The Role of Organisational Change Management in Robotic Process Automation Implementation Projects

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Attestation of Authorship

"I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgments) nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning."

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I am the sole author of this thesis. Some elements and ideas, e.g., hybrid processing, the dual role of RPA bots, and the structure of the episodes presented in the Findings chapter, were originally developed as part of a paper written by myself and my research supervisors to disseminate of the findings of this study, which I presented at the Australasian Conference on Information Systems (ACIS) in December 2021. However, all elements and ideas in this thesis are explained and adapted in my own words based on my own perception and understanding. I was the lead and principal author of the ACIS article: Wallace, E., Waizenegger, L. and Doolin, B. (December 2021) Opening the black box: Exploring the socio-technical dynamics and key principles of RPA implementation projects. *ACIS 2021 Proceedings*.

This study was approved by the Auckland University of Technology Ethics Committee (AUTEC) on 1 December 2020, with the application number 20/295. The approval letter can be found in appendix A of this study.

Abstract

Robotic Process Automation (RPA) has witnessed a significant increase in popularity since 2018, with numerous medium and large enterprises adopting RPA each year. Despite the high uptake of RPA, there are many challenges that organisations may face. People management is a significant challenge during RPA implementation. However, the literature lacks a clear Organisational Change Management (OCM) framework that is suitable for RPA projects and assists in managing the needs and expectations of the stakeholders in the project. As RPA performs human tasks, it impacts the human workforce as well as their work processes and practises but also has significant technical implications. Therefore, a socio-technical approach to RPA implementation is needed to assist in constructing a suitable OCM framework for RPA implementations. This study aims to investigate the underlying socio-technical dynamics of key issues and events that occur during RPA implementation in a tertiary institution to understand how RPA projects unfold. The study also investigates how OCM strategies can influence and how they should be applied in RPA implementation projects.

I conducted a qualitative case study in an Australasian university by interviewing 13 employees, managers, and RPA vendor representatives, to address the following research questions: "How do RPA projects unfold in the context of a tertiary institution?" and "Which Organisational Change Management strategies can address the challenges faced by organisations when they are implementing RPA?"

Taking an abductive approach informed by socio-technical theory and process analysis, I constructed a detailed narrative, consisting of six logically coherent episodes that explained the key issues, and events that were identified throughout the project. The episodes also illustrated the underlying socio-technical dynamics, to understand how the key issues and events led to the outcome of RPA implementation at the university.

I found that the socio-technical components (actor, task, technology, structure) were tightly coupled and had cascading effects between the various levels of an organisational system. Where one component was impacted, gaps formed in the system which posed the need for an intervention strategy to realign it. Often, OCM strategies were utilised and were either effective or not utilised, causing problems within the organisational system. This reinforced the importance of utilising OCM to increase the likelihood of project success. In taking a socio-technical perspective, it was found that RPA technology fulfils a dual role between technology and actor and introduces the

concept of hybrid processing which enforces the notion of using the complimentary skills of humans and bots for greater outcomes.

This thesis presents an evidence-based illustration of the project phases of RPA implementation and a framework that describes the key OCM strategies to consider during RPA implementation projects. The findings of this study will be useful for practitioners who are considering adopting RPA to learn about RPA technology and what is involved in its implementation. It additionally assists in planning an RPA project with the associated OCM strategies to improve the likelihood of project success. The findings also encourage practitioners to utilise hybrid processing to optimise their business operations through close collaboration between humans and bots.

Keywords: case study, hybrid processing, organisational change management, process analysis, robotic process automation (RPA), socio-technical theory.

1. Introduction

Due to the benefit the technology may afford, RPA has witnessed a huge uptake across several industry sectors in recent years. Such industry sectors include healthcare, financial services, and telecommunications as they complete many administrative tasks and processes in their service delivery (Hofmann et al., 2020; Siderska, 2020; Syed et al., 2020). The high demand for RPA has resulted in the market witnessing a growing demand every year, with the market forecasted to grow to a value of over 13 billion American dollars by 2030, as opposed to 12 billion in 2020 (Liu, 2021). 44% of industries worldwide are expecting RPA to have a significant impact on their supply chains by 2023 (Mazareanu, 2021). Overall, RPA is expected to gain significant traction overall by 2023 where RPA expenditure will increase from the 5.4 billion that was spent in 2021 (Liu, 2021). To remain competitive and maximise efficiency, organisations often choose to optimise their business processes. In particular, completing processes that include non-value-adding tasks, in a cost-effective and efficient manner is very compelling to organisations, especially those in pursuit of operational excellence (Hofmann et al., 2020). RPA has become a critical tool to optimise the execution of business processes as adoption may lead to maximised efficiency, increased productivity, reduced error rates and delivering fast response times (Hofmann et al., 2020; Syed et al., 2020). In light of the global Covid-19 pandemic, RPA has also been critical in maintaining business continuity efforts for many organisations to ensure their operations continue to function despite the unexpected crisis (Siderska, 2021).

RPA builds on automation, robotics, and other technologies such as cloud computing, virtualisation, screen scraping, and artificial intelligence (AI) to produce a cost-effective and scalable automation solution (Hofmann et al., 2020; Syed et al., 2020). RPA employs software agents, known as software robots or 'bots', to complete the tasks and processes of human employees by mimicking their actions (Hofmann et al., 2020; Syed et al., 2020). In this study, the definition of RPA is adopted, provided by the IEEE Corporate Advisory Group (2017, p. 11) as: "A preconfigured software instance that uses business rules and predefined activity choreography to complete the autonomous execution of a combination of processes, activities, transactions, and tasks in one or more unrelated software systems to deliver a result or service with human exception management."

RPA is classified as a lightweight automation technique as it can be overlayed on top of existing information systems with little to no need for back-end intervention of the legacy systems (Hofmann et al., 2020). Furthermore, RPA implementation boasts a relatively quick project timeline of 4-6 weeks from initiation to production in comparison to other automation techniques

that require significant changes to the backend to reconfigure underlying systems (Hofmann et al., 2020; Syed et al., 2020). RPA bots can work 24/7 to carry out rule-based, non-value-adding tasks while freeing up the time of human employees to complete more complex tasks that add more value to the organisation (Hofmann et al., 2020). With the bots working 24/7, operating costs and transaction processing costs are also reduced (Syed et al. 2020). Employees may experience higher job satisfaction as they have more time to conduct tasks that require decision-making and empathetic skills (Hofmann et al., 2020). The bots are programmed to execute each instance of process in the same way, therefore they usually make fewer errors than human operators, and are highly compliant therefore adhering to their pre-configured choreography and therefore governance protocols and legal obligations, (Moffitt et al. 2018).

There are many organisations that are quick to implement RPA due to the potential benefits that can be realised in a short amount of time (Hofmann et al., 2020; Syed et al., 2020). Yet, during implementation, they often face many common challenges, such as integration issues between the bot and the application it interfaces with (Santos et al., 2019), and access control implications (Syed et al., 2020). If the problems are not mitigated, the project may fail, which has led to a reported high RPA project failure rate of 30-50% (Kokina & Blanchette, 2019; Ernst & Young, 2017). While research has been conducted to explore the benefits and challenges of RPA implementation, (Hofmann et al., 2020; Santos et al., 2020; Syed et al., 2020), there is little academic research that presents a thorough depiction of how RPA implementation projects unfold. In particular, the challenges present themselves during the project, what is involved in RPA implementation and how RPA is successfully embedded into organisations (Syed et al., 2020). Understanding the challenges that occur during implementation and how to mitigate them alongside key considerations for organisations is pivotal to improve the likelihood of project success. Therefore, the first research question explored throughout the study is “How do RPA projects unfold in the context of a tertiary institution?”

Resistance to change among employees has also been identified as a significant issue in existing research (Asatiani & Penttinen, 2016; Santos et al., 2019). The employees may not want to adapt their way of working or may view RPA implementation as a threat to their employment which causes them to reject RPA implementation (Santos et al., 2019). Employee rejection of RPA implementation is likely to have negative effects on the success of the project, as considerable collaboration is required between the project team and business unit to ensure the bot is trained correctly (Santos et al., 2019). Consequently, OCM has been identified as a critical success factor of

RPA implementation (Kyheröinen, 2018). However, there is a lack of understanding regarding which OCM strategies are important in the context of RPA and how they should be applied to mitigate the prevalent issues (Syed et al., 2020). Hence, the second research question is posed: "Which Organisational Change Management strategies can address the challenges faced by organisations when they are implementing RPA?"

To answer these research questions, a qualitative case study was conducted (Tetnowski, 2015) in an Australasian university that implemented an unattended rules-based bot on the school leaver process in the Student Admissions department as an RPA pilot project. Taking a case study approach has allowed the author to understand how RPA implementation, adoption and use unfolded in the Student Admissions team, as well as the use of OCM strategies. In line with the first research question, a process approach was taken (Van de Ven & Poole, 2005) to understand the key issues and events that occurred during the RPA implementation process. The key issues and events were logically grouped into six distinct yet temporarily overlapping episodes to develop a temporal process-based narrative of how RPA implementation unfolded in a tertiary institution. The theoretical underpinnings of socio-technical theory (Leavitt, 1964) were also employed to identify the socio-technical components and root causes of the key issues and events. Applying the theoretical concepts of socio-technical theory (Leavitt, 1964) has allowed the author to understand how the key issues and events led to a gap or misalignment in the socio-technical system. The system consists of the actor, task, technology and structure components (Leavitt, 1964) at either the work system, project, or organisational level (Lyytinen & Newman, 2008). Furthermore, it was able to be determined which intervention strategy was applied to address the gap or misalignment and the outcome of applying the intervention. Throughout the data, it became evident that OCM strategies were often used to address gaps or misalignments or were not used and caused gaps or misalignments. Therefore, the concept of OCM strategies is introduced as intervention strategies to prevent and address gaps and misalignments in the socio-technical system.

The study contributes a comprehensive explanation of the project phases of RPA implementation in the context of a tertiary institution, as well as revealing the often complex, underlying socio-technical dynamics. The nature of RPA technology presents unconventional complexities in a socio-technical system as it has the attributes of both a technology and an actor and performs a 'dual role,' which is also explored in the study. The concept of the dual role posed the opportunity to expand the concept of hybrid intelligence (Dellerman et al., 2019) to include RPA, thus introducing

the concept of ‘hybrid-processing’ (Wallace et al., 2021). Finally, a framework that proposes the key RPA OCM strategies is presented to assist practitioners in planning the RPA project and the corresponding OCM strategies.

The remainder of this study is structured as follows: Chapter 2 presents existing literature covering the following: a) RPA related topics including an overview of RPA, its use in organisations, benefits and challenges, and impact on employees’ work processes and practises; and b) OCM related topics, including organisational change, organisational change due to IT implementation, OCM, and a summary of the literature review. Chapter 3 introduces the theoretical lens of socio-technical theory and its use in the data collection and data analysis processes in the study. This leads to the research methodology in Chapter 4 which explains the philosophical underpinnings of the study as well as the data collection and analysis methods. Chapter 5 presents the findings of the case study and analysis, where a process approach was taken to construct the findings, explains how the RPA implementation unfolded and the interplay between the socio-technical elements as well as the influence of OCM. Key findings of the study are discussed in Chapter 6 (discussion), alongside the theoretical and practical contributions, limitations and areas for future research. A short conclusion is presented in Chapter 7.

2. Literature Review

This chapter describes reviews of relevant literature to establish an understanding of the context of the research problem and its location within the current body of knowledge. This is done by explaining the key concepts that underly the study from existing research in the fields of RPA and OCM. In addition, the researcher intends to identify and explain the knowledge gaps apparent throughout this study. The chapter is split into two main sections. First, Robotic Process Automation in which the key RPA-related concepts, benefits, challenges and the impacts on the human workforce are discussed. Second, Organisational Change and its management wherein the phenomenon of organisational change, organisational change due to technology implementation, OCM strategies and importance of OCM strategies are discussed.

2.1. Robotic Process Automation (RPA)

The concept of RPA leverages various existing technologies, including scraping technology (Syed et al., 2020) which involves a computer programme extracting data from a programme and displaying it in a human-readable form (Madakam et al., 2019) and workflow automation (Syed et al., 2020). The functionality of RPA is often extended through the use of Artificial Intelligence (AI) techniques such as Machine Learning, Natural Language Processing to draw meaning from text (Syed et al., 2020) and Optical Character Recognition (OCR) which enables the bot to process data of various formats such as text, audio and images (Hofmann et al., 2020). These technologies on their own have limitations. Therefore, as RPA consolidates the technologies, their capabilities are enhanced to create a unique yet powerful solution to automating business processes and simplifying the daily tasks of users (Hofmann et al., 2020; Syed et al., 2020). The consolidation of these technologies has created software agents called software robots or 'bots' that mimic the actions of a human employee to complete tasks and processes (Syed et al., 2020). The usability of RPA has evolved over time to afford wider scale functionality and scalability (Anagnoste, 2017; Syed et al., 2020). This is possible using virtualisation and cloud computing technologies, which involve being able to complete process modelling, manage the virtual servers that store and operate the bots, and orchestrate the bots online (Anagnoste, 2017). The advancement in RPA technology also allows one or more bots to work on many processes throughout an organisation using the cloud to replicate a virtual 'office' space without the necessity of a constant physical screen display (Anagnoste, 2017; Hofmann et al., 2020).

Through the maturation of RPA, the software bots have been classified as attended and unattended bots. Attended bots require human intervention to trigger the bots to complete various tasks (Hofmann et al., 2020). For example, by preparing data that is the correct input for the bot to process. By contrast, unattended bots work autonomously and continuously, usually on entire simpler processes with minimal human intervention (Hofmann et al., 2020). Furthermore, the bots have been categorised based on their capabilities into rules-based, knowledge-based, and learning-based bots (Hofmann et al., 2020). The most common is the rules-based bot that is programmed with pre-defined rules to carry out repetitive and high-volume tasks, similar to how a human would have completed the task (Aguirre & Rodriguez, 2017; Hofmann et al., 2020; Moffit et al., 2018). Second, knowledge-based and learning-based bots leverage AI to extend the functionality of rule-based bots and reduce the need for human intervention (Hofmann et al., 2020; Kroll et al., 2016). The knowledge-based bots leverage AI to search for information across relevant systems, while the learning-based bots may leverage machine learning, to learn how to complete their tasks from given data sets (Hofmann et al., 2020; Kroll et al., 2016).

RPA leverages software bots (Anagnoste, 2018) which access systems and applications in a similar way to which a human operator would typically carry out complex, lengthy, high volume, mundane, repetitive, and rules-based tasks using computer applications (Hofmann et al., 2020) by utilising existing user interfaces (Asatiani et al., 2018). The screen scraping functionality enables the technology to be overlaid on existing legacy systems where the bots have access to the 'presentation layer' which allows the bots to interact with the legacy systems without the involvement of a human employee (Bygstad, 2017). In addition, the bot will not interfere with underlying infrastructure, business logic, or data access layers (Hofmann et al., 2020). Therefore, there is no change required of the back-end of the systems, which classifies RPA as a lightweight automation technique (Bygstad, 2017). RPA is also relatively inexpensive to implement and has a quick project timeline on average, which means benefits can be attained quickly, especially in relation to other automation technologies (Hofmann et al., 2020). This makes RPA an ideal mechanism to automate tasks and processes without significant disruption of existing work processes and practises and without embarking on a complete business process automation project (Van der Aalst et al., 2020).

RPA's capabilities are constantly increasing (Syed et al., 2020). It can, for example, open a new or existing Excel spreadsheet, update, save and close it (Hofmann et al., 2020) or conduct periodic reporting, data entry, archiving, and generate and send mass emails within seconds in comparison to a human employee who may take several minutes or even hours to complete (Anagnoste, 2018;

Leopold et al., 2018; Hofmann et al., 2020; Syed et al., 2020). It can also conduct copy and paste activities to transfer data from one application to another and save it (Hofmann et al., 2020). In addition, it may be used across entire processes, such as the client or employee onboarding process where the steps remain the same each time to triage and disperse information (Lamberton et al., 2017). The software bots can triage information from an email or online application form and input it into the system that will retain this data, and create relevant user accounts (Fung, 2014; Lamberton et al., 2017). It may also trigger subsequent emails when an error is detected and additional information from the client or people manager is needed (Lamberton et al., 2017). The bots may subsequently be used in payroll, sales orders, and invoice processing (Anagnoste, 2017; Evans, 2017).

Organisations that are considering purchasing new information systems or employing business process management systems (BPMS), could also consider investing in RPA as a complementary or alternative solution (Hofmann et al., 2020). Having the option to implement RPA is a pivotal advancement for these organisations, to effectively meet their needs and solve the issues in their processes (Hofmann et al., 2020). However, it is important to consider the use of RPA amongst other automation and software tools and decide if RPA alone, several automation techniques, a different automation approach or RPA supplemented with additional technologies, is best suited to an organisation's unique processes and objectives (Hofmann et al., 2020; Syed et al., 2020; Willcocks et al., 2015). Processes or process tasks and activities that meet the RPA implementation criteria for being structured, rule-based, manual, high-volume, require little to no cognitive human effort and require accessing multiple systems should be considered first as a pilot (Syed et al., 2020). Once the implementation of the pilot process is completed, post-implementation planning for continual monitoring and auditing must be undertaken to ensure the bots are working at an optimal level and can be readjusted to eliminate unforeseen discrepancies if needed (Lacity & Willcocks, 2018).

2.1.1 The use of RPA in organisations

Figure 1 synthesises the key attributes that are encompassed in RPA to better understand its adoption, implementation, and use. It outlines the RPA journey that companies undertake, which starts with the initiation of RPA projects to implement software robots for the purpose of automating processes (middle pillar). The software robots are controlled by choreographies that consist of modules and control flow operators which provide functionality and control the software robots (Hofmann et al., 2020) and may only use the applications as per pre-defined choreographies.

These software robots operate within Information System (IS) ecosystems, consisting of applications that the software bots use (right pillar).

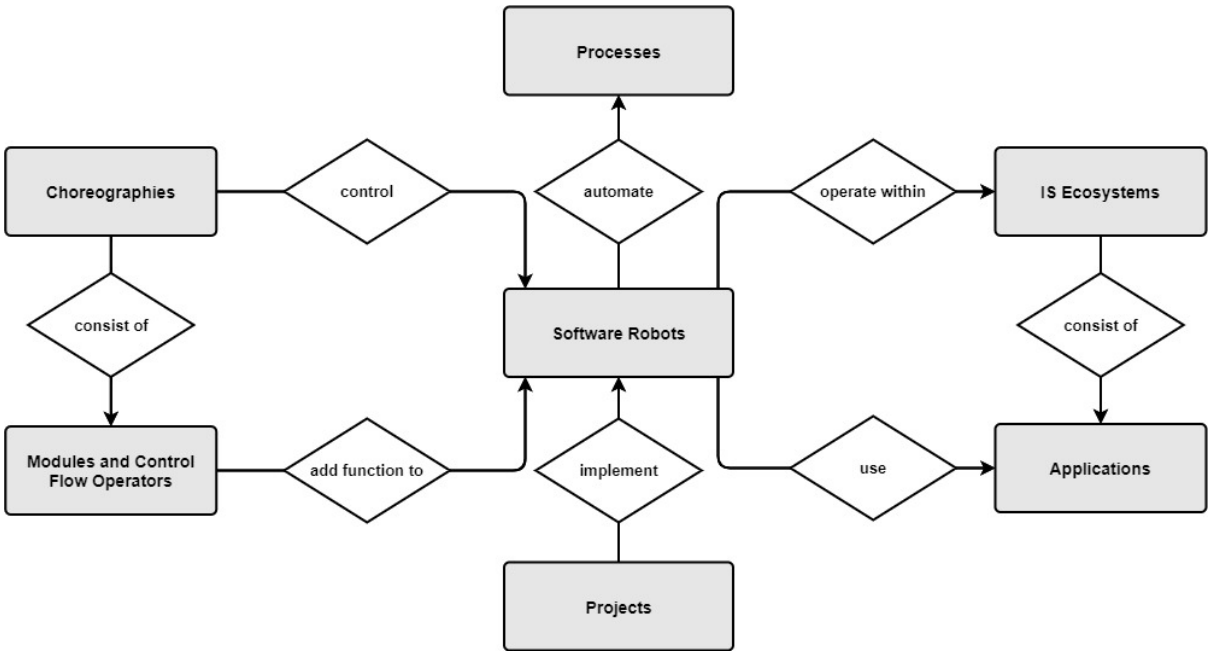

Figure 1: The nature of robotic process automation (Hofmann et al., 2020)

RPA is used by many different organisations with various business models in many industries such as banking, healthcare, insurance, retail, and telecommunications (Evans, 2017; Hofmann et al., 2020; Siderska, 2020; Syed et al., 2020). It is becoming increasingly flexible and able to adapt to discrete work environments and their specific needs (Syed et al., 2020). Software robots may be implemented to drive efficiency in mission-critical business processes (Syed et al., 2020). However, they are usually implemented into back-office departments that are not typically customer-facing and perform administrative or support tasks in areas such as accounting, procurement, and human resources (Evans, 2017). These departments often conduct tasks, activities, and processes that comply with the RPA process selection criteria for rules-based, high-volume, repetitive tasks (Evans, 2017; Leopold et al., 2018). Employees may spend long periods of time completing these tasks when they could be completing tasks that require human judgment, empathy, and critical thinking, as well as tasks that are generally regarded as high-value-adding (Syed et al., 2020). Moreover, RPA becomes a mechanism for streamlining the operations in these departments by simplifying processes but most importantly, by improving the job design of the employees and removing tasks that are not necessary for a human to complete. RPA may also encourage and facilitate globalisation capabilities where it is implemented in processes that speed up the time taken to deliver global offerings. Additionally, it may aid in electronic markets where the robots harness the ability to

rapidly carry out pre-defined actions at any time of the day (Alt, 2018). This results in strengthened relationships, as various actors throughout the market chain are more efficiently and effectively connected (Alt, 2018; Hofmann et al., 2020).

2.1.2 Benefits and challenges of implementing RPA

The popularity of RPA is increasing due to the many benefits it provides to organisations to suit specific organisational objectives and governance parameters. These benefits include the software bots' ability to execute their tasks autonomously, traceably, quickly, and accurately (Hofmann et al., 2020; Syed et al., 2020). Implementing RPA also allows the organisation to deliver faster customer response times and improved processes for the employees, as well as increasing quality of service and customer and employee satisfaction (Anagnoste, 2017; Anagnoste, 2018; Evans, 2017; Hofmann et al., 2020; Leopold et al., 2018; Siderska, 2020; Syed et al., 2020; vom Brocke et al., 2018). Organisations also benefit in terms of increasing their productivity as bots can work 24/7 by contrast to human employees, which enables them to spend more time on value-added tasks (Moffitt et al., 2018). They can also reduce their operating costs as the bots may decrease the FTE count and lower transaction processing costs, often by 30-60% (Syed et al., 2020). Due to RPA's ability to be tailored to meet specific needs in specific periods of time, it has the potential to improve business agility, and scalability (Anagnoste, 2018; Hofmann et al., 2020). It also increases auditability and security and decreases compliance risk, as the work the bot completes can be traced through logs and reports and cannot differ from its programmed path (Syed et al., 2020; Hofmann et al., 2020; Evans, 2017). However, the most significant benefit of RPA is operational efficiency regarding a reduction in cost and human capital, manual and mundane tasks, workload, and time, whilst increasing productivity and aiding in achieving key performance indicators, as employees have more time to focus on value-added work (Van der Aalst et al., 2018). The user-friendliness of RPA also makes a more desirable automation option with intuitive user interfaces and software bots that operate based on business rules and pre-defined protocols (Hofmann et al., 2020). Furthermore, with the collaboration between the IT team and the business unit, employees learn about the bot and may become empowered to want to manage the bots themselves (Aguirre & Rodriguez, 2017). Employees can adjust the number of operational bots by adding, deleting, reconfiguring, or moving the bots with little to no back-end intervention, depending on the volume of work at different periods throughout the year (Aguirre & Rodriguez, 2017; Lacity & Willcocks, 2016); for example, during natural disasters, product launches or peak sales periods. Additional benefits include faster response times and reduced error rates, which in turn may lead to increased customer satisfaction (Moffitt et al., 2018).

Despite the plethora of benefits that result from implementing RPA, there are also several challenges that must be addressed. The introduction of unattended bots that are working in the background autonomously and continuously presents points of complexity that are worth noting. The autonomy of the bots remains limited. First, because the outputs of the bot need to be monitored periodically to ensure it is completing its work correctly. Second, depending on the scope of the bot and the underlying infrastructure, the bot will present exception cases that it cannot process, which requires human employees to intervene and make judgments or decisions (Dey & Das, 2019). There are usually pre-defined exception cases. However, the bot may also throw exceptions for several reasons unbeknownst to the organisation (Hofmann et al., 2020; Syed et al., 2020; Santos et al., 2019). For example, when an application is unresponsive, a human can work on other tasks while they wait for the application to begin to work normally, while this is not possible for a bot. It is also not possible for a bot to acknowledge let alone troubleshoot connection issues. Both examples would cause the bot to forfeit the process and not complete the task.

The scalability and ability to process more cases than human employees can are usually regarded as beneficial. However, the downside is that software bots could rapidly scale problems, either if they are programmed with errors or if they encounter flaws in the process path (Hofmann et al., 2020; Syed et al., 2020). Since a bot is programmed to complete its tasks based on pre-defined rules, it would not recognise unusual or suspicious patterns that an experienced human would recognise immediately (Syed et al., 2020). Consequently, the bot would complete the process as usual, likely multiple times and potentially cause significant damage (Syed et al., 2020). For example, if the bot was generating and sending correspondence of loan agreements with incorrect interest rates, banks would be faced with a significant problem if the interest rates could not be adjusted. Therefore, the bots must always remain monitored to account for unforeseen circumstances (Hofmann et al., 2020; Van der Aalst et al., 2018). In addition, although it is a positive point of difference that RPA is overlayed on top of the legacy systems, several challenges may occur as a result. Examples include, slow performance, integration problems between the RPA software and the applications it will leverage, and further integration implications due to frequent updates of the underlying system (McGrath & Gilmore, 1995; Santos et al., 2019). Updating the underlying system often poses the need for the bot to be reconfigured, which is often time-consuming, complex, and expensive (Santos et al., 2019). The change in access control from human to bot could compromise organisational security and present compliance threats (Syed et al., 2020). Consequently, bots must be programmed with strict safeguards that adhere to organisational security standards and the work

of the bot needs to be audited to ensure there are no compliance breaches (Syed et al., 2020). However, the access controls cannot be too strict resulting in the bot being blocked from accessing the virtual environment and not being able to complete its work (Syed et al., 2020). In saying that, once the bot is programmed effectively to meet security standards, it may be more secure than a human as it will always complete its work in the same way, abiding by the same security standards each time (Syed et al., 2020).

A significant organisational challenge relates to the quality of the underlying business process. It is important to note that RPA implementation alone does not improve the quality of processes per se. Bots only follow the logic they have been programmed to execute (Fung, 2014; Santos et al., 2019). Therefore, if existing processes are inefficient or contain errors, bots will continue to execute an inefficient process and scale the error, which may obstruct the benefits of RPA from being realised. Thus, practitioners must evaluate current business processes to determine which processes are suitable to incorporate RPA and which ones to redesign first to eliminate error and inefficiencies (Fung, 2014). The bots are an excellent efficiency booster in many cases but, they are not a quick-fire solution to solve all process-related problems (Hallikainen et al., 2018; Hofmann et al., 2020). Instead, RPA is a complementary addition to processes to aid in efficient execution (Hofmann et al., 2020).

2.1.3 RPA implementation success factors

Several research studies showcase successful RPA implementations and RPA related benefits (Fung 2014; Hofmann et al., 2020; Syed et al., 2020; Viehhauser & Doerr, 2021), however, around 30-50% of RPA projects result in project failure (Kokina & Blanchette, 2019; Ernst & Young, 2017). To mitigate the consequences of potential implementation challenges and successfully embed RPA into organisations, researchers have identified seven key success factors that facilitate successful RPA implementation projects (Aguirre & Rodriguez 2017; Hofmann et al., 2020; Kyheröinen, 2018; Santos et al., 2019). The success factors are explained in table 1 below and explained in the following paragraph.

Table 1: Summary of success factors

	Authors	Success factor
1	Hofmann et al., 2020; Santos et al., 2019; Syed et al., 2020	Project and contingency planning
2	Anagnoste, 2017	Adequate evaluation of vendors
3	Kyheröinen, 2018; Santos et al., 2019; Asatiani & Penttinen, 2016	Organisational Change Management (OCM)
4	Kyheröinen, 2018	Senior management support
5	Syed et al., 2020; Hofmann et al., 2020; Santos et al., 2020	Adequate process and process task selection
6	Kyheröinen, 2018	Business process redesign
7	Kyheröinen, 2018	User satisfaction

First, thorough and considerate planning that considers the impact on employees, existing IT/Information System ecosystems, governance, leadership, management systems, organisational strategy and capabilities, and existing process landscapes is needed. Similarly, provisions for adequate planning, provisioning, and communication of IT strategies, available finances, and required time should also be considered (Hofmann et al., 2020; Santos et al., 2019; Syed et al., 2020). Second, it is equally important to evaluate vendors by price, deployment mechanisms, availability, and quality of product, which allows organisations to select an RPA offering that is most suitable to their unique business landscape (Anagnoste, 2017). Third, OCM programmes are important to ensure that the impacts on the human employees and the vision and objectives of RPA implementation are communicated delicately but effectively. It is critical that the employees are on board the project and contribute their expertise to the project team to ensure the bot is programmed correctly (Santos et al., 2019; Kyheröinen, 2018; Asatiani & Penttinen, 2016). Fourth, support from senior management facilitates easier implementation and scalability of RPA (Syed et al., 2020; Santos et al., 2019; Kyheröinen, 2018). Fifth, adequate process and process task selection are needed to ensure processes or process tasks that are selected to meet the RPA implementation criteria (Hofmann et al., 2020; Syed et al., 2020). Sixth, business process redesign should be used to streamline processes where necessary and ensure the selected processes are free of error and inefficiency (Syed et al., 2020; Kyheröinen, 2018; Fung, 2014). Seventh, user satisfaction is critical, including that the users of RPA know how the technology works, how to use it, and that they are comfortable implementing it into their work routine (Kyheröinen, 2018; Santos et al., 2019).

2.1.4 Impact on human employees' work processes and practices

RPA enables human-robot interaction and will require a level of collaboration; it does not isolate the work of the robot and the work of the human. Instead, RPA facilitates an efficient collaboration between bots and humans to execute processes easier, faster, and of higher quality (Fung, 2014; Syed et al., 2020). The software bots are adopted into teams to execute various activities, tasks in a process or an entire process which eliminates or reduces the need for human employees to complete these actions themselves (Anagnoste, 2017; Dey & Das, 2019). The ability to rid employees of mundane and repetitive tasks allows them to capitalise on their time and resources to complete meaningful tasks. As a result, employees have more opportunities to conduct value-added and critical tasks that require social skills, logical judgement, and critical or creative thinking, while the software bots complete the clerical tasks that remain crucial to their work (Aguirre & Rodriguez, 2017). For example, the robots are often programmed to complete the information gathering and pre-processing tasks prior to the human employee, who will subsequently utilise the bot's work as an input for the tasks that are conducted in later phases of the process that require human discretion (Anagnoste, 2018; Dey & Das, 2019). In an insurance claim process, this may look like the bot capturing all the information about the claim from the client; the human employee may then assess the information and accept or reject the claim.

With the growing capabilities of RPA, the technology is becoming more powerful and will most likely have compounding effects on the human workforce. This occurs at three levels. First, within the organisation, the business unit and the IT team would collaborate to develop the bots. However, the ownership and responsibility of the project may be unclear between both parties as the processes are owned by the business unit and IT will often oversee and complete much of the development tasks (Santos et al., 2019). As a result, conflict may arise. Second, in many cases, RPA may become a tool in organisations' pursuits of decreasing their human workforce as it is cheaper to employ, compliant, and often more efficient (Santos et al., 2019). Even if this is not the case, employees tend to become anxious when their typical work practises change and see the bots as a threat to their job security (Santos et al., 2019; Syed et al., 2020). This fear is not unfounded as RPA implementation often leads to job redesign or relocating employees to other positions within the organisation (Asatiani & Penttinen, 2016; Santos et al., 2019). Third, where there are more people to consider in a project, depending on the contextual factors, the implementation may become less straightforward. Additionally, studies have also identified that there is a lack of knowledge on RPA among employees in many organisations which deters employees from embracing the adoption (Syed et al., 2020). Thus, practitioners should demonstrate the benefits of RPA to employees and explain the implications of its implementation to minimise the risk of rejection (Santos et al., 2019; Syed et

al., 2020). Together, these factors create tension in the workplace as the employees resist the change associated with RPA implementation. Resistance to change can significantly impact the success of the project if the employees boycott implementation activities or provide misleading information (Asatiani & Penttinen, 2016; de Fátima Nery et al., 2020). Thus, following change management best practice is fundamental to reducing anxiety among employees, bringing them on board the implementation journey and increasing acceptance and use of the bots (Asatiani & Penttinen, 2016; de Fátima Nery et al., 2020).

2.2 Organisational Change and its Management

2.2.1 Organisational Change

Organisational change does not only cover the complex and challenging processes organisations go through when significant change is endured while moving from one state to another, but also the effects of the change on the organisation and its stakeholders (Peus et al., 2009). Examples of organisational change are, a change in structure, operational procedures or strategies, and implementation of technologies (Peus et al., 2009; Rafferty & Griffon, 2006; Stensaker & Meyer, 2011; Whelan-Berry & Somerville, 2007).

The rate of change in organisations is faster than ever before with new technologies, business tools, and strategies continually surfacing (de Fátima Nery et al., 2020; Whelan-Berry & Somerville, 2010). Therefore, it is a constant battle for organisations to attain and sustain competitive advantage. Organisations are aware they cannot obtain every opportunity that comes into the market as opportunities are vast, ever-changing and new opportunities are developed very fast (Burnes, 2009). However, a better-suited method of achieving a competitive advantage is by aiming to achieve the highest profit margins in their industry (Burnes, 2009). Often, the way to achieve this is to change the way organisations conduct business activities to deliver higher quality products and services, and improve the customer experience at a lower cost (Burnes, 2009). Aside from achieving competitive advantage, organisations may also choose to embark on change initiatives to optimise their business model and/or reach strategic objectives more effectively. The proposed benefits of implementing cutting-edge strategies and infrastructure seem rather compelling for organisations as they can significantly save on costs and maximise efficiency. However, wrongly embarking on the change process may come at a large cost for organisations, one which outweighs the expected benefits of the implementation (Whelan-Berry & Somerville, 2010). It is important for practitioners to recognise that a proposed ‘need’ for change does not necessarily constitute successful implementation of that

change. Thus, practitioners must make significant efforts to successfully facilitate the change in their organisations (Whelan-Berry & Somerville, 2010).

Appreciating and understanding the organisational change process and having the skills to effectively execute a change initiative in a variety of contexts is a required and enviable skill in the fast-paced environment of the 21st century (Whelan-Berry & Somerville, 2010). Organisational change requires strong leadership skills and support, a clear vision, communication, training, and participation. These elements are commonly seen in literature as the key factors to consider in successful change initiatives in organisations and may help to facilitate adoption on an individual level (Rafferty & Griffon, 2006).

Arguably, the most important success factor is managing the expectations and discomfort of the employees as employee rejection can produce unfavourable effects on themselves and the organisation (de Fátima Nery et al., 2020). Most impactfully, substantial economic loss may occur if there is potential for immediate profits to be realised when an opportunity for change is available, but the company is unable to swiftly realise these benefits due to the delay in implementation (Georgalis et al., 2015). The buy-in of employees is crucial, as when employees begin to produce low quality work as a rebellion against the change that is being implemented, it can result in customer dissatisfaction and ultimately to an increased turnover rate and a decrease in revenue (de Fátima Nery et al., 2020; Georgalis et al., 2015). The response from the employees is often anticipated as the general reluctance towards change among groups of individuals is well-recognised throughout most contexts (Georgalis et al., 2015). Change within the workplace has proven to be particularly unsettling as it often results in a perceived or literal monumental change to the employees' role, workload, and potentially the skills required to complete their tasks which makes them feel uncomfortable as they proceed into the uncertain future (de Fátima Nery et al., 2020; Georgalis et al., 2015). Most prominently, as soon as employees are notified of change within an organisation, fear of losing their jobs tends to be triggered immediately. This can cause extreme anxiety as they tend to immediately associate the change with a threat to their livelihood if they perceive their employment to be uncertain (de Fátima Nery et al., 2020; Whelan-Berry & Somerville, 2010). Furthermore, employees often experience feelings of a lack of control as their environment changes and they may need to unwillingly leverage or develop new skills to cope with their job redesign and their perception of a chaotic environment (de Fátima Nery et al., 2020).

The perception of the change will vary among employees which may result in positive and negative reactions (Georgalis et al., 2015). However, the existing stance on change is salient for those impacted individuals, as their attitude may affect their wellbeing while experiencing that change (de Fátima Nery et al., 2020; Georgalis et al., 2015). Some individuals naturally have a positive attitude towards change. They convey positive perceptions and happily cooperate throughout the process as they find excitement in the unknown, regardless of the potential consequences (de Fátima Nery et al., 2020), which may include job redesign, upskilling, or losing their place in the organisation entirely. Employees with this attitude, coupled with a supportive organisation, reduce the risk of negative consequences of organisational change (Kim et al., 2011; Smith, 2005). However, some individuals do not naturally possess the ability to embrace change and present a negative attitude towards it. Further, exuding negative cognitions and behaviour may act as a barrier towards effective change implementation (Oreg et al., 2011).

Feelings of uncertainty are one of the main consequences of change and can result from emotions, thoughts, and opinions that are internal to the individual (Bordia et al., 2004). Feelings of uncertainty can also be a result of past experiences of change and organisational history of change processes, perceived thoughts, expectations of the future of the process and results of the change. Other factors that may influence the perception of change among employees includes the frequency and quality of change management programmes, planning of the change, magnitude, and the intensity of the change (Bordia et al., 2004; de Fátima Nery et al., 2020). Several researchers in the organisational change field suggest that perceived uncertainty and risk among employees contributes to the development of negative perception and feelings throughout the organisational change process (Fugate et al., 2008; Fugate et al., 2011; Kiefer, 2005). However, de Fátima Nery et al. (2020) concluded in their study, that feelings of uncertainty and risk do not inevitably result in a negative perception of their work and towards their organisation.

Individuals may also feel threatened if organisations market the change as increased responsibility, possibly if two jobs merge or if enjoyable aspects of the jobs are going to be removed (Dahl, 2011) Overall, poorly planned and implemented change increases the potential to cause significant discomfort for employees, causing detrimental effects for the entire organisation as well as external stakeholders (Stensaker & Meyer, 2011).

Studies have found that there is a correlation between employee attitude towards change and the effects on mental health (Bohl et al., 2001). If employees are open to welcoming the change, there

are fewer harmful consequences on their wellbeing, but if employees reject the change, they may feel frustration, anxiety, and stress (de Fátima Nery et al., 2020). The effects on their wellbeing can be detrimental and may even lead to serious incidents, such as heart attacks, strokes, or even death (Bohl et al., 2001; de Fátima Nery et al., 2020).

2.2.2 Organisational change due to Information Technology (IT) implementation

Technology-driven change is typically the primary option for organisations to increase their profits by decreasing expenses through streamlined business activities that minimise operational costs (McGrath & Gilmore, 1995). Technological capabilities are becoming increasingly disruptive and revolutionary which poses several opportunities and techniques for organisations to update their business operations (de Lima & de Souza, 2019). Industries are constantly changing to keep up with external demands and various technologies are often used to execute organisations' responses to this ever-changing environment (de Lima & de Souza, 2019). There are many technologies such as Enterprise Resource Planning systems (ERPs), automation, and cloud computing available that will aid in increasing competitive advantage, customer satisfaction, and time and cost savings to enable an efficient working environment. In turn, this provides the highest quality products and services to their customer base which expectedly increases customer and employee satisfaction and the profit margin of the organisation (Pine et al., 2020).

Adopting new technology generally comes at a high capital expense (Pine et al., 2020). However, with the potential to significantly reduce operational costs as tasks are executed more efficiently and human labour costs can be saved, it often achieves a high return on investment. Implementing a new technology is commonly marketed as a rapid, transformational solution to improve organisational operations (McGrath & Gilmore, 1995). However, this is not always the case and practitioners must take a holistic approach to evaluate the necessity of the implementation and how it would become effectively integrated into existing business operations (Bechky, 2020; de Lima & de Souza, 2019). Most importantly, employees must be considered, especially those who will be required to use the new technology (Bechky, 2020). This emphasises that careful consideration should be taken by practitioners to develop suitable OCM plans when embarking on organisational change initiatives (de Fátima Nery et al., 2020).

2.2.3 Organisational Change Management (OCM)

OCM has been identified by researchers as a key success factor for RPA implementation projects (Kyheröinen, 2018). It is defined as the management of an alteration within organisations to address

organisational change both internally and externally, with the aim of minimising the negative effects of the change whilst maximising the potential of the organisational transformation (By, 2005). It is reasonable for organisations to envision their future presence in the market; however, it is equally important to consider and carefully plan the steps to achieve the changes (By, 2005). Despite the importance of organisational change management, there is a lack of agreement in the academic literature regarding how to successfully execute organisational change (Whelan-Berry & Somerville, 2010). This may be an indicator as to why many organisations continue to wrongly engage with change initiatives, with anywhere from 35-80% of change initiatives reportedly failing (By, 2005; Burnes, 2014; Doyle, 2001; Whelan-Berry & Somerville, 2010). Change management is complex and challenging, with many variables to consider, such as the employees involved, the specific requirements, and the context which differs widely depending on the organisation (Hughes, 2011). Practitioners acknowledge that any organisational change process is complex, but scholars have recognised that although the process is complex, it can be conceivable and mappable if practitioners spend significant efforts on researching, understanding their organisational culture, processes, and planning (Whelan-Berry & Somerville, 2010).

Throughout the literature, the most accepted steps to integrate change into organisations have been identified as developing a clear, compelling vision, and then bringing that vision to the group level to create a shared understanding. This involves a) ensuring all stakeholders understand why the change is happening; b) how the organisation will perform post-implementation; c) individual employees' adoption of the change; and d) maintaining momentum throughout the change implementation process (de Fátima Nery et al., 2020; Diefenbach, 2007; Rosenbaum et al., 2018; Stensaker & Meyer, 2011; Whelan-Berry & Somerville, 2010).

It is also pertinent for change leaders to thoroughly plan the project. First, it is important to accurately evaluate and allocate adequate resources throughout the planning phase to ensure there is a high likelihood of carrying out the plan as presented and agreed upon by the stakeholders, especially the employees as they often do not have a say (Raferty & Restubog, 2010). Adequate planning has positive effects on employee well-being. They can see and understand the significance of the change and how it will unfold, which further increases certainty and their feelings of control (Rafferty & Griffin, 2006). The plan must include an indication of the duration of the change process, goals, and a logically structured sequence of steps that illustrate the change process clearly, coinciding with the proposed objectives (Bryson et al., 2013; Green, 2011). These factors are important as wrongly allocating resources can cause unforeseen monetary issues and delays

which are prime causes for derailing a plan (de Fátima Nery et al., 2020). A detailed and clear plan contributes to their perception that extensive considerations, negotiations, and preparation have gone into the planning of the change prior to the implementation. This subsequently decreases the likelihood of negative effects on employee wellbeing that can arise as a result of uncertainty (Bryson et al., 2013). Where this is obvious to employees, the change becomes more predictable, which reduces shock and anxiety (Rafferty & Griffin, 2006). Although sometimes necessary, diverting from the disclosed plan can cause employees to lose faith and trust in the organisation and experience increased feelings of lack of control, lack of clarity, and anxiety (Green, 2011) as they perceive their working environment to be increasingly volatile and uncertain (Dahl, 2011; Bryson et al., 2013).

Most commonly, organisational change involves change at the individual level, whether it is the employees of the company or other stakeholders, such as the customers and shareholders (Smith, 2005). The stakeholder's typical interaction with the organisation will have to change and as the interaction begins to change, the interaction may become unnatural, and often they must unlearn old habits and adjust their behaviour, values, and frameworks that underly the organisation or shape their interaction (de Fátima Nery et al., 2020). Therefore, organisations must take action to improve their ability to support their employees through this time; this may include an adaptation period and support for employees to cope throughout the change process (Stensaker & Myer, 2011).

Employees are integral to the success of any organisation and arguably hold the largest stake in change initiatives as employees have control over their engagement with their daily tasks and change activities. Whether their perspective is positive or negative, their engagement has a strong influence on project success or failure (Doyle, 2001). Furthermore, to encourage a shift in employee perspective, attitude, and behaviour, it is very important that organisations make significant efforts to get the employees on board (Burnes, 2014; Doyle, 2001; Whelan-Berry & Somerville, 2010). Despite employees being identified as having a large stake in change initiatives, organisations continue to have an absence of effort ensuring that the wellbeing of these employees are preserved, not necessarily because organisations choose to neglect this fact but often because organisations do not know how to manage the employees during this time (Stensaker & Myer, 2011; Whelan-Berry & Sommervile, 2010).

The attitude toward change may not always be internal to the employee, instead, it may be a result of how change was communicated to them by the organisation (Rafferty & Restubog, 2010). The process of sense-making (Weick et al., 2005) explains that feelings towards new information will be

based on previously accumulated past knowledge, actions, and meanings (Weick et al., 2005) Therefore, as soon as employees hear of the change, they attribute a feeling to it and much of that feeling is to do with how the message is delivered and what they have experienced in the past. This emphasises the necessity for creating a strong backing for the project and communicating it effectively to the employees. Consequently, the employees understand the change and believe it makes sense. In turn, as employees create their perspectives, the level of uncertainty is lowered (Weick et al., 2005; Vakola, 2016). This is particularly important for individuals who have past negative experiences of organisational change (Weick et al., 2005; Vakola, 2016). To prompt buy-in, organisations must clearly illustrate a compelling vision to the stakeholders to ensure that they concur with the change, are willing to accept it, and come on board the project (Whelan-Berry & Somerville, 2010). It is useful for senior managers to utilise formal mechanisms such as presentations and training sessions, and informal mechanisms such as team building activities that are culturally appropriate, as well as maintain communication throughout the implementation (Whelan-Berry & Somerville, 2010; Bordia et al., 2004). These efforts can be used to nurture the buy-in of the employees, while building and maintaining the momentum to ensure employees accept the change (Whelan-Berry & Somerville, 2010).

Psychology research has shown that change management programmes that emphasise employee involvement are a great promotion technique for the change artefact as it leads to increased levels of commitment to the organisation and willingness to accept the change (Vakola, 2016; Armenakis et al., 2016). Such OCM programmes will likely stimulate their interest and maintain their engagement in the change artefact regardless of the change that will be implemented. As the level of buy-in increases amongst various groups of stakeholders, the change artefact becomes more compelling to other stakeholder/s who are more sceptical, unsure, or noncommittal, which strengthens the buy-in levels across the organisation (Hughes et al., 2017).

2.3 Summary

Existing literature has elaborated on the benefits, challenges and success factors of RPA implementation (Hofmann et al., 2020; Santos et al., 2020; Syed et al., 2020). Yet it remains unclear how RPA projects unfold in practise, including how the various challenges may occur, how to mitigate the challenges and what is involved in implementation overall. Therefore, the first goal of this research project is to explore how RPA projects unfold, how the challenges occur and how they are mitigated through the implementation process. To better understand the dynamics of RPA implementation projects, the issues that arise, and relevant OCM strategies to apply, this study

conducts a fine-grained process analysis of how an RPA implementation project unfolds across its different phases using the principles of socio-technical theory. Socio-technical theory is employed as the theoretical lens because RPA is neither solely a technology to be implemented nor a social system that is controlled by human actors. Instead, both elements are equally important and form part of a reciprocal relationship (Doherty & King, 2005; Sawyer et al., 2003). While we know that RPA implementation can lead to several benefits and challenges, further research is needed to understand how employees can be better guided through the process of implementation. This is important because many employees experience resistance to change which is detrimental to the success of the project as significant collaboration between employees and the project team to successfully develop RPA bots (Santos et al., 2019; Asatiani & Penttinen, 2016). A solution for this is to utilise OCM strategies. While OCM has been identified as a key success factor in RPA implementation projects (Santos et al., 2019), there is a lack of research that describes OCM strategies that should be applied when implementing RPA to achieve project success. Therefore, the second goal of the project is to understand what OCM (in the context of RPA) entails, how it occurs and the strategies that organisations apply already when implementing RPA (Syed et al., 2020; Aguirre & Rodriguez, 2017; Fung, 2014; Moffitt et al., 2018; Hofmann et al., 2020; vom Brocke et al., 2018).

3. Theoretical lens

3.1 RPA Implementation as Socio-Technical Change

In this study, the RPA implementation is viewed as a socio-technical change (Lyytinen & Newman, 2008). Socio-technical theory was used as a sensitising device to guide the interview guidelines and analyse the data. Socio-technical theory was developed by Eric Trist, Ken Bamforth, and Fred Emery during their work in the coal mining industry (Davis et al., 2014; Trist & Bamforth, 1951). They discovered that the introduction of new machinery, illuminated the consequences of solely taking a technical-focused approach in the planning and implementation, while excluding the associated social impacts (Davis et al., 2014; Trist & Bamforth, 1951). Since then, the theory has been applied for approximately 60 years by researchers and practitioners (Baxter & Somerville, 2011; Eason, 2008). For example, researchers and practitioners in organisational management (organisational behaviour and organisational change), software development, and business process management have worked to continually evolve and develop the theory by contributing new insights into socio-technical thinking and emerging frameworks (Baxter & Somerville, 2011; Hughes et al., 2017; Davis et al., 2014). Socio-technical theory describes the interrelationship between the social and technical elements of an organisation (Hughes et al., 2017). Both elements must be jointly optimised to maximise the effectiveness of an organisational system (Hughes et al., 2017). It is also important to consider taking a holistic approach during a technology-driven organisational change to evaluate the existing organisational landscape and effectively balance both the social and technical aspects (Hughes et al., 2017).

Socio-technical theory is relevant in the context of this study as RPA is different from other technologies that organisations adopt, such as ERPs which employees use to complete their tasks. Instead, the RPA bots complete the tasks for the employees either autonomously or can be triggered to complete tasks (Hofmann et al., 2020). This poses additional complexity in an organisational system as it blurs the boundaries between the technological and social elements and emphasises their interrelated nature. The intersection of technological and social elements can result in dynamic interactions that may pose further positive or negative consequences (Orlikowski, 1992). The implementation of RPA involves significant collaboration between the IT professionals of the organisation, the business unit who will adopt RPA, and typically an RPA vendor, all of whom have varying stakes in the implementation. The stakeholders must also manage the RPA technology itself at varying levels, which results in dynamic interactions between the social and technical components (Orlikowski, 1992). There is also a significant requirement for human-robot collaboration between the employees and the software robot. Therefore, it is important to develop an

understanding of how both the social and technological elements can be jointly optimised, to ensure the human stakeholders and technology can co-exist harmoniously. Otherwise, successful change initiatives are less likely to be achieved. Furthermore, scholars argue that if socio-technical theory is applied in instances of organisational change, the change initiatives have an increased likelihood of success (Axtell et al., 2001; McGowan et al., 2013). Overall, socio-technical theory aids in ensuring that both the needs of the social stakeholders and the technical complexities are understood and investigated by the researcher.

Leavitt (1964) proposed a diamond structure to extend socio-technical theory that suggests that organisations consist of four interrelated and interacting elements: tasks, structure, people, and technology. He argues that balancing the interdependencies between the four components ensures that an organisational system remains in a stable state. Building on Leavitt's 'diamond' model, Lyytinen and Newman (2008) developed a Punctuated Socio-Technical Information System Change model which proposes that information systems-related (IS) change evolves through stages and occurs at multiple levels of an organisational system. They further argue that any interactions or alterations to the organisational system take place in punctuations. Once a punctuated sequence of events is clear, it can be understood how the change unfolded (Lyytinen & Newman, 2008). The authors propose that the three levels in which IS change impacts are, (1) the work system, which is the business unit that is adopting a technology; (2) the building system, where the technology is developed and implemented, typically by a project team; and (3) the organisational environment, which encompasses the entire institutional context in which the technology is implemented. The external environment such as the social, competitive and political influences on the organisation are involved as well. The implementation of RPA is deliberate and involves significant planning efforts from the project team at the building system level to coordinate correctly. Once introduced into the work system level, it causes reconfiguration at this level as the impacted process is likely to be altered as well as the employees' typical way of working. Both the building and work systems exist within the organisational environment. This presents a continuous reciprocal relationship by which the actions and activities of the organisational environment influence the operation of the work and building system levels. Also, the work and building system levels may influence the output and success of the organisational environment (Lyytinen & Newman, 2008). If one element is altered in a socio-technical system, it may have positive or negative consequences for other elements and may have cascading effects in one or more of the levels of the organisational system.

Socio-technical theory, and particularly Leavitt's (1964) diamond model, can be applied to IS related change and development (Lyytinen & Newman, 2008) as it provides a framework to analyse the impacts on the actors involved, the organisational context or 'structure', and the fundamental aspects of the technology (Orlikowski & Iacono, 2001). The four socio-technical components (people or actors, task, technology, and structure) can be applied at all three levels, work system, building system, and organisational environment, when regarding the context of implementing RPA at the university as a socio-technical system. For example, at the building system level, (a) actors include all involved stakeholders (vendors, IT team and developers, users, middle and upper managers) and their varying interests, expectations, characteristics, and roles; (b) structure represents governance and business rules that form the parameters actors can work within and that inform their choices and behaviour, organisational culture, project management, and hierarchy and decision-making structure; (c) technology includes the RPA technology, development tools and relevant technical infrastructure of the organisation; and (d) task refers to how the relevant development tasks are accomplished and the project scope and goals that determine the tasks that must be carried out for the project to be completed (Lyytinen et al., 1998; Lyytinen & Newman, 2008; McLeod & Doolin, 2012).

Interactions between the socio-technical components on a system level or between system levels may lead to a gap or misalignment between the impacted socio-technical components (Lyytinen & Newman, 2008). This may place the level of stability of the system in a compromised position if it is not addressed. To address the gaps or misalignments between the components, interventions with the system are required to mitigate potential negative consequences or remove gaps, harness positive opportunities, and stabilise the system components. An intervention can be described as action taken to resolve a gap or misalignment in a socio-technical system (Lyytinen & Newman, 2008). However, interventions may fail for several reasons, including complex or tight coupling between components, rejection by, and/or inadequate performance of actors. The interventions may also impact the whole socio-technical system in either a positive or negative unintended manner (Lyytinen & Newman, 2008). Camillus (2008) proposes the concept of 'wicked problems' that highlight the severity of gaps or misalignments (consequences) resulting from a critical event among work systems. Within work systems, problems may become so large and complex that the problem cannot be clearly defined by stakeholders and is therefore incredibly difficult or impossible to resolve. The complexity generally stems from incomplete or contradictory information stemming from inadequate planning, the volume of people from various stakeholder groups involved, monetary implications, and the web of interrelated problems it may reside in (Hughes et al., 2017). Overall, these issues generally occur as a result of failing to adequately plan for inherent socio-technical implications of unbalanced action

towards components in the socio-technical system, or not having a plan for managing unanticipated issues (Hughes et al., 2017). Thus, acknowledging and managing the unanticipated challenges that cause ripples throughout a socio-technical system must be addressed (Hughes et al., 2017).

4. Research Design and Methodology

This chapter describes the research methods used and explains the philosophical basis on which the research is conducted to justify the use of qualitative research guided by abductive reasoning to answer the research questions: "How do RPA projects unfold in the context of a tertiary institution?" and "Which Organisational Change Management strategies can address the challenges faced by organisations when they are implementing RPA?"

4.1 Research Design

The insights from the existing literature on the key concepts and success factors of RPA implementation as well as OCM strategies have informed the research design, in particular the development of the research questions. Informed by the theoretical insights, the research addresses these questions by taking a case study research approach. The case study method was chosen as it provides exploratory descriptive analysis to evaluate a phenomenon within a specific real-life environment (Tetnowski, 2015).

Using this method allows detailed accounts to be gathered of how the RPA implementation unfolded holistically from the individual employees, managers, and vendor perspectives to further identify and explain in-depth insights (Tetnowski, 2015). To effectively theorise in this context, capturing distinct individual views and experiences that will naturally vary in the subjective social world is critical. It is also critical to collate the data and determine common aspects to construct a narrative that leads to a clear conclusion on how RPA implementation projects unfold and how Organisational Change Management should be used to support a successful RPA implementation project (Tetnowski, 2015).

In this study context, RPA was implemented in an Australasian university that is continually looking for new opportunities to leverage new technologies with the purpose of improving internal operations. In addition, the University strives for operational excellence by putting great efforts towards executing business processes efficiently. By executing efficient processes, operational costs are minimised, and productivity and job satisfaction of the employees is maximised, which ensures the University remains competitive and progresses toward their goals to attain excellence. It is also a prime objective of the University to ensure all students, including prospective students, receive excellent care, and have a positive experience which is often facilitated through IT advancements. Through monitoring emerging technologies and evaluating the validity from real-life cases of RPA implementation, RPA was recognised as a great mechanism to achieve the goals of the University with little disruption to existing operations. Therefore, senior managers agreed to conduct

a pilot implementation of an unattended rules-based bot in late 2020. The aim of the pilot was not to realise a return on investment but to learn about the bots, test the validity of utilising RPA in the University, including the potential benefits and issues that arise, and how to address them. Another long-term goal of conducting the RPA pilot was to build a foundation for further RPA implementation in other departments. For the pilot process, the Student Admissions team were approached as they conducted several tasks that are rules-based, high-volume, and repetitive. They are also a critical team in delivering excellent service to prospective students. Therefore, their school leaver process was chosen to be automated due to the volume of work the bot would reduce for the team. This would provide several other benefits such as staff stress reduction, flexibility and the ability to spend more time working on value-added tasks.

Conducting a case study and interviewing participants from an Australasian university enables an exploration of how the OCM strategies are applied, unfold, and how the OCM strategies potentially differ in the context of RPA to OCM strategies proposed in the literature. It also allows insights into the dynamic relationships to be gained between the socio-technical components and the consequences they present.

4.2 Research philosophy

In order to answer the research questions, the philosophy of interpretivism (Myers & Walsham, 1998) is adopted, which takes the position that there are multiple true realities that are subjective to individual experience. Interpretivism acknowledges and advocates for human beings to create the meaning of the situations they experience, which may be influenced by a variety of factors which impact their cognition (Myers & Walsham, 1998; Gray, 2014). These factors may include their country of origin, culture, religion, education, occupation, and household (Gray, 2014). The varying experiences of individuals develop opportunities for a rich understanding of diverse social worlds by interpreting a phenomenon through the individuals who assign meaning to it (Gray, 2014; Orlikowski & Baroudi, 1991). In addition, interpretivism in Information Systems research aims to understand the context of an information system as well as how the information system and context in which it resides influence each other (Walsham, 1993). By adopting an interpretivist approach, the author was able to explore how the RPA implementation project unfolded through the eyes of the individuals who experienced it. Retrospective accounts of the involved employees, middle and senior managers and employees of the vendors who experienced the RPA implementation from different points of view are utilised. By collating unique experiences of the sequence of events, an understanding was developed of how the RPA implementation unfolded from beginning to end, including the events leading up to

RPA adoption and the events post-implementation. Aside from contributing how they experienced RPA implementation in the University context unfolded, the vendor also assisted in contextualising the events that were contributed by other participants based on their past experience as they have experienced several RPA implementations. To deepen the understanding of the RPA implementation, socio-technical theory was used to investigate how the socio-technical components are affected at the multiple levels in the organisational system when key events occurred and how the issues were mitigated, or opportunities were leveraged to rebalance the system.

To determine which OCM strategies are applied to mitigate or prevent issues that have occurred during RPA implementation, the perspective of the employees of the vendor involved are drawn on. They have vast experience in RPA implementation to develop a deeper understanding of how and why the employees view the RPA implementation and OCM strategies or lack thereof. They also assisted in this understanding based on their experience of how implementations generally unfold, common experiences in a variety of workplaces, the existing team and company culture, and potentially the individual personalities or personal circumstances of the employees. The congruent and conflicting experiences, opinions and perspectives of all the participants are synthesised to determine the relative importance of OCM strategies and how they can be applied to RPA implementation to ensure all stakeholders' benefit.

In alignment with Lyytinen and Newman (2008) and their introduction of intervention strategies to realign the socio-technical system, the author suggests the use of OCM strategies to act as interventions to address the consequences that arise from implementing RPA. However, since, interpretivism claims that individuals attribute their own meaning to their experiences, the diversity of the social world poses immense complexity, as the outcome may be perceived in various ways (Myers & Walsham, 1998). For example, several participants may believe the communication OCM was helpful and valid as an intervention strategy, but several others may believe the opposite. In addition, interpretivism reinforces that various factors, such as reactions, behaviour or the environment, lead to an outcome that may differ if certain factors are changed (Myers & Walsham, 1998). Furthermore, being able to develop an understanding of how the RPA implementation process unfolded allows the identification and evaluation of the impact of gaps or misalignments, and how the reactions and behaviour of the stakeholders may have changed if OCM was utilised.

In line with the interpretivist stance and the reasoning above, the epistemological standpoint of constructivism is adopted (Bogna et al., 2020). Constructivism emphasises that the world is a construction of individual experiences and perceptions (Bogna et al., 2020). The constructivist theory claims that truth and meaning can be discovered without the need for scientific measures (Bogna et al., 2020). It is believed that objectivity is not a concern here to investigate the implementation of RPA from the employees' perspective. The knowledge can only be discovered if there is active participation in the data collection with minimal distance between the researcher and the research subjects (Bogna et al., 2020). Additionally, constructivism believes knowledge comes from interaction with the research subject and must be extracted by conversing with them or observing them to understand their thoughts, experiences, and perspectives regarding a certain phenomenon (Bogna et al., 2020).

Finally, building on the underpinnings of interpretivism and constructivism, a qualitative research approach is applied (Kaplan & Maxwell, 2005). Qualitative research aims to understand a particular phenomenon by exploring the individual experiences, behaviour, and perspectives of those participating as well as developing an understanding of the events and processes involved that contribute to the phenomenon (Kaplan & Maxwell, 2005). In the Information Systems discipline, there are several techniques to conduct a qualitative study, however all studies rely on qualitative data in forms such as interviews, images, and sounds (Sarker et al., 2018). This study follows the interpretive case study method (Sarker et al. 2018) to explore how RPA implementation projects unfold and which OCM strategies are best suited to RPA implementation projects. A theoretical lens of socio-technical theory is adopted to inform the interview guideline and data analysis with the goal of understanding the phenomenon under study and producing novel insights in the form of a framework that guides scholars and practitioners. This study contributes to the RPA and OCM literature using words and expressions of the participants to understand and explain why and how the phenomenon occurred. Qualitative research assumes the position that an ever-changing reality exists that is subjective to the person experiencing it (Kaplan & Maxwell, 2005). The experiences and input of the participants who contribute their unique perspective of the relevant social context are vital to extract meaning, to define the meaning, and present insights that consider different perspectives (Kaplan & Maxwell, 2005). In the context of this study, detailed accounts are presented by the research participants during qualitative interviews to discover their experience of the RPA implementation. Qualitative interviews focus on asking open-ended questions to research participants and interpreting the answers. In this endeavour, questions may be posed to the participants in different ways or in different orders depending on the responses provided (Qu & Dumay, 2011; Myers & Newman, 2007).

Qualitative interviews were adopted to allow the capture of key issues and events that occurred during the RPA implementations and the OCM strategies that were employed and potentially missed opportunities to employ them. In addition, there was an exploration of the outcome of the interplay between socio-technical elements from varying perspectives. The analysis of the perceptions and experiences of the participants informed the developed OCM framework for RPA implementation with the aim to support scholars in their efforts to study RPA implementation and/or OCM as well as practitioners to achieve a successful RPA implementation.

4.3 Data Collection

The data collection was undertaken by conducting semi-structured interviews with eleven employees from an Australasian university who were from different teams, including several ICT teams, senior management, and student admissions, as well as two employees from a third-party RPA vendor. Thus, perspectives from a variety of participants were gathered in different roles and with various professional and demographic backgrounds. Please find an overview of the participants, including their role, time spent in the organisation, use of RPA in the future and openness to change in Table 2. After the data was collected, the interviewees were referred to by their job titles to protect their confidentiality.

Table 2 Overview of participants

Participant	**Gender**	**Time in current position**	**Job title and role in the implementation**	**Use of RPA**	**Openness to change**
1	Female	Less than 10 years	Employee A – assisted project team from a user perspective as a Subject Matter Expert (SME)	Moderate	High
2	Female	Less than 10 years	Employee B – RPA user	Moderate	Medium
3	Female	10+ years	Employee C – RPA user	Moderate	High
4	Female	10+ years	Employee D – RPA user	Moderate	High
5	Female	Less than 10 years	Employee E – RPA user	Moderate	Low
6	Female	10+ years	Test Manager	Low	High
7	Male	Less than 10 years	Project Manager	Low	High
8	Male	10+ years	Student Admissions Manager – process owner	Moderate	High
9	Male	Less than 10 years	Application Support Analyst	Low	High
10	Male	10+ years	Developer	Low	High
11	Male	Less than 10 years	Acting CIO – oversaw entire project	Low	High
12	Male	Less than 10 years	(Vendor) Solutions Architect	High	High
13	Male	Less than 10 years	(Vendor) Relationship Manager	Moderate	High

The majority of the interviews with the project team were conducted 1-12 weeks after the implementation project was complete, depending on their availability. The interviews with the employees from Student Admissions were conducted 3-5 months post-implementation. Meanwhile, the Acting CIO and Student Admissions Manager (process owner) were interviewed 5-6 months post-implementation, after the employee interviews were completed.

The interviews with the Student Admissions team were conducted once the integration period was complete, and employees had time to settle into their new work processes and adjust to their new tasks and processes. This allowed them to thoroughly illustrate the change in working habits, behaviour, attitude, job satisfaction, and workload, as well as their perception of the pre-implementation, and post-implementation phases retrospectively. Furthermore, they could reflect on RPA, the entire implementation and the change management process, but most importantly, they now had experience with working with the software robot side by side. This allowed the development of a holistic picture with rich accounts of the implementation from pre-to-post-implementation. The diverse perspectives also helped to better understand the nature of the RPA implementation, the issues that were encountered and how they were addressed, as well as how to manage the needs and expectations of the stakeholders using OCM strategies.

Besides the employees of the student admissions team, members of the project team were interviewed who were responsible for developing the bot and its environment, managers, the CIO and two employees from the vendor. The vendor was responsible for delivering the solution tailored to the University's needs. To deliver the solution, they guided the development and implementation of the RPA product which included data collection, process analysis, document creation, training, and getting the bot into production. The vendors also have a strong influence on OCM activities. The employees of the vendor were interviewed focusing on their experience at the University as well as their experience with other organisations, and knowledge of the RPA market.

The chosen data collection method of semi-structured interviews (Qu & Dumay, 2011) allowed a few guiding questions to be asked to trigger thoughts in the participants which left space for them to partially guide the interview and for the discovery of new information that the participants may present. The interview guidelines for the employees and managers were developed in three iterative cycles and informed by the insights from the RPA and change management literature as well as socio-technical theory (Leavitt, 1964). They were discussed with the supervisor and the ethics committee and feedback was implemented after each round. The interview guideline for the

employees covered, a) their current role, b) change in how employees work and their job satisfaction due to RPA, c) their experience of the RPA implementation and how they perceived it, d) their experience with the OCM practises, and how they perceived them. The interview guideline for the project team (excluding the employee A - SME for the project team), Student Admissions Manager and the Acting CIO included a) their current role, b) change in how they work, and their job satisfaction due to RPA, c) experience with RPA and the guidance needed for the implementation, d) planning and facilitation of the implementation, and change management, e) their experience of the RPA implementation and how they perceived it. The interviews of the vendor representatives included a) their current role, b) their background with RPA, c) project planning, d) experience of RPA implementation at the university, and how they perceived it, e) experience with implementing RPA in other organisational contexts, f) their perspective on OCM.

The interviews took place via Microsoft teams or at the University (the organisation of the participants). The interviews lasted 1 hour on average and were audio-recorded. Each interview covered the entire pre-to-post-implementation process. Throughout the interview, the author sought to explore the initial stages of the project to evaluate the planning efforts and the rationale behind the RPA implementation. Also, it was sought to understand how the project team planned the implementation and how that change was communicated to the employees, including the selection of OCM strategies that were utilised. Finally, the employee's perception and receptiveness of RPA was evaluated; the promotion versus the rate of buy-in, and their openness to change. Overall, it was aimed to determine and understand how the implementation unfolded, from both the managerial and employee perspective, their perspective on the change management strategies, and integration of RPA into the organisation. Throughout the interviews, brief notes were taken that were elaborated on as soon as the interview finished, as, having thorough notes on the participants' behaviour, attitude and answers are pivotal in case study research (Tetnowski, 2015) to deliver a clear and detailed narrative (Braun & Clarke, 2006).

Figure 2 below presents a model of the process undertaken to collect and analyse the qualitative interview data. The methods are discussed in detail above in the data collection section and below in the data analysis section.

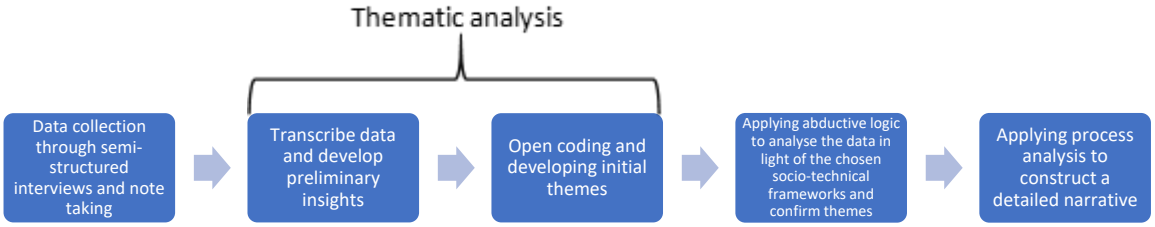

Figure 2: Data collection and analysis method

4.4 Data Analysis

In order to understand the RPA implementation phases, theorise OCM strategies in the context of RPA and develop practical recommendations, the data was analysed using a three-step approach. In the first step, a thematic analysis was conducted following the process suggested by Braun and Clarke (2006). Thematic analysis (Braun & Clarke, 2006) seeks to identify themes within a set of data to determine meaning within a phenomenon. This allowed the discovery of patterns and themes that describe the interactions among the socio-technical components and system levels. The patterns and themes also allow the understanding of key events that occur during RPA implementation, pinpoint the OCM strategies that are applied whether directly or indirectly, and the impact of OCM strategies based on the data. When the conclusions are drawn, the insights can be used to inform the validity of OCM strategies as an intervention during RPA implementation in a socio-technical system.

Following Braun and Clarke's (2006) process of thematic analysis, the interview audio was transcribed, and read through the multiple times to familiarise the researcher with the data and develop preliminary insights. The initial codes were then developed using qualitative data analysis software NVivo 12. The process of initial coding involved coding pieces of the data relating to key issues and events in the RPA implementation process, social and technical aspects of the RPA project, and associated organisational change. They also included codes that suggested RPA implementation success factors, as well as other insights that were not necessarily related to the research focus but provided interesting supplementary insights.

At this point, the dynamic interactions between the social and technical components of the project and between different groups involved in the project were noticed to begin to unfold. Understanding the socio-technical dynamics in relation to the key issues and events that occurred throughout the project, and how they were addressed, was also starting to become evident. For example, *"This was an opportunity to obviously help ICT out with this software and see if it could work in our environment" (Student Admissions Manager- Process Owner)* was coded as interdepartmental collaboration. This indicated that there were interactions between the actors that reside in both the Student Admissions team and the Project team which facilitated the opportunity to train the software bot. The entire data set followed the same process of coding. It also became evident that the organisation did not emphasise OCM. Due to the scope of the project, they deemed the risk of negative effects on employees very low and therefore did not conduct a significant OCM programme. However, OCM strategies were still consciously carried out in some regard. For example, the Student Admissions Manager maintained constant communication within his team to ensure they were on board the project and remained informed. The communication strategy of the student

admissions manager correlates to established OCM strategies in the literature, and communication and buy-in (Whelan-berry & Somerville, 2010; de Fátima Nery et al., 2020). There were also missed opportunities to adopt OCM strategies which caused problems.

From the coding process that had taken place so far, patterns were identified among the initial codes and grouped into preliminary themes. At this point, a better understanding emerged of the themes and their relationship to each other. Patterns to inform the selection of socio-technical frameworks were then able to be utilised. While searching for suitable socio-technical frameworks, the diamond structure was identified (Leavitt, 1964) which helped to understand that interactions between components do occur and when these interactions occur there are positive or negative consequences for other components in the structure. However, since the interactions between the components occur not only among one stakeholder group but also between various stakeholder groups (Student Admissions team, Project team, and Senior Management), the diamond structure alone was insufficient to contextualise all the dynamics in the data. A mechanism was needed to complete a fine-grained analysis that better explained the socio-technical dynamics that occur across the various groups. This was very important to ensure it could be illustrated how RPA projects unfold by completing such a fine-grained analysis that explains the underlying socio-technical dynamics of the key issues and events that occur during RPA implementation. Subsequently, the work of Lyytinen and Newman (2008) was selected to explain the dynamic interactions between the components among the levels of an organisational system. Lyytinen and Newman (2008) name socio-technical system levels as the work system level, building system level and the organisational environment. However, to simplify the concepts and suit the context of the study, the building system level was renamed to project level, the organisational environment to organisational level, and the work system level remained unchanged. The dynamic interactions between the socio-technical components and among the work system, project and organisational levels, were often a result of collaboration between the Project team (project level) and Student Admissions team (work system level). However, collaboration within the project level and the work system level were also prominent. Consequently, collaboration became an emergent theme. “Collaboration within project team,” “Interdepartmental collaboration,” and “Saved time by working collaboratively,” are all examples of codes relating to collaboration. The remainder of the codes were grouped into preliminary themes in the same way. The dynamic interactions were explored between the components of the diamond structure (Leavitt, 1964). With the chosen socio-technical model as described in the work of Lyytinen and Newman (2008), a theoretical framework was gained that considered many of the prominent themes that were present

in the data. To assist with the theoretical process, a slide deck was developed where the prominent emerging themes were specified and explained.

Next, following abductive logic (Kovács & Spens, 2005), the researcher went back and forth between theory and data to analyse the interview data through the lens of socio-technical theory and in turn address the research aims. Abductive logic typically involves an incomplete data set with prominent, evidence-based themes and minor elements that lack evidence (Kovács & Spens, 2005). Abductive logic seeks to synthesise the meanings provided by the research participants and develop an explanation that is the most highly probable explanation from the available data for a given phenomenon (Kovács & Spens, 2005). Although a complete data set is not available, the factual elements can be used to develop a proposition based on what is known and how it aligns with the current literature (Kovács & Spens, 2005). In particular, the current literature that identifies the key concepts of RPA, RPA implementation success factors and OCM were drawn upon.

Abductive logic is used in the study as the information discovered throughout primary data collection does not provide a complete data set. However, it is factual in the setting of the study and provides valuable insights that align with the research aims and current literature. A complete data set is not possible as there are people in the organisation who were involved in the project who were not interviewed and may have had different experiences. Therefore, the distinct experiences and perspectives of all involved were not fully captured.

Although the original coding was mostly aligned with socio-technical theory already, it was necessary to ensure the coding effectively highlights the interactions between the socio-technical components that occur at the various levels of the organisational system. For example, the following data excerpt was originally coded as “Interdepartmental collaboration:”

> *“We (project level) do work with the student admin manager (work system level) as he's you know, like a customer being admissions, they'll put jobs through for Elbion. Um, but the rest of the team, the RPA developer (project level) is in one of the dev teams that I often work with, but this was a like a little slightly unusual project. Which is pretty cool.” (Project Manager)*

To reflect the work of Lyytinen and Newman (2008), the data excerpt was now additionally coded with “work system level” and “project level” to represent the relationships between the levels in the coding. The remainder of the data was scrutinised under the work of Lyytinen and Newman (2008). If the quote aligned with one system level, it would be coded with the relevant one, otherwise they were coded with as many system level codes as relevant.

Using the socio-technical components to guide the analysis, conflicting interests between the vendor (project level/actor) and the expectations of the University regarding the developer's availability (organisational level/structure) was identified. The vendor required a full-time developer, whereas the University could only offer a developer who was primarily working on the RPA project but was to remain available for other projects. This would have negative influences on the RPA project being completed on time, however, the vendor agreed to this arrangement (project level/task). If there were delays in completing the RPA project, the Student Admissions team and wider University would experience a delay in benefiting from RPA (actors, structure/work system level). Since the developer was required to complete other tasks, the development of the bot had to cease until he had completed the other tasks (technology and task). The remainder of the analysis and coding was undertaken in the same way. Overall, the interactions between the socio-technical components were primarily coded under the "collaboration" and "communication" themes as they show the exchanges in information and physical interactions (e.g., the SME from Student Admissions working in the project team) between various components across the different levels. Furthermore, 12 themes were confirmed: work system level, project level, organisational level, actor, task, technology, structure, buy-in, collaboration, communication, planning and training.

Finally, a process perspective (Van de Ven and Poole, 2005) was adopted in the third step of data analysis to explore the implementation of RPA as a complex, multi-faceted process with a non-determined outcome that emerges over time. Poole et al. (2000) utilise process analysis for developing a narrative that follows a sequence of events to describe how development and change unfold. However, Van de Ven and Poole's (2005) approach was utilised in this study which builds a process narrative by avoiding surface-level observations and description to provide an in-depth 'process-theory' explanation of how change unfolds. This follows a temporal sequence of events in which RPA is implemented and may incorporate a variety of elements into the explanation, such as critical incidents and events, causal influence and antecedent events that motivate the change, and influence the sequence of events (Van de Ven & Poole, 2005). In this perspective, the RPA implementation is analysed as a sequential process with distinct issues and events with underlying socio-technical dynamics. This explains how the RPA implementation unfolded at the University, which OCM strategies were applied and led to project success, or where opportunities to implement OCM strategies were missed and hindered the process. To identify the key issues and events, the initial codes were examined in relation to their corresponding data to understand the key issues and events that occurred which were imperative to the progression, successes, and downfalls throughout

the project and when they occurred. This process assisted the researcher in prioritising the issues and events and understand their relation which further informed how the process unfolded in the context of RPA implementation at the university. Highlighting and understanding the issues, events and path-dependent outcomes makes utilising process analysis to evaluate the socio-technical system beneficial to develop a clear narrative that explains how the dynamic interactions at the University unfold and were managed when RPA was implemented.

Table 3 below presents the operationalisation table which provides an overview of how the key themes were constructed. The table includes the theme, key examples of the initial codes and related quotes accompanied by explanations. The operationalisation table is an indicative sample of how the entire data set was coded.

Table 3: Operationalisation table

Concept	Definition of concept in the study context	Initial codes that are associated with the concepts	Quote and explanation that relate to the concept
Socio-technical theory related themes			
Work System level	The work system level refers to the Student Admissions team, as the business unit that implemented the RPA. Within this team, the employees may be resistant to change, attached to existing habits and there may be difficulty in changing the system due to historical decisions that make future advances difficult to execute.	• Communication to employees done by line manager • Complex and mundane processes in the admissions team • Constant high volume of work • Decrease workload • Despite increase in team size, workload is still too high • Existing positive information sharing culture within team • Positive, supportive relationship within student admissions in general • Employees could spend entire day on school leaver process	The following quotes were coded as **work system level** as they provide examples of how the student admission team as a business unit execute and coordinate the student admission processes, why they joined the RPA project and the nature of their team. *"I think it was seen as a positive it's just there's a bot sitting here, it's not taking anyone's job. Yeah, it's taking on a task, because we're a smallish team, I think we're talking 15 for the University, so it's not purely just admissions, there's a whole lot of other things that we do. Yeah, I see it as an efficiency." (Student Admissions Manager)* *"We [student admissions] basically process student applications from the start when the students apply and then the whole process we go through the process until we send the offer, or we decline basically. Yeah, so we process both domestic and international students." (Employee A)*
Project level	The project level refers to the RPA implementation team that consists of the developer, tester, application support, the project manager, and two vendor representatives.	• Collaboration between project team members • Support within project team • Access rights constraints • Project team buy-in	The following quote was coded as **project level** as it describes the collaboration and communication practices of the RPA implementation team. *"The QA, vendor and I talked through what needs to be tested and all the test scripts. After that we*

		• Actions restricted due to governance constraints • Defined project phases	*go to the vendor for UAT testing, and set up the environment with the help of application support" (Developer)*
Organisational level	The organisational level refers to the senior management of the University and their governing influence on the operations and decision making.	• Upper Management support • Benefits drive success • Budget constraints • Centre of excellence • Communication should start with senior management to middle management to employees • Cost savings is not the focus	The following quote was coded at **organisational level** as it describes the activities and responsibilities of the executives of the University. *"We are not anticipating any whole scale workforce changes though. … We are getting to the next phase now where we would have more than just the developer for doing a pilot but our goal would be to have five bots done in a year which isn't going to have a monumental impact on our workforce, but it'll hopefully still deliver value in terms of the cost of implementing those bots should be not financially recouped, but in terms of the hours saved should have more value than the cost of implementing the bots, so yeah, that's kind of the scale of what we're attempting to do it in, in this first year." (Acting CIO)*
Actor	The stakeholders involved in the implementation of RPA. • Project team ○ Developer ○ Test Manager ○ Application Support Analyst ○ Project Manager • Vendor ○ Solutions Architect	• Anxious about the bot being implemented • Customer (Student Admissions team) embraces future use of RPA • Developer empowered for future automation himself • Admissions team are required to complete many tasks • Employees dislike manual and mundane tasks	The following quotes were coded as **Actor** as they present the actors in the process and cover some of the expectations and characteristics of stakeholders in the project. *"I expected it [the bot] to work faster, I thought this kind of integrated with the system, because I have IT background so I kind of know what is going on" (Employee A – SME in project team)*

	○ Relationship Manager • Senior leadership team ○ CIO ○ Acting CIO ○ HR Executive ○ Finance Executive • Student Admissions ○ Manager ○ SMEs in the project team ○ Student Admissions Employees		*"One of my colleagues, I think she has got quite a good IT background. Yeah, she's qualified, so maybe she was chosen [to work in the project team] because her background is in that area, which is great. She would have been the best person in the team." (Employee E)*
Task	The tasks are pieces of work that the actors and/or bot are required to carry out and are related to the process under study or project execution. This may differ at the various system levels. • A task on the work system level relates to activities that are required to perform the school leaver process. • A task on project level relates to activities that need to be performed in order to implement the RPA technology. • A task on the organisational level relates to the resourcing and decision-making that affect the RPA implementation project.	• A lot of tasks require human discretion • Admissions have to repeat process several times if a student applied for multiple programmes • Automate to relieve employees of unnecessary tasks • Bot removes high volume, mundane tasks • Bot provides summary report to manager once eligible applications are processed	The following quotes were coded as **task** as they relate to the steps that must be carried out when completing the school leaver process (work system level) *"[We] just check double ID, verify their name, checking okay, they are completing their final year of high school. Then send the provisional that's it." (Employee A)* *"If you've got a school leaver and they've applied for five programmes, you repeat that process five times. They get five different pieces of communication." (Student Admissions Manager)*

Technology	Technology includes software, hardware, design methods, tools ICT infrastructure. Including, Elbion, RPA software and bots.	• Knowledge of RPA • Technical implications • Using technology for process improvement • Bot processes undergraduate programmes exclusively • Bot active when Elbion is least active	The following quote was coded as **technology** as it describes the technology that was developed in-house. Further, it is the system that the bot interfaces with. *"Elbion is unique for the university in that sense because our team actually develops Elbion as well, so we have a lot more flexibility about building automation into Elbion." (Acting CIO)*
Structure	The structure refers to the organisational operations of the University, including the organisational hierarchy, the structure of the teams, and how communication, decision-making, authority and work tasks are defined and unfold in the context of the study. This includes organisational culture, norms, project management frameworks, work expectations and values.	• Different parts of the organisation have different appetites for change • Institution operates in separate business units • Foster self-sufficient culture • Communication coming from all stakeholders • Make precautions with infrastructure that are sustainable for the future	The following quotes were coded as **structure** as they relate to the governance and culture of the University which presents an overview of the nature of the institution and how it operates. *"I work with a great team, and you may have heard that from any of us in Admissions. We have an awesome team that are so close that we you know, we will do things like have lunches together." (Employee D)* *"I mean in our department, they usually say if there is something new, they are working on, even if it is not in the beginning, at least in the middle or before even produce this one to this staff. So, you know what is going on." (Employee A)* *"The university is very balanced so work life balance, family oriented so all those things." (Developer)* *"There was a high-level technical oversight, and during the implementation there were some problems with the technology interfacing*

			with Elbion. So, I coordinated that, to get the Elbion team to work closer with the developer so that we could come up with a solution." (Acting CIO)
OCM Strategy related themes			
Buy-in	The actors develop a vested interest in the RPA project.	• All stakeholders should be engaged and buying into the project • Employee buy-in is critical for success of the project • Project team buy-in • Customer buy-in • Interest in output and processing time of bot • Interest in RPA capabilities • No particular interest in learning about RPA • Not interested in forcing teams to implement RPA if they have no interest in it • Student admissions and ICT were keen to work together based on common RPA interests	The following quotes were coded as **buy-in** as they relate to the importance of buy-in, how buy-in occurs at different system levels and stakeholders that are willing or not willing to buy into RPA implementation. *"I think one of the reasons why it was successful student services was because there was everyone buying into it and they are overloaded and they could, you know they were very willing participants and when we start getting into different areas potentially, we won't have that same set of people buying into it" (Acting CIO)* *"The University is a big place so I wouldn't rate the University as a whole, as a single entity, I would rate it separate places is so different, like the place that we went to, so you know the people that use this system, they really wanted change. They were like willing. As developers we wanted to do it and so I guess for this project that was we're wanting to change, and we were willing to change and so we did it." (Test Manager)* *"I want a human on the other end of my communication, not a robot, so I'm thinking now of the student talking to a robot. It doesn't sit well with me." (Employee E)*

Collaboration	Instances where the actors work together to complete a given task. Also, instances where the bot (as a virtual operator) is working with the human operators (Student Admissions team).	• Interdepartmental collaboration • Collaboration within project team • Intimate collaboration helps to prevent project failure • Pandemic forced online collaboration but did not affect project success • Saved time by working collaboratively • View software robot as a new team member	The following quotes were coded as **collaboration** as they describe the ways in which the stakeholders interacted and worked together to develop the bot and how they collaborate with the bot. *"So, we selected the process to be improved and we did some documentation and then we left it up to the developer and the third party in the vendor to go through the development process. While that was happening, my colleague set up our side, so set up the infrastructure for the deployment of the agent plus software, and so we also had to engage with the student team." (Application Support Analyst)* *"It kind of gives you the feel of having a new team member which is helping you in your daily workload, which is good actually because sometimes during peak season we could spend like a whole day processing a few hundreds of students which is like a crazy amount of students." (Employee B)*
Communication	Information exchanges between the actors in a single system level or between system levels in a verbal (face-to-face, calls or video conferences) or written (emails, instant messages) manner. Communication also includes how stakeholders were informed of the project, the frequency of communication and maintaining	• The message in the communication is very important • Communication coming from all stakeholders • Communication through email and meetings • Communication should start with senior management to	The following quote was coded as **communication** as it illustrates the communication flows that occurred during the RPA project, how communication was perceived, the importance of communication and the effects of negative instances of communication. *"Who told me? I think nobody really told me anything because that time I was away on annual*

	communication so that stakeholders remain onboard.	middle management to employees • Communication to employees done by line manager • Existing positive information sharing culture within team (Student Admissions) • Employees may feel threatened depending on how initial communication is executed • Employees may lie about their tasks if they feel threatened • Failure to communicate • Importance of clear communication • Insufficient communication • Missed communication • Opportunity for higher quality communications and training if BA is used	*leave. I was away but I was still checking my emails." (Employee B)* *"I started by walking through [explaining the process] the student admissions manager and then the project manager was going through with them [student admissions manager] and the developer who was developing it as well" (Application Support Analyst)*
Planning	The efforts taken to coordinate tasks to successfully achieve a goal. The efforts include activities such as developing structured project plans, clear vision and objectives and creating provisions for considerations that are relevant to the organisation, such as governance protocols. In this context, the planning mostly includes the efforts taken to develop and implement the bot.	• Business and process transformation requires deliberate action and planning • Following design plans • Importance of clear and thorough planning • RPA may require more licenses than planned • Strong thorough planning • The selected RPA vendor must fit objectives and contextual factors of the client • Process selection criteria	The following quotes were coded as **planning** as they describe planning efforts that stakeholders carried out, what planning should be included in RPA implementations and the positive influence planning has on the project. *"A person can do some process improvement and then walk away, and everyone finds new spaces or new pathways to work in automation. Yeah, it has to be a very deliberate process, otherwise, you will break everything." (Vendor Relationship Manager)*

		• Selecting and utilising most effective resources • Clear vision and objectives • Documenting objectives • Clear documentation • Set up governance re roles and responsibilities • Aim to stay on budget • Business and process transformation requires deliberate action and planning	*"Analysis of the process, the needs of the client that's part of the developers as well, then designing the solution and also documenting the design and the implementation of the design." (Developer)* *"The road map, short term and long-term goals for your program, your short-term goals. Would be to do these processes to show immediate benefit to the company but you also have to have your long-term road map" (Vendor Solutions Architect)*
Education and training	The efforts taken to teach a human or virtual (human or 'bot') to complete tasks and educate them on the RPA technology.	• Opportunity for higher quality communications and training if BA is used • Adequate training is important • Training or workshops would have provided more certainty • Will need technical training for developer and may need end user training • Unclear how training communications were delivered • No use of formal training for employees	The following quotes were coded as **training** as they illustrate the importance of training and how training may occur in RPA implementations. *"It was more the solutions architect from the vendor, he was showing the developer and he would have told application support but, in the beginning, he had to learn a lot for himself. He had their free training at the beginning and that was a prerequisite for him to start. He had to do academy training and do some of these modules online and then there was some more formal training that the solutions architect gave the developer." (Project Manager)* Responding after being asked if training or workshops would have helped them to feel more comfortable about RPA: *Yes, we could actually find out like how does it actually work in his space? I mean in RPA space,*

			yeah? It's kind of interesting to find out how that works." (Employee B)

5. Findings

From the data analysis process, 24 key issues and events were identified that were important in the implementation of RPA at the university. Those 24 key issues and events were selected based on their impact on the project as they were either critical for project to progress, caused issues, or were pivotal for success. Following a process approach (Lyytinen & Newman, 2008; Van de Ven & Poole, 2006) these issues and events were grouped into logically coherent episodes based on their natural association and temporal flow to form 6 distinct, yet temporarily overlapping analytical episodes. Structuring the analysis in a sequence of analytical episodes enabled the creation of a coherent process narrative, with specific issues and events guiding the narrative of each episode. However, in reality, the process of implementing RPA at the university was often complex and therefore iterative. It is important to note that while the sequence of analytical episodes may loosely follow and share some similarities with the sequence of phases of an RPA implementation project, they are created by the researcher to serve an analytical purpose.

Based on the data analysis informed by socio-technical theory (Leavitt, 1964), the socio-technical dynamics that were underlying the key issues or events in each episode were identified. The system level where the issue or event which had occurred was also identified; this may be the work system, project, or organisational level (Lyytinen & Newman, 2008). Due to the close collaboration that is required between the department implementing RPA (work system level) and the project team (project level), as well as necessary intervention from senior managers (organisational level), issues or events may take place across one system-level or on multiple system levels at the same time. The issues and events that occur within and across levels will always affect one or more of the socio-technical components; actor, task, technology, or structure (Leavitt, 1964) which may cause a gap or misalignment between the components. To address a gap or misalignment and realign the system, an intervention strategy is required. Often issues were successfully addressed but other times, the solution posed additional problems and complexity or could not be solved at the time. Therefore, the analysis also includes the outcome of applying the intervention strategy. In this chapter, a detailed process narrative is provided that follows the RPA implementation process at the university. The chapter concludes with Table 4, which summarises each analytical episode with the key issues and events alongside the associated socio-technical dynamics, including the components, intervention strategies and the outcome of the interventions. The issues and events in the table were constructed using the codes and themes from the data analysis process. The researcher then went back into the data to identify specific codes that alluded

to the activities and environment that surrounded the issue or event to understand how it came to be, how it affected the different socio-technical components and how the university responded.

5.1 Episode 0: Antecedent conditions to project

The leaders of the ICT department at the University regard themselves as being open to change and ensure they remain aware of technological opportunities. This attitude allows them to grow their own technical expertise by using various technologies as well as improve business processes across the organisation. In their pursuit for continuous technological advancement, ICT staff periodically check the latest Gartner Hype Curve and technology trends. Consequently, they noticed RPA as an up-and-coming technology that was becoming increasingly popular in many industries. They also thought it may be beneficial in the University as there are many mundane, repetitive, high-volume tasks undertaken by the various administrative units that could be automated. Therefore, at the end of 2019, the CIO was becoming increasingly convinced that RPA could be used and enrolled the support of other members of the senior leadership team to support the initiative. Together, they further explored the potential of adopting RPA. Specifically, they aimed to understand how RPA works and how it could benefit the organisation, by traveling together to Australia to investigate RPA products, vendors, and use cases in different organisational contexts. When discussing how the Acting CIO became involved in the project, he explained the ICT division's proactive and enthusiastic nature of continuous improvement and aim to run the organisation as efficiently as possible. Specifically, that:

> *"We have a Gartner subscription and so we sort of monitor the hype curves and the upcoming technology … RPA has been there for quite some time and so before covid, the directors of finance and HR and my boss [permanent CIO] went to have a look at a couple of RPA programmes, one in particular in Australia … [they] saw the potential of it in other universities and left me in charge of implementing something in the RPA space, so that's kind of what was the motivation or the driver for me making it happen." (Acting CIO)*

The Solutions Architect of the vendor explained that when RPA implementation is starting to be discussed in an organisation, the stakeholders have different priorities for proceeding with a project and buying into the project. The senior managers are typically concerned with the cost savings and increase in productivity, middle managers are concerned with ensuring their teams are still running efficiently, the employees are concerned with ensuring they still have a job, and if they can be involved in the project. He explained:

> *"I report to senior management and leadership teams, CEOs and things like that. What they don't want to know is if the process ran today or how long it took to run. They want to know how much money will they [the bots] make me or how much money did it save me and how many*

> *FTEs saved? How many people did it take out [of the process] to actually do something else? That's all they care about. Then middle management wants to know if the job is still getting done and the worker wants to know … is there anything I still need to do? Can I help with anything?" (Vendor Solutions Architect)*

Members of the senior leadership team were convinced of their decision to implement RPA once they saw it operational in another Australasian university, as it illuminated the potential benefit they could possibly afford in this university as well. Due to the COVID-19 pandemic, the CIO was required to assume higher responsibility in a different area of the organisation. Thus, the Solutions Development Director assumed the duties of the CIO, becoming the Acting CIO, and took the lead in the project. He became the project sponsor and was initially tasked with acquiring an RPA vendor, constructing the project team, and working together with the project team to identify a suitable pilot process to automate. Proceeding with RPA as a pilot project enabled ICT services to expand their in-house technical expertise and understand if RPA technology is suitable to be used in the University, which justified funding the project from the ICT operating budget. The Acting CIO explained the goal of the pilot project was to:

> *"Learn what bots are so that we have a feel for whether they would work in our environment. Those sorts of things. The return on investment was kind of a nice to have, but it wasn't critical for moving to the next phase, so here the measure of success will be mostly whether the value of the bots outweighs the cost of implementing them." (Acting CIO)*

5.2 Episode 1: Establishing the project

The acting CIO was very deliberate with the selection of a vendor. It was important that the vendor matched the University's goals and values. In particular, it was important that the vendor was supportive of helping the project team to understand how RPA works within the University by starting with a small pilot process. It was also important that the vendor could support the University in having a scalable RPA programme that extends into additional business units and fosters in-house expertise by training an existing ICT resource on RPA practices. The Acting CIO explained that he was already confident of RPA's functionality and potential to provide great benefits. In explaining the aim of utilising RPA at this stage, the Acting CIO explained:

> *"I don't think it [RPA] needs to be tested. I think it needs to be shown to work in our environment and what I mean by that is that RPA is a mature technology, we don't need to do the proving of the technology. It's been proved. What we need to do is get it embedded in our environment and working." (Acting CIO)*

Various vendors pitched their services and ultimately, a world-leading vendor who specialises in process excellence and system integration was chosen to provide the technology and lead the development and

integration of RPA into the University. The Acting CIO explained this vendor was chosen because *"These guys just stood out. Everyone else agreed. So, we just decided to explore that further." (Acting CIO)*

Once they had worked together for some time, he also observed that *"They continued to demonstrate that they knew what they were talking about and what they were saying resonated with our environment. So, we just decided to carry on with them." (Acting CIO)*

In line with the University's strategy to develop in-house expertise, it was important that the members of the project team worked closely with the RPA vendor, to learn how to develop bots and implement them together, rather than the vendor developing the bot for them. This ensures individuals can take responsibility for the development and maintenance of the software bots so that they can troubleshoot and manage the technology themselves once the vendor had left. When asked about the stance of the University, the Relationship Manager replied *"Well, at the moment the focus was internal, so they wanted it to be effectively self-sufficient."* Furthermore, it enables the scalability of RPA within the University long term. When discussing the collaboration with the vendor, the Acting CIO reflected that *"They ended up working with us the way that we want to work with them, which was us doing the bulk of the work and they're just upskilling us rather than doing the work." (Acting CIO)*.

The project team was formed after the selection of the vendor. The team consisted of a Project Manager, Test Manager, Application Support Analyst, Developer, and two vendor representatives: a Relationship Manager and a Solutions Architect. The Relationship Manager of the vendor described the working relationship as:

> *"We had the developer from the university who was doing the development and the Solutions Architect who's training him and then I was mapping to the project manager at the university and the CIO in terms of the sponsoring side." (Relationship Manager)*

The vendor was very experienced and largely assisted in the planning efforts of the RPA project. They had pre-defined project phases and milestones for the University to follow. This ensured the project team were aware of what was involved in each stage and all project team members were on the same page. The Project Manager explained the process:

> *"There was a roadmap, quite a defined number of steps that you go through to automate a process and the vendor had that documentation which we became quite familiar with. In terms of what a stage is, you know what its outputs are and what documents are involved that need to be done and who is responsible for doing it and who's responsible for reviewing them." (Project Manager)*

Very soon after the project began, the Project Manager faced issues with the University's Application Support Analyst assigned to the project. The Application Support Analyst did not buy into the RPA project due to his high workload in other areas of his work which impacted his ability to adequately contribute to the RPA project. The Project Manager explained:

> *"We had one guy up in the enterprise support who umm, he didn't make it easy, he was the first initial contact when it started and then he tailed off and it went to someone else. I tried to get him to do an internal network diagram design but I never got one from him and he kind of wanted to do it, but he just didn't have time and so that was a bit of a hassle for me." (Project Manager)*

Ultimately, the Application Support Analyst left the project, and a different Application Support Analyst was assigned to the project. He was very committed and contributed a great effort towards the success of the project. The Project Manager noted his work ethic as:

> *"He was really good, he got really enthusiastic about it, which was really good. He went right through to the end, you know, with logging the change, going into production, and doing all the support and handover documents. We had quite a lot of meetings with support groups because it was a new technology and a new process, so everything was new. So, you have to involve, you know platforms people, applications people, service desk people, the testers here you know QA [Quality Assurance] type, people." (Project Manager)*

Once the project team was successfully assembled, a suitable pilot process needed to be identified. Several administrative teams were considered and contacted to find a suitable process, including the Student Admission team. Once understanding the requirements of RPA, how RPA will work for his team, and the value it would add, the Manager of Student Admissions was eager to join the project. When asked how he came on board the project, the Student Admissions Manager replied *"It just came to our attention because ICT had a project and they were just trying to find what processes could be kind of utilised." (Student Admissions Manager)*

The Student Admissions team processes various applications related to admission into the University's academic programmes through email or Elbion, which is the in-house built student management system. There are several mundane, repetitive, and high-volume processes that the Student Admissions employees must work on daily. For this reason, there had been talks of implementing some form of automation technology among the team, including among the employees, for years already. One employee reflected that *"I remember when my manager told me about this idea, we wanted to do it two or three years ago." (Employee A – SME from project team)*

Another employee explained that there were whispers about RPA implementation. However, student admissions did not realise that the bot would actually be implemented so soon. She explained:

> *"I think before I was away, they were saying well, we were talking about it, a robot is going to be involved in our workload, but we wouldn't talk much about the robot. So, it was just like a suggestion to have this robot." (Employee B)*

Once the Student Admissions team joined the project, the Student Admissions Manager and an employee from Student Admissions became part of the project team as Subject Matter Experts (SMEs) to assist in the data collection, requirements analysis, and user acceptance testing (UAT). The project team then needed to work with the SMEs from Student Admissions to determine a suitable pilot process. Ultimately, the school leaver process was chosen for the pilot.

The manual process entailed: First, running a report in Elbion, to identify the school leaver applications that have been submitted. Secondly, check double-ID (check if the same student has applied twice). Thirdly, verify their name only, if possible, at this stage as it is not compulsory until the full offer is issued. Therefore, students may or may not upload formal identification documents at this time. Fourth, check if they are currently completing the final year of their secondary school qualification in a third-party system. Fifth, send the provisional offer. In this process, employees need to access multiple applications, both web, and non-web-based, and some applications need to be handled differently depending on the qualification that is applied for. Additionally, if a student has applied for multiple qualifications at once, they will have to repeat the process multiple times for each qualification.

The Student Admissions team found that they were overwhelmed with the number of applications they received during their peak period, which is between September and January. The process is a high-volume, rules-based, repetitive process that would take 1-2 minutes to complete for each application. The Student Admissions Manager explained the process:

> "*We came up with a number of options, but this [process] seemed to be the simplest one to start off with and had the most impact because we are talking thousands of applications potentially that staff members won't need to actually touch." (Student Admissions Manager)*

The volume of applications was too high for employees to keep up with and occasionally caused them to not comply with the service level agreements (SLA) of 7 days to get back to the applicants. Also, in previous years the volume of work has caused employees to work significant overtime hours and become

prohibited from taking annual leave during the peak period, causing significant stress and overwhelm. When asked about the implications of completing the school leaver process manually, an employee from Student Admissions replied:

> *"There was a time when Admissions couldn't take leave between October and March. We couldn't take any leave in that 6-month period because that was one of our busiest periods, that had a bad effect on all of us because you know, we couldn't plan anything for Christmas. Well, that's one of them and things like overtime … which is great because everyone likes a bit of overtime. We just don't want to do it every day of the year." (Employee D)*

Given the immense impact the school leaver process has on the Student Admissions team, its ability to meet the RPA implementation criteria as well as satisfying the requirements of the project team, this process was the perfect candidate for the pilot project. The automation of this process was also likely to deliver benefits to the Student Admissions team, student candidates, and the wider organisation.

5.3 Episode 2: Developing the bot

The Project Manager oversaw the entire project to ensure the team remained on schedule. He managed stakeholders, coordinated the communication and meetings, ensured that resources had what they needed to complete their tasks in order to complete them on time. Additionally, he was responsible for the project documentation, such as writing the business case, finalising the vendor contract, ensuring agreement of the deliverables, and managing invoicing and resourcing. This was pivotal to the success of the project and was greatly appreciated by members of the project team. When the Student Admissions Manager was asked which elements of the project were particularly helpful, he replied:

> *"I found the Project Manager really good to work with and he made everything clear. Yeah, so you knew what you had to get done and if you didn't do it, he will remind you of it. So, I think he had a plan, everything had to meet a certain deadline, and everything was laid out in front of you so, I found that really good and when issues did arise, then, you had to just reset the timeframes." (Student Admissions Manager)*

However, not everything went smoothly. The Project Manager had trouble with little and unclear information coming from the Finance team, as they did not willingly and readily give out solutions or information needed for him to manage the finance and resourcing aspect of the project. He explained:

> *"There was a bit of frustration working with finance internally here with regard to getting clarity around where the budget is going to fall and where it's going to sit, that's always frustrating not just with RPA but with many projects here, they're not particularly clear and don't communicate clearly how that's all going to work." (Project Manager)*

He then had to follow up with the Finance team multiple times to acquire the relevant information before he was able to complete the tasks.

Another aspect, which originally was perceived as a potential challenge, was that the selected vendor was offshore. Therefore, the collaboration and coordination had to take place online. However, there were effective online working mechanisms in place and as the city where the university was based went into lockdown at the beginning of the project and all employees were forced to work from home, the offshore location was not of concern.

Initially, the project team was concerned about the project progressing, as they were forced to work off-campus. However, they quickly realised that they could easily and conveniently collaborate online. The Test Manager explained:

> *"I thought at the start of the year that it would be really disruptive, so that any project, even if it's with the normal set of people that you work with on site, would be made, you know heaps more difficult by being in scattered locations. As a consequence of that, that any project that involved external members would have the same kind of problems, but we just didn't. Yeah, I really didn't. … One of the coolest things to come out of this year is to figure out that we work really, really well and collaboratively remotely." (Test Manager)*

To cater to the vendor being offshore and to comply with the stay-at-home regulations of the government and the University, the test manager, developer and solutions architect of the vendor held 1+ hour daily video calls to develop the bot. She explained the reasoning for this:

> *"[The developer] needed a lot of coaching along so it made sense to have a regular time, every day and it was somebody's very clever decision to involve me right from the start, which I haven't had the time to be able to put into it, so I was right there to help sort out the requirements, and the more requirements you get sorted out the least testing you have to do because it's not so much broken stuff. Yeah, it's built right to start with." (Test Manager)*

In doing so, they could work on the tasks together and iron out any issues as they came up, which mitigated a lot of the testing workload that usually occurs at the end of the project. The project team members enjoyed this way of working which was highlighted by the Test Manager as a key takeaway for future projects. The Test Manager also explained the significant impact this way of working had on the timeline of the project, how it affected the quality of the development of the bot and project success as:

> *"I was sort of embedded in the dev process. There was no separate testing phase that I had to run. Ah, we prevented a bunch of issues by having me sitting in on all of the meetings with the developer while he was actually doing some of the work. It wasn't like he'd go away and do a day's worth of coding and then come back and show us what it was, he would actually be doing*

the work in these meetings. There's like an hour or something every day, which is a fascinating way to work." (Test Manager)

During the project, weekly meetings took place to keep the entire project team informed. Besides those meetings, the project team members would also communicate with each other as needed when other tasks or information came to light through email or through the weekly catch-up meetings on Microsoft Teams. The interactions were particularly frequent during the data collection phase.

The way the vendor managed and delivered the project was different from typical technology implementation projects. In this case, the developer assumed many duties that a Business Analyst and Project Manager would typically carry out. The Developer was required to be involved in the data collection and requirements analysis, write most of the project documents, such as the solution design document, draw the process maps, and frequently communicate with other project stakeholders. The Developer was unfamiliar with writing documents and project documentation tasks in general, as he is usually only responsible for programming. When asked about specific challenges in the implementation, the developer replied *"Yes, well documentation of course because as a developer we don't usually do documentation so it's a bit odd that they do everything that was a bit of a challenge."*

Therefore, he had to learn these skills quickly as he went through the implementation process. However, the vendor was very supportive and provided document templates, guidance, and advice as needed which equipped the developer to attain the required skills. The Solutions Architect from the vendor was very impressed by the Developer's work and their ability to learn quickly. He also mentioned that he was willing to participate and really bought into the project. Specifically, he explained that *"The developer was very onboard and very switched on and the project manager obviously helped to move it along for people." (Vendor Solutions Architect)*

Beyond that, despite the developer having experience in various coding languages, he has not developed software robots before. Developing software robots using drag and drop and screen scraping was very different from the typical programming techniques he applied. To overcome this challenge and upskill himself in RPA development, he followed the advice from the vendor and completed the UI Path training modules. Being pushed out of his comfort zone caused him to struggle temporarily, but overall, with the support of the vendor, the developer was enabled to upskill and gain valuable experience.

Additionally, this ensured a high-operating bot was developed within the time frame of the project. The developer was enthusiastic about rising to the challenge and described picking up these new skills:

> *"I basically upskilled myself because I'm usually doing hardcore development so this one is a bit out of my area of expertise. It's more on GUI so, drag and drop kind of thing, it a little bit of logic but it's not really hardcore development so it's a new thing for me, it's kind of out of my comfort zone." (Developer)*

Due to resource constraints, only one developer had been allocated to the project. Developers are scarce in the University, and they already have a high workload as they need to support various other technologies on site. Although the vendor asked for a full-time developer to work on the project, it was not possible. The project manager was aware of this issue and knew it was likely that the developer would be required to work on different projects. The Project Manager logged the lack of a full-time developer as a risk in the project plans and clearly communicated it to the vendor. Nevertheless, it was difficult to forecast and calculate specific delays as the Project Manager did not know which other tasks and projects the Developer had to take care of. Although the Developer dedicated most of his time to the RPA project, it remained a requirement for him to be available for any work that arose and required his attention. In two instances, the Developer was required to work on other tasks, which caused minor delays to the project. When asked about challenging aspects of the project, the project manager explained:

> *"I probably wasn't going to get the developer full time and the vendor wanted a full-time dedication. The problem was with some of the development teams here, is that they're thinly spread so you can't just get someone full time because they often have to be called on to do support for other problems, issues, technologies or projects which is unfortunate. I kind of knew it might happen too, so I had it as a risk and it did happen twice so yeah, that was a bit of a shame, but I knew in the beginning and I logged it and made the vendor aware of it and they were quite happy with just going with what we could do so that couldn't really be changed." (Project Manager)*

Most of the project team had worked for the University for several years, which meant they have considerable experience and knowledge of the Elbion system. Thus, the project team knew that the student management system Elbion is slower when staff and students are using it throughout the day. However, they did not realise how the speed of Elbion would impact the work of the bot. The speed of Elbion caused the bot to work slower in the same way a human operator would experience delays when using a system with high traffic. In fact, it was so slow that the bot took longer to complete its work than a human employee. As Elbion is an in-house application built for the university, there are limitations that larger software brands would not have. With all the users and governance, there are limitations with

the changes that can be made to it. The way in which the bot works once this solution was put in place, is still slower than some human employees, but that does not concern the project team or the student admissions team as it is more important that the bot frees up human employees to do more value-added work. The Student Admissions Manager did not realise what the bot actually does and was surprised at the actions and speed of the bot. He explained:

> *"I didn't realise that's what it [the bot] was. It's quite a slow process because it's actually like someone's doing the work, so they actually go and click and it's dependent on Elbion's performance as well. So, for example, if Elbion crashes then obviously the bot can't continue doing its work or it times out or something. Something goes wrong. … In actual fact, for example, if one of my staff members process the application, they would be quicker. So, it's not about speed, it's just about why would we get someone to do this when there's not really any thinking involved?" (Student Admissions Manager)*

To mitigate the bot's slow performance, the project team decided to only allow the bot to work from 7am-9am every morning. The bot would run the report which identifies the current applications to process at 7am which outlines the work to be done and produces another report at 9am when it stops working, which shows the exceptions and successfully processed cases.

There are applications the bot theoretically could process. However, to keep the pilot as simple as possible, the project team decided the bot will not process these complex applications as it would need to go through additional steps or require extra checks. Also, this would minimise the risk of error that the bot may cause due to the complexity of operation. The student admissions manager explained that he, as well as the rest of the project team, were happy to aim for a benchmark of work the bot can complete that still offers great benefits to his team. Specifically, he explained that:

> *"What we're looking at most for the bot is just the nice simple ones that they can go through and so 80% of the time it would be programs that just require University entrance so the bot can just go through the process and send out a provisional offer." (Student Admissions Manager)*

Throughout their work day, the employees of Student Admissions will go through the report the bot produces to see which applications it processed and which applications were exceptions that the employees must process themselves. Although the bot will not process the complex applications, the bot will still receive them and be programmed to understand that the application is one it cannot process and flags it as an exception. For example, there are applications that the bot can process if it meets a certain condition, otherwise, it will come out as an exception. One example of this is a preferential entry

application for the Bachelor of Design where the bot checks if the applicant has a certain grade and if the student does not have the grade, they will need to submit a portfolio that the faculty will assess. The portfolio is a document with several examples of art or photography work that the student has done throughout the school year. Assessing the portfolios requires domain expertise which neither the bot nor the Student Admissions team has. Therefore, the portfolios are released to the Design Faculty to evaluate regardless of whether the process is completed by a human employee or the bot. However, the bot can check the grade of the applicant to see if it can be processed, i.e., there is no need for a portfolio as it meets the preferential entry requirements, but cannot process an application that does not meet the criteria. Since the bot cannot read which file (portfolio) the applicant has uploaded, if the applicant uploads an incorrect file, the bot cannot recognise that, which poses a significant risk of error. This exception is described:

> *"If it doesn't meet that requirement, it gets spat out as an exception and then we'll probably ask for a portfolio but we didn't want to make things too complex in the beginning, so I'm pretty sure the robot could have gone and come back and looked for a portfolio and if there was a portfolio on it, that they've already uploaded, it could have just released the application for faculty assessment. Yeah, but you don't know what the students are uploading." (Student Admissions Manager)*

The SME in the project team explained that there is a range of qualifications that require additional provisional entry checks and requirements. For example, the Bachelor of Culinary Arts requires an interview. She explains in the following quote:

> *"It just depends, sometimes we do the assessment, otherwise there are some criteria to meet. If we can do the assessment based on that, it is fine. Otherwise, we release [the application] to the faculty … but health faculty, for example, they want to offer provisional based on providing some documents, addendum, police clearance." (Employee A – SME in project team).*

There are also limitations for the Bachelor of Arts as there are several different qualifications a student chooses which fall under the Bachelor of Arts degrees, for example, psychology, or sign language. However, the bot cannot read the intended pathway that the applicant selects in the application due to its limited functionality, therefore it may select a pathway at random and potentially send the wrong provisional offer letter.

It is also important to check that the documents that are uploaded are not fraudulent; this is critical to note. As an employee stated, *"We have to be able to pick out fraudulent documents."* Therefore, human

discernment is needed when applicants are required to upload documents, for example, for police clearances or addendums.

The RPA programme is aimed to scale across the university and automate processes across the University landscape. However, for a wide-scale project to be sustained effectively, it is important that there is clarity around who is owning the technology, who is supporting it, and who is responsible for the various issues on different levels of severity that may arise due to RPA. Consequently, a mechanism was needed to control the flows of information and provide clarity over the ongoing responsibilities of RPA. Thus, a three-tiered support model was constructed robustly from the beginning, which can scale with the RPA programme. The information and responsibilities are clear to employees which saves time and confusion in the future because the information is clear, and it does not change drastically as the programme grows. The Acting CIO explained the support model as:

> *"We have the bot doing its job on a daily basis and that is supported by the team who supports Elbion from an end-user point of view. Then, we have the idea being as we add more bots that, that becomes scalable because the application support teams then support the bot that's primarily working in the application that it [the bot] is for. Then we have a level above that which is the orchestration support. Um, so the bot is not running at the right time [on different processes], or we want to schedule five bots, how can we do the scheduling? So, there's that sort of support, and then there's the "that's broken", we need to do some development, then that comes through back to the development team. That is the support model. I think we've set that up so that it can be scaled, and it was one of the learnings of the pilot with student services. What's the support model for these bots which will be created at the university?"*

5.4 Episode 3: Managing organisational change

The decision to limit the bot to complete only simple tasks results in the employees having to collaborate with the bot in order to complete all student applications. Historically, student admissions completed this process manually and it had a strong governing influence on how their workdays unfolded. This is due to the high volume and urgency of processing the provisional applications, therefore, 2-3 employees would work on the school leaver applications each day during the peak period. During this time, the employees who are working on the process cannot do anything else throughout their day as the volume of school leaver applications are so high that it would take up all their time. However, the diversity of work is still maintained as they complete different tasks on other days. Although most of the employees enjoy not having to spend significant amounts of their time working on the school leaver process anymore, passing the responsibility to the bot is an adjustment which some employees perceived as disruptive. Thus, employees must learn new boundaries regarding their role in the school leaver process. Rather than

the human employees working together to achieve the goal to process the school leaver applications, they must now also collaborate with the bot. The main interaction between the bot and the employees is managing the exceptions. There are defined protocols for the bot to reject certain applications if they do not meet its criteria to process. In this case, the bot will begin to check the application, realise that it does not meet the criteria, stop working on it, record it as an exception and move onto the next application:

> *"So, even if the student applies for that one [an application the bot can't process], the bot will just go through it and then if it's not an application he can process, he will not process it any further and it will come to the exceptions report. It's not too many, you know. I mean, it's still like he does most of the school leavers." (Employee A – SME in project team)*

Once the bot has completed the pending applications for the day, it sends an email to the Student Admissions Manager that lists the successes and exceptions which they review. Then, the tasks are allocated to human operators based on the skill set available to process the applications manually. This report must be checked every day to understand the applications the bot is going through, the number of applications, the exceptions, and why the exceptions occurred to ensure all applications are processed promptly and the bot is working optimally. Now that the bot has taken over the majority of the school leaver process, the employees can focus on other applications and tasks that require more human judgment. This results in a significant reduction in workload and mundane and repetitive tasks.

Another mode of collaboration between the employees and the bot is the Student Admissions team checking for double ID. The double ID involves checking if an applicant has applied for the same programme twice and therefore generating two student IDs for the same applicant. This may occur if the applicant had forgotten their ID or password or changed their mind about what they applied for, decided to start from scratch and apply again. The team runs a report every two weeks to check for instances of double IDs, and will merge the two IDs for the applicant. The occurrence of double IDs is infrequent, but it is still an important check to ensure no time is wasted on processing multiple applications for the same person unnecessarily. The bot does not have the functionality to check if an applicant has applied twice under different IDs, therefore human employees must use their judgment and decision-making skills to complete this check for the bot. The bot then uses the work of the employees as an input, to ensure its tasks are completed correctly. An employee explained:

> *"We usually do verifications and check if there is a double ID because you have some students who have applied twice, they started applications, apply and then a few days later, he forgot his previous ID. So, he will apply again. He had a new application, so that kind of thing. … it happens occasionally, we just run it maybe every week or every two weeks to see if there is a double ID. Double IDs don't occur often from the school leavers to be honest, most of the time its*

from the older students, they forget their ID. Then they apply again." (Employee A – SME in project team)

Most team members were happy to adopt and interact with the bot and were appreciative that it would alleviate the workload. They were also very interested to see how the bot functions and the possibilities for the future of RPA. One employee explained that she was surprised and impressed by the functionality of the bot. When discussing the perceptions of RPA bots prior to the RPA implementation by contrast to the actual skills and functionality of the bot, one employee disclosed:

"So, for design, there is a thing called preferential entries so if you've got high enough marks … you don't need to supply a portfolio and they [the bot] can actually go onto the high school qualifications website and check that like we would and then bring it back to Elbion. That's pretty smart." (Employee C)

On the other hand, there was one employee who was specifically anxious and concerned as she does not think collaborating with the bot should be necessary. She believes that the bot is further complicating the task as it does not complete the entire process because the Student Admissions team must continue to check the reporting of the bot, rectify any errors and process the exception cases. Further, she finds it confusing that an automation technique is employed that cannot complete the entire process. She explained:

"We have to check other things. So, it's [the bot] not checking those other things, which means in the end we have to check them anyway. So, if you're going to do a job, it has to be a total job, if the robot is going to do it. That's just my opinion." (Employee E)

The employee also explained that she has prior negative cognitions about automation and technological advancements and has experienced negative situations in these areas. She explained:

"I'm not that keen on automation. So, this is my personal opinion. It has nothing to do with work really. My personal opinion is that we are humans, and we need human interaction. I don't like automation, that's just my personal opinion. If I was an assessor and a student wanted their application assessed, I would prefer a human on the other end of my application rather than a robot." (Employee E)

The Acting CIO was not expecting the RPA pilot project to cause significant disruption to the university and human workforce and as a result, no structured OCM plans were constructed. He explained that the plan was to start small and as more experience is gained, bigger and more impactful processes could be automated using RPA. He also added that as the RPA programme grows, there is likely to be higher impacts on the employees. This is because there would be more people with various and/or different needs and expectations to be managed and potentially more complicated processes to

implement RPA on. When the bigger processes get automated, it will become increasingly important to manage the expectations and needs of the affected employees and OCM strategies may become more prevalent. He explained the University's approach as:

> *"I guess the approach that we're taking at the moment is a softly, softly type of approach. We are not anticipating any whole-scale workforce changes though. So, the change management aspects of it we would anticipate, or the people change management aspects of it we would anticipate would be a reasonably minor part of the project." (Acting CIO)*

Employees were aware that the RPA programme is intended to be upscaled and will likely impact other processes within Student Admissions and in different business units throughout the University. Simultaneously, technology evolves quickly and becomes increasingly powerful which was concerning for one employee. When discussing the fear of job loss, she explains that: *"Um, well yeah maybe but not with school leavers. If they made it smarter and it was able to do more complex assessments beyond school leavers, I might get a bit nervous." (Employee C)*

The relationship manager of the vendor strongly advised that change management strategies were used and believes that they are fundamental for project success. He explained that maintaining involvement, communication, and managing the expectations of the Student Admissions staff who would be affected by the implementation of RPA in their area of work was important. This was proved to be true for several of the impacted employees. The Relationship Manager explained passionately:

> *"The technology is very secondary to the success of the program. The traditional levers that made transformation either successful or unsuccessful 10 years ago have not changed. Ah, in today's world they are still the same. You need a strong sponsorship spine. You need engaged people. You need to give them a vision of what the future state looks like, and they need to understand every step of the journey along the way." (Vendor Relationship Manager)*

When explaining the importance of strong and well-planned communication, the Solutions Architect of the vendor explained that he had seen the adverse effects of inadequate communication to the impacted business unit. He described the employees as shutting down and not contributing to the project because they are unaware of the outcome of the project and potential impacts on their job. Furthermore, he highlighted the underlying tensions that RPA implementations can cause and the importance of the employees of the business units as stakeholders as they are pivotal to the success of the project. He explained that:

> *"People won't talk to me if I come in and say I'm going to automate your process, they say I'm not going to tell you the truth about my process because I think I'm going to lose my job and it's happened. I've seen it happen. I say to people: What do you do day-to-day? Oh, nothing, I just*

press 'A' on my keyboard every day. It's like, no, no, you're lying. What are you doing and then people shut down immediately, right, if they feel threatened, and that's human nature. If they feel threatened and they think, man, I have three kids at home that I need to feed, and this guy is going to take my job because he's going to automate it. They're not going to tell me what they do. They're going to try their hardest to make it fail so they can keep their job." (Vendor Solutions Architect)

When enlisting communication techniques, the vendor recommends a top-down approach to communication which means communication flows with the chain of command. In this case study, the acting CIO communicates to the project staff and the Student Admissions Manager communicates with his team. Therefore, the information comes from a source they trust. The communication approach was followed by the University. The Acting CIO initiated the first communication when he constructed the project team and introduced the RPA project. The Student Admissions Manager was also informed by senior management and notified his team thereafter. The communications pathways were clearly followed by the managers involved, for example, when discussing how the employees of student admissions were informed, the Project Manager explained:

"Their manager's job was to do that (inform the team), yeah, he must have done it at some point, I don't particularly know. The developer made a video, it was a 15-minute video just showing the automation process and how it worked. We shared it with the manager, so I don't know if he showed his staff that, but that was up to him to choose how he was going to sell it and inform his team about that." (Project Manager)

Initially, the student admissions team were informed casually in a meeting after the decision was made to implement RPA in their team. Therefore, they knew RPA would be implemented at some stage, but it was unclear when it would happen. The announcement was not a shock for many of the employees as there have been conversations around automating the school leaver process for years. Although, at the time, it was seemingly going to be an automated workflow in Elbion, similar to other automated processes in their team. Once the project team had been formed and the preparations for the project started, the Student Admissions Manager was informed that the project was about to begin. He subsequently informed one of the employees who is working on the school leaver process, about the project start as she would be working with the project team as well. The remainder of the Student Admissions team was told later in a meeting once the project had already started. The SME in the project team explained the communication:

"He told me first and then the next meeting after we started the project, he told everyone about it. All of us knew that at some stage something like this will happen because they told us before in a different meeting this kind of project would be implemented, but we didn't know when until we started, I don't know the procedure here but it's not something easy. So, once they were ready,

they told my manager, then he asked me to help and then we had a meeting and he told everyone about the new bot project." (Employee A – SME in project team)

The Solutions Architect of the vendor has been part of several RPA implementations and views communicating to the stakeholders as critical. Not only for the sake of the impacted business units but also for future business units and other stakeholders such as project team members who may be impacted if RPA scales into other business units. In cases where there is little effort in planning and delivering communication to the involved stakeholders, there is a significant risk of employees spreading rumours and incorrect information which fosters negative connotations of RPA, and the employees may be more likely to reject the implementation. He explains that:

"It's also a risk in a company when you start engaging people around a transformation or an IT program. It starts spreading like wildfire. It's like people go to the coffee machine is like did you see that bloke with a suit on. He's going to take your job tomorrow. You can't do that. Then you're going to fail. So, the message needs to be really good and solid before you go out there." (Vendor Solutions Architect)

The team also received an email describing the project and its rationale, the vision and objectives for implementing RPA and how it would affect them, including the impact on their jobs. The Student Admissions Manager finds it important to care for the employees in his team in general. With the RPA implementation, it was important to him to ensure they were involved and informed and he was confident that he had delivered in not only communicating the project to them but also discussing it with them. He explained:

"It [the email] was purely from me, I initiated it. It was an email discussion so; it was not just an email saying this is what is going to be happening. I kept the staff up to date and you know, just giving them progress how it is going. So, like progress like every two weeks or every month." (Student Admissions Manager)

Despite the efforts of the Student Admissions Manager to involve the employees, several employees deemed the communication insufficient and required clarification. The conflicting perceptions of the quality of communication created a sense of tension between not only the manager and the employees who were unsatisfied with the communication but also the employees and the bot as they were nervous about RPA implementation. One team member explained:

"To me, it [the email] wasn't really sufficient because it just gives you a brief idea of this new tool. So, because you know, I was like away and then I didn't hear much from my team with how that will actually affect our workload until I return [from holidays], and I kind of fear it myself." (Employee B)

A further employee explained that she felt that the RPA implementation came out of the blue and took her by complete surprise. She was very unsure of what to expect going forward and had to request clarification and reassurance from her manager. She disclosed that:

> *"Administration told us, yeah, that this is going to happen. I mean, I suppose a few years ago, they would have said, this is what we're thinking of doing but I think I missed that email and then it came into effect, and I did ask the boss, I said; will this affect us? He goes, no, it's just mainly school leavers or something." (Employee D)*

The perceived lack of communication about the RPA implementation caused anxiety and confusion among some of the employees in the student admissions team. The COVID-19 pandemic has led to a lot of redundancies in the country's population, and many of the Student Admissions team members feared that the RPA implementation would result in them losing their jobs as well. When explaining the feeling of anxiety towards job loss, an employee stated:

> *"Ah, because that time it was like, Umm, you know when covid is here and then we were like worried about our job security and you never know what's going to happen, because it's actually like affecting most on the education field. Yeah, and the border is closed. International students cannot come in, yeah." (Employee B)*

The employees of the Student Admissions team were not taught how the bot works and what it would actually be doing. When asked about training, an employee from student admissions replied *"Training, no? Ah, introductions of some sort? I don't think so. I don't think there's any training." (Employee B).* The lack of training and education seemed to concern some of the employees. Thus, they did not trust that the bot could complete the process to their standard and were concerned that it will cause errors. Employee E presented her concerns when she said, *"it still leaves bits and pieces out, I don't know the ins and outs, I have not been involved in this, I don't know how it works out the exceptions, I don't know how it works, I know nothing."* However, there was an opportunity to present the work of the bot, but this idea was put on hold by senior management to allow them to showcase the work of the bot to other business units at a later date. The Student Admissions Manager explained:

> *"Umm … we did get the developer to create a video just showing the process and you know showing the bot in action but that hasn't come yet. That was more for the University to showcase. I was told not to kind of distribute that video, but nothing really happened in terms of kind of showcasing the bot, what it's done for admissions. I don't think that's actually progressed yet." (Student Admissions Manager)*

Employees believed that if slightly more detail was included in the communication, it would have been beneficial for the acceptance of the bot. One employee explained that *"You always feel a bit put off if*

something happened and you weren't told. Especially, when it's a big change … I think our team is quite good with the information sharing as far as that goes." (Employee C)

Another employee was quite against the implementation of the bot in general but became increasingly frustrated as she felt there was a communication barrier between herself and the SMEs from her team. She further felt excluded from the project and did not understand what RPA was, how it would work, why it was being implemented, and what the long-term goals for the RPA project in the University were. She explained her position as:

> *"I've said that all along with my job I like to see the big picture. I don't like being given a little snippet of it and then do those because I need to know why I'm doing that how I am. Yeah so, I like to see the big picture, but for this it was my manager's, little project and he goes oh well the bot will do that and I just I didn't think about it again. It just meant I didn't have to do any school leaver applications. … Maybe even a written document, just giving a brief outline of what they're doing. Yeah, so that even if we didn't even have a meeting about it, that, there's an explanation in writing somewhere. This is how it works. This is what happens. This is what happens on a daily basis. Uhm, this is what we hope to achieve, that would have been good." (Employee E)*

Team members who had concerns were comfortable presenting them to their manager. He tried to accommodate them where possible, which settled the anxiety of most employees. The employees who were worried about RPA implementation were largely concerned solely due to a lack of communication which was rectified once the manager discussed the concerns with the employees. This was clear from the quote below from an employee who grew to accept RPA over time once her queries and concerns were addressed, she explains her path to accepting RPA:

> *"When I first heard about RPA, I was like oh, so it's being implemented now? I didn't use to have a good feeling with this RPA robot. It was kind of like hmm how is it going to affect my workload now if it is doing our job if you know what I mean because it is kind of like it is one function to kind of like help us to process the applications. So, what happens when it comes in? Will it help us or take away our jobs? Me, I had a bad feeling about it when I first heard of it, and then I talked to my manager about it. I was like what are the robot expectations like are we having it just to help with our workload or what will happen in our job descriptions? I mean, we don't want our jobs description to be revised again, or what will happen? So, he was positive about it. He was like hoping this RPA will help us in processing it more efficiently because that RPA is kind of working on domestic school leavers, so it has not reached that maximum capability that it can process any source of applications. Yeah, so he has that selected functionality only. So, I wasn't too worried after all because it's in a positive way." (Employee B)*

Despite having no formal presentation of how the bot operates, the Student Admissions Manager welcomed the employees who showed interest, to look at the computer the bot was operating on to see how it works. The manager also tried to include the employees in other tasks relating to the bot. For

example, troubleshooting if exceptions were thrown that are outside of the programmed exceptions. Employee B explains:

> *"From time to time, my manager will just come to us [Student Admissions team members] asking us to check it (the bot) like he would give us a list of applications the bot missed, like … Why didn't the bot pick up on these applications, like what's going on? Are there any issues? How can we improve? … Yeah, he will just ask what's going on … so we will just do a random quick check to see what's going on. What happened to these applications? Sometimes this could be just identification number, or maybe the students indicated the wrong end of the school year." (Employee B)*

5.5 Episode 4: Integrating with other systems

Several technical issues were identified throughout the course of the implementation project. For example, the bot needed to interact with Elbion to perform its tasks. However, programming the integration between the two technologies presented significant complexity. The bot was unable to recognise and penetrate certain controls to access specific information in Elbion. The controls were shown as a rectangle or "blob" rather than a penetrable grid that was critical for the bot in order to access the information. The Acting CIO explained this:

> *"There was a high-level technical oversight, and during the implementation there were some problems with the technology interfacing with Elbion. So, I coordinated that, to get the Elbion team to work closer with the developer so that we could come up with a solution." (Acting CIO)*

A human operator could see the information on a menu and choose one option. However, for the bot to mimic this action is more complex. The controls in a non-web-based application, such as Elbion are typically hidden and/or difficult to access, therefore a bot that is attempting to access the information from the frontend could see that there is information there but cannot make sense of it or understand how to retrieve it. Therefore, it took several meetings among the project team to come to a solution which was to change a part of Elbion's configuration. This was done by building a grid filter to ensure the bot could penetrate the rectangle. Consequently, the bot could access the grid filter and find the record it needed. These issues resulted in a 1–2-week project delay. The Test Manager found this particular issue challenging but embraced it and eventually found the excitement in it. She explained:

> *"The product actually changed Elbion. We needed to put a filter on a grid so that the robot could pick the right row because in an automated test some of the controls in Elbion software seemed like a blob to RPA. The robot can't get into them, so instead of, you know we'll look at the screen and we'll see a list, and then in that list, you can see that there's 10 records, so that we think, okay we need to go inside that list, filter, or scroll or whatever and find a particular record. Whereas, the robot will just go, oh these are blob controls? I can see that there's a rectangle on the screen, but I can't get inside it. So that was one of the challenges because we had basically a blob and we*

had to help the robot get into the blob and find the information out of it. So, we had to put through a work item for the Elbion team to add the grid filter. So, the robot taps into the grid control, and it would come up and it would know that the only thing in this blob is the one record that I'm after, because I tapped in to filter it." (Test Manager)

When processing applications, the Student Admissions Team would interact with Elbion using the graphical interface at the front end of the system. For example, they can run a variety of reports that would list the applications that have been submitted over a period of time, through queries from the database. However, the project team realised they could decrease the run time of the process by programming the bot to access the database directly, rather than mimicking the actions of the human operator, which provides an efficiency saving. *"It's much more efficient to do, you know, but a human can't go and get into the database." (Vendor Solutions Architect)*. Therefore, the bot was programmed to go into a backend database to fetch the information, which was not possible for the Student Admissions team as they do not have a technical background or access rights. Thus, the process flow was changed to represent the updated process.

Due to the cost of implementing RPA for the pilot project, being funded out of ICT's operating budget, there were additional limitations on the available resources. The project team had originally only acquired a single unattended bot license for it to run in the production environment. Also, because of the high costs of maintaining different environments that are encompassed within an application, the university could not sustain all the environments with full functionality. Therefore, it was difficult to decide which environment the bot should be tested in because it needs to be tested in an environment that accesses the physical display of Elbion as it uses the user interface to complete its tasks. The Project Manager explained the complexities:

"There's usually a development platform, a staging and test platform, and a production platform. ICT are not particularly good at having all of those platforms for all systems and applications because it costs quite a lot of money from a resourcing point of view to support them, so we ended up sort of putting it into the staging environment you know? To test on and part of it was that Elbion does many releases, they have regular agile teams that develop software and release production updates for out in the public-facing environment for people, their students, and lecturers to use so we had to kind of sync up with those as well, as things like that come up, it's quite a lot to consider." (Project Manager)

The staging environment is the only environment where the bot could access the physical screen display without being in the live production environment. Staging is an environment similar to production where updates can be tested and visualised in a similar way to how it would present itself when the bot is live.

However, once Elbion is released into the staging environment, the Testing team typically does not have access to the new release anymore as their testing work should already be complete. Therefore, if the bot were to be impacted by the release, it would be difficult to solve the issue within the required time frames. Despite the difficulty in deciding on the environment, it was clear that a testing license was required to ensure that the updates to Elbion worked and to be mindful of the impacts on the bot that the Elbion updates may have. Since the test license was placed in the staging environment, additional work was required from the vendor and the project team to embed the second bot license into the staging environment and the acting CIO was required to find supplementary resources to pay for the additional bot license and the additional work provided by the vendor. The Project Manager explained that *"he [Acting CIO] found we needed money to buy the bot unattended production license, a test license and pay Vendor T&M time."* These issues resulted in a further project delay as a solution had to be developed as well as acquiring additional resources to fund the extra costs.

5.6 Episode 5: Managing implementation performance

Despite acquiring an additional license to test RPA in the staging environment, a complete solution was not reached. Due to the decision to use the testing license for the staging environment, there is no license for vigorous testing by the testing team further upstream to ensure there are no impacts on the bot. Therefore, each time Elbion has a new release they don't know if the bot would still be working. For example, if the grid is altered in some way or the application is updated to the point that the process has changed, they don't know if the bot is still working until the release has gone into staging. At this point, the Test Manager and her team would have completed their testing of the new Elbion release to ensure deadlines are met. This was concerning as the implications of the bot going offline would impact several stakeholders including, the student admissions team, current and prospective students, and potentially the developer or the Elbion support team. The release deadline may also be missed. Therefore, it is very important to keep the bot live. Consequently, vigorous testing would be needed to ensure the integration is correct and maintained through Elbion's monthly releases with various updates to the system.

Until the Test Manager can acquire an additional license, she and her team are doing their best to be mindful of the bot in future releases by ironing out any issues to the best of their ability before the Elbion release reaches the staging environment. If issues with the bot are found once the Elbion release goes into staging, the new version would need to be rolled back until the Test Manager

and her team fix the issue and retest the release alongside the Elbion team and RPA Developer. However, this scenario seems to be unlikely, the Test Manager explained:

> *"The involvement with the robot that we built for this project will come with the Elbion product releases. We have to make sure that we don't break it because the robot's going to come along and every month that software is going to change. So, if for example, we change something about this grid, then it might break the process. So, the challenge that we've got, that I, in particular, have going forward is that the robot sits on an end-user machine, so we change the software, we put all these changes, these bug fixes and these RFC's and I have several test environments that we go through which has them on our main test environment and then at the end of the release cycle we've packaged it all up and we put it on another test environment to make sure it all works and then we hand it over to the support team who put it on stage and stage is the first environment that has the robot on it, so they only got 2 licenses. One for stage and one for production. So, it's not like I can test it over and over during that month. So, by the time it gets to them, we're done with it. We hand it over and then that'll be our first time to think oh, oops. We've done something that has broken the process. Then if we changed the process too much, the admissions process, or the parts of the software that function to support the admission processes, the robot is not going to work and we're not going to find out until after we have delivered. So that is a challenge for me."*

The Test Manager further explained that the only solution is one that will require additional resources to fund: *"We could require that they find another license somehow, that's probably the easiest way. Get another license, get the bot installed on an environment that I have more access over more and more room to access." (Test Manager)*

Once the development of the bot went into the UAT or controlled production phase, the Student Admissions Manager and the employee who worked in the project team were required to monitor the output of the bot. However, through the monitoring, the employee noticed that the provisional offer letter that was being sent included an incorrect expiry date. Fortunately, this was still a controlled environment where test applications were coming through and once the problem was fixed, the project team was confident that the bot could process the real applications. When discussing the experience of the SME from Student Admissions, she explained the issues she encountered when the bot moved to controlled production as:

> *"He [the bot] starts working, but even then, I have to check for problems. For example, the letter's expiry date. We faced a little bit of a problem with that. I can't remember why, but the bot sent an incorrect expiry date a few times, that was later than it was supposed to. So, we had to fix that. There were some technical things [to fix], but it's all solved now. I mean, by the time the bot started working, it was all solved. ... I had to prepare a list [of data] to match scenarios I was given because they [the developer, test manager and solutions architect] wanted to test that the bot was working correctly depending on the scenario they provided. So, we had to manipulate data for some of the students to meet the requirements of the scenario. The test applications were going through a different server which is a kind of testing server. We did not use a real student number. So, whatever we change, it is not going*

to be real. It's just for testing. Yeah, so the bot will be processing all those applications in the testing environment and sending the outcome and we have to check if everything is fine, if it's fine, we do nothing. If not, we have to tell them what the bot is doing incorrectly, so they fix it and after all of that we moved to the live applications. So that's it, now it's working but we continue to monitor the bot to make sure it is working correctly." (Employee A – SME in project team)

Table 4: Overview of findings

Episode	Issue/Event	Level	Components	Strategy	Outcome
0	Identifying opportunities to leverage technologies to optimise business processes.	Organisational level	Actors Task Technology Structure	Monitoring the Gartner hype curve.	• Identification of RPA as a technology of interest
	Evaluating the feasibility of RPA in the organisation	Organisational level	Actors Technology Task Structure	Enrolling top management support and matching RPA to the organisation's needs.	• Agreement to implement RPA as a pilot project initially instead of big bang approach
	CIO was required to assume a different role in the university due to the COVID-19 pandemic.	Organisational level	Actors Task Structure	Solutions Development Director became Acting CIO and the project sponsor.	• Constructing a project team, • Need to acquire a vendor, • Need to identify a suitable pilot process to implement RPA.
1	Vendor selection that fits with the IT division's strategy.	Project level	Actors Task Structure	A decision to collaborate with a highly skilled vendor that supports the development of in-house expertise.	• Allows internal skill acquisition in RPA, • Independence from vendor, • Scaling opportunities.
	Personnel issues within the project team.	Project level	Actors Task	A decision to replace the original Application Support Analyst with another one.	• New Application Support Analyst worked hard and was committed to the project.
	Finding a suitable process for the pilot project that is rule-based, mundane and high-volume.	Work system level Project level	Actors Task	Educating administrative units on RPA and pitching the benefits of RPA technology.	• Identifying the Student Admission team's school leaver process as

					suitable for the pilot project.
	Student Admission team is overwhelmed with the volume of student applications during peak times.	Work system level	Actors Task	Decision to implement RPA to ease the workload for student admission employees.	• Outsourcing school leaver applications to software bot, • Potentially reducing workload, • Potentially easing stress from employees, • Granting more flexibility.
2	The selected vendor was offshore, and all collaboration had to take place online.	Project level	Structure Technology Task Actors	Regular communication, collaboration, and coordination had to be facilitated through digital technologies. Holding daily 1+ hour online meetings between the developer, test manager, and the solution's architect of the vendor. The test manager was included in the development process right from the beginning.	• Project coordination worked seamlessly, • Work tasks e.g., developing the bot, were completed synchronously online, • Being able to solve issues as they occur, • Consistent communication and coordination, • Reducing the testing effort as the software bot is built correctly right from the start.
	The developer was required to complete tasks that were different from his usual tasks and skillset such as conducting requirements analysis, and documentation. Further, he had to apply programming	Project level	Actors Task Technology	RPA vendor provided guidance and documentation templates. The developer completed UI Path training modules.	• Developer learned how to write project and process documents e.g., process maps, solution design documents,

	techniques that he was not used to which was challenging				• Developer upskilled in RPA development.
	COVID-19 lockdown led to enforced working from home.	Project level	Actors Task Technology	All communication was done online, including between the stakeholders of the university. Regular meetings continued to occur.	• Work continued to be completed seamlessly.
	Besides the RPA project, the developer had to work on other tasks he was responsible for.	Project level	Actors Task Structure	The availability of only one developer who couldn't work full-time on the project was logged as a risk. The developer dedicated most of his time to the project but was required to work on tasks relating to his other responsibilities twice.	• The project got delayed but not significantly.
	Managing slow performance of the bot.	Project level Work system level	Actors Technology	The goal was not to work faster than a human employee but to outsource non-cognitive tasks. Therefore, the bot was scheduled to run between 7-9 am when traffic on Elbion is low.	• The bot completes its tasks before human users start their work day and complete their tasks in Elbion which cause high traffic.
	Managing bot's limited capabilities.	Work system level	Technology Actors Task	Restricting bot usage to simple rule-based tasks.	• Bot takes over rule-based applications, • Human employees continue to process the complex applications.
	The RPA programme is aimed to scale across the university. Therefore, a mechanism was	Work system level Project level	Technology Actors Task	A three-tiered support model is constructed.	• It is clear which teams within the university have responsibility for

	needed to control the flows of information and provide clarity over the ongoing responsibilities of RPA.		Structure		the various issues of different levels of severity that may arise due to RPA.
3	Implementation of RPA was communicated to the employees of the Student Admissions team casually in a team meeting until employees were comprehensively informed in a subsequent meeting and through an email after the project began and periodically updated thereafter. This communication was inadequate for some employees, and they were left anxious and concerned about job loss.	Work system level Project level	Actors Task Structure	The student admissions manager tried to mitigate the poor communication by fostering a culture of honest feedback and input from the employees. An explainer video was created but was not shown to the employees as the video was to be showcased to the entire university to promote the use of RPA at a later date. The student admissions manager assures that no redundancies will result from the RPA implementation.	• Employees felt they were being heard by their manager, • Employees felt assured that there was no risk of job loss at this stage, • Many of the employees were excited about RPA implementation.
	Employees were not educated on how the software robot works and what it can do. Consequently, they didn't trust the robot. Some employees had existing negative cognitions towards technology and automation which increased the ill feelings towards implementing RPA.	Work system level	Actors, Technology Task	The student admissions manager and the SME from the project team showed their colleagues what the robot was doing on the computer and explained as much as they could to accommodate the other team members.	• Employees were less anxious about the technology, • One employee remained against RPA even after additional discussions.

	Opportunity for true collaboration between the employees and the software robot was established. Most employees embraced working alongside the bot, but others did not believe the bot was necessary or were apprehensive about working with the bot.	Work system level	Technology Actor Task	Task allocation between the employee and the bot depending on the skillset – overall the employees and bot worked together to achieve the goal of completing school leaver applications.	• Exception cases are processed by the human employees which are applications that require human judgment and visual recognition, e.g., the Bachelor of Arts with various pathways or a Bachelor of Health in paramedicine qualification were executed by the employees. • The bot processes simple applications that are repetitive, mundane and high-volume, • The bot and the human employees hand over tasks at allocated times through reports, • Employees ensure the bot is completing its work correctly, for example by checking the double ID report.
4	Integration issues with Elbion.	Work system level Project level	Technology Task	Building a grid filter in Elbion so that the software robot can access the information.	• Elbion's configuration was changed, and the bot could access the required information.
	Opportunity to leverage process efficiencies.	Work system level Project level	Technology Task	The developer made changes to Elbion so that the bot could	• Increased speed of process execution.

				access the system's database through the backend.	
	Insufficient licenses.	Organisational level Work system level Project level	Technology Task Structure	The acting CIO had to get more funding. Another license was purchased.	• Bot could now be tested in the staging environment prior to the production environment and run in the production environment with the two available licenses.
	Uncertainty regarding the decision in which environment the bot should be tested in.	Work system level Project level	Technology Task	A decision was made to test the bot in the staging environment in order to access live systems.	• Further issues came up as Elbion monthly releases which may require adjustments to the bot.
	It is possible that new Elbion releases will cause the bot to break, requiring its reconfiguration.	Work system level Project level	Technology	Test Manager suggesting purchasing another license, which, however, hasn't been purchased yet.	• Test Manager will need to monitor the effects once it goes into the staging environment so that if it causes issues for the bot, they can promptly roll back or fix the issue.
5	Software robot has performance issues, e.g., sending out acceptance letters to students with incorrect dates.	Work system level Project level	Technology Task	The bot was reconfigured so that it uses the correct date.	• Bot sent out the correct information to the students.

6. Discussion

The goal of this research was to answer the questions: *How do RPA projects unfold in the context of a tertiary institution?* and *What Organisational Change Management strategies are applied to address challenges during the RPA implementation phases?* Therefore, a qualitative research study (Qu & Dumay, 2011) was conducted in an Australasian university that implemented RPA in their Student Admissions team. By taking a process approach (Van de Ven & Poole, 2005), key issues and events were grouped together to understand the project phases of RPA implementation. The data was then analysed through the lens of socio-technical theory (Leavitt, 1964) and it was found that during RPA implementation, the data largely aligned with the concepts of Lyytinen and Newman (2008). In an organisational system the socio-technical components are tightly coupled, when RPA is introduced, it leads to a disruption in the existing system which needs to be managed. Furthermore, when one socio-technical component is altered there are often ripple effects affecting several of the other components. In addition, it was found that in a multi-level IS change, the impacts of affected components in one system level may have cascading effects in one or more of the other system levels. For example, the technical oversight leading to integration issues between the bot and Elbion (project level, technology) triggered the Acting CIO (organisational level, actor, structure) to coordinate a solution (structure). The solution caused backend changes to the Elbion technology which the Elbion support team needed to carry out (work system, task, technology) and lead to project delays (project level). In this scenario, there was a large gap due to the integration issues that affected several of the socio-technical components at all three levels (work system, project, organisational) of the organisational system. It also demonstrates the dependencies of the components and their effects across multiple levels. The gap needed to be solved using an intervention strategy; it was attributed to the Elbion team to carry out a solution.

In many cases, the intervention strategies were successful, and often the interventions were related to OCM, for example, providing education and training to the developer or providing consistent communication to the employees. By contrast, the lack of OCM strategies being applied highlighted their necessity. For example, when the employees did not know how the bot worked and therefore did not trust it, providing education and training early in the project would have mitigated most of the uncertainty and discomfort among the employees and prevented a gap from forming. Moreover, the use of OCM strategies in the case study and the significance of it as a success factor for RPA

implementations in the literature (Kyheröinen, 2018), signifies the potential of exploring OCM as an effective intervention strategy in RPA implementations.

Many organisations adopt RPA successfully, but there are also a significant number of organisations that experience challenges and may not receive the intended benefits of implementing RPA (Santos et al., 2019; Syed et al., 2020). The RPA technology is advancing swiftly (Syed et al., 2020) and many studies relay the benefits, challenges, and success factors of RPA (Hofmann et al., 2020; Santos et al., 2019; Syed et al., 2020). Yet, there is little knowledge regarding the implications RPA technology has on the employees involved (Syed et al., 2020). In addition, RPA implementation affects not only the existing infrastructure but also the human workforce. Therefore, a socio-technical approach to RPA implementation is needed to help scholars and practitioners understand and manage the implications on their human workforce (Syed et al., 2020). An effective framework that assists the design of OCM strategies during RPA implementation is also required to manage the needs and expectations of the employees involved and increase the acceptance of RPA adoption (Asatiani & Penttinen, 2016; Syed et al., 2020). Therefore, the findings of the study were important to address the knowledge gap regarding the socio-technical implementation of RPA and the lack of knowledge on OCM strategies that are suitable for RPA implementations.

In the following sections of this chapter, the socio-technical dynamics of 3 key issues or events are explained alongside the outcomes of applying an OCM strategy as an intervention to address or prevent a gap or misalignment and rebalance the organisational system. In addition, the concept of the 'dual role' of the RPA bots who fulfil the attributes of both a technology and an actor in the diamond model (Leavitt, 1964) are discussed, which adds further complexity to the socio-technical system and its analysis. Then, an OCM framework is introduced that describes the OCM strategies that should be applied during RPA implementation projects to increase the likelihood of project success. Finally, there is a discussion about the theoretical and practical contributions as well as the limitations of the study and areas for future research at the end of the chapter.

6.1 The socio-technical implementation of RPA

To answer the first research question "How do RPA projects unfold in the context of a tertiary institution?" The theoretical concepts of socio-technical theory (Leavitt, 1964) are built on, including the diamond model (Leavitt, 1964) and the multi-level socio-technical system (Lyytinen & Newman, 2008) to explain the complex and punctuated nature of IS change.

In the findings of this study, Table 4 is presented which provides an overview of the underlying socio-technical dynamics of each key issue and event. A process approach (Van de Ven & Poole, 2005) was taken to elaborate on the key issues and events and to construct a narrative that explains how the RPA implementation unfolded in the tertiary institution. From the findings, we understand that RPA implementation occurs within a multi-level socio-technical system of the work system, project, and organisational levels with tightly-coupled socio-technical components. If a socio-technical component i.e., actor, technology, structure, task is altered in one level, e.g., the work system level, it may have cascading effects on other components within that system-level and/or effects on other system levels e.g., project level (Lyytinen & Newman, 2008; Davis et al., 2014).

The findings of the study coincide with the conclusion of Lyytinen and Newman (2008), who claim that IS driven change is multi-level and punctuated. Using process analysis (Van de Ven & Poole, 2005), the series of issues and events based on their temporal flow, were grouped into six distinct episodes to present a punctuated model of RPA implementation. Further, it is clear from the findings that RPA implementation must go through a sequence of stages and reach certain milestones before moving on to the next phase to avoid future issues forming and maximise the potential of successful implementation. For example, it is critical to evaluate the feasibility of RPA implementation in the organisation prior to making an official decision to proceed with the implementation as RPA is not suited to all organisational contexts (Hofmann et al., 2020). In this case study, the CIO did not decide on implementation based on their willingness and perceived feasibility of RPA implementation in the University but enlisted the help of other senior executives. Together, the senior managers witnessed RPA implemented in different contexts to carry out the required due diligence and make a confident and informed decision to implement RPA. If a thorough feasibility check was not conducted and RPA did not align with the operations of the University, the efforts to adopt RPA may not have returned the intended benefits in the future.

IS change is often complex, impacts multiple levels in the organisational system, and is also sporadic with multiple processes and tasks occurring and colliding simultaneously which tends to lead to unpredictable outcomes of implementation (Lyytinen & Newman, 2008). Despite the system levels being seemingly separate, it is clear that the work system and project levels are particularly coupled and should be viewed as a co-evolving structure (Lyytinen & Newman, 2008). The work system and project levels can only exist if they are embedded in the organisational level which has a governing force over their activities. Therefore, there are cascading influences between all three levels (Lyytinen & Newman,

2008). For example, the governing force of the organisational level is particularly evident when the senior managers requested that the informative video on RPA was not shown to the Student Admissions work system, which blocked the 'education and training' OCM strategy as an intervention and had a negative effects on the employees.

The University as a whole can be viewed as a socio-technical system (Lyytinen & Newman, 2008) but can also have various socio-technical systems within it. In the context of RPA implementation at the University, the interactive and sometimes collaborative relationships between the socio-technical components in one system-level or between system levels were evident. Decisions or actions that were taken in relation to a component on one system-level often affected components on one or more of the other system levels, which generated a gap or misalignment between components in the organisational system and required an intervention to realign the system (Lyytinen & Newman, 2008). Throughout the findings, OCM strategies were applied either directly, indirectly where the actors applying the strategy did not realise it was an OCM strategy, or opportunities to apply OCM strategies were missed. The adoption or avoidance of OCM strategies proved the impact of OCM as an intervention strategy (Lyytinen & Newman, 2008) to address the gaps or misalignments that occur during RPA implementation. The gap analysis is demonstrated in three key examples below.

First, a missed opportunity for the '*communication'* OCM strategy to be adopted was the delayed communication (task) about the RPA implementation (technology) from the project team (actors, project level). The communication barriers were imposed by senior managers and the project team (actor, structure, project level, organisational level) as they decided to wait to inform the employees until after the project had started (structure, task). This led to uncertainty and anxiety among some of the employees (actors) of the Student Admissions team (work system level) which posed a gap between the actors on the work system level (employees) and structure components on the project level. This created tension due to the shock of an unexpected RPA implementation. However, in cases where the employees (actor) queried their manager (actor) about the integrity of the bot or their job security (structure), the '*communication'* and *'education and training'* OCM strategies were applied as interventions to help the employees learn about the bot and the corresponding impacts. The manager was transparent in explaining the implications and welcomed the interested employees to watch the bot perform its tasks on the computer (structure, technology, actor). This intervention strategy was successful in most cases as the employees were satisfied with the information they received. However, in other cases, the employees remained apprehensive about the bot due to existing cognitions about

implementation because of prior negative experiences and general distaste for automation. Overall, all employees were willing to work alongside the bot and the intervention strategy can be considered successful which closed the gap.

Second, on the project level, the Developer (actor) was unfamiliar with the development of software robots and how to produce the required documentation (tasks, technology), leading to a gap between the actor and task components most prevalently but also between the actor and structure components and the actor and technology components. A gap occurred between the developer (actor) and programming the bot (task) because first, he did not know how to complete the documentation which was a prerequisite to programming the bot. In addition, he usually programmes (tasks) using traditional coding languages, whereas RPA requires different development techniques which were unfamiliar to the developer. Therefore, a gap is also formed between the developer (actor) and RPA software (technology) as the software could not be used to develop the bots until they received training on how to use the software (task). Finally, because the developer (actor) was out of sync with their typical work practices (task) and the usual requirements of their role (structure,) a gap is formed between actor and structure. Overall, at this point, the socio-technical system on the project level was significantly out of alignment. To realign the system and close the gaps, the OCM strategy of '*education and training'* was employed by the RPA vendor's Solutions Architect (actor) who provided the developer with guidance and advice where needed, templates for the documentation, and required him to complete training modules about RPA development using the UI Path software (task). The intervention of the '*education and training'* OCM strategy closed the gap between actor and task as it ensures the developer feels confident and equipped to complete both the development and documentation. Subsequently, the gap between actor and technology was closed and the developer (actor) has the skills to programme the bots using the RPA software (technology). Now that the developer had acquired these skills, they could be integrated into his working norms and he can continue to develop RPA bots in the future, thus closing the gap between actor and structure. The intervention strategy was a success, and the success of the project was not threatened.

Third, the project team (project level) experienced personnel (actor) issues. The Application Support Consultant (actor) was not completing his tasks (task), due to a high workload (task). This posed a gap between the actor and task components most prominently but also the actor and structure components. The Project Manager (actor) became increasingly frustrated with the lack of effort of the Application Support Consultant (actor) as they did not complete the required tasks and responsibilities

pertaining to not only their role in the project team but also in the University (structure, task). This was a pressing issue that needed to be addressed promptly due to the quick project timeline of RPA implementation (Syed et al., 2020). Consequently, the intervention strategy was a decision (structure) to replace the Application Support Consultant (actor) with a different Application Support Consultant (actor). The gaps between actor and structure and actor and task were closed immediately and the intervention strategy was successful as the new Application Support Consultant (actor) worked hard, completed his required tasks and was committed to the project (structure, task). In this scenario, the *'planning'* and *'communication'* OCM strategies could have been implemented in the early stages of the project to prevent the gaps from forming by gauging the workload and availability of the Application Support Consultants as well as their willingness to participate in the project and select the appropriate Application Support Consultant based on the information received.

6.2 The dual role of RPA software robots leading to collaboration between humans and machines

Adopting a socio-technical perspective on RPA implementation highlights a distinctive aspect of the RPA technology in comparison to traditional technologies such as ERPs that employees use. With RPA, the software robots become part of the team and take over tasks that the employees would typically complete. This is because software robots are autonomous agents that can work by themselves and execute prescribed tasks and processes (Hofmann et al., 2020). Since RPA is an independent actor, the employees do not need to "use" the RPA software, as they would with traditional technology; human employees either trigger the bots to complete various tasks or the bot works autonomously and continuously (Syed et al., 2020). For that reason, RPA can be considered both a technology and an actor in a socio-technical system, which increases the complexity of both the socio-technical system and its analysis. RPA can be described as performing a dual role as an actor and technology. Since the software bots still have the material attributes of a technology with limited functionality that must be managed, but also work autonomously, the typical roles of actors and machines become blurred. This leads to higher levels of collaboration than are seen with other technologies which needs to be taken into consideration. This phenomenon can be explained using the concept of hybrid intelligence (Dellerman et al., 2019). Hybrid intelligence utilises and combines the complementary intelligence of both humans and AI-powered agents to provide an output that is not possible to produce separately, on their own (Dellerman et al., 2019). The concept aims to utilise both the creative, empathetic, decision-making and problem-solving skills that humans possess, and the insentient yet intelligent and productive nature of AI-powered technologies to provide superior outcomes (Dellerman et al., 2019).

Modern forms of RPA utilise various forms of AI to take on more complex tasks (Hofmann et al., 2020), but the fact remains that it is only possible for the bots to execute process flows that are structured, rules-based, and follow pre-defined configuration (Hofmann et al., 2020). It is impossible at this point for the bots to mimic the empathy and decision-making capabilities that humans have. Therefore, it is critical to maintain the involvement of humans to manage complex cases that do not follow the programmed logic of the bot. On the other hand, RPA is an excellent solution for solving tasks that humans would prefer not to do themselves (Dellerman et al., 2019; van der Aalst, 2021). This is where the need for collaboration resides and reinforces that humans and machines cannot realise their full working potential without each other and can augment each other to work in the most efficient way (Dellerman et al., 2019). The bot supports the human employees by completing their preconfigured tasks in a compliant manner. This decreases risk and increases the productivity of the business unit as the bots can work 24/7, while humans focus on value-added tasks. It also alleviates pressure off the employees as the bots complete high-volume tasks that are essential to complete and typically consume a lot of time from the employees, but provide little value (Hofmann et al., 2020; Syed et al., 2020). Although humans tend to equate task and process automation with job loss, the concept of hybrid intelligence reinforces the certainty that humans and machines can work synergistically when the needs of both heterogeneous agents are balanced (Dellerman et al., 2019). Creating a socio-technical system centred on hybrid intelligence may foster a sense of trust and acceptance among humans as both human and software robots as agents adopt specific roles in the automated process (Dellerman et al., 2019).

In an article based on the findings of this thesis, written with the research supervisors, the term hybrid processing was coined (Wallace et al., 2021). Hybrid processing extends the concept of hybrid intelligence (Dellerman et al., 2019), to include the collaboration between humans and bots where they work together to complete and accomplish tasks and processes. The tasks and processes are allocated based on skillset. The bot processes the simple, rule-based and mundane applications, whereas human employees work on those that require human judgment and decision-making skills. In this case, the human employees remain available to complete value-added and enjoyable work, but together the bot and the employees complete the tasks and processes. The complementary skills are optimised for the betterment of the team and to achieve a more satisfying work environment for human employees (Dellerman et al., 2019). Additionally, employees understand their role within the automated process and that software robots serve the purpose of enhancing the process and making their job easier rather than replacing them (Dellerman et al., 2019). As task and process automation is often equated with job

loss, the concept of hybrid processing reinforces the notion that humans and bots can work synergistically to complete work processes together (Dellerman et al., 2019).

Based on the data of RPA implementation in the Student Admissions team, it was found that employees and software robots collaborate in the sense of sharing workloads and working towards the same goal by fulfilling the student application process. The bots provide great assistance to the employees in the Student Admissions team by taking on a mundane, high-volume task, such as the school leaver process, that is time-consuming and employees do not enjoy. This provides them with more freedom to focus on value-adding tasks that they do enjoy. Despite the number of employees increasing, the Student Admissions team still could not keep up with the demand. Therefore, implementing RPA was equally critical for the well-being of the employees as it removes the pressure they were faced with every year during the peak period. Overall, both the Student Admissions team (actor) and RPA (technology/actor) are able to collaborate to achieve superior results that would never have been possible by completing their work tasks alone (van der Aalst, 2021).

Over time, the socio-technical system is likely to improve in their areas of work both individually and collectively, with the experience with RPA increasing as more processes can be automated and human employees have more time for complex work. The functionality of RPA may also be improved through the maturity of its use within the work system. For example, through the increasing experience in RPA use, the University is likely to become more comfortable allowing the bot to complete tasks that it is capable of doing but they did not allow the bot to do in the pilot project. Already, the Acting CIO explained expansive plans for rolling out RPA in other work systems throughout the University which may further contribute to the maturity and growth in the Student Admissions work system and the multi-level socio-technical system overall.

6.3 Organisational Change Management as an intervention strategy for RPA implementation

During the data analysis process, gaps in the socio-technical system were often revealed due to similar reasons. The three most significant factors that caused gaps were, first inadequate or misinformed planning which led to project delays and frustration or uncertainty among the project level and the work system level. Second, inadequate communication between stakeholders especially between the work system and project system levels which impacted the rate of 'buy-in' among several involved individuals and caused individuals on the work system level to feel excluded. Third, a lack of education and training amongst the work system level which caused uncertainty and a lack of trust among some employees. These issues are reflected in several initial codes in the thematic analysis and led to the creation of the six OCM related themes; 'buy-in', 'collaboration', 'communication', 'education and training', and 'planning'. To address the issues, an RPA OCM framework was developed and is introduced in figure 3 and table 5 below.

There were many instances of inadequate or missed opportunities to apply OCM strategies as well as good use of the OCM strategies throughout the project that is reflected in the data. This is in turn captured in the initial codes, themes, and construction of the episodes in chapter 5 (findings). The detailed accounts from the supporting data of each episode informed the specificity, priority, and order of points noted in each section of table 5. In particular, both the significant positive and negative issues and events alongside the corresponding intervention strategy and the outcome of the strategy from table 4 were used to inform figure 3 and table 5. This assisted the researcher in developing the RPA OCM framework based on pivotal activities that occurred throughout the project, forming an understanding of the response to the issue or event, and identifying how the response impacted the remainder of the project. By considering the accounts of the interview participants and leveraging OCM and RPA literature, this helped the researcher understand when the organisational change was managed well and when the application of OCM could have been improved.

It was concluded that the OCM strategies that were relevant in the RPA implementation context corresponded with some of the most widely accepted OCM strategies in the literature; buy-in and creating a shared understanding among all stakeholders of the project (de Fátima Nery et al., 2020; Georgalis et al., 2015), communication (Whelan-Berry & Somerville, 2010; Bordia et al., 2004), planning (of the project) (de Fátima Nery et al., 2020), collaboration (Santos et al., 2019; Vakola, 2016; Armenakis et al., 2016)., and education and training (Whelan-Berry & Somerville, 2010; Rafferty & Griffon, 2006). These strategies form the key elements in figure 3 and table 5. In table 5, there are several supporting points which

thoroughly explain the application of the OCM strategies. Many of these points have arisen from the empirical data such as collaboration among the project team or notifying the wider organisation about RPA implementation. However, several of the points are also supported by existing OCM and RPA literature which reinforces their significance. For example, providing a clear timeframe of implementation (Rafferty & Restubog, 2010), utilising workshops to educate and train the employees on RPA (Bordia, 2004; Smollan, 2015), or involving SMEs from the business unit implementing RPA to encourage other employees to buy into the project (Hughes et al., 2017). Each strategy should be applied proactively to prevent unnecessary gaps from forming in the organisational system and as intervention strategies to address gaps and misalignments.

The interdependent yet cyclical nature is depicted in figure 3 through the continuous circle to present the five strategies that are equally important for managing organisational change during RPA implementation projects. Careful consideration should be taken for each one to build a strong foundation among the stakeholders in the project. For example, if no planning had taken place to determine how OCM strategies will be applied, the remainder of the strategies will either be executed poorly or not at all which may have consequences on the employees and potentially the success of the project. Another example is if adequate communication does not occur, the stakeholders may not buy in. In a previous example, it was mentioned that the employees of the Student Admissions team were notified of the RPA adoption late in the project and did not receive any training or education on what the bot would do, how it works, and what the implications were for the employees. The lack of communication made several of the employees uncomfortable because they feared for their job security, and they did not trust the bot, which posed a gap between the actors and technology. If the communication and education and training OCM strategies were applied early, the gap would have most likely been prevented from forming. Also, if employees become anxious throughout the implementation, for example, if the project is taking longer than expected, the frequent communication promptly addresses the further gaps in communication that could occur.

The strategies in the framework may be performed concurrently with the potential to revisit the strategies as needed. For example, before an RPA project can commence, senior managers at the organisational level must agree to RPA implementation. This invokes a preliminary planning phase for an actor to form a proposal as to why they would like to adopt RPA and how best to communicate this vision to the senior managers. In doing so, the use of the ‘communication’ and ‘buy-in’ strategies are required. Once the organisational level agrees to implement RPA, formal planning is required to successfully carry

out the project. To acquire and maintain buy-in at all levels throughout the project, constant 'communication', 'buy-in' and 'collaboration' are needed as well as 'education and training' to ensure all stakeholders understand the need for RPA and how to leverage it. Naturally large organisational projects such as an RPA implementation tend to falter during the process, thus the planning strategy may be invoked multiple times to refine the overall strategy or address outstanding issues. A thorough explanation of the application of the strategies is presented in table 5.

Figure 3: RPA OCM framework

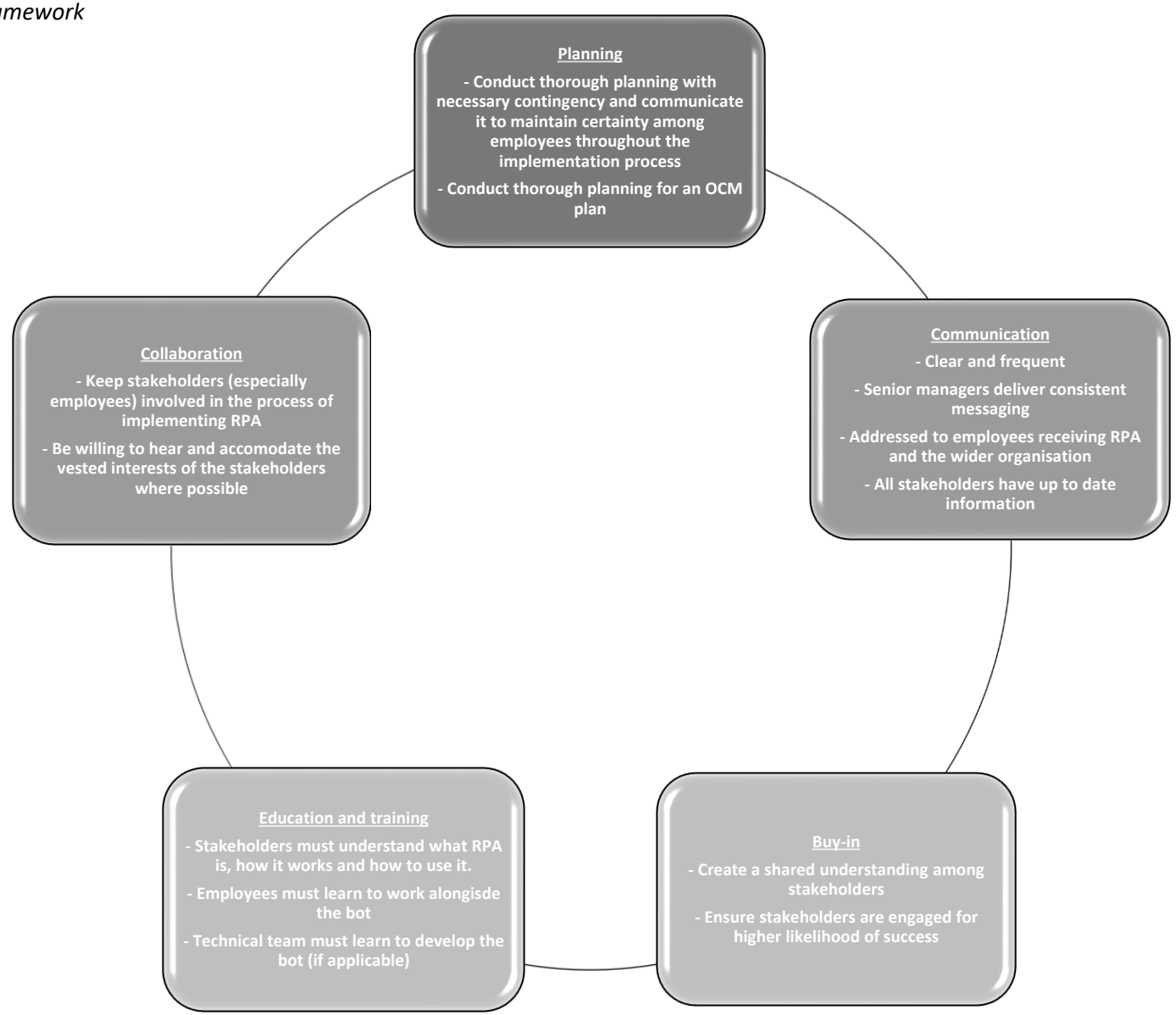

Table 5: Organisational Change Management strategies for RPA implementation projects

Organisational Change Management Strategy	Applied to RPA implementation projects at the university
Buy-in	➢ When implementing RPA, not only must the employees buy into the project, but the project team, senior managers, and relevant middle managers must also buy-in. For buy-in to occur at all levels, organisations must foster a shared understanding. To do so, those leading the changes must be able to employ the communication OCM strategy to explain their motivation, vision, and objectives for implementing RPA and the benefits they expect to realise to motivate the stakeholders to cooperate with the implementation. A breakdown of the importance of buy-in at each level is explained below. **<u>Employees of the business unit adopting RPA</u>** ➢ Employees are crucial to the success of the RPA project as they must work with the project team to provide the correct information about how they execute the process to train the bot. The employees may become uncomfortable as they are required to work alongside the bots and may have to change their way of working to accommodate the amended process, which is now automated (de Fátima Nery et al., 2020). If the employees don't trust the bot, don't want to change their way of working, or feel their job security is threatened, they may reject RPA implementation. If employees reject RPA implementation, they may not engage with the project team at all or provide inaccurate information which hinders the progression of the project and performance of the bot (Waizenegger & Techatassanasoontorn, 2020). This is particularly important in cases where employees have prior negative cognitions about automation or technology and are more likely to reject RPA for that reason alone (Weick et al., 2005; Vakola, 2016). **<u>Project Team</u>** ➢ The Project Team is usually made up of several different people such as a developer, project manager, solutions architect and SMEs who perform different roles in the organisation and therefore have varying responsibilities. They also bring with them specific experience, skills and professional norms. Therefore, the priorities of the team members and their willingness to join the project will vary. Furthermore, precautions must be taken to ensure the project team are committed and 'buy in' to the project. Initially, the project team members must be informed of the project in a similar way to business unit employees, they must understand why it is occurring and see the benefit for themselves, for example, if it is marketed as an opportunity to upskill. With the shared understanding and benefits in mind, project team members are

	more likely to abide by the deadlines and contribute significant efforts to the project. Project team members should have the time available to work on the RPA project and not feel burdened by the project if their schedule is already filled with other tasks. This is particularly important because of the quick project timeline of RPA projects (Syed et al., 2020). Each project phase must be completed promptly for the project to progress on time. However, if the project team members don't prioritise the RPA project, it will be difficult for the organisation to realise the benefit of RPA having a quick project timeline. In addition, project team members may have to learn new skills to develop the bots or expand their knowledge and expertise, which may be intimidating and cause project team members to disengage. Therefore, it is also important to speak with the potential team members and gauge their availability and willingness to participate prior to the project. **Middle Management** ➢ Middle Managers must see the benefit for the team, be willing to accept that the way of working for their team will change and cooperate with the project team. They must also understand that the productivity of the team may fluctuate while RPA is being implemented if employees spend some of their time working with the project team. **Senior management** ➢ Adopting RPA may be initiated by senior managers or a business unit which is interested in RPA (Dubey & Burns, 2020) but either way, upper management buy-in is critical. If the RPA approach is business-unit led, the project cannot go through without the financial backing of senior managers and relevant approvals, for example, for governance models, buying software licenses and wide-scale RPA programmes. When the RPA initiative is management-led, the executive pioneering RPA adoption must seek the buy-in from other relevant senior managers to support the project going through. Whether business unit or management-led, the senior managers must understand what RPA is, how it works, and what the benefits are for the organisation.
Communication	**Employees from the impacted business unit** ➢ Communicate a clear vision to ensure the employees understand why RPA is implemented, describe how it will benefit them and how they will need to collaborate with the bot to foster trust and increase the likelihood of acceptance (Santos et al., 2019; de Fatima Nery et al., 2020). The project team will require certain information, such as that regarding how the process is executed or the frequency of process

	execution and employees may be more resistant to disclose it if they are afraid of RPA's effects (Santos et al., 2019). ➢ Provide a clear timeframe of implementation, keep the employees involved and provide them with frequent updates about how the project is progressing (Rafferty & Restubog, 2010). ➢ Provide reassurance that the employees' jobs are safe, if that is the case. Otherwise, employees should be informed once a decision is confirmed if their job is altered, for example, if they move to a different team or face redundancy, to ensure they are prepared and do not feel blind-sided (Rafferty & Griffin, 2006; Santos et al., 2019). **Project team** ➢ Mechanisms for clear communication between the project team, SMEs, and vendor (if a vendor is employed) or RPA software company must be in place to ensure information sharing is, timely, accurate and of high quality. Overall, the managers and project team should be transparent, encourage open communication, and share as much as possible within appropriate boundaries. **Senior managers and project team** ➢ Those with authority in the project must present a united front and continue to portray the same message as to why RPA is implemented and how it will work in the organisation. When the employees are on board with RPA, they will be much more likely to welcome RPA into more processes (Dubey & Burns, 2020). **Wider organisation** ➢ Notify the wider organisation of the RPA implementation. Once they realise that other business units are adopting RPA, they may hear rumours of RPA implementation and rely on the information received from the employees of the business units currently impacted by it (Smollan, 2015). Therefore, there is a risk of information being biased or misconstrued. As a result, the employees may make them fearful for their job in the organisation or they will not trust the bot and then reject RPA implementation if/when it is implemented in their business unit (Santos et al., 2019). ➢ The organisation should provide an overview of the current RPA project, how RPA works, and the potential benefits and impacts on the employees in the wider organisation. By providing clear information, the

	employees understand the RPA implementation scenario and feel assured as the RPA programme progresses.
Planning	➢ Planning for RPA may differ depending on the organisational context, but as a baseline, planning should include: A) Identify the need to adopt RPA and potential benefits. B) Attain support from senior managers. C) Evaluate the use and feasibility of RPA within an organisation prior to implementing it. D) Consider preliminary vision and objectives and implementation strategy (RPA programme or one-off implementation). E) Identify experienced vendors and evaluate them by price, deployment mechanisms, availability, and quality of the product. F) Work with vendor to confirm objectives, including the method, they will use for implementation, i.e., whether the vendor will develop the bot themselves (outsourcing with a new provider), whether the organisation develops the bot themselves and only purchases the licenses from the software provider (insourcing), or the vendor and organisation work together to develop the bot (insourcing and consulting). G) Construct a project team with dedicated resources and consider backup members if a member leaves or must work on their other responsibilities. H) Determine the role of the wider ICT team in the project. I) Select an automatable pilot process. J) Develop the OCM programme. K) Plan scalable governance model (if opting for an RPA programme). L) Conduct a review of network architecture and application architecture that the bot will interface with. M) Project management activities, e.g., budget, scheduling, and deadlines.

	N) Documentation for each step, e.g., solution design, test plans, the outcome of tests plans. ➢ Once the vision, objectives, and guidelines for implementation are communicated to the employees of the business unit, they expect the project to unfold in a certain way (de Fatima Nery et al., 2020). If the project deviates from the proposed plan, they may experience anxiety and uncertainty because how they proceed is now unclear (de Fatima Nery et al., 2020). It is natural for projects to go off track for reasons beyond the control of the project team, however, it is important that contingency (time and resource) is included in the plan to provide some space to respond to issues quickly and adhere to the project plan as much as possible (Rafferty & Restubog, 2010).
Collaboration	**<u>Employees from the impacted business unit and SMEs</u>** ➢ Select 2-3 SMEs from the business unit who will work with the project team. The project team must include SMEs from the impacted business unit to ensure the project team members learn how the process is currently executed by human employees and develop the bot with input from the employees of the business unit. ➢ Having SMEs from the business unit allows them to develop RPA skills and ensures they are equipped to work with the bot. ➢ Involving SMEs from the business unit may foster trust in the project (Vakola, 2016; Armenakis et al., 2016) and strengthen the level of buy-in of other members of the business unit who are sceptical about RPA (Hughes et al., 2017). **<u>Project team</u>** ➢ Among the project team, an intimate collaboration between the Solutions Architect, developer, and tester during the development of the bot should be considered. This ensures that the key actors involved in developing the bot remain on the same page and problems that arise during development are addressed as they emerge, which provides significant time-saving. The work can be showcased to the rest of the team periodically to ensure everyone has updated information on how the project is progressing. ➢ The Project Manager will need to coordinate and facilitate most of the activities within the project team, which in turn fosters team collaboration. Therefore, it is helpful to build a strong project management foundation with a project manager who has extensive project management skills and experience (within the organisation). They will have an overview of the timeline, remind team members of deadlines, liaise

	between project team members, and conduct thorough planning efforts with contingencies to minimise the likelihood of the project going off track. Overall, the project manager facilitates the majority of the collaboration activities and can enhance the skills of others in the project team. **<u>All stakeholders</u>** ➢ Engage the stakeholders early and work together throughout the journey to maintain certainty and ensure their needs and vested interests are addressed.
Education and Training	**<u>Senior managers</u>** ➢ Education is required for senior managers to gauge the feasibility of RPA in the organisation. They must understand what RPA is, how it works, and its potential benefits. **<u>Employees from the impacted business unit</u>** ➢ Employees must be educated about what RPA is and how it works to build trust in adopting bots (Santos et al., 2019). Workshops are a great opportunity for the organisation to showcase the use of RPA and for the employees to ask questions and build their understanding (Bordia, 2004; Smollan, 2015). If employees within a business unit which has adopted RPA are orchestrating the bots themselves, e.g., increasing or decreasing the number of bots, they must be trained how to complete all of their required activities. **<u>The project team and RPA support teams</u>** ➢ Members of the project team and other IT teams must also be trained to perform functions to support the bot. It is advisable to have some in-house RPA expertise which allows the control of the bots to remain within the organisation (Deloitte, 2017). Employees can manage the number of bots which are operational and troubleshoot when there are issues which saves considerable amounts of money in the long run, as third-party IT providers or in-house IT teams are not required to be employed to manage or repair the bots in most cases. However, to create this level of in-house expertise, training is required so that the stakeholders who are responsible for RPA and the other involved IT teams can carry out their responsibilities of RPA.

6.4 Theoretical contributions

This study provides four key contributions to the RPA, organisational change, and socio-technical theory literature. First, Syed et al. (2020), argue that despite the plethora of RPA vendors and the high uptake of RPA, there is very limited academic knowledge regarding what RPA represents for organisations and how RPA should be successfully implemented and used. The authors further argue that academic research into this phenomenon is in its infancy, and it is difficult to determine the level of bias in practitioner articles from consultancies or software providers which relay the fundamentals of RPA implementation and use. Hence, it is difficult for organisations who are interested in implementing RPA to understand what is actually involved in the process and what they should consider before implementation for both the adoption and use of the technology. Therefore, this study addresses the knowledge gap presented by Syed et al. (2020) by contributing to RPA literature a data-based process analysis (Van de Ven and Poole, 2005) that shows the issues and key events which can provide an honest picture of RPA implementation by contrast to the existing consulting reports (Deloitte, 2017; Ernst & Young, 2017). The process analysis of RPA implementation is enriched as the underlying socio-technical dynamics of the key issues and events are also discussed. This provides a rich depiction of the complex dynamics of RPA implementation in a tertiary institution and presents an understanding of the social and technical aspects to manage during RPA implementation as well as the key challenges that occur and how they were mitigated.

Second, this study addresses the call from Syed et al. (2020) for a socio-technical approach to RPA implementation to reveal potential socio-technical implications of RPA implementation, whereby currently there is very little research in this area. By applying the theoretical concepts of Lyytinen and Newman (2008) the RPA implementation was evaluated in a tertiary organisation as socio-technical change across multiple levels. Building on socio-technical theory in the context of RPA in the study, the researcher was able to identify and explain the underlying causes of the key issues and events, which levels they occurred on, and the complex interdependencies between the different socio-technical components at each level. Further the interconnected effects of RPA implementation between different levels is explored. In particular, action taken at one level may have positive or negative consequences in other levels. The gaps and misalignments that arose and the intervention strategies to mitigate the gaps and misalignments, alongside their consequent outcome were also explained. Informed by Lyytinen and Newman (2008) a punctuated model of change was contributed in the context of RPA implementation to show how RPA adoption leads to a change in the existing organisational system. This includes the sequence of project phases that occur during RPA implementation and the milestones that need to be reached before moving to subsequent tasks and project phases. The punctuated model of RPA implementation aids in

minimising issues forming and maximises the potential of successful implementation, therefore the author contributes to the RPA literature and socio-technical theory.

Third, differing from other IS change, in the context of RPA, RPA software bots encompass the material attributes of a technology but also fulfils the role of an actor. The bot (technology) performs a 'dual role' of a technology/actor, which imposed unconventional complexities on the socio-technical system and needed to be explored. The term 'hybrid processing' was coined (Wallace et al., 2021), which builds on the concept of hybrid intelligence (Dellermann et al., 2019). Hybrid intelligence refers to leveraging the strengths of both humans and artificial intelligence to provide greater performance than when they work alone (Dellerman et al., 2019). Hybrid processing (Wallace et al., 2021) however, refers to the allocation of tasks between human and machines based on the required skillset in order to execute processes in a superior way than any of the counterparts could have done on their own. Hybrid processing allows humans and machines to augment each other and work in the most efficient way. Overall, socio-technical theory, and especially the diamond model (Leavitt, 1964), is extended by introducing the role of a technology-actor that assumes the roles and responsibilities of an actor but equally possesses material attributes of a technology.

Fourth, a framework is contributed that proposes the key OCM strategies for organisations to consider adopting during RPA implementation projects and how they should be applied to suit the context of RPA. The RPA OCM framework provides insights based on the empirical data from this study and literature in the areas of organisational change, OCM and RPA to present a comprehensive framework. The OCM framework highlights the necessity for OCM strategies to effectively plan the RPA project as well as getting the required stakeholders to come on board the project and sustain their interest and involvement whilst minimising discomfort. This further contributes to the likelihood of project success. By creating an OCM framework, the knowledge gap introduced by Syed et al. (2020) is addressed, who called for future research into the effects of RPA implementation on the human workforce and how the effects can be managed as well as guidance in designing effective OCM planning that is suitable for RPA implementations. The RPA literature is also extended by providing key insights into how the needs and expectations of the various stakeholders (employees of the impacted business unit but also the project team, senior managers, and other business units who may be impacted in the future) should be managed. How OCM strategies can be applied to mitigate or prevent upcoming issues in RPA projects is also investigated. In this case, it is able to be understood how the OCM strategies behave in a new environment that is not well studied and RPA specific OCM strategies are contributed to the RPA literature.

6.5 Practical implications

This study provides 3 important practical implications. First, organisations that consider the implementation of RPA, may use the insights from the literature review and the findings of this thesis to better understand the nature of RPA technology and how RPA projects unfold. They will understand the project phases that they must undergo during the RPA project, issues that may occur and how to mitigate them, necessary stakeholders, resources, and potential impacts of implementation. The identified process of RPA implementation in the University can assist practitioners as a guiding framework to understand what is important to consider and in which sequence, what issues can occur and how to mitigate them. For example, the implementation method (insourcing, insourcing and consulting or outsourcing with a new provider), determining if they have suitable processes to implement RPA on and if they have the required resources available to give them the best chance for a successful implementation. Overall, this study assists organisations in their decision-making regarding implementation and their trust in the technology as they decide to proceed with implementation.

Second, organisations that embark on the RPA journey may want to leverage the RPA OCM framework as a guide to plan their RPA project and the associated OCM strategies to improve the likelihood of project success. The likelihood of project success is increased as the chance of employees rejecting RPA is much lower. If their needs and expectations are managed, they become committed to the success of the project and they are likely to provide better insights (Hughes et al., 2017; Vakola, 2016; Armenakis et al., 2016). Fostering a positive implementation is very important as organisations must build a path forward that considers all stakeholders during RPA implementation, as the literature suggests this is in the best interest of the organisation embarking on a change initiative (de Fatima Nery et al., 2020). Organisations that have experienced failed implementation can utilise this study to potentially pinpoint their downfalls through the insights from the literature review or the findings of this study relating to OCM. In these organisations, employees may have developed negative connotations towards RPA and be reluctant to adopt it in the future. The OCM framework presents a path forward for course-correcting their RPA programme with the aid of implementation best practices and OCM strategies that should intervene and provide a positive experience for employees.

Third, leveraging hybrid processing enables close collaboration between human and bot employees to achieve superior outcomes. Therefore, practitioners can consider supplementing the work of employees with bots and enable employees to complete more enjoyable and value-added work, while the bots take on mundane, repetitive and high-volume tasks. By using RPA to automate tasks, the bots can also work 24/7 and often complete the mundane tasks much faster and free of errors

which increases productivity overall (Hofmann et al., 2020). The concept of hybrid processing and the insights about appropriate task allocation for humans and bots, can be leveraged by organisation to build a successful hybrid workforce.

6.6 Limitations

This study posed 4 limitations to note. First, the data collection was undertaken up to 8 months after the RPA implementation project had been completed and when the bot had not been used at its peak. Participants could therefore only reflect on the project retrospectively. Despite collecting retrospective data, the participants were able to contribute rich accounts of their unique experiences which were invaluable in developing the findings of the study as they could reflect on their experience before and after RPA implementation.

Second, the OCM framework was created based on the insights gained from the empirical data of the case study. However, there may be other OCM strategies that are relevant in different contexts of RPA implementation, and it is not claimed that the framework is exhaustive. This limitation was mitigated by reviewing the OCM literature and including OCM strategies that were prevalent in OCM and RPA literature.

Third, this study focused on a small pilot process and the University did not place significant emphasis on applying OCM strategies due to the perceived low risk of adverse effects on employees. Organisations that undertake RPA implementation projects which involve a larger process or multiple processes at once and impact a larger number and wider variety of stakeholders would likely expose different needs for OCM. Nevertheless, the lack of applying OCM strategies posed the opportunity to extract interesting data relating to the clear need for the application of OCM strategies that were not provided by the managers involved in the RPA implementation. By understanding the success of the OCM strategies that were applied and strategies that could have been applied to prevent key issues that arose, the OCM strategies that are relevant to RPA implementation are highlighted.

Fourth, the tertiary institution under study utilised a vendor in their implementation but drove the initiative from within the organisation by keeping the expertise in-house, for a hybrid approach called ‘insourcing and consulting’ (Lacity & Willcocks, 2016). However, there are two other implementation models that organisations can adopt as well. First, the ‘insourcing’ approach where organisations may not utilise a vendor and contact an RPA Software provider directly but instead implement RPA themselves (Lacity & Willcocks, 2016). Second, ‘outsourcing with a new provider’ where organisations engage an RPA vendor to provide the RPA product and complete the work to implement RPA entirely (Lacity & Willcocks, 2016). Therefore, it is not claimed that the OCM

strategies are exhaustive in all cases. The other implementation approaches may likely require more or less OCM strategy interventions or different/additional OCM strategies overall.

6.7 Areas for future research

The study identifies several opportunities for future research; however, the three most prominent avenues are explained. First, further research of OCM strategies is encouraged in different RPA contexts. For example, in different process types and sizes, industries, organisation sizes, and where different implementation models are used to understand the influence of the OCM strategies in different contexts. In addition, further research is needed to overlay the OCM strategy on retrospective RPA projects in different contexts to pinpoint where OCM strategies did or could have intervened and how it may have impacted project success. Overall, further research is required to test the validity of the developed OCM framework in different settings and to extend and amend it depending on the respective contexts.

Second, further research is needed into the concept of hybrid processing (Wallace et al., 2021) as an extension of hybrid intelligence (Dellerman et al., 2019). In this study, the majority of the workload is handled by the bot and the employees are only required to handle exception cases, complete the check for double IDs and monitor the bot's work. However, in other cases, the level of human-robot collaboration may be much higher. For example, where attended bots are employed or when bots are employed throughout large mission-critical processes that require human actors from multiple teams to work together as well as alongside the bot and where multiple handovers between humans occur. Therefore, it is important to understand how hybrid processing unfolds in more complex cases where there are higher levels of human-robot collaboration. It is also important to explore and better understand the impacts on employees who experience high levels of collaboration with bots and how the human and digital employees can augment each other to work together effectively.

Third, in this study, the author elaborates on the dual role of RPA software robots as both a technology and an actor as first presented in a conference article, written by the author and their research supervisors building on the insights of this thesis (Wallace et al., 2021). The dual role of an RPA bot is presented in a socio-technical system where the bot has the material attributes of a technology while executing tasks and processes of a human actor. However, in the diamond model (Leavitt, 1964), the 4 socio-technical components are distinct with clear definitions and the concept of the 'dual role' of technology-actor has not yet been explored. It is believed that several other autonomous technologies, such as AI-powered agents, would also fulfil a dual role in a socio-technical system. While some autonomous technologies may be used alongside RPA such as intelligent document processing, others may be used independently. Overall, future research is

needed to explore the dual role of technologies in a socio-technical system and further extend the Leavitt (1964) diamond model as well as socio-technical theory research.

7. Conclusion

The goal of this research study was to understand how RPA projects unfold and determine the OCM strategies that are best suited to RPA implementations and increase the likelihood of project success by answering the research questions: “How do RPA projects unfold in the context of a tertiary institution?” and, “Which Organisational Change Management strategies can address the challenges faced by organisations when they are implementing RPA?” In order to address the research goal, a qualitative case study was conducted in an Australasian university using semi-structured interviews with employees of the Student Admissions team, project team, and vendor. Applying a process approach and socio-technical theory, it was shown how the RPA implementation unfolded in the tertiary institution. In particular, the different issues and events in overlapping yet logical coherent episodes were highlighted, explaining the different socio-technical components, the different levels, the intervention strategies used to address issues and events, and the associated outcomes. Through the application of socio-technical theory and conducting the gap analysis, the validity of Organisational Change Management strategies was determined as an intervention strategy or the ability to prevent or mitigate gaps or misalignments and rebalance the socio-technical system. From this, it was determined that buy-in, collaboration, communication, planning, and education and training are suitable OCM strategies for RPA implementations.

This study contributes to the existing body of knowledge by a) demonstrating how RPA implementation projects unfold, including highlighting the different socio-technical components and their interdependencies, b) proposing the RPA OCM framework as guidance for organisations and researchers to extend, amend and test in various contexts, c) coining the term hybrid processing, and d) suggesting that emerging technologies such as RPA software robots play a dual role in socio-technical systems.

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Appendices

Appendix A: Ethics approval

Auckland University of Technology Ethics Committee (AUTEC)

Auckland University of Technology
D-88, Private Bag 92006, Auckland 1142, NZ
T: +64 9 921 9999 ext. 8316
E: ethics@aut.ac.nz
www.aut.ac.nz/researchethics

1 December 2020

Lena Waizenegger
Faculty of Business Economics and Law

Dear Lena

Re Ethics Application: **20/295 The role of Organisational Change Management in Robotic Process Automation implementation projects**

Thank you for providing evidence as requested, which satisfies the points raised by the Auckland University of Technology Ethics Committee (AUTEC).

Your ethics application has been approved for three years until 27 November 2023.

Standard Conditions of Approval

1. The research is to be undertaken in accordance with the Auckland University of Technology Code of Conduct for Research and as approved by AUTEC in this application.
2. A progress report is due annually on the anniversary of the approval date, using the EA2 form.
3. A final report is due at the expiration of the approval period, or, upon completion of project, using the EA3 form.
4. Any amendments to the project must be approved by AUTEC prior to being implemented. Amendments can be requested using the EA2 form.
5. Any serious or unexpected adverse events must be reported to AUTEC Secretariat as a matter of priority.
6. Any unforeseen events that might affect continued ethical acceptability of the project should also be reported to the AUTEC Secretariat as a matter of priority.
7. It is your responsibility to ensure that the spelling and grammar of documents being provided to participants or external organisations is of a high standard and that all the dates on the documents are updated.

AUTEC grants ethical approval only. You are responsible for obtaining management approval for access for your research from any institution or organisation at which your research is being conducted and you need to meet all ethical, legal, public health, and locality obligations or requirements for the jurisdictions in which the research is being undertaken.

Please quote the application number and title on all future correspondence related to this project.

For any enquiries please contact ethics@aut.ac.nz. The forms mentioned above are available online through http://www.aut.ac.nz/research/researchethics

(This is a computer-generated letter for which no signature is required)

The AUTEC Secretariat
Auckland University of Technology Ethics Committee

Cc: Qfk7401@autuni.ac.nz