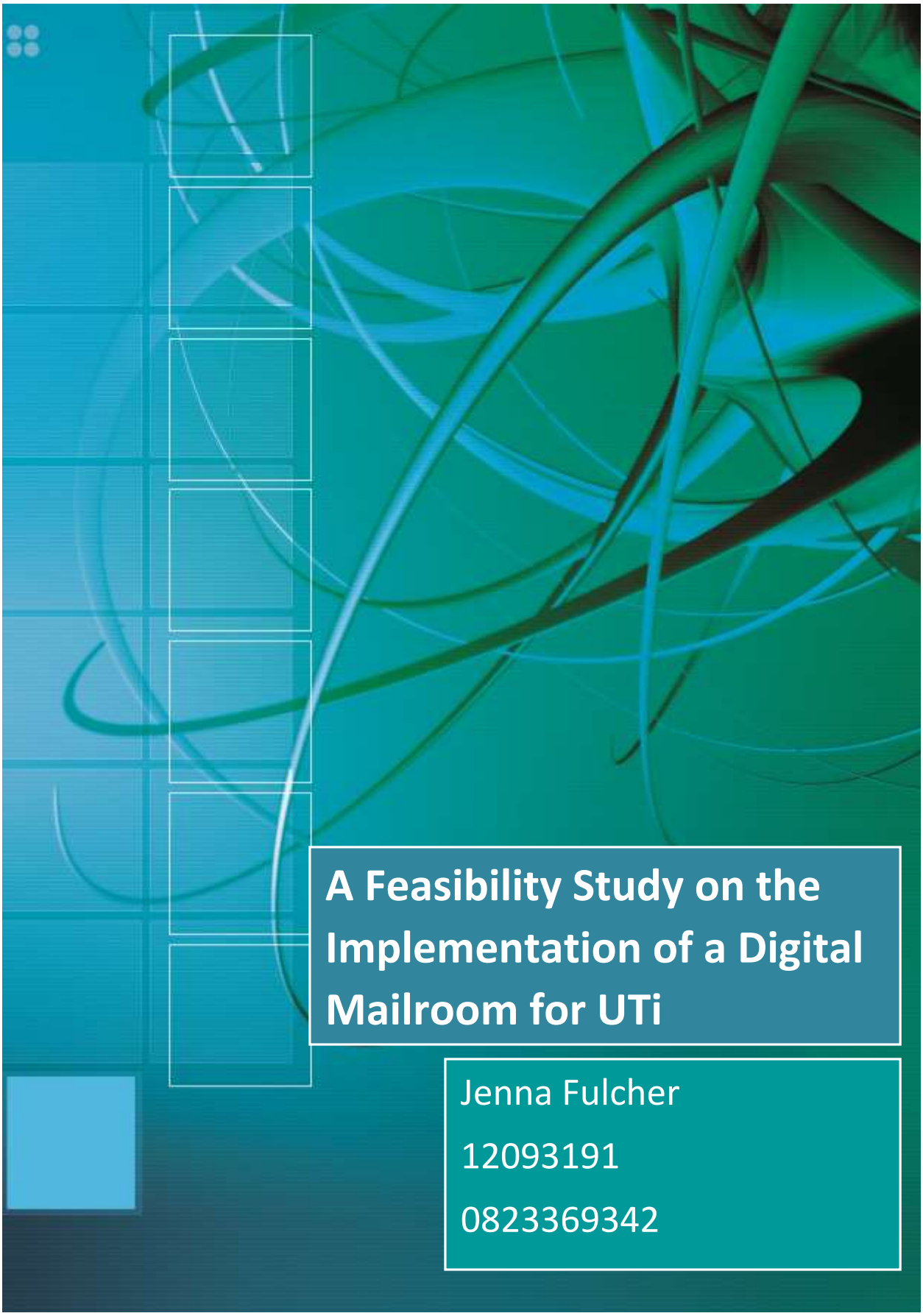

A Feasibility Study on the Implementation of a Digital Mailroom for UTi

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Executive Summary

Most organisations are faced the task of sorting through large amounts of incoming mail on a daily basis. This mail can be in the form of paper mail, electronic mail, faxes and other digital documents. Usually, mail is sorted manually and then forwarded to the relevant departments for further processing. This is a labour intensive process that it is not optimal and has a number of inefficiencies.

UTi delivers a large amount of mail to four major banks across the country every day. 'Bank A' in Johannesburg, has a large mailroom that requires an innovative solution to reduce costs, increase customer satisfaction and improve the quality of the entire process. A digital mailroom automates the process of incoming mail. It uses scanning and capturing technologies that allow incoming mail to be digitised. This helps automate the classification and distribution of mail within the organization. Internal mail distribution procedures can be standardised through the implementation of a digital mailroom because both paper mail and electronic mail can be managed through the same process.

This final research project report focuses on Phases 1 to 6 that are detailed in the 'Project Approach' in Chapter 1. Chapter 2, the Literature Review, explores concepts surrounding digital mailrooms and investigates similar processes that are used in industry. It places the problem in context and expands on the approach to the project by explaining various Industrial Engineering tools, techniques and methods that can be used to develop a solution to the problem that has been defined in Chapter 1. Chapter 3, the Problem Investigation, explores the problem in greater detail using the tools and techniques that are defined in Chapter 2. Chapter 4, the Solution Approach and Development, describes the approach to the solution by exploring and evaluating the solution alternatives; it illustrates a conceptual process model of a proposed digital mailroom solution and describes the simulation model construction and formation. Chapter 5, the Solution Analysis, interprets and analyses the final results of the simulation. Lastly, Chapter 6: Recommendations and Conclusions draws up valid recommendations and conclusions on this feasibility study.

The ultimate goal of this project is to identify whether a digital mailroom solution is a feasible option that UTi could offer to their clients in the future. This goal can be achieved by assessing the current system at 'Bank A', designing a conceptual digital mailroom process model, developing simulations on both scenarios (the current mailroom and the proposed digital mailroom solution) and conducting a comparative analysis to decide which system is the best option for 'Bank A's' mailroom.

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Chapter 1: Project Details

This chapter explores the project's background, problem statement, project aim and project approach.

1.1. Introduction and Background

1.1.1. Company Background

UTi specialises in logistics and other distribution services that are unique to customer needs. According to UTi Sun Couriers (2011a), UTi aims to deliver competitive advantage to their clients' supply chains through innovative and integrated solutions.

The UTi Mounties Division is one of the divisions at UTi that provides secure logistic solutions for risk-sensitive freight. UTi Mounties has built up relationships with the major banks of South Africa for over 30 years. It delivers confidential documentation and other parcels to bank branches all over the country and they also offer warehousing solutions and distribution services (UTi Sun Couriers, 2011b).

UTi Mounties wants to expand their market potential by offering a mailroom solution to their clients; this solution needs to show their clients that they offer 'cutting edge' solutions and are up-to-date with the latest technological advances. UTi Mounties requires their mailrooms to be innovative and efficient as labour costs are increasing by 9% while the return of investment on a mailroom is approximately 6% (UTi Sun Couriers, 2011b).

One of UTi Mounties' clients, 'Bank A', has various different mailrooms on-site at their biggest branches – these mailrooms are operated by UTi Mounties. This project is conducted at one of their largest mailrooms in Johannesburg.

1.1.2. Overview of Current Systems in Place

The process that is currently used in UTi mailrooms is a generic process that UTi uses in all of their mailrooms around the country. This process is adapted from the UTi Mounties Mailroom Guide (2009) – it is important to note that this is a theoretical model of the process. The mailroom requires input from UTi drivers, administration staff and foot messengers. Mail is delivered from various sources – ranging from other 'Bank A' branches, UTi hubs, the post office, 3rd party courier services, external business partners and internal clients. As mail comes into the mailroom, it generally moves through the main service pillars. There is incoming mail and outgoing mail that moves through the mailroom. The four main pillars within the mailroom consist of receiving, sorting, dispatching and delivering which can be seen in Figure 1: 'Mailroom Process Map' (UTi Mounties Mailroom Guide, 2009).

Receiving: packages that are received at the mailroom range from general mail envelopes to larger parcels. Each item is received according to their respective trip sheet. Tracked items are scanned with handheld scanners and tracked up until delivery via the 'UTi CORE' application. Untracked mail is counted and recorded. Furthermore, queries and requests are that received by clients are processed by the mailroom staff, usually through email correspondence.

Sort/Resolve: received mail is sorted by branch, department and floor by the mailroom staff. If recipient information is incomplete or incorrect, the right information is sourced from the 'Global Contact' application at 'Bank A'. The queries and requests received through email from the 'Bank A' clients are prioritised and actioned accordingly.

Dispatch: this pillar refers to the process of dispatching items whether these items are ordinary mail, packages or important documents that need to be personally collected. All dispatched items are accompanied by a proof of hand over.

Delivery: the process of delivery includes scanning goods out of the mailroom onto trip sheets for delivery by either the foot messengers within the building or by the UTi drivers outside of the building. The items successfully reach the client, UTi transit hub or the post office.

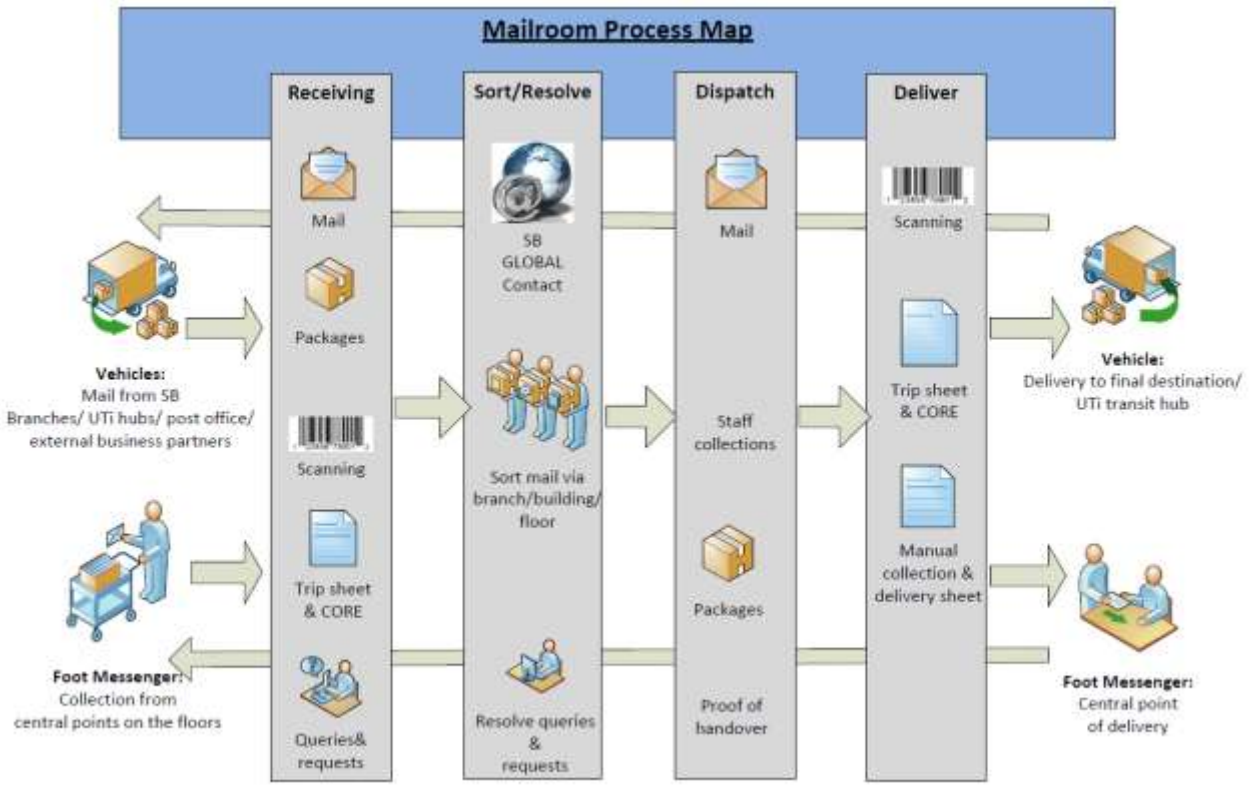

Figure 1 *– The Mailroom Process Map (UTi Mounties, 2009). Incoming mail: "Receiving" - mail is received and scanned in (if tracked item). "Sort" – mail is then sorted according to branch, department and floor. "Dispatch" – mail is prepared for delivery. "Delivery" - mail is delivered to various departments or collected by staff, the trip sheet need to be signed for proof of delivery.*

As seen in the Figure 1, there is incoming mail and outgoing mail. Incoming mail refers to all the mail received by the mailroom from external sources to be distributed to 'Bank A' employees inside the building. The incoming mail process follows this procedure: the mailroom receives incoming mail that is either counted (untracked mail) or scanned in (tracked mail). Each incoming mail item is recorded on a spreadsheet. Sorters then manually separate the mail according to the branch, department and floor. The mail is then delivered to a 'Bank A' mail representative on each floor. The mail representative signs the messenger's trip sheet as proof of delivery. The mail representative is responsible for distributing the mail to the final recipient within the department.

Outgoing mail refers to items that need to be sent by 'Bank A' employees to a recipient in either the same building or a location outside of it. Outgoing mail is classified as tracked or untracked mail items: tracked items are mail items that are urgent or sensitive that require the recipient's signature. Untracked mail is internal mail that is sent between 'Bank A' sites at economy service level. It is a more cost effective way for sending documents that are not urgent and individual proof of delivery would not be required.

1.1.3. Introduction of the Digital Mailroom

Organisations, such as 'Bank A', receive high volumes of various types of documents – such as paper mail, faxes, overnight letters and emails with attachments on a daily basis. These documents come from different channels of business correspondence, as shown below in Figure 2.

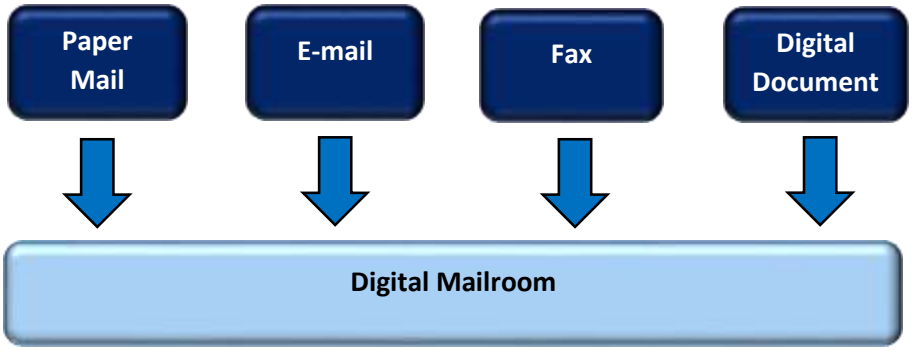

***Figure 2** – The different document input channels of a digital mailroom.*

Interpreting these documents, extracting data from them and forwarding them on to others for further processing consumes valuable company resources which increases operating costs. The ability to process this information from incoming documents quickly, accurately and securely is a key to an organization's responsiveness and ultimately its profitability.

A digital mailroom or variations of it could help address challenges that organisations face in their mailrooms because it automates the process of incoming and outgoing mail (Xerox Global Services, 2008). The implementation of a digital mailroom could reduce response cycle time which improves client satisfaction; it can improve communication and assure regulatory compliance of the organisation (Datafinity Ltd, 2012).

Furthermore, manual intervention is reduced which decreases operating costs. Because a large part of manual sorting is eliminated; there are fewer processing errors and greater accuracy within the company's mail distribution system (Xerox Global Services, 2008). Workers can also focus on attending to customer demands and queries rather than focusing all their energy on sorting mail. This is a great solution to explore for UTi Mounties in order to present their clients with a 'cutting edge' solution.

The concept of a digital mailroom is discussed further in Chapter 2.

1.2. Problem Statement

The way in which mail is processed at 'Bank A's' mailroom is not optimal. Processes are labour intensive and time consuming – this means that operational costs are high. The control of the mail processing is limited as mail can still get lost. There are a few unsuccessful deliveries due to human error and delays can occur due to incomplete or incorrect recipient information. These delays may reduce client satisfaction. Communication lines between the helpdesk at 'Bank A', reception and the mailroom also need to be improved.

UTi Mounties wants to make use of this opportunity to expand their market, increase their visibility within 'Bank A' and offer an innovative mailroom solution to 'Bank A' as well as other UTi clients – if the proposed system is proved to be feasible. At 'Bank A,' there is a need for the following problems to be addressed:

1. Large volumes of documents that are received daily for 'Bank A' employees (clients). These documents need to be manually sorted in the mailroom; resulting in a long cycle time which ultimately affects customer satisfaction as clients wait longer for their mail to be delivered.
2. Data security issues as a result of high exposure to compliance risk, especially since these documents are required in a financial environment. This risk is a result of handling important paper documents that may get lost or the confidentiality of the document may be compromised.
3. High on-site document storage cost resulting from high volumes of incoming paper mail and long-term document retention requirements (archiving documents).
4. There is a lack of UTi visibility at 'Bank A.' The end user (recipient of the mail) and 'Bank A' are unware of the value-added services that UTi offers.

1.3. Project Aim

The aim of this project is to assess whether the implementation of a digital mailroom at 'Bank A' is an affordable and feasible option. The objectives of this project are to address the above problems by:

1. Designing a digital mailroom process customized to the 'Bank A' mailroom that shows UTi clients that they are a strategic courier that offers innovative solutions.
2. Using Industrial Engineering tools, techniques and methods to develop valid solution alternatives that can solve the problems that are faced in the mailroom at 'Bank A.'
3. Developing a simulation of the current system in place and a simulation of the design of the digital mailroom that can help with deciding which option is more sustainable in the future in terms of time quality.
4. Preparing a comparative analysis on the newly designed system and the current system and choosing the best alternative for the mailroom at 'Bank A'.

1.4. Project Approach

The project approach consists of six phases. Once these phases have been completed successfully, the feasibility of the implementation of a digital mailroom for UTi is realised. The project approach is described in Table 1.

***Table 1** – A Table showing the Approach to the Project, detailing the Research Design and Methodology*

Phase	Design	Methodology
Phase 1 – Research and Analysis of the Current System	Research manual mailroom techniques and observe operations in the mailroom	Research the current method that is in operation in the mailroom at 'Bank A.' Observe the current flow of materials and construct a process flow diagram of the incoming mailroom process. This forms part of the "as-is" analysis. Furthermore, use simple business process modelling to map out the current incoming mail process.
	Obtain data for project	Complete time studies and work studies of employees in the mailroom. Obtain data spreadsheets from depot manager indicating the amount of items coming in and going out of the mailroom.
Phase 2 – Literature Review	Research methodologies for designing a digital mailroom	Complete a literature review on digital mailrooms by researching journal articles and other literature for methodologies on solving a problem similar to the one at hand.
	Find alternatives of a digital mailrooms that suit the mailroom at 'Bank A'	Select digital mailroom processes that work for the mailroom at 'Bank A' from the literature review. These methodologies need to involve a way of solving the problem. Select solid arguments and include these in the literature review.
Phase 3 – Design of the Digital Mailroom Process	Develop a business process model on the selected alternative for the digital mailroom	Define digital mailroom requirements using basic system engineering techniques. Develop three valid solution alternatives and using a concept selection matrix select the best alternative. Use simple business process modelling to map out the process of the digital mailroom to understand the process flow and how it improves from the current process. Compare this process map to the one that was created previously on the manual system to validate the conceptual process.
	Design a facility layout that suits the design of the digital mailroom	Sketch the existing layout of the mailroom and use facilities planning to design the layout of the digital mailroom. This involves very basic facilities planning techniques and logic.

Phase 4 – Data Analysis	Data Analysis	Determine the number of employees working in the mailroom. Determine the rate at which one item is sorted. Determine the time it takes for items to be delivered to the end user from time study sheets using derived equations. Use Monte Carlo simulation to determine any uncertainties within the data. Produce probability distributions of raw data that has been collected as well as historic data that is available. Prepare data for use in the simulation.
Phase 5 – Model Development	Build a simulation for the current mailroom system	Use AnyLogic simulation software to build a simulation of the current mailroom system.
	Build a simulation for the newly designed digital mailroom	Use AnyLogic simulation software build to simulation of the digital mailroom system.
Phase 6 – Analysis and Evaluation of Results	Compare simulations	Compare the throughput, quality and the cost of the two systems. The Analytical Hierarchical Process (AHP) could also be used for comparison.
	Assess Feasibility	Assess the operational, technical, economic, legal and cultural feasibility.
	Identify which solution is the best for 'Bank A'	Choose the best solution based on the project analysis.

Chapter 2: Literature Review

The purpose of this literature review is to provide insight on important elements of a digital mailrooms that are relevant to this project as well as other information on the Industrial Engineering tools, techniques and methods that are used to achieve the project's aim. A suitable approach to solve this problem is only realised after literature on digital mailrooms is critically analysed and placed in context. This chapter focuses on Phase 2 of the project approach.

2.1. The Shift from Traditional Mailrooms to Innovative Mailroom Solutions:

Companies are moving away from the traditional manual systems and towards business solutions that are innovative and in line with the 'digital era' (Dean, 2007). Because of the competitive business environment; companies need to be at the forefront of innovation. The goal for most businesses is to make a sufficient profit; this can be done by satisfying customer expectations and demands, decreasing expenses and increasing revenue (Seal at el., 2015).

Attempting to go 'digital' is one way in which companies can become more technologically advanced while automating a process is another. According to Doclabs (2012), automation reduces the amount of human intervention involved in a process. In the case of a mailroom, this can be achieved by investing in machinery that automatically sorts mail into various departments or floors; or adopting principles of a digital mailroom where software enables information to be automatically routed to the desired end-user

Digitalisation is the process of converting information and documents into a useable digital format (Kofax, 2012). Digitalisation can reduce operating costs, eliminate paper waste and minimise on-site storage requirements (Messier, 2010). Becoming a 'paperless' organisation also encourages sustainability and the use of green business practices in order to conserve resources for future generations.

In the case of a digital mailroom, there is a significant difference between a digitalising and an automating application. The main difference between the two applications has to do with the way imaged data is treated. With a digitalisation application, the document image is the end product. With an automation application, data is successfully extracted from the document and the image is thrown out (Gingrande, 2005).

There is a large gap between 'wanting' to create an innovative business process and making this 'priority' a reality because companies still battle with managing their incoming paper trails (Dean, 2007). Organisations have many concerns when it comes to transforming their manual systems to digital systems, namely: investment costs, legal admissibility and the need for physical signatures (Pitney Bowes Incorporated, 2015).

Furthermore, organisations make use of mailrooms that are reliant on manual labour which is time consuming, increases operation costs and allows for human-error. According to Dean (2007), paper documents remain the dominant business medium for organisations that deal with a large number of suppliers and customers across different sectors. This means that businesses need to transform their document scanning and capturing systems, extract the relevant business information from the paper mail as it arrives and integrate the extracted data and information into the corporate workflow for processing by the right department (Kofax, 2012). A system that aids in this transformation is a digital mailroom.

There are a few organisations in industry that have implemented digital mailrooms. Top Image Systems (2015), has patented many digital mailroom technologies; this company has implemented digital mailrooms in global corporations such as Coca Cola, DHL and FedEx. These corporations need to ensure that their global supply chains function efficiently to ensure their customer demands are met in a reasonable amount of time.

Another important example of an organisation that makes use of a digital mailroom is Pitney Bowes Incorporated. This company believes that a digital mailroom is an enormous commitment for a company; however, if a company is reliant on receiving or distributing any amount of mail; the benefits associated with the implementation of digital mailroom can be vast because costs can be reduced, effectiveness can be increased and accuracy can be improved (Pitney Bowes Incorporated, 2015).

2.2. An Overview of Digital Mailrooms

2.2.1. Description of a Digital Mailroom

In simplest terms, the digital mailroom is a concept where all forms of incoming mail, both departmental and personal, are centralized in the mailroom and converted to digital form. Most often this is done by document scanning and capturing technologies (Messier, 2010). After data has been captured, it is routed electronically to the appropriate parties throughout the organization based on established distribution rules (Datafinity Ltd, 2012). This enables internal mail distribution procedures to be standardised because both paper mail and electronic mail are managed through the same process so information can be saved and accessed at any time (Messier, 2010). This aspect often forms part of a content management system. Mauthe and Thomas (2004) describe a content management system as a computer application system that enables documents and other content to be published, edited, organized, maintained or deleted from a central interface.

According to Messier (2010), a variation of a digital mailroom is where incoming material is scanned into the mailroom and the recipient is notified via email. The recipient is then given a choice as to what the final disposition is for their mail – whether it should be delivered electronically or physically, re-routed to another department or discarded.

2.2.2. Reasons for Implementing a Digital Mailroom

There are many reasons an organisation should implement a digital mailroom. Firstly, a digital mailroom can archive documents; this can save valuable storage space, ensure corporate compliance and improve business accountability as there is a comprehensive audit trail that adheres to company policies (Datafinity Ltd, 2012).

There is also be greater control over documents in a digital mailroom because losses in valuable mail are minimised and a secure platform can be developed to ensure confidentiality. A digital mailroom also has the ability to track mail within a system (Xerox Global Services, 2008). This mail delivery process ensures that mail is delivered to the right person within reasonable time which ultimately improves customer satisfaction (GISTICS Incorporated, 2009). Furthermore, manual intervention is reduced because there is no need for sorters in the mailroom or staff who deliver the mail (foot messengers). The reduction of staff reduces labour costs which decreases operating costs. Because a large part of manual sorting is eliminated; there are also fewer processing errors and greater accuracy within the workplace (Xerox Global Services, 2008).

Moreover, the effect that a digital mailroom can have on a supply chain is considerable. It has the potential to cut out a large part of the required courier services that usually deliver the mail because mail is digitalised and electronically distributed to the involved parties through the digital mailroom interface (GISTICS Incorporated, 2009). This means that mail is be scanned and captured at the source and routed directly onto the digital mailroom system that is accessed at the desired end destination. This brings up the topic of 'decentralised digital mailrooms' (Doclabs, 2012). A digital mailroom is able serve more than one branch of an organisation, delivering digital mail to branches country wide. This solution has the potential to save the organisation a lot of money in terms of courier service costs and transportation costs.

2.2.3. Stages of a Digital Mailroom Process:

Digital mailroom variations may have these components that form part of the process. The digitization of paper documents via imaging and capturing involves a fairly standard flow that uses several different technologies. These major stages of the digital mailroom process are adapted from Doclabs (2012) and Datafinity Ltd (2012).

Physical document preparation: this involves the steps required to prepare documents for scanning or automatic capturing of the documents such as unfolding, removal of staples or paper clips, sorting by documents in terms of size, priority and so on. This part involves a high amount of manual labour.

Scanning and document capture: is the use of devices to digitise inbound paper documents and convert them into an electronic image. Types of devices that create image files include digitalisation applications such as scanners or other automatic processing technologies such as bar code readers or optical character recognition.

Indexing: involves associating or tagging the document with different 'search' terms so the technology is able to recognise the data from an image. Most capture software provides automated recognition and indexing techniques such as barcode recognition.

Validation: this includes a quality assurance step that may involve automatic or manual indexing; in which images are routed to another workstation for final review of the image quality and data accuracy. This step is very important as the data needs to legible so the client receives the needed information from their digitalised mail.

Export to a content management system or other repository: images and indexed data are imported to multiple destinations such as file systems, content repositories, email addresses, a user-accessible portal and other databases.

Data Security: images, data and documents that are accessed by the user on the portal or other suitable interfaces may require a password. This ensures that data is kept private and protected.

2.3. Legality of Digital Mail

Many organisations believe that they are legally required to archive paper documents for a certain period. However, the reality is that these regulations only apply to a small minority of documents. Most digitized documents are now legally admissible in a court of law (Datafinity Ltd, 2012). There are two acts in South Africa that protect personal information, namely: The Protection of Personal Information Act and The Electronic Communications and Transactions Act.

South Africa's Protection of Personal Information Act helps with regulating the processing of personal information. In short, this act aims to promote the protection of personal information processed by public and private bodies (Parliament of the Republic of South Africa, 2013). The other relevant act, the South African Electronic Communications and Transactions Act's basic premise is that digital communications are no less valid than paper based communications (Parliament of the Republic of South Africa, 2002).

Furthermore, it is important to note that UTi complies with the 'Visa and MasterCard Accreditation' which takes these acts into consideration and it is internationally recognised (UTi Sun Couriers, 2011b). UTi Mounties already deals with secure freight and documents on a daily basis; it has the facilities in place to deal with personal information.

2.4. Digital Mailroom Models used in Industry

Digital mailrooms are implemented in many different industries. In this section of the literature review, different digital mailroom alternatives are assessed to help determine a process that could be implemented at 'Bank A.' It is important to note that these are theoretical processes; in order to develop valid solution alternatives for the mailroom at 'Bank A' it may require adaptations of these processes and applying them to the environment at 'Bank A.' A digital mailroom solution means different things to different organisations – a clear understanding of what 'Bank A' wants to achieve by implementing a digital mailroom is key in assessing and developing the design of the digital mailroom process in Chapter 4.

Alternative 1:

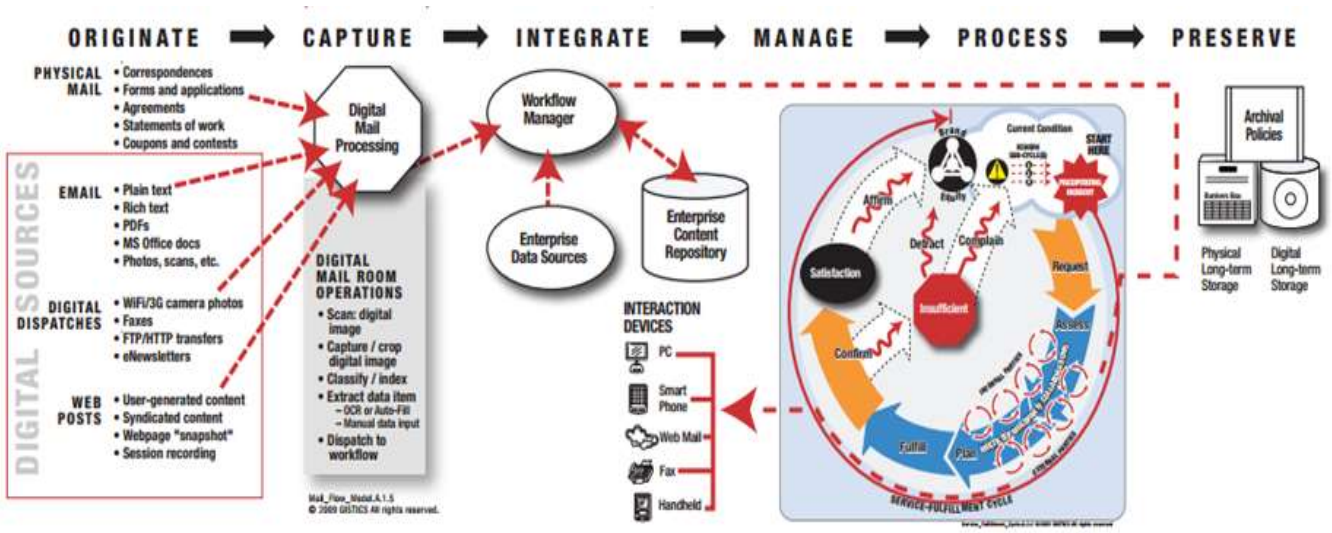

Figure 3 *– The GISTICS digital mailroom solution follows the above process path. In the diagram, it can be seen that there different channels of mail that are digitalised and processed all together. The preserve function at the end of the process is an important aspect of a digital mailroom at UTi needs to consider (GISTICS Incorporated, 2009).*

The basic process of the GISTICS Incorporated (2009) digital mailroom includes five steps, namely:

1. Originate: this step involves collecting and preparing all the incoming documents which can be physical mail, electronic mail and other digital documents such as digital dispatches and web posts.

2. Capture: the digital image is captured through scanning technology. Digitalisation takes place during this step.
3. Integrate: this step involves combining all documents that have been captured and integrating the system with the company's content management system.
4. Manage: this step involves assigning information to the repository system, assigning documents to workflows so they can be processed and separating the documents into various departments and integrating to IT services.
5. Preserve: this step involves archiving documents and preserving the documents for any future enquiry.

Manual intervention still exists in the 'originate' step because a worker still needs to collect all the mail when it is received at the mailroom. The 'capture' step also manual as the documents are digitalised using a scanner; this requires input from an operator. During the 'integrate', 'manage' and 'preserve' steps automation takes place because the digital mail is automatically integrated into the system using advanced general algorithms, sorted into the correct workflow and preserved in the correct file location, usually according to departments.

An important part of this alternative is that archiving is taken into account under the 'preserve' section as seen in Figure 3. Archiving is an important aspect of a digital mailroom as it allows an organisation to save documents in order to comply with business policies and requirements. It also improves business accountability and saves valuable storage space. Referring to the 'Problem Statement' in Chapter 1 - this is ultimately addressing the high on-site document storage costs that 'Bank A' is experiencing.

Alternative 2:

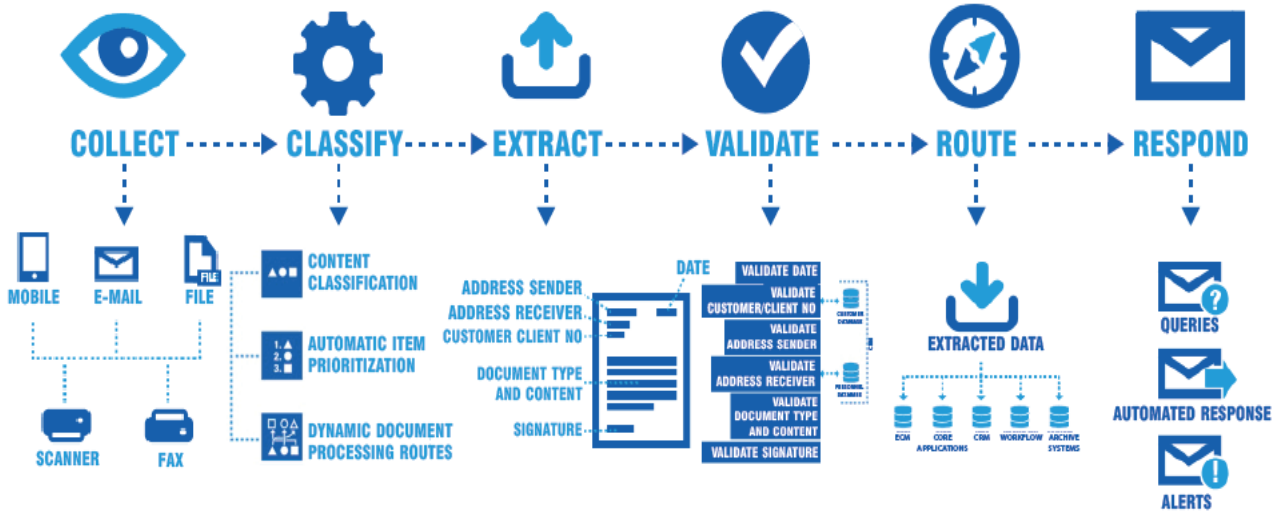

Figure 4 *– The eFlow digital mailroom solution follows the above process path. In the diagram, it can be seen that there different channels of mail that are digitalised and processed all together. The digital mailroom also looks at an additional step 'Respond' – this allows for outgoing mail to be digitalised (Top Image Systems, 2015).*

The basic process of the eFlow digital mailroom from includes six steps, namely:

1. Collect: this step involves collecting all the incoming documents which can be paper mail, electronic mail, faxes, mobile attachments and other digital documents which are scanned and digitised.
2. Classify: the documents are screened and indexed (associating or tagging the document with different 'search' terms) according to business priorities and departments.
3. Extract: the digital mailroom technology automatically finds and extracts all relevant data using key words and scripts or even through barcode reading.
4. Validate: the document that has been extracted is validated against information on the company's internal databases.
5. Route: the extracted data is then sent to the content management system, core applications and other archive systems. Employees can then view the documents in their inboxes.
6. Respond: Employees can then respond to the documents sent to their inbox. Their inbox should be password protected to ensure data security (Top Image Systems, 2015).

This digital mailroom process is different from the first alternative as the image is digitalised in the 'collect' stage as it is scanned onto the system and then the data is automatically extracted via indexing or bar code reading. The automation also takes place during the 'extract,' 'validate,' 'route,' and 'respond' steps. Data is extracted from the digital copies of the mail; it is automatically validated against content on the internal database by using advanced algorithms. The mail is then delivered to the end-user electronically cutting out manual delivery by a company 'foot messenger' that usually delivers the mail to the end user.

This alternative follows a similar procedure to the previous digital mailroom; however, archiving is not emphasised. Top Image Systems (2010) includes a response interface allowing the end user to respond to any requests that are submitted to them, as seen in Figure 4. This allows the company to improve its customer service. In addition to that, it also validates the data ensuring that the information is correct and is not sent to the wrong recipient. It also ensures that the client's documents are password protected. Referring to the 'Problem Statement' in Chapter 1 – this alternative helps UTi improve customer satisfaction and addresses the problem of data security.

Alternative 3:

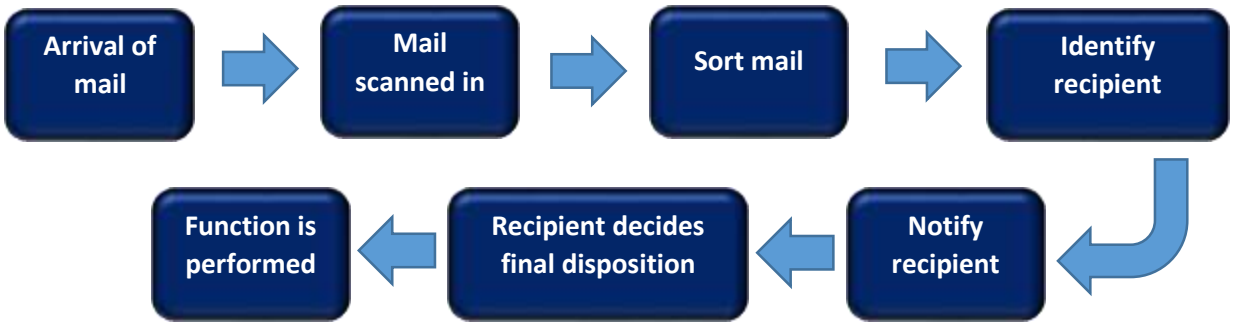

Figure 5 *– A basic flow diagram showing the process of a variation of a digital mailroom. This is a flexible solution that only requires mail to be digitalised when the end recipient asks for it to be electronically delivered (Messier, 2010)*

Messier (2010) explores a variation of a digital mailroom whereby the mail is scanned, using hand held scanners, into the mailroom and automatically recorded on a spreadsheet and the recipient is notified via email. The recipient is then given a choice as to what the final disposition is for the mail that has been received – whether it should be delivered electronically or physically, rerouted to another department or discarded because the client has no use for it. In this process mail is still sorted manually; however, there is an element of innovation as the mailroom offers the option of digitalisation of mail to the client. If the client wants the mail delivered electronically then it is a form of an automated process; however, if the client wants the mail to be delivered physically then it is a fully manual process. Referring to the 'Problem Statement' in Chapter 1 – this alternative addresses the problem of the lack of UTi visibility at 'Bank A' because the client has the option to choose how they want their mail delivered which is a value-added service and the client's experience is put first.

After briefly assessing these three alternatives, it is clear that archiving from Alternative 1 is an important aspect to include in the design of the digital mailroom. A response interface, the validation of data and data security from Alternative 2 and the notification tool and giving the client the option to choose what delivery method they prefer from Alternative 3 are important to include in the design of the digital mailroom for 'Bank A.' The design phase is explored further in Chapter 4 under the 'Conceptual Design' section.

2.5. Tools, Techniques and Methods

The approach to this project is briefly explored in the 'Project Approach' in Chapter 1. This section of the literature review looks further into each Industrial Engineering tool, technique or method that is used and why that particular technique is used in this project.

In Phase 1, 2 and 3 the following tools, techniques and methods are used. These techniques allow the problem to be placed in context and understood in depth. They also allow a conceptual process of the digital mailroom to be developed.

2.5.1. Flow Charts

To place the current system in context and understand the flow of mail through the mailroom at 'Bank A,' a flow process diagram is used. This is a pictorial representation of the flow of operations in a certain process (Freivalds, 2014).

Tompkins et al. (2010), illustrates a few examples where process flow diagrams are used. They are mainly used in factories to identify the flow of materials and where potential bottlenecks exist. In this project, this technique is used to analyse the current flow of mail in the mailroom at 'Bank A' as it provides a greater understanding of the sequence of the flow of mail; where the bottleneck exists; how the mailroom is run and where improvements need to be made.

2.5.2. Business Process Modelling

In addition to the process flow diagram, simple business process modelling assesses the current mailroom process in more detail. According to Krogstie et al. (2006), process modelling is the activity of representing the processes of an organisation to allow the current process to be analysed and improved.

BPMN stands for Business Process Model and Notation and a BPMN diagram makes use of the notation and symbols used to represent a business process. These symbols can be seen in Figure 6.

According to Shapiro et al. (2012), the BPMN 1.0 specification was developed by the Business Process Management Institute; BPMN 2.0 was developed and released as a formal specification in 2011. BPMN 2.0 models can be used to understand the process in detail and to identify what the business requirements of a process are (Krogstie et al., 2006). It may also help design and conceptualise a new process solution.

It is important to note that a BPMN diagram is constructed in 'pools' and 'swim lanes.' A 'pool' is a department and the 'swim lanes' would be entities in the departments. Krogstie et al. (2006), states that the BPMN flow objects are: events, activities and gateways. An event is something that happens during a business process that affects the flow of the process in some way. An activity is work that is performed during the process. A gateway is used for the branching and merging of paths so it controls where the sequence flow diverges or converges (Krogstie et al., 2006).

Furthermore, BPMN connecting objects in include: sequence flow, message flow and association. Sequence flow represents the sequential execution of the process; message flow represents communication between a process and an external entity and associations are used to link non-flow objects into flow objects (Shapiro et al., 2012). BPMN artefacts include: data objects, groups and annotations. A data object has information that might be moving along with a particular process such as a document or a transaction. A group is used to graphically arrange activities for analysis purposes. Annotations are used to provide descriptive information about the occurrences in a process flow (Krogstie et al., 2006).

Converga (2012) has made use of business process modelling to map out both their manual mailroom and the proposed digital mailroom; however, they mapped the process out in terms of their upstream process, in-use process and their downstream process. From Converga (2012), it is clear that business process modelling is a valuable tool to understand the process and to design a new system. This technique allows the "as-is" model to be analysed and placed in context. Once the current model has been mapped out, areas that require improvement are clear and the digital mailroom process can be conceptualised and designed.

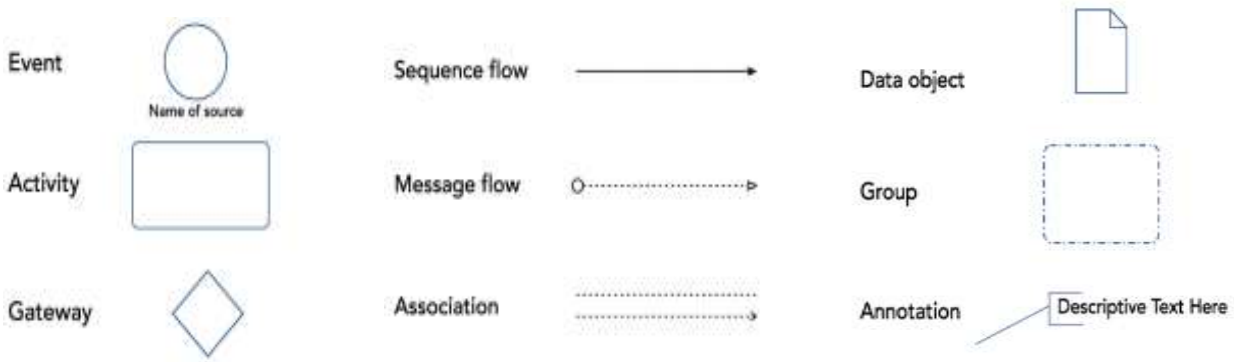

Figure 6 *– showing BPMN flow objects, connecting objects and artefacts. These symbols are used in the construction of the Business Process Model for the current systems and the proposed system Shapiro et al. (2012).*

2.5.3. Time Study

Freivalds (2014) defines a time study as the procedure of using stopwatch timing to establish work standards and standard times that it takes to complete a task. A time study is used to gather data on the counting and sorting rate of mail, the time it takes to scan mail in and out of the mailroom and the time it takes to deliver a mail item to the end user. The process of delivering mail throughout 'Bank A's' building is repetitive and occurs in cycles which means a time study can be completed successfully (Freivalds, 2014).

There are two ways in which a time study can be completed, namely: the continuous method which allows the stopwatch to run for the entire duration of the study and the snapback method which involves the stopwatch being read at the break point of each element then the stopwatch is returned to zero (Freivalds, 2014). The time study conducted in this project makes use of the snapback method because it is a more flexible method to use and no clerical time is needed to make successive subtractions. According to Freivalds (2014), the observed time can be placed directly in the 'OT' column when using the snapback method.

2.5.4. Concept Selection Matrix

According to iSixSigma (2015), the concept selection matrix allows an individual or team to:

1. Compare different alternatives.
2. Create strong alternative concepts from weaker concepts.
3. Arrive at an optimal concept alternative that may be a hybrid or variant of the best of other concepts.

In the matrix, the importance of the evaluation criteria is rated out of 10; this rating is obtained through discussions with UTi mailroom staff and innovation meetings attended throughout the year with management. Each alternative is given a numeric weight or symbol (5, 3 or 1) that indicates the correlation of the alternative with the evaluation criteria:

◌ = 1 is the numeric weight of this symbol; this indicates a weak correlation between the alternative and the criterion.

o = 3 is the numeric weight of this symbol; this indicates a moderate correlation between the alternative and the criterion.

● = 5 is the numeric weight of this symbol; this indicates a strong correlation between the alternative and the criterion.

The numeric weight is then multiplied by the importance rating for each criteria. These weighted factors are totalled for each column. The preferred concept has the highest total (iSixSigma, 2015).

In Phase 4 and 5, various simulation techniques are used to find the optimal solution for the mailroom at 'Bank A' and they enable a comparative analysis to be performed after the final results are analysed and interpreted.

2.5.5. Simulation

2.5.5.1. Simulation Overview

Peters et al. (2001) states that a simulation of a complex system is an approximation of the actual system that is developed according to a particular set of objectives. When no simple analytical model is available to accurately analyse a system, simulation is a suitable tool.

Simulation is defined as a technique that imitates the operation of a real-world system as it evolves over time (Winston, 2004). The use of simulation has many advantages; one being that it can deliver a large amount of important information in only minutes because it enables the visualization of the system over a period of time (AnyLogic, 2015). The main purpose of simulation is to gain insight into the operation of a system; develop solutions to improve a system's performance; test new concepts or systems before implementation and to gain information without disrupting the actual system (Winston, 2004). The main purpose of this project's simulation is to test a new concept and compare the proposed system to the current system.

There are three major methodologies used to build dynamic business simulation models, namely: system dynamics, discrete event modelling and agent based modelling. According to AnyLogic (2015), the system dynamics method assumes a high abstraction level and is primarily used for strategic level problems. Process-centric modelling is mainly used on operational and tactical levels and focuses on simulating the process of system. Agent based models are used at all levels: agents can be competing companies, consumers, projects, ideas, vehicles, pedestrians or robots (AnyLogic, 2015).

This project is going to make use of agent-based modelling because the simulation is a representation of an idea of a digital mailroom. Macal and North (2010) believe that agent-based simulation is a relatively new approach to modelling complex systems that are usually composed of interacting 'agents'. Agents have behaviours that are often described by simple rules and interactions with other agents which in turn influence their behaviours (Macal and North, 2010).

Macal and North (2010) state that a typical agent-based model has three elements:

1. A set of agents, their attributes and behaviours.
2. A set of agent relationships and methods of interaction.
3. Agents interact with their environment in addition to other agents.

Two small simulations are built in Phase 5; one on the current mailroom model and the other on the designed digital mailroom model. These two simulations are compared to each other to determine which option is better for the mailroom at 'Bank A' and to demonstrate if the digital mailroom is a feasible option. Two out of the three important metrics of the project are accessed in the simulation study, namely:

1. Time (effectiveness):
   - On-time delivery
   - Order cycle time

2. Quality (accuracy) of the process:
   - Order cycle time variability
   - Schedule adherence

Cost (efficiency) is the third metric; however, this metric is explored further during Phase 6.

2.5.5.2. Simulation Data

Data is collected through work studies, time studies and historical records. One of the important steps in creating a simulation model is identifying the type of data required to support the model. A simulation model is only valid for a particular application if its logic is correct and if it uses appropriate data (Peters et al, 2001).

It is important to document the data in order to obtain a clear idea of the structure of the data. The definitions of the input and output parameters should be clear and all model assumptions should be stated (Jain et al, 2011).

2.5.5.3. Simulation Model Conceptualisation

A real world process should be translated and abstracted into a conceptual model or process. A general rule of thumb is to build the simplest model possible that solves the problem. Jain et al (2011) states that a good place to start with conceptualisation is with defining the data and using that definition to begin building the logic of the simulation model.

2.5.5.4. Verification and Validation

Verification and validation of models are important steps in the simulation study. The verification of the model ensures that it behaves as the simulation modeller expects it to (Jain et al, 2011). The model must first be verified by comparing it to the conceptual process. There are various methods of verification (Grabau, 2006):

- One agent is allowed to enter the model. This agent is followed every step of simulation process to ensure that the logic is correct and there are no errors in the model. This is known as 'de-bugging.'
- Verification is also carried out by comparing the results of the output parameter with the values shown through the variables. These values should be similar.

Validation means that the model is an accurate representation of the real system (Jain et al, 2011). The simulation model is validated by comparing the model outputs to the real world outputs. There are various levels of validating a simulation model. The simulation in the project is validated by (Winston, 2004):

- Comparison to other models: various results (outputs) of the simulation model are compared to results of other (valid) models.
- Face validation: this involves asking individuals knowledgeable about the system whether the model and its behaviour are reasonable.
- Process validation: this determines the correspondence of the modelled process with the real world system.
- Parameter validation: this determines if the model parameters align with reality.

2.5.5.5. Simulation Approach

When conducting the simulation study, a seven step approach is followed. According to Peters et al. (2001), this is the 'Seven Step Approach for Conducting a Successful Simulation Study'. This is an iterative approach and it can be seen in Figure 7.

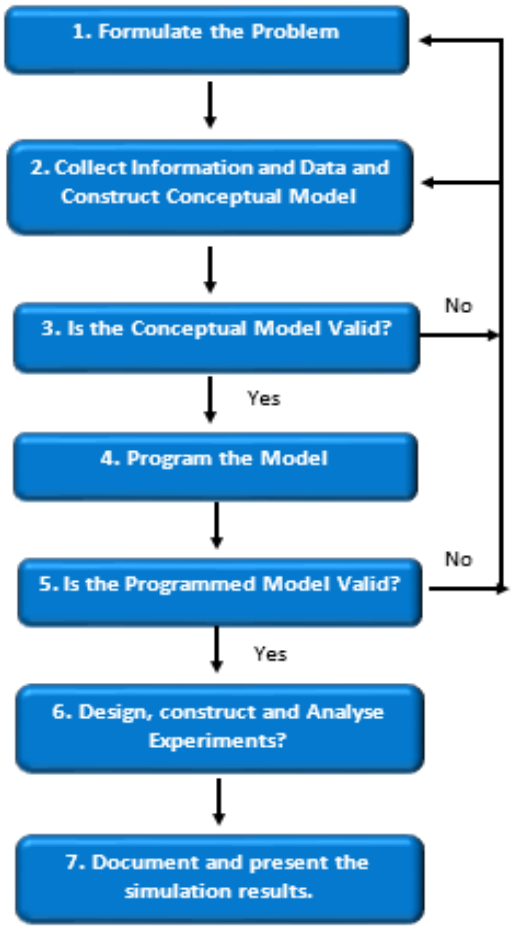

Figure 7 *– 'The Seven Step Approach to Conducting a Successful Simulation Study' adapted from Peters et al. (2001). This approach is an iterative process whereby the model is continuously validated.*

2.5.6. Monte Carlo Simulation

Once the simulation has been completed, a Monte Carlo simulation is used to access the robustness of the parameters to identify which parameters have the largest effect on the model. According to Winston (2004), this is a method for evaluating a deterministic model using sets of random numbers as inputs because the inputs of the data have an element of uncertainty. A Monte Carlo simulation is able to tell how likely the outcome of a system is.

A Monte Carlo simulation allows many simulations to be run within a short space of time. An example that illustrates this is: Converga (2012) developed a Monte Carlo simulation to address an uncertainty an experiment that assessed the connection of carbon emission reductions and a digital mailroom. According to Converga (2012), to determine the stochastic variation and standard deviation of the net carbon emission reductions 10 000 simulation runs were carried out using the Monte Carlo technique. A Monte Carlo simulation is used to understand the impact within the data analysis of this project. A sensitivity analysis is performed to validate parameters.

In Phase 6, the following two techniques are used to determine the best solution for the mailroom at 'Bank A.'

2.5.7. The Analytical Hierarchy Process

The Analytical Hierarchy Process (AHP) aids in making a decision between alternatives. This is a structured technique for organising and analysing complex decisions that have multiple factors affecting the decision. The three metrics: cost, time and quality are compared in this technique.

The four major steps of the AHP according to Winton (2004) are as follows:

1. Breaking the decision down into criteria and alternatives.
2. Obtaining judgemental preferences for the alternatives for each criterion using pairwise comparisons. Pairwise comparison allows the relative comparison of the criterions to be identified. In matrix form, the pairwise comparisons are identified as being: 1 (equal), 3 (moderate), 5 (strong), 7 (very strong) and 9 (extreme). The inverse of the relative importance is reflected in the matrix too.
3. Computing relative priorities for each decision using matrix multiplication and normalising each row by dividing them by the row total.
4. Aggregating the relative priorities to obtain a relative ranking of the alternatives. The alternative that has the highest value is the best alternative.

2.5.8. Risk Management

Kossiakoff et al (2011) describes risk management as the methodology that is employed to identify and minimize risk in system development. The development of a new system needs to be reliable and affordable. At every step of the development of the new process unpredictable outcomes can be encountered that pose risks in terms of performance shortfalls, environmental susceptibility, unsuitability for purpose, or a host of other unacceptable consequences that may require a change through the life cycle of the system development (Kossiakoff et al, 2011).

Risk assessment helps identify the potential risks of a new system. The risk in this project is assessed using a risk cube. This tool looks at the likelihood of risk and the consequence or impact of the risk. The likelihood of risk is the probability of the risk occurring – this is measured on a level of one to five and the consequence of risk is the impact that the risk has on the system in terms of technical aspects, cost and schedule – this is also measured on a level of one to five (Kossiakoff et al, 2011). The risk cube as well as the criteria for each level of risk can be seen in Figure 8.

Once the risk cube is completed, the risk of the project is classified as being high, medium or low. A risk assessment is done for the chosen solution in this project; this assessment of risk is also taken into consideration when completing the feasibility study in Chapter 5.

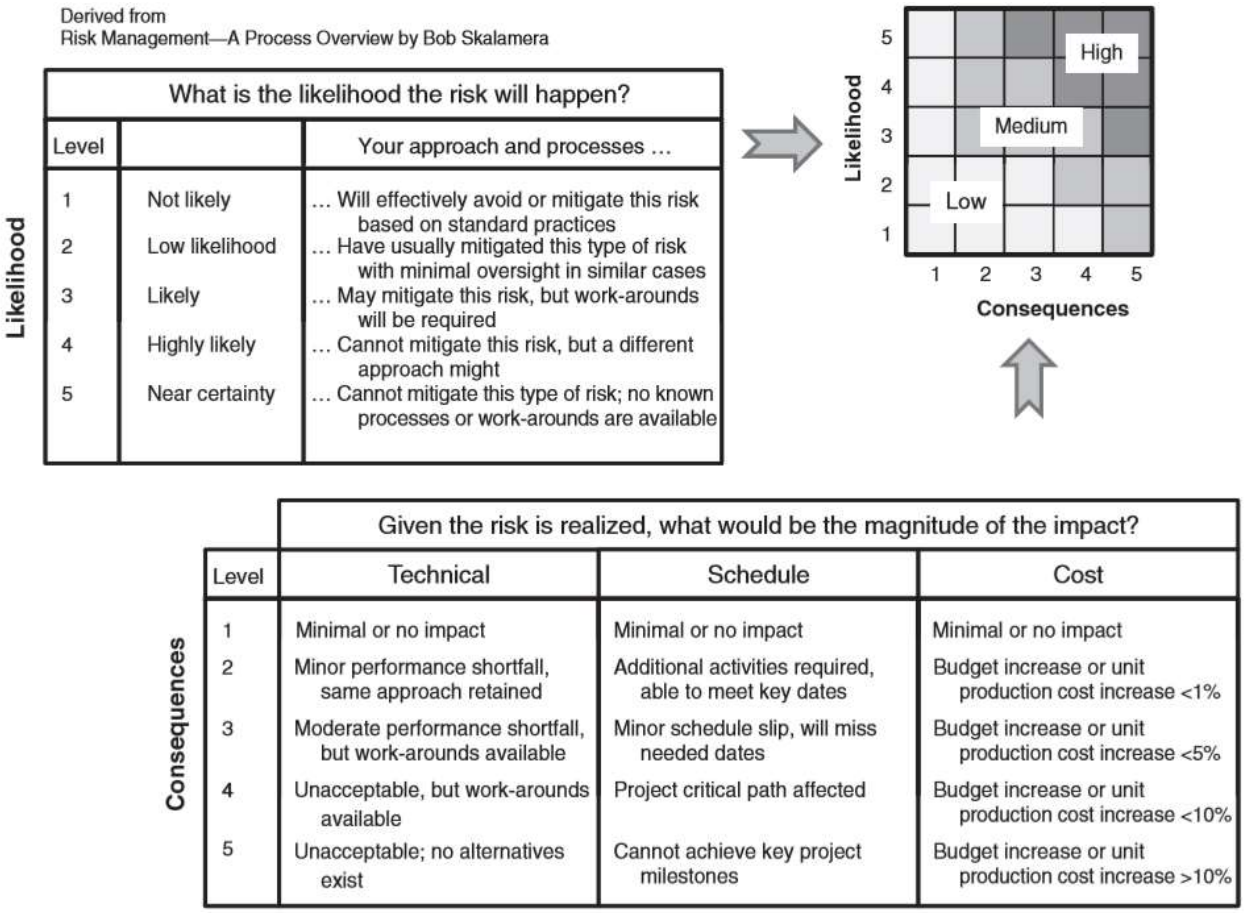

Figure 8 *– A diagram that illustrates how to use a 'Risk Cube' taken from Kossiakoff et al. (2011). As mentioned before the risk likelihood and the risk consequence are rated on a scale of one to five; this then helps determine whether the project is a high, medium or low risk.*

2.5.9. SWOT Analysis

SWOT is an acronym for Strengths, Weaknesses, Opportunity and Threats. A SWOT analysis is a tool for understanding a solution and it aids in decision-making in businesses and organisations. When completing a SWOT analysis, strengths and weaknesses are regarded as internal factors, whereas opportunities and threats are regarded as external factors (Kossiakoff. A, 2011).

2.5.10. Feasibility Study

In the last phase of the project, a feasibility study is conducted. The main motivation of this feasibility study is to quantify the potential risks of implementing a digital mailroom in the mailroom at 'Bank A.' According to Whitten et al. (2007), a feasibility study is a methodology that is used to determine whether an idea will be successful by evaluating its potential. It also tests the viability of the proposed system and emphases the importance of identifying the problems that may occur so that areas that require improvement can be identified (Whitten et al, 2007). Whitten et al's (2007) approach to a feasibility study is going to be used to assess the final solution.

Whitten et al (2007), conducts a feasibility study looking at the feasibility in five major areas of interest, namely: operational, technical, economic, legal and cultural feasibility (Whitten et al., 2007). The operational feasibility is how well the solution meets the identified system requirements. Technical feasibility is a measure of the practicality of the solution. Economic feasibility is one of the main techniques used to determine the efficiency of a new system. It refers to a brief comparative cost analysis. Seal et al. (2015), defines a comparative cost analysis as a technique that compares the current system to the newly designed system, taking relevant costs into consideration. It is important to note that the mailroom service is costed by the headcount of employees in the mailroom. This is where the third metric: cost is assessed. Legal feasibility is when a new system is analysed according to legal requirements of the applicable country. Cultural feasibility is when the new system is compatible with the employees and working culture. This can be assessed by conducting interviews with the mailroom employees. The main goal of this project is to determine if the designed digital mailroom is feasible in all five areas of interest.

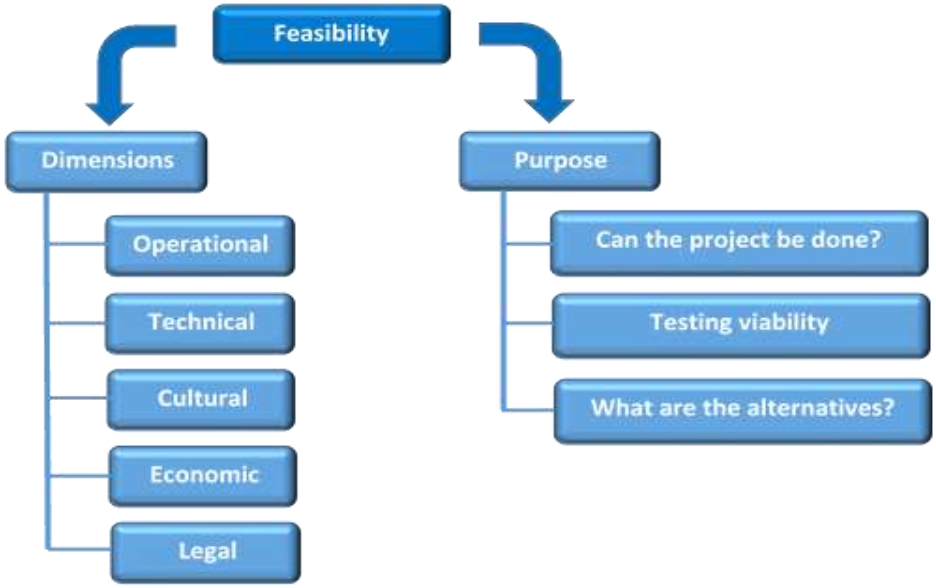

Figure 9 *– A basic breakdown of the feasibility approach that is followed in Phase 6. This approach is adapted from Whitten et al (2007).*

2.6. Literature Review Conclusion

In conclusion, the literature review provides the relevant information needed to understand the problem context and reveals multiple existing solutions and approaches to develop a conceptual process for the digital mailroom. It explores the need to shift from traditional systems to more innovative systems and gives an overview of the digital mailroom. This literature review discusses the important concept of the legality of digital mail and assesses a few alternatives of digital mailrooms that are available in industry that may aid in the development of the mailroom solution for 'Bank A'. Lastly, the literature review looks at tools, techniques and methods that are used in developing a solution to the problem statement.

Chapter 3: Problem Investigation

This chapter focuses on the problem investigation which involves looking at current process in detail with the objective of understanding the main problems that the mailroom experiences. This chapter focuses on Phase 1 of the project approach.

3.1. Current Mailroom Process

Both the incoming and outgoing flow of mail in the mailroom at 'Bank A' are observed in the work study; however, the incoming mail process is more relevant to this project. Site visits, observations and time studies are key in developing this description. The time study tables can be seen in Appendix A and they are analysed in Phase 4. The process flow chart assesses the flow of incoming mail through the mailroom at 'Bank A.' The current mailroom process consists of six steps, namely:

- Step 1: A driver from UTi Mounties Gauteng Central arrives at the mailing department at 7:00 with freight. The receiving clerk scans in the parcels, using a hand held scanner, comparing the trip sheet received by the driver and the amount of mail items received – this is called consolidation. The receiving clerk signs the driver's trip sheet as a proof of delivery.

- Step 2: The receiving clerk then deconsolidates, counts and scans in the parcels that were delivered, using the 'UTi CORE Application System' for tracking and delivery status. Mail is received from the post office (registered and unregistered mail), from other 'Bank A' branches, 3rd parties and other external clients.

- Step 3: The mail then gets sorted according to floors and departments (a) and placed in the relevant pigeon holes (b). The pigeon holes are marked according to 'Bank A's' floor and department.

- Step 4: If the mail is not addressed properly, it is sent to the workstation where an employee searches for the person on the 'Global Contact Application' and identifies which department they are located in. Then that mail that has been re-addressed is put in the relevant pigeon hole.

- Step 5: Each foot messenger checks their mail that is going to be delivered according to their departments that they are responsible for (each foot messenger has a scheduled route that they follow each day). The foot messenger then assembles their mail and then gets it scanned out – this serves as proof that the mail has left the mailroom. Once the mail is scanned out, trip sheets are given to the foot messengers – this serves as a proof of delivery.

- Step 6: At 10:00, the foot messenger takes mail to various departments. When mail is delivered, the department representative needs to sign the trip sheet. Because, UTi uses a scheduled stop route, the foot messenger needs to go to each department regardless if there is mail to be delivered or not.

The Current Incoming Mail Process: This process can be seen in Figure 10.

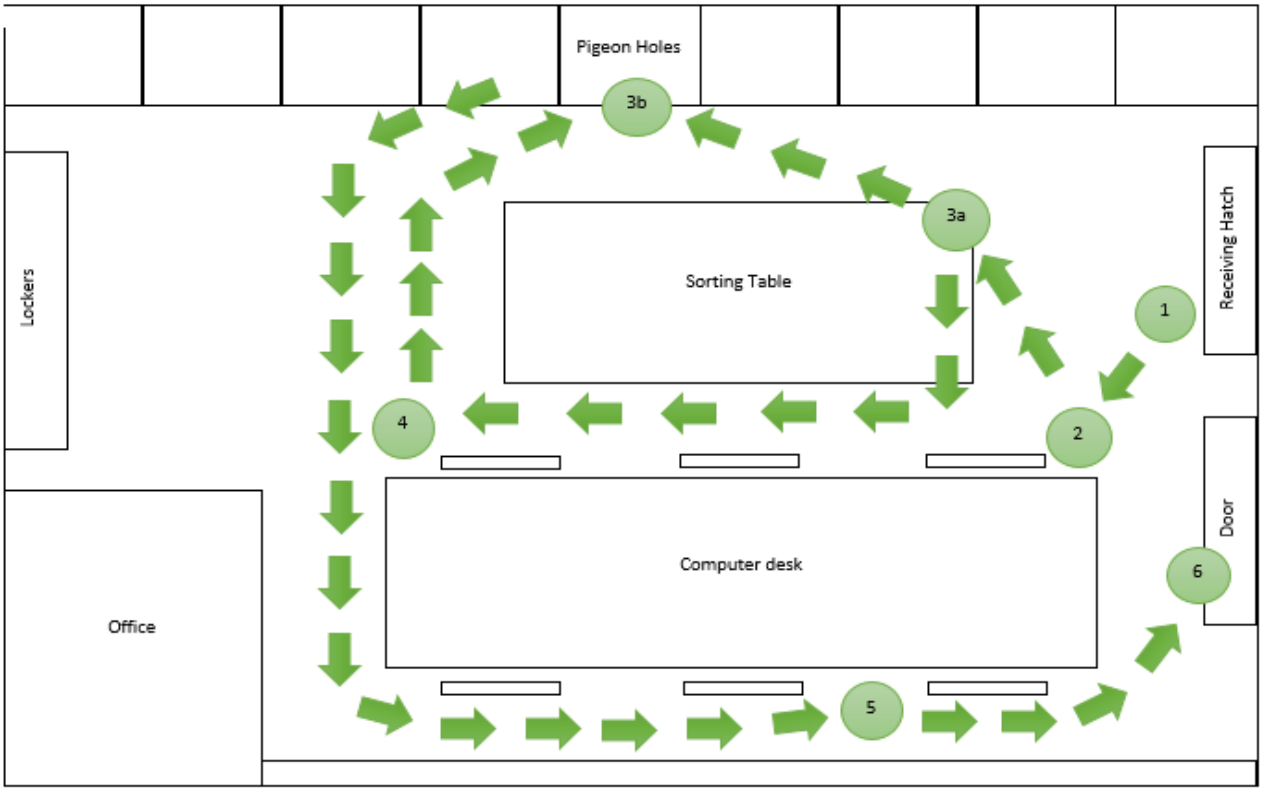

Figure 10 *– A flow chart of the current incoming mail at the mailroom at 'Bank A.' The numbers in the schematic diagram represent the steps that the process follows. This diagram is not drawn to scale.*

3.2. Problems Identified in Current Mailroom Process

Apart from the problems mentioned in the 'Problem Statement' in Chapter 1, it is clear that from the observation of the operations in the mailroom at 'Bank A' that incorrect or incomplete recipient information causes a major bottleneck when sorting the mail into the various departments. If a particular piece of mail is poorly addressed or does not have enough information on the recipient; a worker (the 'searcher') looks for more information on the 'Global Contact Application.' This causes a big time delay because searching for the correct recipient information is extremely manual and time consuming. This problem cannot be solved by a mailroom solution; however, processes dealing with the incorrectly addressed mail should be made efficient.

Furthermore, the sorting process also needs improvement because there is no strategic approach to sorting – staff members are able to sort the mail due to experience and 'on the job' learning. When sorters are absent, there is a delay in the sorting process. Workers are also often left idle and unproductive when mail is not coming in and going out the mailroom which is another concern.

In addition to that, the foot messengers also go to each department in the building regardless if there is mail or not – this is due to the 'bus stop' delivery model of mail which is redundant and impractical. When the incoming mail is delivered to the client, they refuse to sign the trip sheet, hence it is clear that the overall client experience needs improvement.

Communication channels between UTi and 'Bank A' also need to be improved because stationery such as 'Mount Pac' sleeves, tracking labels and other packaging equipment are not easily accessible for the client. The client is also unaware of the additional services that UTi offers and many end users do not understand how the incoming or outgoing mail process works.

3.3. Process Mapping of the Current Mailroom Model

The focus of this project is to assess the feasibility of all mail that is being delivered throughout 'Bank A's' building. Mail that needs to be delivered from the post office, third party couriers, other departments within 'Bank A' and UTi hubs to 'Bank A' departments is classified as incoming mail. A simple BPMN diagram of current incoming mail process can be seen in Appendix B.

Chapter 4: Solution Approach and Development

After gaining a better understanding of the problem in the Chapter 2: The Literature Review and Chapter 3: The Problem Investigation; various alternatives are explored and evaluated and a conceptual process is selected and developed. Small simulation models are constructed to allow for the comparison between the current mailroom environment and the conceptual process of the digital mailroom; this chapter involves Phases 3 to 5 of the project approach.

4.1. Requirements Analysis

Before, the conceptual digital mailroom process alternatives are considered, a brief requirements analysis is conducted. The operational requirements determine what the main purpose of the digital mailroom should be. The functional requirements determine how the digital mailroom fulfils this purpose by defining specific behaviours or functions that the digital mailroom needs to perform while the non-functional requirements are used to judge the operation of the system as a whole.

***Table 2** – A Brief Requirements Analysis of a Digital Mailroom*

Requirement Type	Digital Mailroom Requirements	Rationale
Operational	Successfully deliver mail to the right client	Increase customer satisfaction
	Deliver mail in a timely manner	Reduce order-cycle time and improve client awareness of UTi
	Ensure data security of digital documents	Ensure secure delivery
	Allow for digital document archiving	Reduce storage costs
Functional	Convert physical mail to digital mail	Increase innovation for UTi
	Automatic sorting application	Reduce manual intervention
	Automatic search and notify application	Reduce manual invention
	Password protected applications	Increase security
	Archiving application	Reduce storage costs
Non-functional	Easily accessible for clients	Improve awareness of UTi at 'Bank A'.
	Efficient	Increase customer satisfaction
	Effective	Reduce waiting time
	User friendly	Better experience for client

4.2. Development of Solution Alternatives

Alternatives are designed and developed to meet the requirements of the digital mailroom and address the problems in the 'Problem Statement' of the project. These alternatives are evaluated and compared and the best conceptual process is selected.

4.2.1. Alternative A

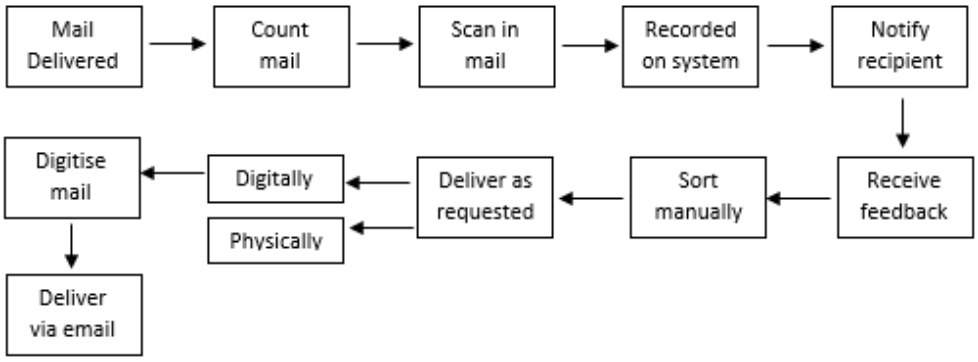

Figure 11 *– A schematic flow diagram of Alternative 1*

Alternative A still requires a lot of manual intervention because the staff members need to manually sort through the incoming mail after feedback is received. However, this system allows the recipient to be notified automatically when they have mail because when the mail item is scanned in; the system records the mail on the UTi designed application and the recipient is emailed immediately. This system should allow the recipient to choose if they want their mail digitised or physically delivered. The cost of this alternative is the same as the current model because the same amount of mailroom staff is required to run the mailroom (sorters, searchers, receiving clerk, dispatch clerk, foot messengers). This alternative has a low risk in terms of the legality of digitising confidential documents because permission is asked by UTi before they digitise the mail.

4.2.2. Alternative B

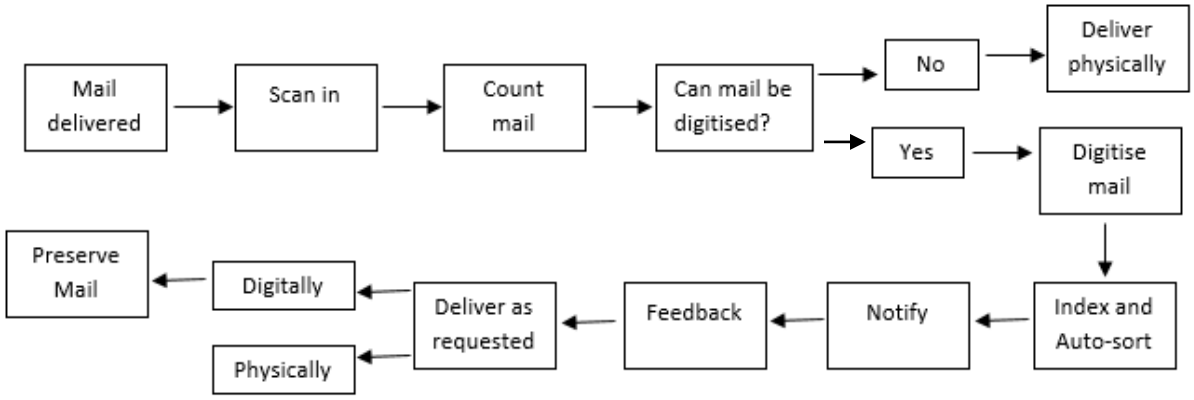

Figure 12 *– A schematic flow diagram of Alternative 2*

This alternative covers all the requirements of the digital mailroom. Manual intervention only exists when mail is scanned into the mailroom (tracking purposes), counted and prepared for digitalisation. The rest of the process is automated in terms of sorting and notifying the recipient. Alternative B allows the recipient to choose whether they want the mail delivered digitally or physically. This means that there is a reduction in manual invention which means that operational costs will decrease; however, the cost of buying high-speed scanners and investing in software development will increase the capital investment in the mailroom. This alternative emphases client experience and optimises the use of the current mailroom resources.

4.2.3. Alternative C

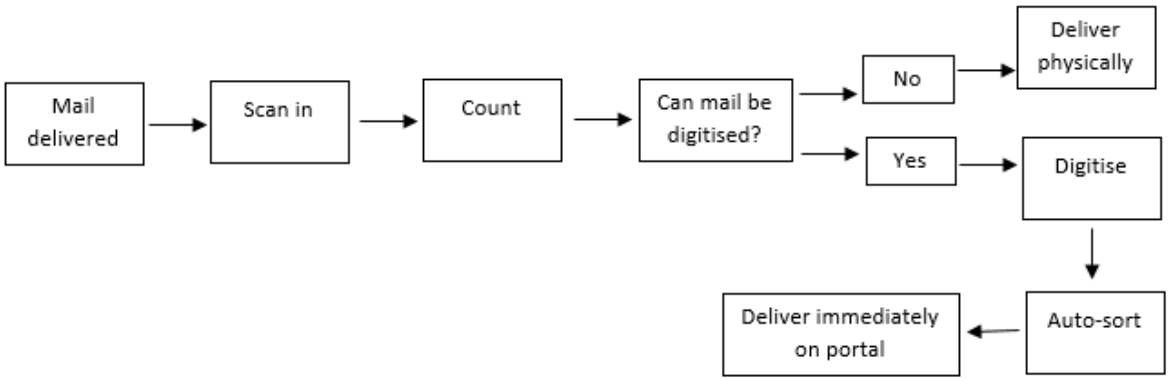

***Figure 13** – A schematic flow diagram of Alternative 3*

This alternative is direct and streamlined. It meets all the requirements of the digital mailroom. Manual intervention only exists when mail is scanned into the mailroom (tracking purposes), counted and prepared for digitisation. The rest of the process is automated in terms of sorting and notifying the recipient. The digitised mail is routed directly onto a portal (a web-based mailbox that is accessible by the recipient through a password). Operational costs will decrease; however, the cost of buying high-speed scanners and investing in software development will be even higher than Alternative B due to the development of an internal portal (online mailroom). This alternative does not give the end user the option of choosing how they want their mail delivered.

4.3 Evaluation of Solution Alternatives

***Table 3** – A Concept Selection Matrix to Aid in the Selection of the Digital Mailroom Process*

Criteria	Importance Rating	Alternative A		Alternative B		Alternative C	
Client Experience	8	○	24	●	40	○	24
Level of Automation	7	○	21	●	35	●	35
Increased Visibility	8	◌	8	●	40	○	24
Level of Manual Intervention	6	◌	6	○	18	●	30
Archiving Ability	6	◌	6	●	30	●	30
Ease of use	6	◌	6	●	30	●	30
Simplicity	5	○	15	○	15	●	25
Cost Variation	8	●	40	○	24	◌	8
		126		229		206	

As seen in Table 3, Alternative B has the highest total, therefore, it is the best suited alternative. However, if Alternative B is not feasible, Alternative C is a 'fall back' alternative. Alternative B is used in the development of the conceptual process.

4.4. Conceptual Process Design

After accessing various industry models and evaluating possible alternatives, the following generic conceptual process is developed from Alternative B:

***Figure 14** – A conceptual process for the digital mailroom at 'Bank A' – adapted from of Alternative B.*

- Step 1 – Collect: this involves gathering all paper mail, parcels, faxes and other mail that need to be distributed.

- Step 2 – Capture: this step involves capturing all mail that can be scanned on high speed scanners; this is the digitalisation process. The document is then keyed and indexed.

- Step 3 – Sort: electronic mail is sorted into various department/client folders using software that automatically sorts mail according to information that is available on 'Bank A's' internal database ('Global Contact Application'), accordingly to the indexing that is done in step 2.

- Step 4 – Notify: once the recipient has been found and identified, they are notified via email that links up with the digital mailroom system.

- Step 5 – Deliver: the recipient can select one of the four options; namely: that the physical mail must be delivered; the electronic copy must be forwarded to the recipient; the mail should be discarded or rerouted to another person/department.

- Step 6 – Preserve: all digitalised mail is stored on a central repository, content management system or a user-accessible portal designed by the UTi IT department. This interface can be accessed by the end user and it is password protected.

Figure 15 shows the process flow of the digital mailroom at 'Bank A' – this helps validate the digital mailroom conceptual model. The new layout of the mailroom ensures that there is a smooth flow of materials (mail, data and information); enough aisle space for the employees to move freely and each workstation is kept separately to prevent any information being lost or confused. The pigeon holes, receiving hatch, door, lockers and the office remain in the same position as they are in the current mailroom. This new layout requires very little alteration to the current mailroom layout.

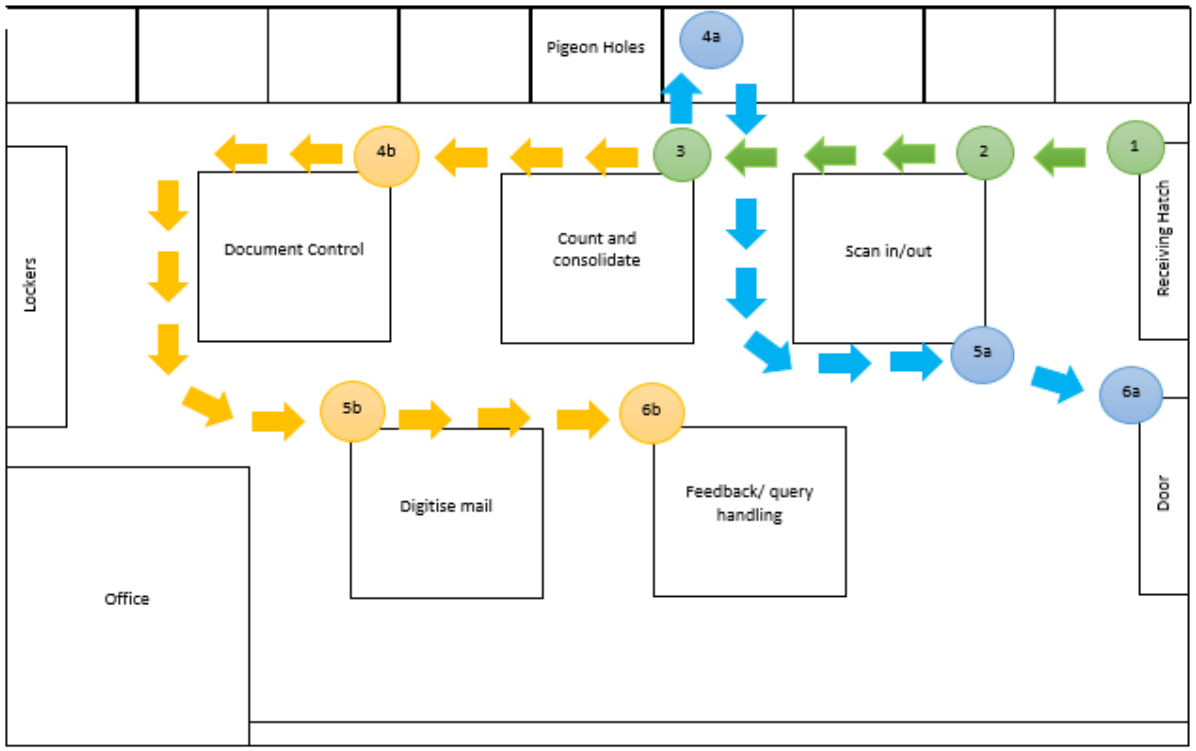

Figure 15 *– A process flow diagram of the digital mailroom. This is a new layout of the mailroom.*

In Appendix C, the BPMN diagram shows how mail is delivered through the conceptual design of the digital mailroom. The mail is received by the receiving clerk and scanned onto the system and then it is counted and consolidated. The mail is then assessed whether it can be digitised or not. If it cannot be digitised, it is placed in the correct department pigeon hole. The recipient is notified and it is delivered physically or it can collected by the recipient. If the recipient does not want the mail it is discarded (shredded and recycled).

If the mail can be digitised, the documents are prepared for scanning, scanned and converted to digital form. Mail is automatically sorted, using indexing and information of 'Bank A's' 'Global Contact Application.' Once the recipient has been found and identified, they are notified via email that links up with the digital mailroom system. The recipient receives an email that gives four options for the mail; namely: that the physical mail must be delivered manually or collected; the electronic copy must be forwarded to the recipient; the mail should be discarded or rerouted to another person/department – this links to a web-based application or an interactive portal designed by UTi; furthermore, this allows the feedback to be documented in a structured format. The digital copy of the mail is preserved securely on the content management system while the physical copy is recycled.

4.5. Model Construction and Formation

After data analysis, the type of data that is needed for the simulation is realised. Some of the data received can be seen in Appendix D. In this section, the use of the simulation software (AnyLogic) to build a suitable model that helps evaluate the feasibility of the digital mailroom process is briefly discussed.

The various assumptions and simplifications from the real world to the simulation model are also highlighted so that the extent to which the real world is represented in the simulation is known. The simulation study comprises of two models. Model 1 is the simulation model of the current mailroom at 'Bank A.' Model 2 is the simulation model of the digital mailroom alternative.

4.5.1. Simulation Assumptions

Some assumptions and simplifications are made to avoid complication and facilitate better model construction. This simulation is used as a tool to distinguish between the current mailroom process and the digital mailroom process.

***Table 4** – A Table of the Simulation Study Assumptions and Reasons for the Assumption that are Made.*

No.	Model	Assumption/Simplification	Reason
1	1 & 2	Workers are well-trained and experienced	This reduces the variability of work rates of the workers and any unnecessary delays that are experienced in real life.
2	1 & 2	Idle time of staff is not taken into account (no interruptions, distractions)	This cuts out unnecessary delays in the model.
3	1 & 2	Workers work at standard pace	This allows there to be standard rates for counting, scanning in and out, sorting and delivering mail.
4	1 & 2	All mail items can be digitised	This allows for an easy comparison between the models and it simplifies the process that needs to be simulated.
5	1	Only one walker route is simulated	There are 11 walker routes that are all different distances and deliver different amount of mail every day. For simplicity, one route will be simulated to measure the time it takes to deliver a mail item.
6	1	Mail items are correctly addressed	This cuts out the 'search' step in the process. This step only occurs sometimes and it is random. For simplicity it is cut out. Incorrectly addressed mail is not something that can be solved by UTi. It is the sender's mistake.
7	2	Auto-sort and auto-notify are immediate	There is no time to deliver the mail – this means that this part of the model does not have any delays. It is instant because of the technology that exists in a digital mailroom. This application cuts out the manual sorting of mail from the incoming mail process.

4.5.2. Simulation Objective

The main objective of this simulation is to assess the metrics of effectiveness (time) and accuracy (quality) of the current mailroom model and the conceptual digital mailroom model. This is a simple simulation that demonstrates the process visually for the client and also helps conceptualise what a digital mailroom entails.

4.5.3. Simulation Description

Models 1 and 2 make use of sources, queues and delays. The source generates the mail items (agents), the queues indicate the number of agents that are waiting to be accepted by the next activity in the flowchart and the delays indicate the amount of time that an activity could delay the agent. A resource pool is used to generate UTi staff that are required to perform tasks on the agents (mail items). The number of staff members is kept constant in both models.

Model 1: simulates the current mailroom situation. Figure 16 illustrates the inputs and desired outputs of 1.

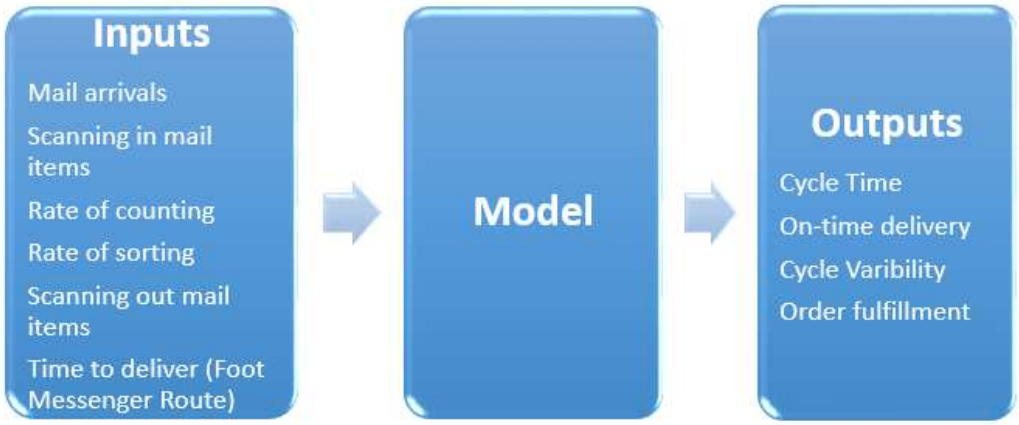

***Figure 16** – The inputs and outputs of Model 1*

Model 2: Furthermore, Model 2 defines the digital mailroom as a a separate agent that can complete the processes independently of human intervention. The digital mailroom performs automatic sorting which ultimately eliminates the sorting process and it also notifies the recipient directly. Figure 17 illustrates the inputs and desired outputs of Model 2. A Monte Carlo simulation generates the feedback time – this is a random, uncertain input parameter in Model 2.

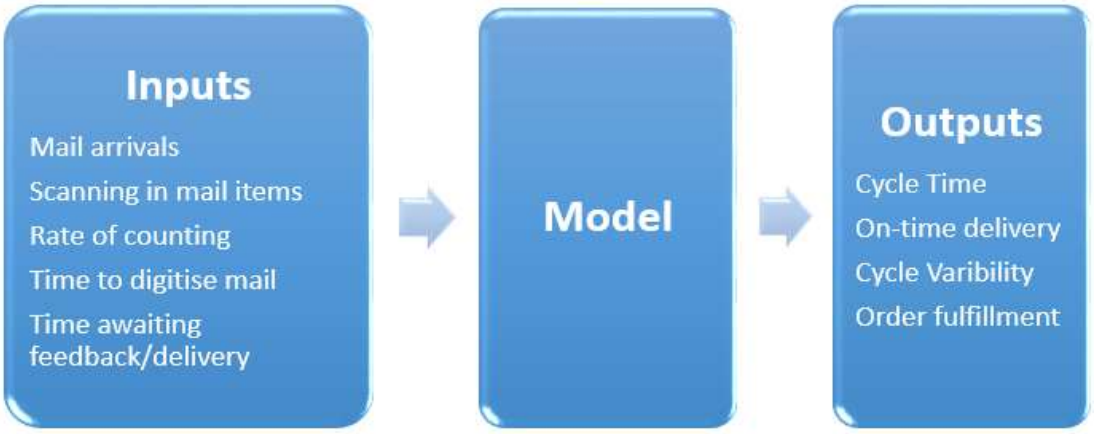

***Figure 17** – The inputs and outputs of Model 2*

4.6. Model Verification

Model 1's results are compared to the real world outputs and a level of similarity is obtained. It is easy to verify Model 1; there is a strong correlation/similarity between the simulated data and the original data. This is seen in Figure 18. Model 2 is more difficult to verify as there is not an existing system to compare the different results to. However, it is compared to the results of the Model 1. This is seen in Figure 19. Model 1 has a higher cycle time whereas Model 2 has a lower cycle time; however, the trend of the data is the same. Model 1 and 2 are verified by a step by step walk through of the logic before running the model. Once the step by step process is completed, the models are run and any errors are corrected – this is 'de-bugging.'

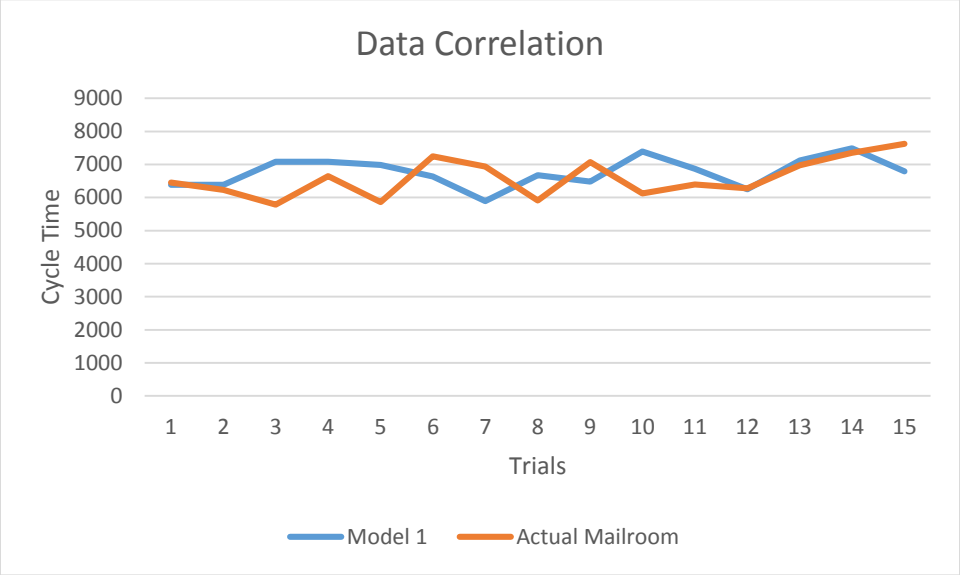

***Figure 18** – A line graph depicting the similarity in results between the actual mailroom and Model 1.*

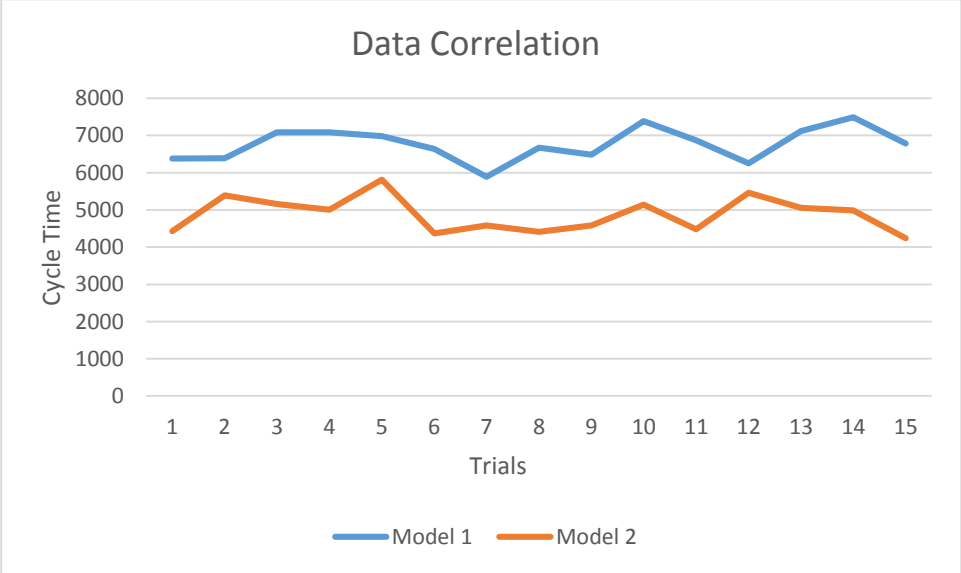

***Figure 19** –A line graph depicting the similarity in results between Model 1 and Model 2*

4.7. Model Validation

Comparison to other models: Model 1 is validated through analysing the original data that is obtained in the time studies and other historical data. The purpose of each model is also analysed. Each system/model has the same purpose of delivering the mail to the recipient. Furthermore, the time in which Model 1 delivers the mail should be similar to that of the actual system – this is confirmed because the mean cycle time of the actual mailroom is 6099 seconds while the mean of Model 1 is 6657 seconds. The time in which mail is delivered in Model 1 should be shorter than that of Model 2. This is confirmed as the mean cycle time of Model 1 is 6657 seconds and the mean cycle time of Model 2 is 4735 seconds.

Face validation: the animation of the current mailroom depicts the real world scenario and the animation of the digital mailroom depicts the newly designed facility layout and the conceptual process. Mailroom employees identified Model 1 as being a reasonable representation of the real world and also identified with Model 2.

Process Validation: the reasonableness of Model 1's process is tested by comparing the layout and process of the mailroom in the simulation model to the layout and process in the actual mailroom. Because Model 2 is a conceptual process, it is designed to fit in within the current facility. The process of Model 2 is validated by a step by step process to ensure its logic is correct.

Furthermore, every step of Model 1 is compared to the process map in Appendix B and every step in Model 2 is compared to the process map in Appendix C – this validates the process of both Model 1 and 2, respectively. It is a challenge to completely validate the simulation of the digital mailroom as it cannot be compared to an existing system; however, as mentioned before, a structured 'walk through' of the model is completed to ensure that the model is valid.

Parameter validation: this technique consists of changing the values of the input parameters of a model to determine the effect on the model's output behaviour. Parameters that are sensitive and cause significant changes in the model's output are made sufficiently accurate prior to using the model. The following parameters are validated for each model: mail arrivals, rate of scanning in/out, rate of counting, rate of sorting, time to deliver on foot messenger route, time to digitise and time spent waiting for feedback. The parameters that have the greatest effect on the performance measurements are: the mail arrivals, rate of sorting, time to deliver and time waiting for feedback.

In conclusion, it is believed that the model is a relatively good representation of the actual system and the digital mailroom simulation is also valid when compared to the simulation of the actual mailroom.

Chapter 5: Solution Analysis

This chapter focuses on the analysis of the final simulation results and analysis of the chosen solution which is the last phase of the project approach.

5.1. Model Results and Interpretation

Final results of the Model 1 and 2 are analysed through histograms. Comparisons are made in terms of cycle time. The statistical parameters of the outputs used during this validation process include the mean cycle time (time) which addresses the time metric and standard deviation of the cycle time which addresses the quality (variation) of the process.

The Actual Mailroom:

The actual mailroom has a mean cycle time of 6099 seconds and a standard deviation of 579 seconds – these values are obtained from the time studies done in Phase 1. These two parameters indicate that the cycle time of the mailroom's delivery is slow compared to the designed digital mailroom. The standard deviation proves that there is variation in the process in the mailroom at 'Bank A' which indicates that the quality of the process needs improvement. Figure 20 depicts the results of the actual mailroom. The blue histogram represents the raw data and the red curve is the fitted normal distribution.

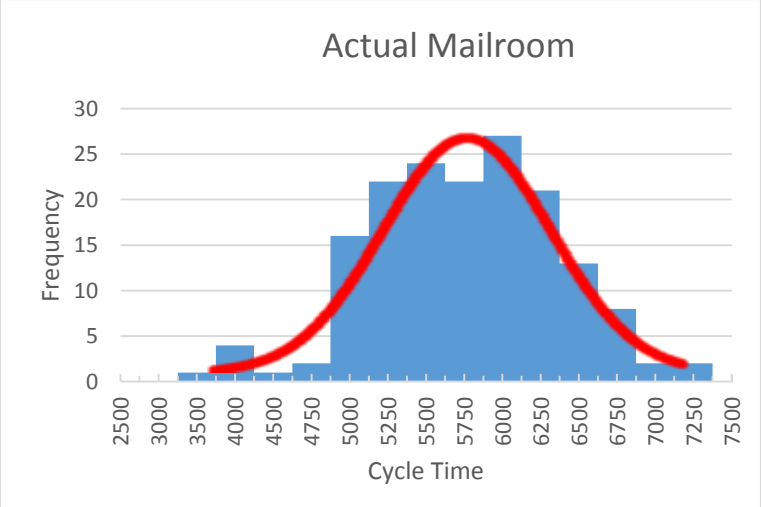

***Figure 20** – A Histogram and a fitted normal distribution of the actual mailroom's cycle time*

The actual mailroom has on average 22 to 23 employees working in the mailroom. This data can be seen in Appendix D. Eleven of these employees are foot messengers.

The Model 1:

Model 1 is a representation of the actual mailroom. Model 1 has a mean cycle time of 6675 seconds and a standard deviation of 503 seconds – these values are obtained from the simulation model constructed in AnyLogic. There is a difference in the mean and standard deviation between this model and the actual mailroom due to model assumptions and simplifications. These two parameters correlate strongly with the actual mailroom's results which means that the model is valid. Figure 21 depicts the results of simulation Model 1.

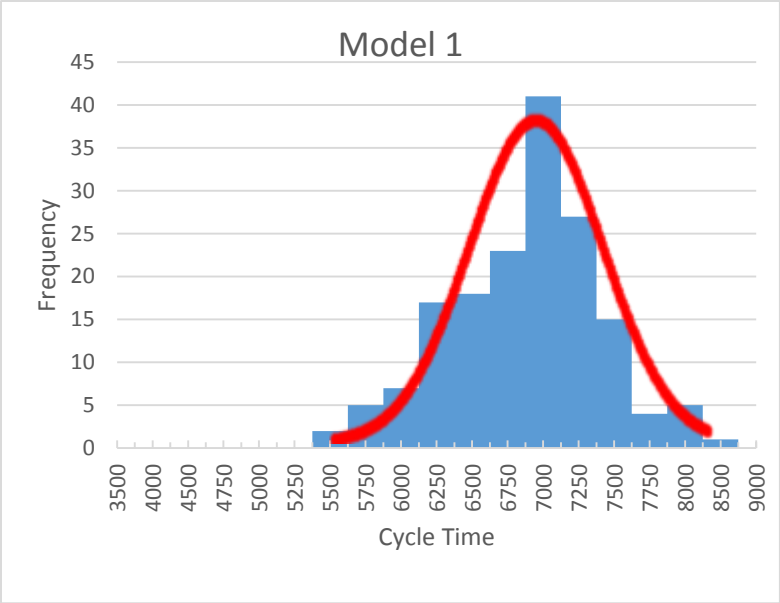

Figure 21 *– A Histogram and a fitted normal distribution of Model 1's cycle time*

The Model 2:

Model 2 is simulates the design of the digital mailroom. Model 2 has a mean cycle time of 4735 seconds and a standard deviation of 268 seconds – these values are obtained from the simulation model constructed in AnyLogic. The mean cycle time in Model 2 is significantly less than the mean cycle time in Model 1. The standard deviation is also less which indicates that the quality of the process in Model 2 is better than that of Model 1. Figure 22 depicts the results of simulation Model 2.

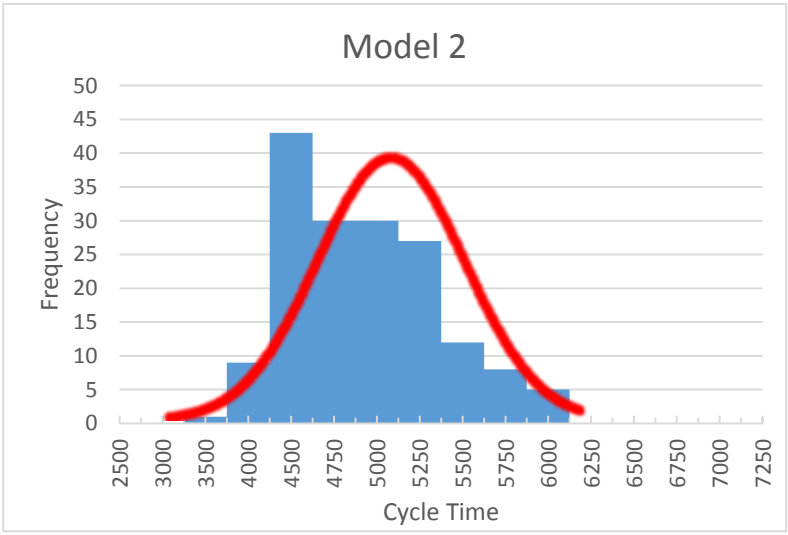

Figure 22 *– A Histogram and a fitted normal distribution of Model 2's cycle*

The number of staff members is kept constant in each model. Because of the model assumption that one walker route is simulated, there are approximately five employees that are redundant while the rest of the foot messengers will still deliver mail but not on a frequent basis due to the mail being digitised.

5.2. Analytical Hierarchical Process

The Analytical Hierarchical Process has two parts to it.

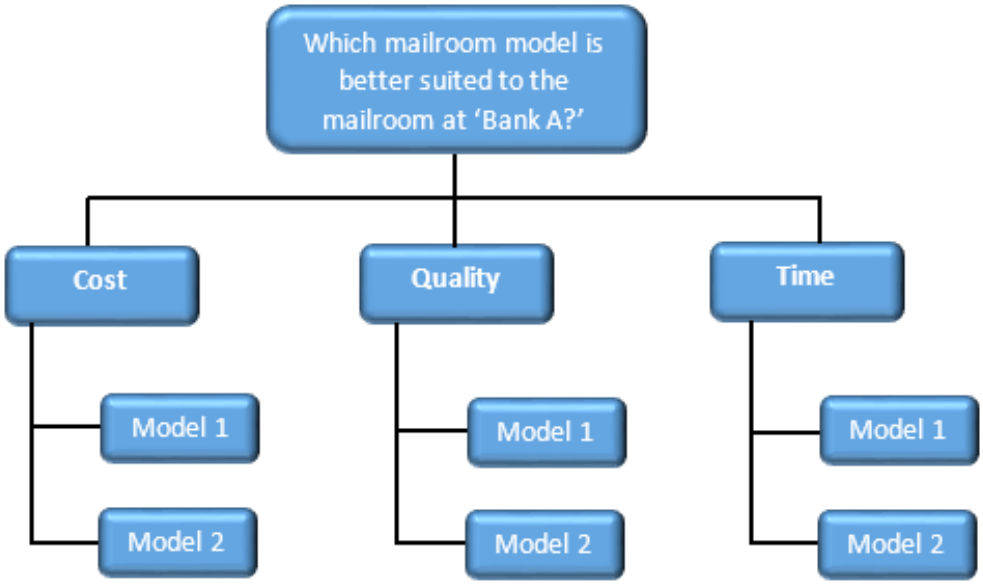

Figure 23 *– The Analytical Hierarchical Processes showing the criteria of the decision-making process and the alternatives that are available.*

Part 1:

1. The symbol C stands for cost, the symbol Q stands for quality and the symbol T stands for time. These are the criteria of the Analytical Hierarchical Process. This pairwise comparison relatively compares the one criteria to the other. These comparisons are obtained though discussions with UTi staff and confirmed with the mailroom requirements and objectives.

	C	Q	T
C	1	3	1/3
Q	1/3	1	1/5
T	3	5	1

2. The matrix is then squared to obtain:

	C	Q	T
C	3	7.67	1.27
Q	1.27	3	0.51
T	7.67	19	3

3. Each row is then added up to obtain the relative ranking of the criteria. Time is the most important criteria, followed by the cost of the model then the quality.

C	11.94
Q	4.78
T	29.67

4. The above matrix is then normalised to obtain the following probabilities:

C	0.2573
Q	0.1030
T	0.6396

Part 2:

This part follows the same process; however, each criteria is assessed in terms of the alternatives: Model 1 and Model 2.

Cost:

	Model 1	Model 2
Model 1	1	0.2
Model 2	5	1

→

Model 1	2.4
Model 2	12

→

Model 1	0.1667
Model 2	0.8333

Quality:

	Model 1	Model 2
Model 1	1	0.2
Model 2	5	1

→

Model 1	2.4
Model 2	12

→

Model 1	0.1667
Model 2	0.8333

Time:

	Model 1	Model 2
Model 1	1	0.1429
Model 2	7	1

→

Model 1	2.286
Model 2	16

→

Model 1	0.125
Model 2	0.875

Once the alternative weights have been identified, the relative ranking of the criteria and the 'alternative weight' matrix are multiplied to identify which alternative is superior.

Model 1	0.14
Model 2	0.86

It is clear that from the AHP decision making tool that Model 2 (the digital mailroom) is the better solution alternative for the mailroom at 'Bank A'.

5.3. Risk Assessment

Using the 'Risk Cube' discussed in Chapter 2, the risk of Model 2 being unsuccessful is assessed. The likelihood of risk is rated a level 2. This is a low likelihood because the solution is using all the available resources; there is no need to employ new staff or move facilities. The only potential risks of this solution are the resistance to change by the employees of the mailroom, user acceptance of the clients at 'Bank A', inaccurate cost forecasts, inadequate training of staff members on the new technology and the failure to integrate with 'Bank A's' existing infrastructure.

The consequence of risk is rated a level 3. The impact in the technical sector is moderate because there may be a shortfall in performance in the beginning stages of the implementation of the new system but work arounds are available with the aid of adequate support staff. The schedule performance may be impacted largely if the digital mailroom is unsuccessful – clients will not receive their mail and communication and work flows will be largely impacted by this. The cost sector may see a budget increase due to the development of the system software and the implementation of new technology.

When using the 'Risk Cube', the risk that the project may be unsuccessful is low; however, if the risks cannot be mitigated the 'fall back' alternative (Alternative C) should be considered.

5.4. SWOT Analysis

This SWOT analysis aims to assess the Strengths, Weaknesses, Opportunities and Threats of the digital mailroom solution.

***Table 5** – A SWOT Analysis on the Digital Mailroom Solution*

Strengths 1. Reduce operating costs. 2. Increased data security. 3. Archiving ability. 4. Reduced cycle time. 5. Increased process quality. 6. Less paper waste 7. Strategic sorting methods (indexing)	**Weaknesses** 1. More complex than current system. 2. System down time will affect communication channels and mail delivery schedule. 3. Not enough information to accurately forecast costs. 4. Budget constraints. 5. Uncertainty of the level of support that will be received from 'Bank A.'
Opportunities 1. Increase customer service. 2. Reduce storage space requirements. 3. Increase visibility of UTi at 'Bank A'. 4. Better ability to communicate with others. 5. Encourage 'paperless movement' at 'Bank A'	**Threats** 1. Resistance to change 2. User acceptance 3. Inadequate training of staff on new system 4. Luck of support from 'Bank A' 5. System implementation disrupts workflow.

5.5. Feasibility Assessment

The operational, technical, economic, legal and cultural feasibility of the solution are assessed in this section of Chapter 5.

5.5.1. Operational Feasibility

The operational feasibility is how well the solution meets the identified system operational requirements. When referring back to the requirements analysis in Chapter 4, the digital mailroom process fulfils all of the stated requirements:

- The digital mailroom successfully delivers mail to the right client as the recipients details are taken off of the content management system. This reduces one of the major bottlenecks in the mailroom which allows UTi to deliver mail in a timely manner as the cycle time is decreased and there are no unnecessary delays.
- The data is protected by passwords because a lot of the documentation at 'Bank A' is confidential and valuable; hence data security is improved with the use of passwords.
- Another value added service that the digital mailroom allows is archiving.

This solution is operationally feasible as it fulfils the main purpose of a digital mailroom and meets all the operational requirements.

5.5.2. Technical Feasibility

Technical feasibility is a measure of the practicality of the solution and how the service of the digital mailroom will be delivered. This includes equipment, labour, transportation, location and the technology that is needed. This solution places a lot of importance on the end-user experience; allowing the user to choose how they want their mail delivered.

The equipment that is needed is mainly computers, desks, chairs, stationery and other office supplies. Staff need to be well-trained and educated on how to use the new technology as it is more complex than the existing technology in the mailroom; during the implementation of the solution there will need to be additional staff to ensure that the transition takes place smoothly and an adequate change management plan is needed. The only transportation that is needed for the digital mailroom solution to operate is the UTi drivers that deliver the physical mail to the mailroom. The location remains the same; however, this mailroom could potentially be a decentralised digital mailroom for all other 'Bank A' branches in the future. Lastly, the technology that is needed is access to 'Bank A's Global Contact Application', an email platform, a feedback/query interface, a user accessible portal, scanning and capturing technologies, indexing and validating applications and report generating technology. It is clear that the designed solution is technically feasible.

5.5.3. Economic Feasibility

Economic feasibility is one of the main techniques used to determine the efficiency of a new system. 'Bank A' is billed according to the headcount of UTi employees in the mailroom. It is important to find a balance between the number of employees that are actually needed to run the mailroom and reducing operating cost for 'Bank A'. UTi wants to provide a better service but they also need to ensure that their revenue remains the same or increases. UTi keeps their cost models confidential; however, a comparative cost analysis showed that the digital mailroom would be more affordable fro 'Bank A'.

The designed solution effectively needs 17 or 18 employees compared to the current 22 or 23 employees. The reduction in employees reduces operating expenses for 'Bank A' but it reduces revenue for UTi. UTi would have to cost the mailroom solution using a different cost model in order to keep revenue constant or even increase it.

This is where value added services that UTi provides for 'Bank A' need to be recorded and billed accordingly. The value added services are: third party parcel delivery, archiving/data storage, data security, options of mail delivery and express delivery of mail items. These services should be billed by a cost model designed by UTi. Furthermore, UTi will have to outlay the capital to buy the necessary technology and develop the needed software and applications to support the digital mailroom.

The digital mailroom is economically feasible if the correct cost model is chosen and UTi is able to invest money in innovation and customer capitalism rather than immediate returns on investment.

5.5.4. Legal Feasibility

As discussed in Chapter 2: The Literature Review, the digital mailroom system would have to abide by the Protection of Personal Information Act and the South African Electronic Communications and Transactions Act. 'Bank A' and UTi would have to work closely to draw up contracts on the legality scope; however, according to literature, the digital mailroom is legally feasible.

5.5.5. Cultural Feasibility

Currently, the mailroom process is slow and relies heavily on manual intervention. The staff sort by 'on-the-job' learning and experience. The implementation of a digital mailroom may be resisted by staff because they would have to be trained on how to use the new system. This can be alleviated by ensuring that there are change management systems in place at 'Bank A' to ensure that the transition from the current system to the digital mailroom solution is smooth and does not cause tension in the working environment.

Furthermore, there also may be a resistance to change from the user's side. The banking world is fast paced and for a process to be changed, it would need a detailed implementation plan.

Employees at the mailroom at 'Bank A' are interviewed. The questionnaire can be seen in Appendix E. It was found that out of the ten employees that were interviewed that five of the employees believed that the mailroom is running at its optimum. Furthermore, seven out of the ten employees believed that a digital mailroom can help improve the challenges that are faced in the mailroom. This is a positive statistic because it means that the current employees are open to change. With the correct change management, this solution is culturally feasible.

Chapter 6: Recommendations and Conclusions

6.1. Recommendations

Both short and long term recommendations are made after completing phases 1 to 6 of the project approach.

6.1.1. Short Term Recommendations

This digital mailroom solution is feasible – as seen in the feasibility assessment in the previous chapter; however, if UTi chooses to implement this solution, the change from the current system to the digital mailroom needs to be managed adequately. If the changeover is not managed well, the digital mailroom will not be integrated into the current infrastructure and it will not be successful. Kotter recommended eight steps for change management (Mindtools, 2015):

Step 1: Create urgency
Step 2: Form a powerful coalition
Step 3: Create a vision for change
Step 4: Communicate the vision
Step 5: Remove obstacles
Step 6: Create short term wins
Step 7: Build on the change
Step 8: Anchor the changes in corporate culture

It is recommended that the mailroom staff are trained thoroughly about the new processes, operations and applications that the digital mailroom possesses in order to streamline the workflow and prevent any unnecessary delays. Furthermore, clients need to be inducted to the new mailroom process, this will create awareness of UTi Mounties within 'Bank A' and ensure that the clients know how to use this potential asset.

Risk management is imperative when implementing a new system. Short term risks should be mitigated; potential risks are mentioned in Chapter 5.

The short term goal should be to ensure that the digital mailroom solution at 'Bank A' is perfected so that UTi can offer this solution to their other clients in the future.

6.1.2. Long Term Recommendations

In the long term, the digital mailroom could progress to a fully digital process that is centralised or decentralised and delivers mail to 'Bank A' branches around the country. This could make communication within the 'Bank A' network more efficient and save the company a lot of money.

UTi Mounties will run the digital mailroom and bill 'Bank A' for the value added services. This would require adequate cost engineering and the development of a costing model so that UTi generates sufficient profit.

This system has the potential to have web-based portals integrated into it, iPads could be used in UTi kiosks around 'Bank A' or hand held scanners could be used instead of signing paper. There is so much potential for this system to grow and evolve!

6.2. Conclusion

The goal of this project is achieved by assessing whether the implementation of a digital mailroom is a feasible option for the mailroom at 'Bank A.' The current process has been observed and analysed and it is found that 'Bank A' processes incoming mail manually which is a labour-intensive process that increases operational costs and hinders customer satisfaction due to delays in delivery.

This presents an opportunity to improve the current system by designing a variation of a digital mailroom. After conducting a literature review, the approach to developing a solution for the mailroom at 'Bank A' became clear. UTi wants an affordable yet innovative solution that increases the visibility of the company, decreases manual invention, reduces the need for on-site storage and increases security in the mailroom. Valid alternatives were assessed against certain criteria and the best solution alternative was selected. The digital mailroom solution alternative and the current system were simulated and ultimately, the digital mailroom solution is a better system for the mailroom at 'Bank A'.

Phase 1 to 6 of the 'Project Approach' have been completed. It is clear that the implementation of a digital mailroom at UTi is feasible and it will aid in addressing some of the main problems experienced in the mailroom at 'Bank A'.

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Appendices

Appendix A: Time Study Sheets

***Table 6** – A Time Study based on a Cycle of Many Mail Items*

								Study No: 1						Date : 11/04/2015				Page : 1				
								Operation : Sorting of Incoming Mail (Current System						Operator :				Observer : Jen				
Element No and description		A			B			C			D			E			F			G		
Note	Cycle	R	OT	NT	R	OT	NT	R	OT	NT	R	OT	NT	R	OT	NT	R	OT	NT	R	OT	NT
	1	100	1235	1235	100	438	438	100	1165	1165	100	1650	1650	100	209	209	110	345	379,5	80	1678	1342,4
	2	90	1134	1020,6	100	501	501	110	1305	1435,5	110	1356	1491,6	110	234	257,4	100	289	289	90	1503	1352,7
	3	110	1324	1456,4	110	345	379,5	100	1234	1234	110	1500	1650	110	190	209	90	395	355,5	80	1667	1333,6
System lagging	4	110	1237	1360,7	110	432	475,2	110	1245	1369,5	90	1800	1620	100	187	187	90	357	321,3	100	1409	1409
Key sorter missing	5	100	1123	1123	90	467	420,3	90	1400	1260	95	1567	1488,65	100	207	207	110	298	327,8	100	1487	1487
	6	95	1024	972,8	110	324	356,4	100	1167	1167	95	1478	1404,1	110	218	239,8	100	287	287	110	1395	1534,5
	7	100	1346	1346	100	398	398	100	1134	1134	120	910	1092	100	198	198	95	346	328,7	90	1689	1520,1
Idle time of admin	8	110	1534	1687,4	80	456	364,8	95	1311	1245,45	110	1256	1381,6	95	256	243,2	95	375	356,25	90	1678	1510,2
	9	100	1146	1146	90	487	438,3	95	1306	1240,7	100	1345	1345	110	199	218,9	100	218	218	100	1498	1498
	10	90	1289	1160,1	100	388	388	110	1186	1304,6	95	1447	1374,65	110	238	261,8	100	275	275	110	1564	1720,4
	11	100	1167	1167	100	356	356	110	1034	1137,4	110	1011	1112,1	100	234	234	100	357	357	90	1601	1440,9
	12	110	1129	1241,9	90	496	446,4	110	1289	1417,9	120	808	969,6	120	186	223,2	100	287	287	100	1478	1478
	13	110	1298	1427,8	90	409	368,1	110	1201	1321,1	100	1079	1079	110	203	223,3	100	226	226	110	1434	1577,4
	14	100	1003	1003	100	367	367	110	1156	1271,6	120	790	948	110	212	233,2	110	278	305,8	110	1342	1476,2
	15	90	1201	1080,9	80	569	455,2	90	1398	1258,2	120	837	1004,4	100	266	266	100	245	245	120	1322	1586,4
Summary																						
Total OT		18190,00			6433,00			18531,00			18834,00			3237,00			4578,00			22745,00		
Rating		101,00			96,67			102,67			106,33			105,67			100,00			98,67		
Total NT		18428,60			6152,20			18961,95			19610,70			3410,80			4558,85			22266,80		
No Observations		15,00			15,00			15,00			15,00			15,00			15,00			15,00		
Average NT		1228,57			410,15			1264,13			1307,38			227,39			303,92			1484,45		
% Allowance		0,06			0,06			0,06			0,06			0,06			0,06			0.06		
Elemental Std Time		1302,29			434,76			1339,98			1385,82			241,03			322,16			1573,52		
No Occurences																						
Standard time																						
Total Standard Time [Sum Standard Times for all Elements]																	0,00					

Foreign elements				Time Check			Allowance Summary	
Symbol	W2	OT	Description	Finishing Time			Personal Needs	5%
A				Starting Time			Basic Fatigue	0%
B				Elapsed Time			Variable Fatigue	1%
C				TEBS	0,4		Special	-
D				TEAF	0,2		Total Allowances %	6%
E				Total Check Time			Remarks : Times for a petrol cycle excluding setup and filling times	
F				Effective Time				
G				Ineffective Time				
Rating Check				Total Accounted Time				
Synthetic time				Unaccounted Time				
Observed time			%	Recording Error %				

Table 7 *– A Time Study based on One Mail Item at a Time*

Study No: 1 | Date : 11/04/2015 | Page : 1

Operation : Sorting of Incoming Mail (Current System) | Operator : | Observer : Jen

Element No and description		A			B			C			D			E			F			G		
Note	Cycle	R	OT	NT	R	OT	NT	R	OT	NT	R	OT	NT	R	OT	NT	R	OT	NT	R	OT	NT
	1	100	2	2	100	1	1	110	4	4,4	100	320	320	100	2	2	100	5	5	100	323	323
	2	100	3	3	110	1	1,1	120	5	6	100	234	234	100	3	3	100	6	6	110	312	343,2
	3	110	1	1,1	100	1	1	100	6	6	110	342	376,2	100	5	5	100	4	4	110	314	345,4
	4	110	2	2,2	100	1	1	100	4	4	120	192	230,4	110	3	3,3	100	5	5	100	354	354
	5	90	3	2,7	110	2	2,2	110	3	3,3	120	180	216	100	1	1	110	6	6,6	100	342	342
	6	100	1	1	120	1	1,2	95	7	6,65	120	211	253,2	100	2	2	90	7	6,3	90	346	311,4
	7	110	2	2,2	95	2	1,9	90	6	5,4	120	203	243,6	100	1	1	90	6	5,4	90	345	310,5
	8	110	3	3,3	95	3	2,85	100	5	5	120	245	294	80	5	4	95	7	6,65	100	298	298
	9	110	1	1,1	100	1	1	95	7	6,65	110	265	291,5	95	4	3,8	100	6	6	110	303	333,3
	10	90	5	4,5	110	1	1,1	100	6	6	110	278	305,8	100	2	2	110	5	5,5	100	311	311
	11	110	3	3,3	120	1	1,2	95	8	7,6	100	315	315	110	3	3,3	90	4	3,6	95	301	285,95
	12	100	2	2	120	1	1,2	100	7	7	100	317	317	100	4	4	110	5	5,5	110	289	317,9
Could not find recipent	13	100	4	4	120	1	1,2	110	4	4,4	95	402	381,9	90	5	4,5	110	6	6,6	95	420	399
	14	100	3	3	110	1	1,1	120	3	3,6	100	253	253	95	4	3,8	110	5	5,5	100	367	367
	15	100	3	3	110	1	1,1	120	2	2,4	100	341	341	100	1	1	100	4	4	120	234	280,8
	16	100	3	3	100	1	1	120	3	3,6	100	256	256	110	2	2,2	100	3	3	100	478	478
	17	110	2	2,2	110	2	2,2	110	4	4,4	120	324	388,8	100	2	2	90	4	3,6	100	498	498
	18	120	1	1,2	110	2	2,2	100	5	5	95	289	274,55	95	4	3,8	90	5	4,5	85	321	272,85
Counter paused	19	95	4	3,8	80	5	4	120	2	2,4	100	361	361	95	4	3,8	95	5	4,75	90	293	263,7
	20	90	5	4,5	100	2	2	95	7	6,65	95	303	287,85	100	1	1	110	3	3,3	100	342	342
Summary																						
Total OT			53,00			31,00			98,00			5631,00			58,00			101,00			6791,00	
Rating			102,75			106,00			105,50			106,75			99,00			100,00			100,25	
Total NT			53,10			31,55			100,45			5940,80			56,50			100,80			6777,00	
No Observations			20,00			20,00			20,00			20,00			20,00			20,00			20,00	
Average NT			2,66			1,58			5,02			297,04			2,83			5,04			338,85	
% Allowance			0,06			0,06			0,06			0,06			0,06			0,06			0,06	
Elemental Std Time			2,81			1,67			5,32			314,86			2,99			5,34			359,18	
No Occurences																						
Standard time																						

Total Standard Time [Sum Standard Times for all Elements] 0,00

Foreign elements

Symbol	W2	OT	Description
A			
B			
C			
D			
E			
F			
G			
Rating Check			
Synthetic time			
Observed time			

Time Check

Finishing Time		
Starting Time		
Elapsed Time		
TEBS	0,4	
TEAF	0,2	
Total Check Time		
Effective Time		
Ineffective Time		
Total Accounted Time		
Unaccounted Time		
%	Recording Error %	

Allowance Summary

Personal Needs	5%
Basic Fatigue	0%
Variable Fatigue	1%
Special	-
Total Allowances %	6%

Remarks : Times for a petrol cycle excluding setup and filling times

Appendix B: BPMN Diagram for Current Mailroom

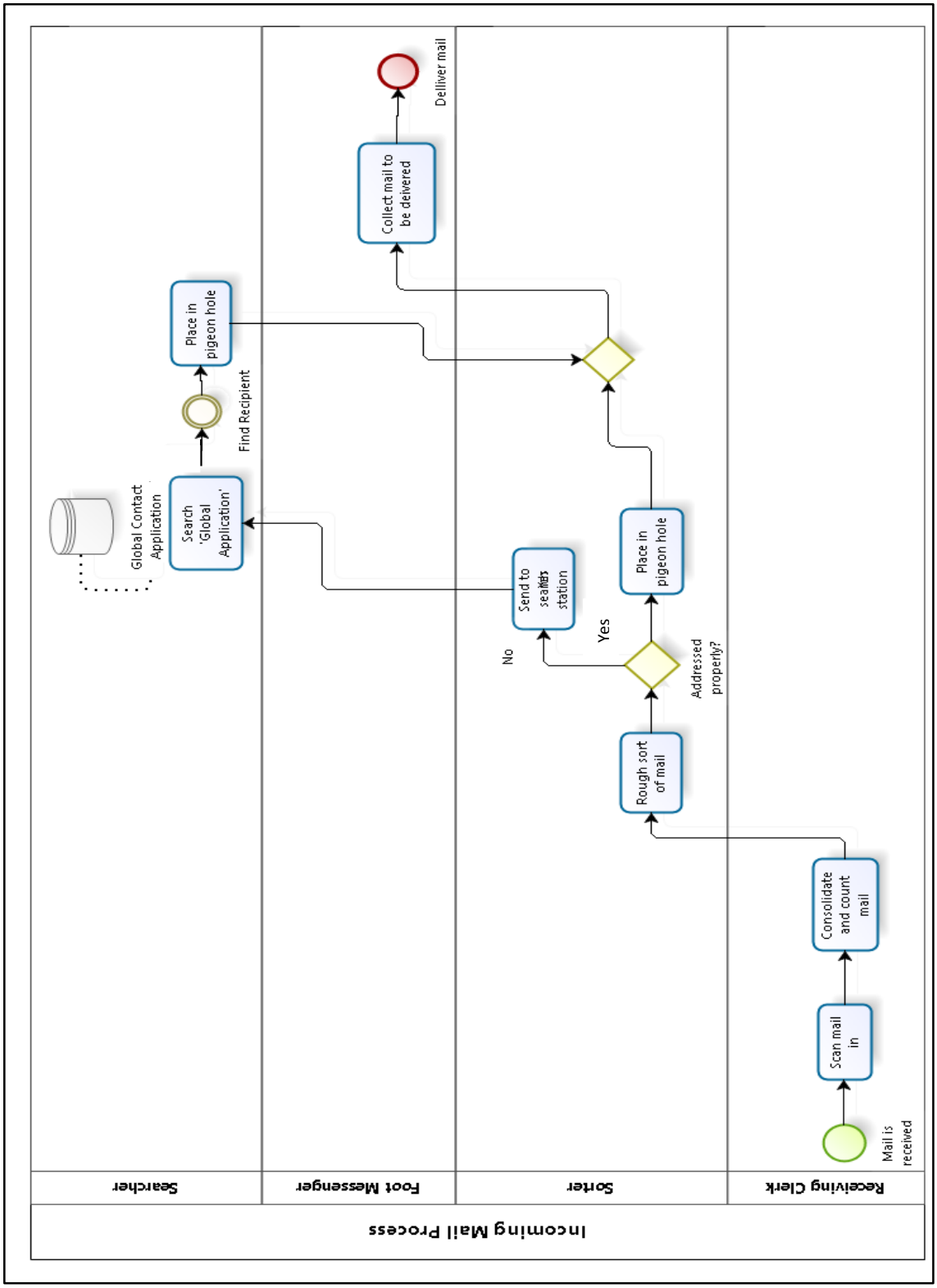

Figure 24 *– A simple BPMN diagram illustrating the existing incoming mail process that the mailroom at 'Bank A' follows.*

Appendix C: BPMN Diagram for Digital Mailroom Solution

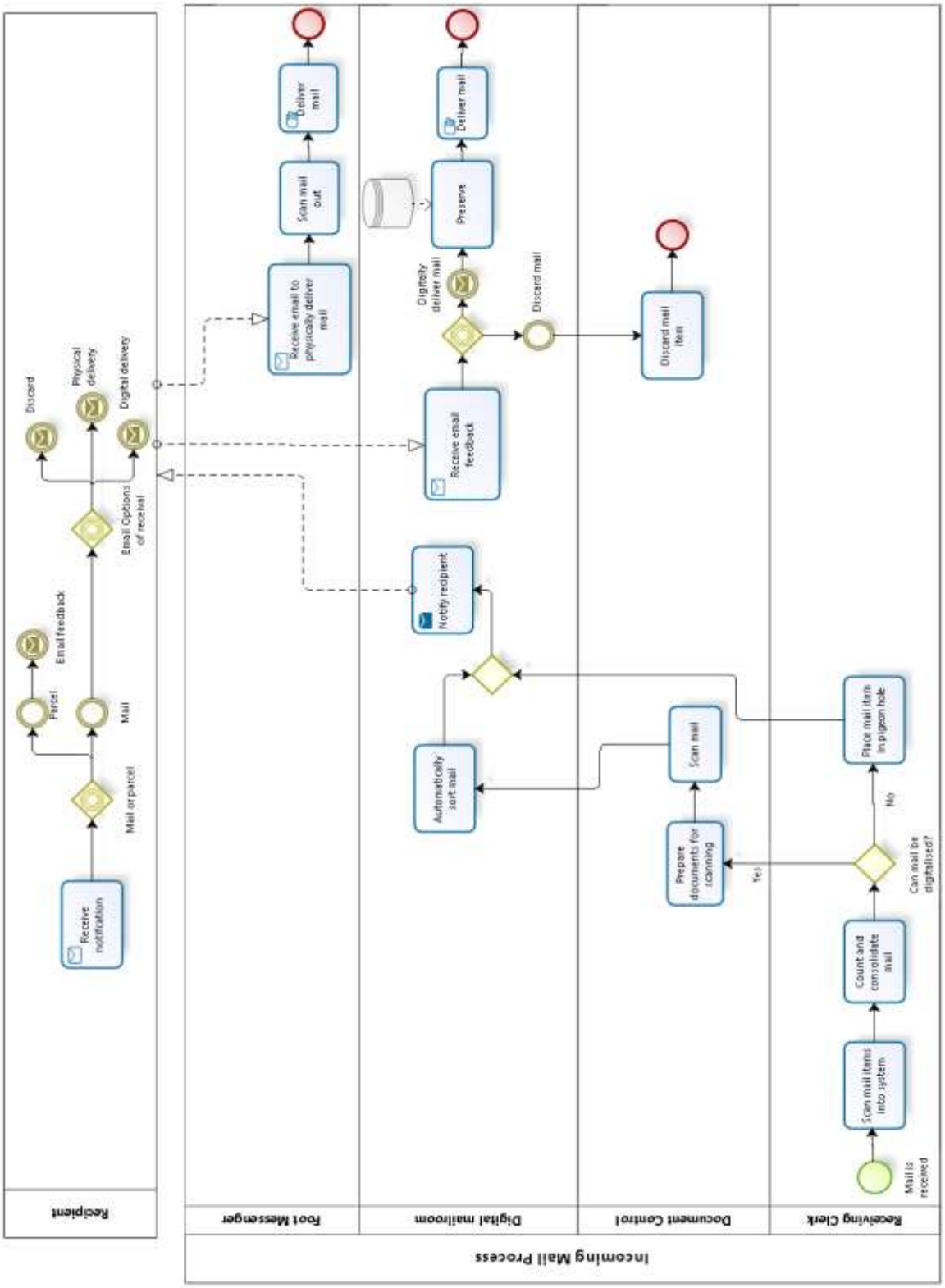

Figure 25 *– A simple BPMN diagram illustrating the incoming mail process for the digital mailroom.*

Appendix D: Data Analysis

Table 8 *– A Table showing the Type of data needed for the Simulation*

	Type of Data	**Type of Distribution**
Number of incoming mail items	Discrete	Poisson
Amount of mail that can be digitised	Discrete	Binomial
Scanning in	Continuous	Normal/Uniform
Rate of counting	Continuous	Normal/Uniform
Rate of sorting	Continuous	Normal/Uniform
Time to place in pigeon hole	Continuous	Normal/Uniform
Collection and scanning out	Continuous	Normal/Uniform
Time to deliver	Continuous	Normal/Uniform
Time to digitise mail	Continuous	Normal/Uniform
Email/Feedback Time	Continuous	Normal/Uniform

Table 9 *– A Table showing the Total Number of staff needed to run the Mailroom*

Month	Total Staff	Admin Staff	Drivers	Messengers	Computers	Vehicles	Learnership
Jan	22	6	5	11	3	5	1
Feb	22	6	5	11	3	5	1
March	23	7	5	11	3	5	0
April	23	7	5	11	3	5	0
May	23	7	5	11	3	5	1
June	23	7	5	11	3	5	1
July	23	7	5	11	3	5	1

Table 10 *– Amount of Mail that is received daily on average per a month*

	Track and Trace		Total Collections & Deliveries	Collections & Deliveries - Drivers	Collections & Deliveries - Footmessengers	Non-Tracked items	Reg Mail	Total number of mail items to be delivered	Working Days in a Month	Percentage of Untracked Mail	Percentage of Tracked Mail
Month	Scan in	Scan out									
Jan	214,95	170,10	859,10	134,67	724,43	554,86	13,05	1 292,33	21,00	42,93	57,07
Feb	258,40	212,50	884,05	179,85	704,20	541,15	19,70	1 265,05	20,00	42,78	57,22
March	228,82	186,14	789,50	184,18	605,32	445,45	40,59	1 091,36	22,00	40,82	59,18
April	184,63	152,32	689,00	164,11	524,89	402,79	29,47	957,16	19,00	42,08	57,92
May	217,10	154,35	641,25	160,45	480,80	320,55	40,45	841,80	20,00	38,08	61,92
June	224,67	155,48	798,71	149,38	649,33	484,57	21,14	1 155,05	21,00	41,95	58,05
July	219,22	146,74	810,52	157,43	653,09	500,09	21,30	1 174,48	23,00	42,58	57,42
Mean	221,11	168,23	781,73	161,44	620,29	464,21	26,53	1 111,03	20,86	41,60	58,40
Standard Deviation	20,18	21,89	81,03	15,78	83,31	76,16	9,89	150,76	1,25	1,70747	1,70747

Appendix E: Questionnaire for Cultural Feasibility

Staff Questionnaire:

1. Do you think that the mailroom is currently operating at its optimum? Yes/No

   Why? _____

2. What challenges do you experience in the mailroom? _____

   _____

3. Are you busy in the mailroom the whole day? Yes/No

4. On average, how long does it take for mail to be delivered? _____

5. How do you sort the mail? _____

   _____

6. Do you think a digital mailroom could help with the problems that are experienced currently in the mailroom? Yes/No
   Why? _____

7. Would you be open to learning new technology that a digital mailroom has?

   _____

8. So you think the current UTi employees will accept this change? _____

   _____