to come into effect at a faster pace compared to their competitors. This was but one of the few examples that were discussed that highlighted the benefits of implementing RPA.

4.3. Impact of digitisation through RPA

4.3.1. RPA impact on existing IT systems

The nature of the RPA technology involves the software imitating the activities that humans perform. The interviewees discussed the impact that RPA has had on their existing IT infrastructure and indicated that there has been no impact or requirements to make amendments to existing infrastructure. The IT security access levels granted to the RPA user required for the IT Risk teams to reassess the levels that are granted, to ensure that there is no additional risk exposure that the organisation might be exposed to by implementing RPA. Rigorous security and IT governance structures needed to be implemented to ensure that the “robot” user credentials are not easily accessible to third parties within the organisation.

4.4. New roles that have emerged out of RPA implementation

4.4.1. The relative pace of implementing RPA

The pace of implementation is greatly influenced by the level of complexity of a process. The interviewees highlighted that complexity can be reduced to the number of systems that the RPA software needs to interact with. A business process that involves one system, one user and has single sign-on can take up to four to four weeks to automate. More complex processes were defined as ones that involved multiple parties, in multiple geographical locations and systems, can take eight to twelve weeks to implement. The interviewees also highlighted that initially, minimal viable products are deployed where the opportunity to automate more activities in the process is done at later stages. This fast pace of implantation meant that the organisations that have embarked on the RPA journey had to thoroughly plan on the upskilling and reallocation of resources t other business units within the organisation.

4.4.2. How using RPA may put jobs at risk

During the discussion on how affected employees were managed, two themes emerged. The first was around the level of impact that the automation has had on different roles. There are three scenarios with different levels of impact on the jobs being automated:

1. The RPA implementation can relieve the workload of individuals who already over allocated. This would be relieving employees of work that resulted in overtime, errors and poor employee engagement levels

2. The second scenario resulted in a significant workload being automated, which has resulted on organisations assessing the existing roles and upskill the affected employees.

3. The third scenario caused more than eighty percent of the role to be automated, where the remaining twenty percent managed exceptions that could not be automated. The individuals that performed these business

processes where then rendered redundant. Organisations then assessed opportunities for redeployment, and as a last option, offer retrenchment packages.

It is worth nothing that the organisation that had implemented RPA had not yet retrenched employees but allowed for natural attrition to come into effect where warm bodies were not replaced when they left their respective organisations.

The second theme was around the new roles that have been created because of the implementation RPA. The main new role that has emerged is that of Data Scientists, that are utilised to assess the performance of the software and assess where the robot performance can be improved where the software capacity would be improved. For the software to be implemented, developers needed to upskill themselves with the skill of developing on the new technology. This is not a new role but a new skill set. Engineering specialists will be required in higher numbers as RPA utility increases and evolves to cognitive RPA. These engineers will play a pivotal role in merging the power of Artificial Intelligence with the RPA.

4.4 Conclusion

Inferences and generalisation can be made based on the interviews conducted based on the sample size of the interviewees, even though the number of respondents was less than previously anticipated.

There were seven themes that arose which speak to the research questions asked:

- Understanding and definition of what RPA is as a tool
- Impact on back office operational processes
- Impact or requirements to existing IT infrastructure
- Pace of implementation
- How using RPA may put jobs at risk

- New roles that have been created

The results of the interviews presented no major deviations from the literature review. The further discussion of the results will occur in the following chapter.

CHAPTER 5. DISCUSSION OF THE RESULTS

5.1 Introduction

The main purpose of this chapter is to assess the themes that were drawn out of the research process and relate the findings to the literature review. This chapter starts off by evaluating the themes that arose during the interviews and discuss their relevance to literature. The demographics of the individuals interviewed was a fair representation in terms of job level and interaction with RPA in a project implementation level. The diversity of the demographics of the technical and business skills has enabled the research to assess the impact of RPA from diverse angles. The research summary was greatly influenced by a Wits MBA graduate Ngubevana L (2014). The topic of the research done by Ngubevana L (2014) was the Sustainable development dilemmas and ethics of biofuels research and production in South Africa.

In summary, the research was conducted at a time where the concept of sustainable development was facing challenges from an interpretation and practical application view point. This also included challenges from a political standpoint and the administrative elements thereof. The analysis of renewable energy and its impact on profitability, power and employment were discussed at length.

Just as with the Implementation of RPA and its impact on unemployment in South Africa, at the time that this research was conducted, the impact of the technology is a topic of debate and confusion amongst many policy makers. This confusion arises from the unknown impact that this type of technology might have on levels of unemployment, the world over.

Ngubevana L (2014), used a qualitative research approach to gather the required data through a series of semi structured interviews. As with this research, the research design utilised by Ngubevana L (2014) was cross sectional. This allowed the researchers to collect qualitative data at a single point in time. The relatively unstructured nature of the interviews enabled the researchers to gain valuable information as recommended by Leedy and Ormord (1997). Due to the nature of the topics of both research papers, Barriball and While (1994) argue that the semi-structured research instrument is well suited for exploring the opinions and perceptions of the interviewees. Once the interviews were completed, Ngubevana L (2014) summarised the results into themes based on the responses received.

From a preference viewpoint, the researcher justifiably utilised a similar approach to summarise the below research findings.

5.2 Understanding and definition of what RPA is as a tool

Through the various interviews and discussions held on what RPA is, all respondents concur with what both Chandu (2016) and Brown et al. (2015) said. They defined RPA as the process of automating clerical on-screen processes using software technology that can replicate/ “mimic” the desktop processes that are performed by office workers. It is software that can automate tedious, time-consuming administrative work. RPA has the ability to take routine repetitive tasks where (Lacity & Willcocks, 2015a) argue that this will result in the creation of a virtual workforce.

A theme that also came out strongly relates to the manner and structure that the information needs to be formatted and located within the systems that the software will be operating in. The configuration of the automation is performed within the end-user environment to capture and inteprete existing application data to execute manual, repetitive and rules-based tasks where data is located in a predictive and structured manner.

5.3 Impact on back office operational processes

The interviews highlighted the streamlining on processes that will be processed via RPA. In agreement with Surdak (2016) and Chandu (2016) , the research further elaborates that businesses are looking into replacing the low-value adding jobs with RPA software with the goal of improving the quality and speed of the organisational outcome. By introducing RPA, organisations have managed to achieve higher levels of process efficacy. This was also highlighted by the research performed by (Chandu, 2016) that highlighted that the implementation of RPA reduced operational costs by over twenty percent. The Institute for Robotic Process Automation (2016) confirms that early adopters of RPA are doing a better job of handling more complex processes which were originally not considered for automation.

A previous study conducted by Frey & Osborne (2013) argues that it is possible to automate almost any tasks provided that enough data is gathered to recognise any kind of pattern. For RPA, this pattern is established during the assessment of rules in processes that are considered for automation.

A study done by (Brown et al., 2015) highlighted that many processes in organisations are already technology-rich, yet they still remain people-intensive. Users continue to move data from one system to another to achieve that last-mile in the process orchestration of business operational activities (Brown et al., 2015). This is the type of work that was highlighted by the interviews as good candidates for automation.

The interviewees discussed how a process can be assessed for RPA suitability and indicated that an operational process that is a good candidate for RPA is one that:

- has a digital trigger
- risk intensive due to it being handled by human
- the data is structured with significant volume
- requires no human judgement
- moves data from one location to another in a structured and rules based manner

Due to the scalability of this RPA, the necessity for people-based processes is further reduced by the value and rule-based logic of machine learning and artificial intelligence (Brown et al., 2015).

5.4 Impact or requirements to existing IT infrastructure

A major feature of the RPA software is its ability to replicate the process activities performed by the human, on the presentation layer of any software. The understanding of existing organisational IT landscape and infrastructure is important for the success of implementation. As per research performed by Lacity and Willcocks (2015b) and Troy (2016), RPA is a non-invasive software that can access other software in the same manner as a human, with user ID's and passwords. When deploying RPA, an organisation needs to ensure that the design meets that IT requirements for scalability, security, change management and auditability (Institute for Robotic Process Automation, 2016). This is a fundamental feature about RPA software that differentiates itself from traditional scripting software that is deployed locally using desktops.

In what is somewhat a bit of a contradiction about the involvement of IT; Troy (2016) states that IT needs to responsible for the provisioning of servers; ensure that the safety of the technology is maintained and make sure that the solutions are well designed from an architectural point of view. This is a contentious issue that the interviewees were in disagreement with. Most of the interviewees have experienced that minimum IT department participation, yet other interviewees have stressed the invaluable role the IT departments play in the implementation of RPA.

Through process orchestration, process optimisation may ensue, which has resulted in the redundancy of the "maker and checker" role requirements that have been built into the respective system for risk purposes. The interviewees indicated that, instead of making changes to the core IT infrastructure, the automated solutions resulted in a robot user being created for the maker user and another

robot user being created the checker role profile. This enabled the technology to be deployed, with no changes to the core systems.

5.5 Pace of implementation

Thoughtonomy (2016) state that 1 “robot” equates to 1 software licence in a RPA platform that can execute tasks that are equivalent to two to five humans, depending on the process being replicated, this could be more. The number of processes handled by a robot is linked to the time it takes to execute the processes, limited to a maximum of 24hrs in the day.

Smith and Anderson (2014) indicate that the previous waves of technology occurred at a slower pace and unskilled labour had the opportunity to naturally gravitate to new skills. The adoption of previous technology in other industrial revolutions was experienced in stages, at different times in different industries. This was highlighted by the interviewees, who elaborated on the different industries that RPA is currently being implemented in. The relative pace of implementation is greatly influenced by the number of alternative flows that a process can follow. The greater the number of alternatives, the longer it will take to deploy.

The study conducted by (Brown et al., 2015) also found that there are variations in staff reductions across various industries and that the speed at which the automation is happening is limited by the underlying systems. This was supported by the participants that argued that the number of systems involved also affects the pace of implementation. The participants indicated that one system with one user and a single sign-on; can be defined as a small process that may take four to six weeks to implement into the live environment. Complex process can be defined as ones that have a high number of full time employees with multiple systems and various alternative flows. Smith and Anderson (2014) state that the current uptake of white collar automation that is experienced in various industries concurrently may change what we currently define as “work”.

5.6 How using RPA may put jobs at risk

The research by Holmes et al. (2016) highlights the importance of understanding which type of roles have a high or low probability of automation, there are jobs that simply cannot be automated soon. The interviewees highlighted that it is the roles that are repetitive in nature, and extract structured data from one software to another, that are at the highest risk of being lost to automation. By understanding that, we can then build an understanding of the possible impact that RPA might have on the unemployment levels.

Supporters of the free market economy like Mill (1864) have questioned the notion that mechanical inventions at the time, really lightened up the day's work load of human beings or whether it created fertile ground for more exploitation and unemployment. This is bolstered by more recent research such as that by Noble (1995) and Campa (2014), who argue that decades after the "information revolution", humans are working longer hours under worsening conditions with less skills, less benefits and less pay.

With the implementation of RPA, organisations have changed the way they perform their processes. As previously highlighted in the literature in a case study observed by Slaby (2012), a business that focused on citizens applying for national government insurance successfully implemented RPA where 12 Full Time Employees who took an average of 15 minutes to complete a process had the process automated which resulted in a new handling time of 4 minutes per process. The interviewees from their experiences implementing RPA shared similar anecdotes.

In several case studies done by Slaby (2012) and by Craig, Lacity, and Willcocks (2015d), have observed that early adopters of RPA achieved multi-faceted organisational results which includes:

- reduction of Full Time Employee's (FTE) - organisations can do more work with fewer resources. In the interviews conducted in the current research, most of the respondents indicated that the impacted employees were redeployed to other operational areas within their organisation. This required for the individuals to be upskilled before the redeployment could successfully take place.

- the quality of service that is provided increased, as the RPA technology will execute a task in the exact sequence that it is configured in. This has meant that the rules based and repetitive processes handled by humans will reduce. The prevailing view of the participants in this research is that introducing RPA does indeed improve service quality.
- the speed in which the service is provided increased exponentially. The interviewees highlighted that the pace that the RPA software can handle the processes improved the service provided by their organisation to their customers, and
- The remaining FTE experienced an increase in job satisfaction as their responsibilities were refocused to tasks that required judgement and social interactions.

A later case study by Lacity and Willcocks (2015a) showed that some organisations deployed over 300 robots that could process 3 million transactions per quarter, for work that that was traditionally performed by 600 people. In that particular case study, only two humans were required to manage the robots. This was also evident in Brown et al. (2015), where it was shown that automation has empowered business to be able to “work smarter” while utilising less employees. Our current research has also revealed that organisations have been able to be leaner and smarter through implementing RPA.

This notion of refocusing humans was further supported by Casale (2014) that shows that organisations that employ RPA tend to re-allocate and redeploy people to high-value adding roles that require the ability to empathise and apply value judgement.

In contrast to the current RPA trajectory, historically, the automation of occupations generally resulted in workers being reallocated from middle-income manufacturing occupations to lower level income service occupations (Frey & Osborne, 2013). This is a viewpoint that is supported by Smith and Anderson (2014) where they further indicate that industries will adapt which will result in the creation of new types of work that will take advantage of unique human functionalities. Job creation is generally associated with economic growth and Walker (2014) contends the notion of new jobs being created, by highlighting that

to achieve economic growth that creates job, an economy needs to be performing at double digit growth levels.

Based on the Statistics South Africa (2017a) report, South Africa's economy has expanded by 2,0%% year-on-year in the last quarter of 2017, another factor that was raised by Smith and Anderson (2014) was the fact that certain highly skilled workers tend to naturally succeed in new economic environments yet far more individuals from lower paying service roles are displaced at best and a considerable amount remain "permanently unemployed" at worst.

The World Economic Forum (2016) report cites automation as a risk (of unemployment or underemployment) for doing business, as it can hold back job creating economic growth and threaten social stability. In 2016, there was a high mismatch between the skills required by our fast changing jobs market and the World Economic Forum (2016) report shows that structural unemployment has remained a major issue since the 2008 world economic crisis; and that even where some countries have experienced economic growth, it has largely remained jobless growth. Although the interviewees have experienced little to no retrenchments through the implementation of RPA in South Africa, implementation of RPA will have a negative impact on the unemployment levels in the country.

The interviewees indicated that operational positions were frozen and role assessments are performed to verify if the RPA-impacted individuals cannot be reskilled up into those respective vacancies. With these type of recruitment strategies, this means that as employees leave, no new people are employed; graduates who leave formal tertiary education to seek new employment will be absorbed a less rate than current.

Assessing the research from Frey & Osborne (2013) and findings from The World Bank (2016) and Holmes et al. (2016). highlights that countries like China and Ethiopia have occupations that have a high risk of automation due to their high levels of low-income jobs that have been created by manufacturing and service industries.

If the same countries are also on the high-risk list of automation, this would mean that instead of those jobs moving to places like South Africa, which is number 22 based on the Holmes et al. (2016) report; these roles will cease to exist resulting in less jobs being off-shored to South Africa.

5.7 New roles that have been created

The interviewees highlighted that unlike previous desktop automation software like macros, the operational team can track and monitor the software as it processes. The Institute for Robotic Process Automation (2016) agree with this assertion and further state that as the product is running in the business process, the organisation is unable to track where in the process the program is running. Another feature that comes with the RPA technology is that it can be to organisational-wide processes and the previous automation programs cannot be deployed in large business processes. Jerry Luftman and Frank Casale (2014) together with the Institute for Robotic Process Automation (2016) argue that these technologies do not offer the functionality to re-purpose for other processes like RPA technology and are best utilised as desktop assistants.

Troy (2016) argues that in the case of RPA implementation, business employees can be upskilled by virtue of the organisation utilising RPA technology; and that the automation of these jobs that Smith and Anderson (2014) refers to, will require someone to code and build the new tools which will lead to a new wave of innovative jobs. His argument is that; not only will these employees need to learn the technology but will be required to follow the same delivery methods that are followed by their IT department. The respondents in this study contradict this notion, in that the new skill to configure the automation tool has been allocated to existing IT developers. The ability to upskill a non-IT operational employee has proven not to be as simple as articulated in literature.

The RPA's ability to be monitored as it processes has created a new role in the Centre of Excellence that monitors that activities of the Robots. A Centre of Excellence is described by the research participants as the centralised, and

sometimes decentralised, management of the software robots that run in the live environment. This is a department that has been created to ensure the growth and sustainability of the RPA software deployment and maintenance. The new roles that have been created because of RPA have been seen to be absorbed into the Centre of Excellence.

One of the first roles that are required to successfully run a Centre of Excellence is the role of a:

“Bot Monitor”

This is the role that monitors to software robots as they execute the operational task. Any errors or issues experienced by the software will be highlighted on the monitoring screen or an email notification is sent to the “Bot monitor” to investigate. The role of the Bot Monitor also involves investigating the root cause of why the software would have stopped running. The interviewees then indicated that the business users are then notified if the issue relates to an issue that can be remedied by the operational teams or contacts the relevant IT team, to address to any core system issues that might have caused the software robot to stop operating.

RPA Analyst:

This is an individual who is a process expert whose role is to proactively seek automation opportunities. Lacity and Willcocks (2015b) states that this analyst writes the detailed RPA requirements. The research participants indicated that the process of creating a requirements documentation includes the RPA Analyst observing the process Subject Matter Expert and documenting the screen by screen activity that is performed by the user. In the current operational areas that have deployed RPA, they have utilised the skills of a Business Analyst, which is an already existing role. The said Business Analyst already has a fair understanding of the operational processes and has been upskilled to understand the RPA technology

Data analysts:

Brown et al. (2015) go on to argue that the type of automation that is performed by RPA technology will result in process data that enables organisations to derive rich and meaningful insights into their business. Ward and Peppard (2016) point to the fact that organisations are now changing the way that they use information which results in a change in how they carry out the value adding processes. One of the outcomes of running an organisational process through RPA is the availability of data that was not easily retrievable in the minds of the individuals who were involved in the processes. The role of a data analyst is one that will be seen as a major role player in the age of big data analytics. The interviewees in this study said that their organisations have not yet utilised this new type of role but conclude that there will be a great need for such analytical skills that will enable to business to better understand their business and improve their value proposition to their clients. This is in agreement with Frey & Osborne (2013) who say that this shift in the labour market will result in an increase in the employment of high-income cognitive occupations and low-income manual occupations.

The research has further indicated that the new IT functionalities that have been created through the existence of RPA resulted in new coding skillsets, which include the learning of a new technology for individuals who already had the skills. The participants have highlighted that the process observation activity has largely been performed by Business Process Analysts. The affected operational individuals participated largely in the testing of the automated processes. They have also been upskilled to manage exceptions that the robot cannot handle. The interviewees also said that this is generally a small fraction of the operational people who previously executed the process.

Although research informs us that there is little to no concern for humanity about the increase in levels of automation. Frey & Osborne (2013) found in their study, that the demand for skill over the past decade has decreased, even with the increase in supply of skilled and educated labour.

The participants in this current study also highlighted that the number of processes and roles being automated far outweigh the new roles that are being created. This is largely linked to the business case for automation, which is the reduction of operating expenses. The interviewees indicated that at the current rate, there can

only be so much redeployment that can take, especially if the jobless economic growth does not improve. Thus, the research and interviews conducted corroborates. Job loss is currently not experienced with the implementation of RPA but, by not replacing employees that are leaving the organisation and the jobless economic condition, the implementation of RPA will have an adverse effect on unemployment levels.

CHAPTER 6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

The following chapter draws conclusions from the literature together with the research conducted and will suggest possible future research that can be conducted.

6.1 Conclusion of study

The literature review indicated that history has shown that there is nothing to concern ourselves with the concept of automation. However, with the current economic climate, the relative pace that RPA software is being implemented and the vast industries that it is being implemented in, has indicated that history is not necessarily the best indicator of future events. Research conducted by Campa (2014) highlighted that development of Information Technology has managed to deskill and displace humans, especially ones who have not managed to upskill themselves. Campa (2014) adds, that many scholars indicate that many workers also get expelled from one sector and get absorbed into other sectors. When they do get absorbed into other industries, due to their skill set, their salaries can decrease by over 33%. In this scenario with RPA deployment, where the companies are not employing employees from outside of their organisation, the affected individuals will find it difficult to move to other firms or industries. The possible reduction in salaries will further exacerbate the income inequality that

exists in South Africa. Policy makers need to consider a possible basic income grant that will supplement the living conditions of the affected individuals.

With every sector in the economy growing at a considerably low rate and the new IT related skills are transferred to already skilled individuals who were within the IT sector, the implementation of such technologies like RPA will have a negative effect on the employment levels. The types of new roles that it will be create, are far outweighed by the number of people that will be displaced. This is further illustrated by the research participants who have indicated that although their organisations have not retrenched the individuals affected, they are not replacing them when they resign. Managers need to strategically assess their organisational structures and assess their future of work requirements. This would mean that as opposed to having triangle based organisational structures that is heavily supported by swivel chair, rule based type of roles, management of employees needs to move to lean, diamond shaped organisational structures.

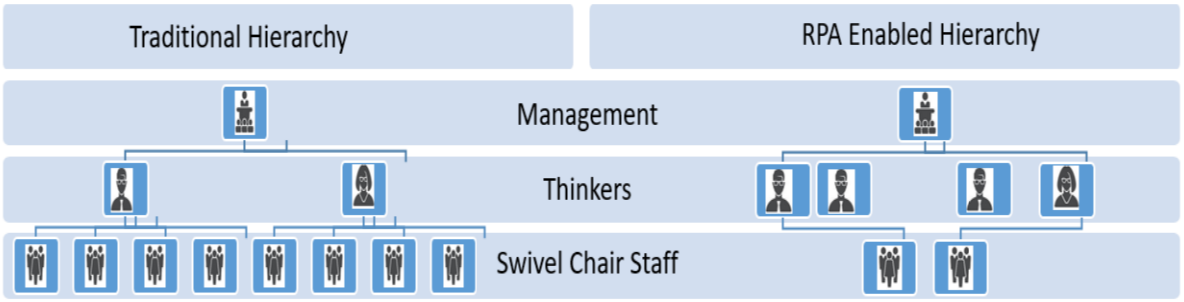


Figure 13 Traditional Hierarchy vs. RPA enabled organisations

As stated by Walker (2014), the main competitive advantage that humans had, were their muscles. That advantage has diminished over time due to automation and now the current evolution of intelligent office is also diminishing and is being replaced by artificial intelligence. It would be naïve to believe that any affected knowledge worker will naturally qualify for the new, limited higher order occupations like data analysts and computer scientist. Policy makers need to make a concerted effort to address our current education system.

6.1 Recommendations

The respondents have pointed out that their various organisation are not recruiting new employees from outside of their organisation. Their main aim is to reduce retrenchments. This means that new graduates have a reduced chance of absorption in the current employment market. It is thus recommended that government and higher education institutions play a pivotal role in the education where curriculums evolve to cater for the future of work. The shift in the education system would require a detailed analysis on how to integrate the use of technology and soft skills like creativity, social and emotional intelligence, into the curriculum since the research together with the interviewees indicates as these are future skill set that is not easily automated. Management styles and models need to evolve as the skills required to manage employees that are transactional in nature is different to managing high intellect low transitional individuals.

6.1 Suggestions for further research

A broader study to include more professionals involved in RPA in other industry sectors, may be necessary, to assess the impact of RPA in broader society.

Also, with the increase of high-intellect low-transitional type of employees, further research to assess what kind of management styles are required to manage fewer individuals and manage virtual employees should occur. Managers need to be equipped to manage the challenges that will come with the future of work.

The Department of Higher Education needs to partner up with Tertiary institutions to promote research in the education that South Africa needs to focus on to improve the type of graduates that we produce in the country.

APPENDIX A: RESEARCH INSTRUMENT –

Points of discussion

1. Define Robotics Process Automation
2. Suitability of processes for automation
3. Key success factors for implementing RPA
4. Impact of digitisation of RPA success
5. average pace of implementation of RPA
6. What is the success criterion for automation?
7. Measurement of Return on Investment
8. Management of affected employees
9. New roles that have emerged out of RPA implementation

Letter of Participation





Date

To whom it may concern:

My name is Atenkosi Ngubevana and I am a current MBA student at the University of the Witwatersrand, student number 0712119W. I am conducting my final research thesis that will investigate “Implementation of Robotics Process Automation (RPA) and the effect it may have on unemployment in South Africa”.

Due to your experience in the industry, whether in South Africa or Internationally, I would like to conduct an analysis on:

1. What RPA technology is
2. The impact on efficiency that bring to organisation
3. The human resource element
4. How other organisations have managed the change that associated with the implementation

This research will be a semi-structured interview process that will have you, as the expert, as the interviewee.

Due to the current sensitivity surrounding the implementation of this technology, this will be a qualitative research that seeks to understand the process and impact that you have experienced in various companies that has implemented RPA. There will be no focus on the organisations that are/ have implemented the technology.

The aim of the study will be to assist organisations who have an interest in the technology to have a better understanding of the process surrounding the implementation of the technology and understand the possible impact that RPA can have on the human resources.

Regards

Atenkosi Ngubevana

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