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**Applying Robotic Process Automation to improve
Customer Operations at Vodafone Portugal**

Catarina Filipa Reis Freitas

Project Work report presented as partial requirement for
obtaining the Master's degree in Information Management

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Instituto Superior de Estatística e Gestão de Informação
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APPLYING ROBOTIC PROCESS AUTOMATION TO IMPROVE CUSTOMER OPERATIONS AT VODAFONE PORTUGAL

by

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Project Work report presented as partial requirement for obtaining the Master's degree in Information Management, with a specialization in Information Systems and Technologies Management

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ABSTRACT

The telecommunications industry is becoming more competitive than ever before but is also a sector with low level of differentiation among operators and, in Portugal, is also a sector with numerous complaints from clients regarding the after-sales services, this makes the customer experience a crucial factor to the organization success. Therefore, is vital to evolve and to find ways to fulfil the customers' needs in the more efficient and effective way possible. Robotic Process Automation (RPA) provides a fast and easy way to change the approach of companies to after-sales support, by automating processes that have value to the customer, such as, notify customers of problems occurring in their network, or providing follow up to their service order when they request. The main purpose of this project was to use RPA technology to developed automated workflow systems to solve the major inefficiencies in the Customer Operations department and therefore improve the customer experience in Vodafone Portugal. Thus, to fulfil the project objective, five automations were developed in three teams of the department – 16916, 16913 and Field Service – and other three quick-fix automations (as supplementary projects) were developed for other related teams.

KEYWORDS

Robotic Process Automation; RPA; Telecommunication; Customer Experience; After-Sales

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LIST OF ABBREVIATIONS AND ACRONYMS

ABPMP	Association of Business Process Management Professionals International
AES	Advanced Encryption Standard
ANACOM	Autoridade Nacional de Comunicações
API	Application Programming Interface
ART	Average Response Time
ASS	After-sales Services
BPM	Business Process Management
BPMN	Business Process Model and Notation
BPMS	Business Process Management System
CoE	Center of Excellence
CPE	Customer Premises Equipment
CRM	Customer Relationship Management
CS	Customer Satisfaction
EPCs	Event-driven Process Chains
ERP	Enterprise Resource Planning
FTE	Full Time Equivalent
ID	Identification
IDEF/3	Integrated Definition for Process Description Capture Method
IP	Internet Protocol
MTTR	Mean Time To Repair
OMG	Object Management Group
OPEX	Operational Expenditure
PoC	Proof of Concept
ROI	Return on Investment
RPA	Robotic Process Automation
SAC-FO	Service Assurance Center – Front Office

SIM	Subscriber Identity Module
SMS	Short Message Service
SO	Service Order
UI	User Interface
UML	Unified Modeling Language
XML	Extensible Markup Language
YoY	Year-on-Year

1. INTRODUCTION

1.1. CONTEXT

Nowadays, the telecommunications industry worldwide is becoming more competitive than ever before. Despite the strategic decisions the major players make to enter new markets and joint ventures, the most distinguish success factor these days is the capacity they have to satisfy their customers' needs. According to Ashfaq (2019) in order to differentiate themselves, organizations are attempting to provide value-added services according to their customers' needs and wants. Since after-sales is a crucial factor to enhance customer satisfaction and loyalty, organizations are trying their best to provide an excellent after-sales service (Ashfaq, 2019) therefore, one way to accomplish this is by providing an effective and efficient solution in the points of contact created due to issues customers have along their journey. This objective is partly accomplished with the use of Customer Relationship Management (CRM) systems since, as emphasized by Al-Weshah et al, (2019), these systems allow for more comprehensive analysis thus providing a better customer service.

In Portugal, there are three major players in the industry – Altice Portugal, S.A., NOS Comunicações, S.A. and Vodafone Portugal – Comunicações Pessoais, S. A. – which leads to a competitive environment. According to ANACOM (2019) is possible to conclude with an arithmetic average of the market share by services that Altice has roughly 40,8% of Market Share, followed by NOS with around 34,9% and finally Vodafone Portugal with 20,9%. According to the Report on Complaints in Communications Sector published by ANACOM (2020), Vodafone had less complaints in comparison with the other two players but had an overall increase in an YoY (year-on-year) perspective.

The products and services offered by the competitors offer a *“low level of a differentiation among operators”* (Simões, 2016, p. 9), what makes the customer journey an even greater success factor, as it is what truly makes the difference between which company to choose or not to choose from, especially to corporate clients where the mean time to repair (MTTR) is crucial for their business, as it can affect their performance. According to Santos (2016) Altice uses SIEBEL as their CRM system as well as Vodafone and, as far as I know, NOS also operates using the same system. Since the three competitors use a CRM system, it is needed something additional to differentiate themselves even further.

According to KPMG (2019) RPA has become the second most important technology for business transformation. The leaders in RPA software industry are according to Ray, Villa, Tornbohm, Rashid, and Alexander (2020): UiPath, Automation Anywhere, Blue Prism and WorkFusion.

Besides Vodafone, many companies in telecommunications industry are using RPA, since as stated by Tripathi (2018), the telecommunications market is one the major markets for RPA.

The organizations using RPA (via UiPath Software) to assist their operations are: Elisa in Finland, Orange Spain, NOS – Comunicações in Portugal, DNA Pic in Finland and NTT Communications in 40 countries. Other telecommunication companies that use other RPA platforms are: AT&T that uses Automation Anywhere and Telefonica O2 that uses Blue Prism. (Tripathi, 2018; UiPath, n.d.-c)

Although NOS is also using RPA (via UiPath) to automate their processes, in this project, RPA will be the differentiator between these companies as Vodafone is going further by using unattended robots¹ to fulfil clients' needs in the Customer Operations area, whereas according to UiPath (n.d.-a), in this department, NOS Comunicações S.A. operates attended robots² to support call center staff to assist in areas such as checking customer data in different systems.

Telefonica O2 is one example of the improvements and business value that RPA can deliver to a company. According to Lacity & Willcocks (2016b), Telefonica O2, with approximately 160 robots, was able to process between 400.000 and 500.000 transaction *per month*, securing a 3 years ROI (Return on Investment) of between 650% and 800%. Another benefit obtained was that those automatizations *"... reduced the turnaround time³ from days to just minutes. As a consequence, customer "chase up" calls have been reduced by over 80% per year because fewer customers now need to inquire about the status of service requests."* (Lacity & Willcocks, 2016b, p. 26), this benefit, represents one of the key objectives that Vodafone wants to fulfil with the implementation of automated workflows systems (via RPA) in Customer Operations department of Vodafone Portugal.

1.2. MOTIVATION

According to DECO Proteste (2019), telecommunications providers are the service providers with more complains in Portugal, throughout the past 12 years.

Vodafone strategy has been improved over the years, in December 2019, Vodafone shifted from Vodafone Way approach to Vodafone Spirit approach. In Vodafone Way the customers were one of the main pillars, since Vodafone considered itself as Customer Obsessed which described the desire of exceed customers' expectations, whereas in Vodafone Spirit the organization goes even further, through desiring to earn their loyalty, though continuous improvement and by offering the state-of-the-art services, products, offers and after-sales support in order to improve their experience, every day.

"After-sales service is very important to satisfy and get customers loyalty, especially in the service sector organizations. Hence, the manager should know how to satisfy the customers and how to get the loyalty." (Ashfaq, 2019, p. 37). Having the perception of after-sales relevance, Vodafone will apply Robotic Process Automation (RPA) to Siebel CRM in order to support their strategy and to differentiate the company from their competitors by improving the after-sales support, through the accomplishment of a faster and more effective response to the client complaints and, also become pioneers in preventive support, meaning that Vodafone will alert the client of a situation they don't even realized yet.

Since clients are the main focus of Vodafone and after-sales proved to be a significant driver of satisfaction and loyalty, it was important to take fast action to mitigate the issues that surround after-sales support. But often, fast solutions are costly, therefore, RPA (via UiPath) was the preferred technology for the execution of this project, since is a cheaper and faster solution than ordinary development, therefore it has a better balance between budget and time as *"Many of these tools are easy enough to use so that business operations staff, including people with process expertise but no*

¹ Unattended robots operate without human intervention

² Attended robots require human intervention.

³ Turnaround time (TAT) represents the amount of time taken to complete a process or fulfil a request.

programming experience, can be trained within a few weeks to automate processes.” (Lacity & Willcocks, 2016b, p. 21) thus resulting in cheaper human resources and faster developments and overall savings in costs and time.

The project will allow the improvement of customers journey at after-sales support through automatization of workflows and resultant reduction of costs in support operations, through the decrease of time spent by employees on bureaucratic work that is out of their scope, allowing them to provide better and faster responses to clients.

1.3. OBJECTIVES

The project objective is to implement automated after-sales workflows systems (via RPA) in Customer Operations department of Vodafone Portugal.

In order to reach the main goal, some intermediate objectives (milestones) were defined:

1. Study the best automated after-sales workflows systems and process modelling and RPA implementation practices;
2. Model the Processes (as-is);
3. Analyze and recognize inefficiencies and improvement opportunities that can be automated (partially or completely) and possible earnings;
4. Prioritize automations;
5. Model the Processes (to-be);
6. Develop and implement automatizations in RPA using UiPath.

These milestones provide a path to guide the fulfilment of the main goal.

2. WORK PLAN

In this chapter the Work Plan will be defined, the stages of the Project will be introduced, along with the tools that will support the development of the project and the chronogram proposed.

2.1. PROJECT MANAGEMENT

This project is composed by six Project Development stages, that will support the fulfilment of the main goal and a closing stage where the Results will be evaluated and discussed (see Figure 2.1). These phases are harmony with the BPM lifecycle introduced by Dumas, La Rosa, Mendling, and Reijers (2018) and that is presented in section 3 (see Figure 3.2).

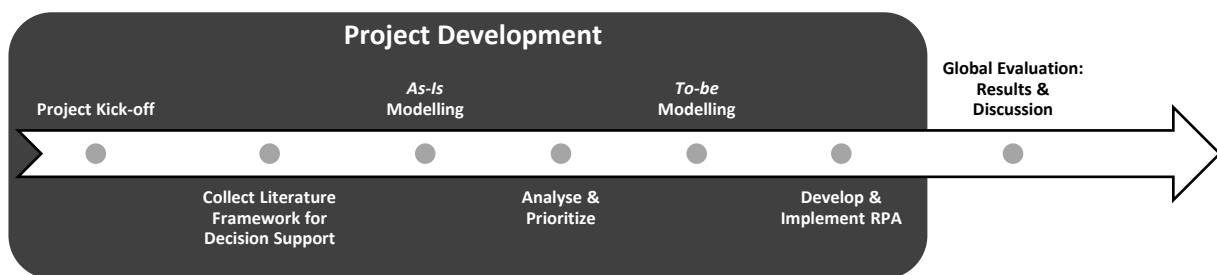


Figure 2.1 - Project Management Stages

Source: Prepared by the author

2.1.1. Phase 1: Project *Kick-off*

The first step consists of the Project Kick-off, where the scope of the Project will be defined, therefore, is necessary to analyze the company (Vodafone Portugal), and more precisely, the department that will be the scope to develop the automation. The outcome of this analysis will allow a more accurate overview of the processes that are available to automate.

Since the Project has the potential to improve the Customer Operations, it might suffer changes regarding the scope, these changes are also introduced in this chapter.

2.1.2. Phase 2: Collection of Literature Framework for Decision Support

In the second phase a Collection of Literature Framework is conducted to support the Decision-making process along the Project. In this stage the most relevant subjects are analyzed, and the theoretical background is presented.

The Literature Framework will gather the most relevant aspects of the BPM, more specifically the BPMN modelling, such as the main challenges, characteristics, and benefits of this modelling option. Furthermore, the RPA developments in after-sales at Telecommunications companies and its implementations will be studied and assessed, to acquire a complete insight in latest scientific advancements to support the path to fulfil this project purpose.

This phase will be in continuous development in conjunction with the project itself, since the outcome of this phase will endorse the decisions made along the project.

2.1.3. Phase 3: As-Is Modelling

In order to facilitate the analysis of the processes, this phase will take as input the available documentation provided by the team and will also be modelled according to a *side-by-side* approach, this is, to come together with the process actors and understand how the process is developed, the challenges they may face and some improvements they think that can be made in the process according with their know-how and experience.

This phase delivers the *as-is* model of the process, and a detailed description of the inputs and outputs of the process, the systems used throughout and, if applicable, the dependencies the process may be affected by.

2.1.4. Phase 4: Analyze and Prioritize

This phase takes as input the *As-Is* model developed in the previous phase and analyses the inefficiencies and the opportunities for automation.

After the analysis, the set of processes are prioritized according to their complexity to automate (i.e. the process is standardized, the systems it uses are stable, among others – see section 3.3.1.1.), the volume of transactions in a defined duration of time, and the expected performance improvement of the processes regarding time, cost or FTEs saved.

If the process is crucial to the department of Customer Operations and the importance is high (eg.: a process that is historically known to be inefficient and is relevant in the internal client operations) this step might be skipped.

2.1.5. Phase 5: To-be Modelling

In this phase the process that will be automated (partially or totally) will be modeled in order to implement the changes.

The output of this phase is an updated model of the process with the measures necessary to mitigate or eliminate the inefficiencies and will serve as foundation for the development of the automation.

2.1.6. Phase 6: Develop and Implement RPA

This phase is where the automation will be developed using UiPath RPA Software.

After the process is developed it will be implemented into the daily operation of the internal client either by unattended or attended approach, depending on the team's intent for the automation.

2.1.7. Global Evaluation: Results and Discussion

This phase will be conducted after all the Project Development stages are completed, in order to construct a Global Evaluation of the Project.

This evaluation will reflect the Results achieved by the Project and furthermore evaluate and discuss them.

2.2. TOOLS

As this project required the modeling and automation of processes the two major tools used in this project were Bizagi Process Modeler and UiPath Studio Software.

Bizagi Process Modeler was the chosen tool for the modeling stages as it fulfilled all the needs of this project, as it was free, user friendly and allowed the processes to be modeled using BPMN.

The implementation of the workflow automations system was executed using UiPath Software since was the RPA Software used in the organization.

The automation via RPA required other applications to be applied to, in this project the applications were Siebel CRM, Microsoft Excel and other peripheral systems such as Vodafone's SMS Broadcast webservice, Vodafone Messaging and eGain.

All the modelling depended on Bizagi Modeler software and the further automations depended on the UiPath platform to be developed and supported, therefore the concepts and parts involved will be described in the following sections.

2.2.1. Bizagi Modeler Core Concepts

This software is part of Bizagi BPM Suite (also called Bizagi Platform), a three-software bundle to turn BPMN models into executable automations (Bizagi, 2020):

- **Bizagi Modeler:**
A process modeling software free of charge (freeware), with an intuitive drag and drop design method, that utilizes BPMN notation.
- **Bizagi Studio:**
A software to transform, design and automate the process model into executable applications and workflows with low-code. Bizagi Studio also offers an integration with UiPath that allows the execution of a robot at a specific step of a process and input the parameters it needs for the execution.
- **Bizagi Automation:**
A module to execute and control the applications developed in Bizagi Studio.

As stated by Bizagi (2020) the Modeler has simple, easy and intuitive interface as demonstrated in Figure 2.2, as it is composed by only five main elements:

- **Toolbar** – Contains customizable quick access commands;
- **Ribbon** – Contains the main functionalities to manage the model;
- **Palette** – Contains all the graphical BPMN elements (see section 3.2.4.1.) to be drag and dropped to the diagram to develop the model;
- **Element Properties** – Used to document the process by changing the properties of each element in the model;
- **View** – Are options to help navigate through the project, allowing to zoom-in and zoom-out or fit diagram, if needed.

The software functionalities allow a complete experience as it enables the modeling and documentation of processes and the simulation of different scenarios in a process and finally the option to export the documents to different formats.

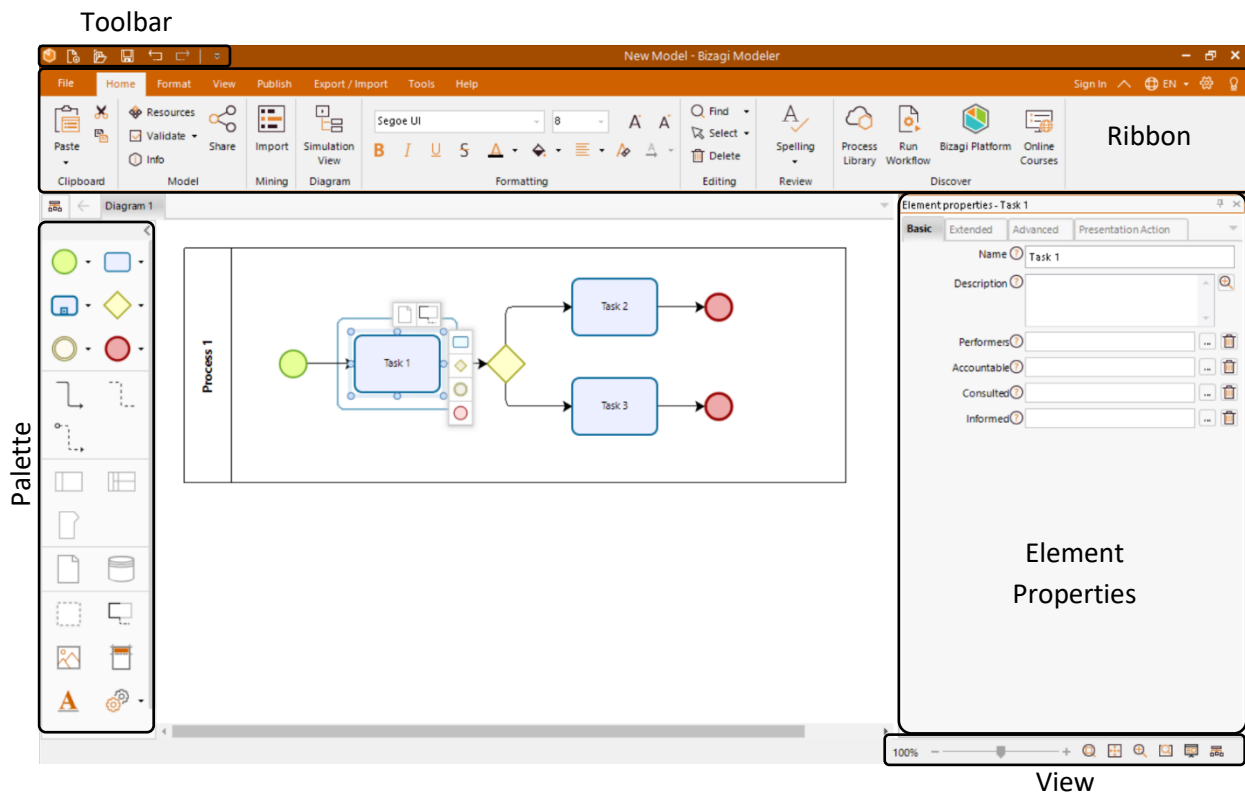


Figure 2.2 - Bizagi Modeler User Interface

Source: Prepared by the author via Bizagi Modeler

2.2.2. UiPath's Core Concepts

UiPath is an automation platform that features three main products: UiPath Studio, UiPath Robot and UiPath Orchestrator. All the products play a specific part in UiPath's automation abilities.

UiPath Studio is the tool that enables the design of automations through a visual approach with diagrams. The automations developed in UiPath Studio are then executed with another product known as UiPath Robot. UiPath also has a product responsible for the management of automations, which is the UiPath Orchestrator, this is a web application that enables deploy, schedule, monitor and manage robots and processes.

2.2.2.1. Studio Activities

UiPath Studio is composed by several packages of activities, each of them covers a certain area of interest.

By default, every project has four dependencies: UiPath.Excel.Activities, UiPath.Mail.Activities, UiPath.System.Activities and UiPath.UIAutomation.Activities, but if new functionalities are necessary to the automation development, more packages can be installed through the tab "Manage Packages"

in UiPath Studio, then those functionalities will be available in the Activities panel of the project (see Figure 2.3).

Every activity has a set of properties to configure it in more detail, those properties are available for adjustment through the Properties panel (see Figure 2.4) (UiPath, 2020c).

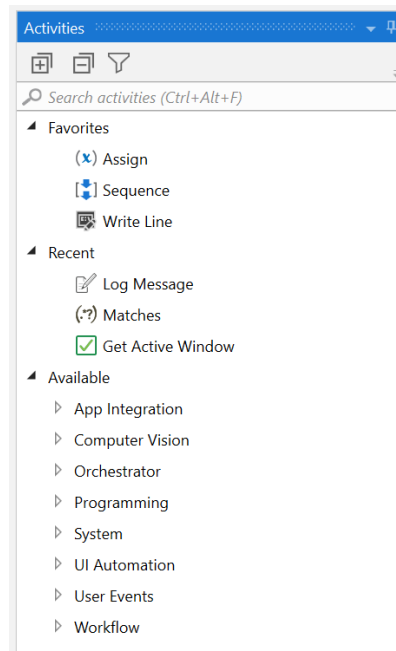


Figure 2.3 - Activities Panel from UiPath Studio

Source: Prepared by the author via UiPath Studio

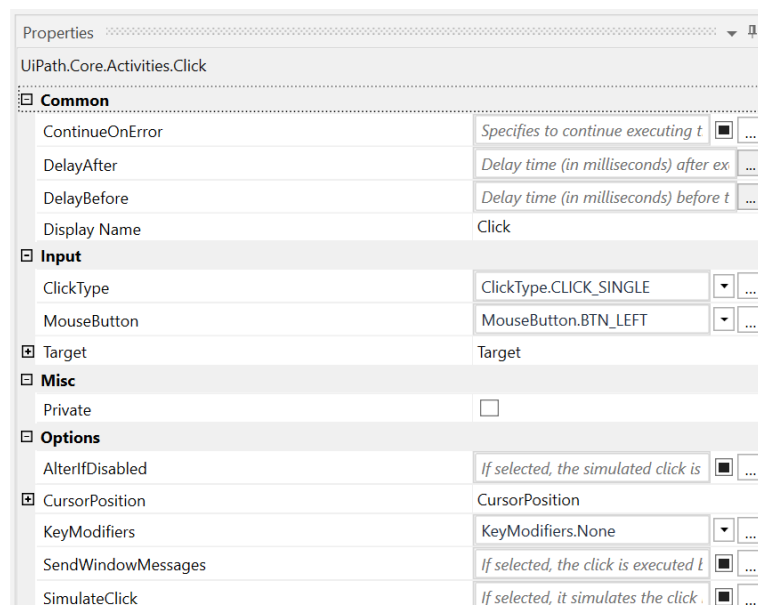


Figure 2.4 - Properties Panel from UiPath Studio

Source: Prepared by the author via UiPath Studio

2.2.2.2. Selectors

RPA acts mostly in the User Interface (UI), and because of it, most RPA products rely on UI elements position, this can cause problems if the layout changes. As an alternative, UiPath Studio uses selectors to store attributes of the graphical interface element in XML to have a more precise and future-proof automation.

Selectors have a great role in the UI activities provided by Studio, such as “Type Into” and “Click”. Those selectors can be changed automatically and validated through the Selector Editor (see Figure 2.5) and are then stored in the properties of the activity it refers to (UiPath, 2020b).

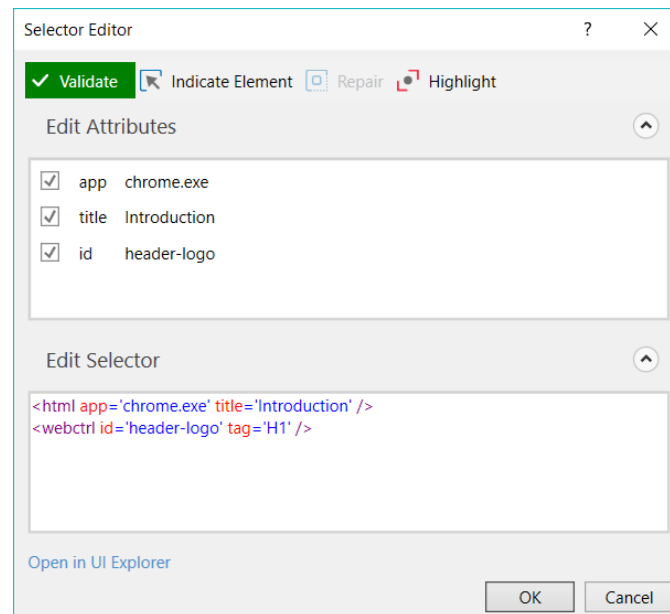


Figure 2.5 - Editing and Validating a Selector in the Selector Editor

Source: (UiPath, 2020b)

2.2.2.3. Orchestrator Assets

UiPath Orchestrator allows the developer to store assets that the robots can easily access it. This feature is vital to guarantee a secure automation since Orchestrator provides an extra layer of security, through AES 256 encryption algorithm (UiPath, 2020a).

If the robot has the required permissions, it can access the assets value through activities available in UiPath Studio by providing the Asset name.

Orchestrator provides four types of assets depending on the type of values it stores:

- **Text** – available to store Strings;
- **Bool** – supports True or False;
- **Integer** – available to store numbers;
- **Credential** – contains usernames and passwords that the Robot requires to execute the process.

The assets can also be defined by the availability of the value, it can be a Global Value or Value Per User, this means, that the value can either be the same and available to all the users (unless a specific value is assigned to them) or the value can be available to only a specific set of users and can be changed for each of them (UiPath, 2020a).

2.2.2.4. Orchestrator Queues

Orchestrator allows the creation of containers to store unlimited number of items to be processed, also called, queues. The queue items can store multiple types of data, this data can be used as an input to the process or can be store as the output of the process.

It is possible to create new items in the queue manually, via Orchestrator, or automatically through the process itself. As the activities in Studio, also the queue items have properties that define them such as:

- **Reference** – allows the user to search for a specific transaction;
- **Deadline** – The date before which the queue item should be processed;
- **Postpone** – The date after which the queue item may be processed;
- **Priority** – Priority of the item: Low, Normal or High.

A process that is responsible to add items to a queue is labeled as Dispatcher and the process that process those items is called Performer.

2.2.2.5. Orchestrator Triggers

To process a queue item is necessary to prompt the automation, the conditions to which a process is prompt are defined through the orchestrator triggers.

Triggers allow the jobs to execute in a scheduled way, at regular intervals through time triggers or when new items are added to a specific queue through queue triggers. In both types of triggers there are parameters to further configure the queues.

In the case of time triggers it is possible to configure the orchestrator to execute the process on different targets: across a dynamically allocation approach, in specified robots or on all robots. Moreover, it is possible to define when to stop or kill the job to prevent it from taking longer than expected and to define when to disable the trigger automatically, this feature is useful when a maintenance occurs during non-working hours and the trigger can be stablished to disable on those hours. Also, is possible to define calendars with non-working days restrictions to be applied to the process trigger.

In queue triggers it is possible to configure the minimum number of items to trigger the first job, maximum number of pending and running jobs allowed simultaneously and when another job is triggered for each time a specified number of new item(s) are added to the queue.

2.2.2.6. Robotic Enterprise Framework (REFramework)

This framework was developed by UiPath to be prepared to face all the challenges of automating a complex business scenario.

The framework is an UiPath Studio automation template composed by several State Machines to represent a particular circumstance of the execution while ensuring the usage of all the best practices regarding logging, exception handling and application initialization (see Figure 2.6).

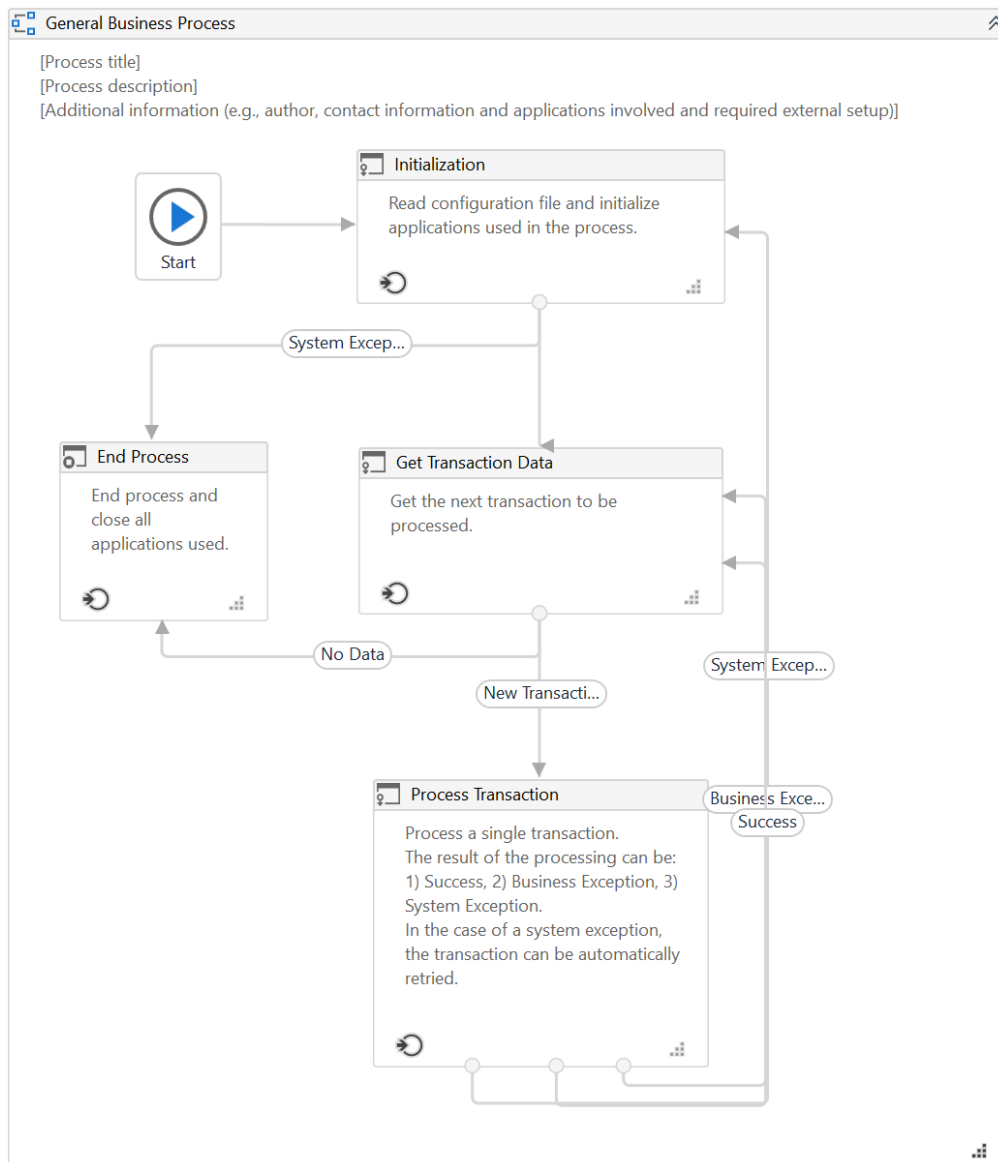


Figure 2.6 - UiPath's Robotic Enterprise Framework

Source: Prepared by the author via UiPath Studio

The four State Machines that compose the REFramework are described as follows:

1. **Initialization or “Init State”:**

In this state the configuration file is read, the machine environment is cleaned, and the applications required to the process are initialized.

This state has two possible transitions, if the initialization is successful, the execution proceeds to the Get Transaction Data State, otherwise it will proceed to End Process State;

2. **Get Transaction Data:**

This state is intended for obtaining the next transaction to be processed, this transaction can be obtained from spreadsheets, APIs or databases but the default source is UiPath queues.

In this state is possible to make the REFramework allow for a linear process (i.e. with only a single transaction) by assigning the transaction item variable only when the transaction number has the value of 1 (i.e. first and only transaction) otherwise the transaction item should be set to Nothing to allow the process to proceed to the End State.

This state has two possible transitions, if any error arises during the state or there are no data to be processed, the execution proceeds to the End Process state, otherwise if the transaction is retrieved successfully, it will be processed in the Process Transaction state.

3. **Process Transaction:**

In this state the current transaction will be processed. The outcome of this state can be Success, Business Exception or System Exception.

In case of Success the execution returns to the Get Transaction Data state to retrieve a new transaction to process.

In case of Business Exception, the current transaction will be skipped, and the execution will proceed also to Get Transaction Data state to retrieve a new transaction to process, since the outcome will not modify with another retry.

Likewise, in case of System Exception, the execution will return to Get Transaction Data state but to retry the process on the current transaction, if the current retry is less than the maximum defined for the process.

4. **End Process:**

In the last state the process will be finalized, and the applications used will be closed to ensure a clean environment after the process is complete.

The Robotic Enterprise Framework was established by the Center of Excellence of Vodafone Portugal as one of the requirements and good practice to develop automations inside the company and can be applied to the development of both Dispatcher and Performer automations.

2.2.2.7. Configuration File

The Configuration file is a feature from REFramework that assures the centralization of all the settings and relevant information to the automation project while ensuring the protection of information. This feature can be transposed to other processes that are developed outside the framework.

The Excel file contains three sheets concerning distinct information's: Settings, Constants and Assets (see Table 2.1).

Configuration Sheet	Data
Settings	• Store Orchestrator Credential; • Store Orchestrator Queues; • Folder Paths; • URLs;
Constants	• Define Max Retry Number (<i>per</i> item); • Define constant Logs; • Define Folders to store Screenshots;
Assets	• Store Orchestrator Assets;

Table 2.1 - Configuration File per sheet

Source: Prepared by the author

Although Credentials are one type of Orchestrator Assets it cannot be stored in the Assets sheets since credentials have two values (User and Password). Therefore, the credentials name should be store in Settings sheet instead.

2.3. CHRONOGRAM

The Figure 2.7 describes the planned chronogram associated with the project. The schedule is composed by seven phases, four milestones and three deliverables.

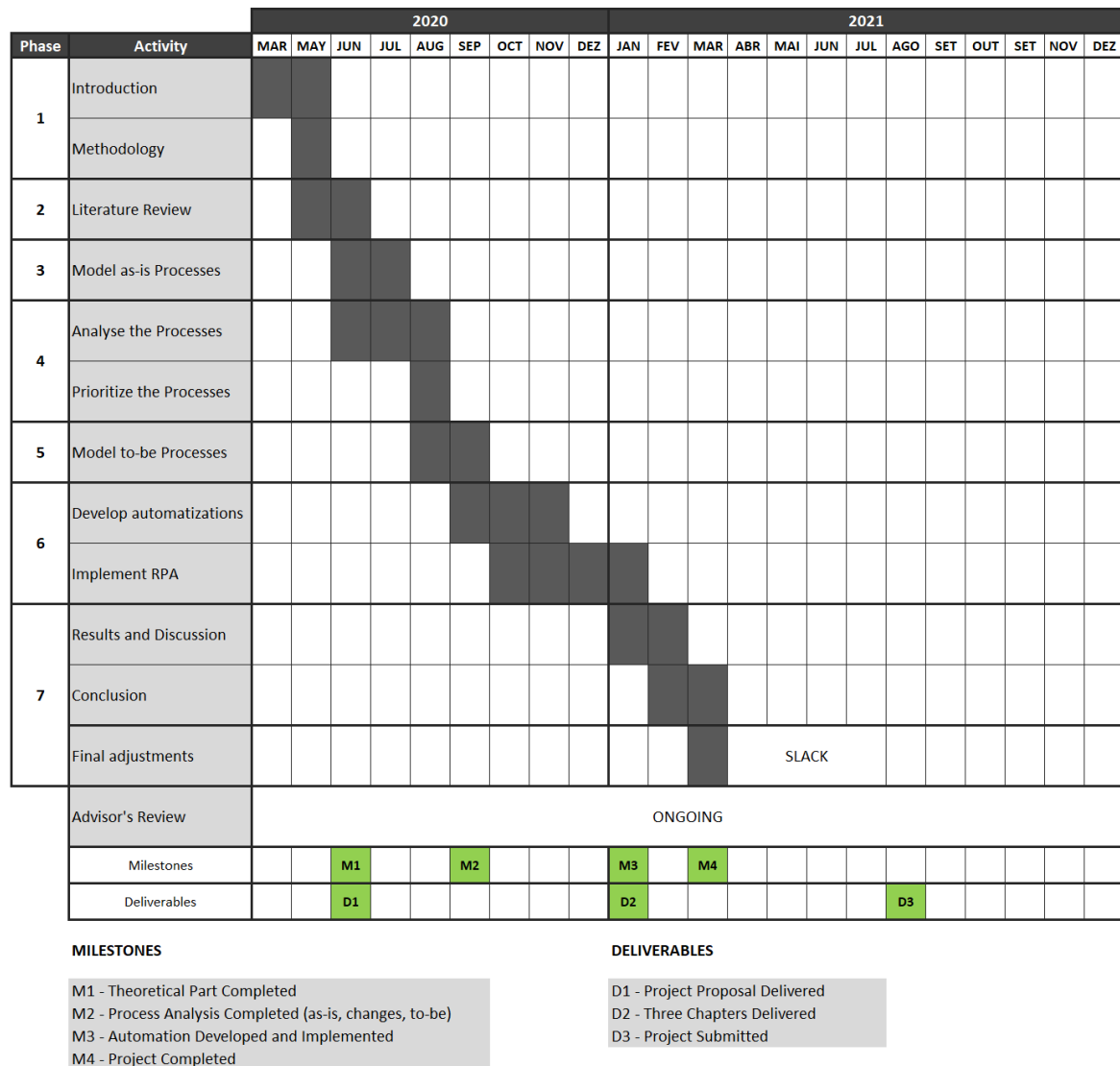


Figure 2.7 - Project Chronogram

Source: Prepared by the author

3. THEORETICAL FRAMEWORK

To accomplish the goals established previously, it was necessary to collect knowledge and experience the scientific community has on the main subjects mentioned in the project.

Hence, this chapter will start with a description of the After-sales services regarding the telecommunications sector, followed by an introduction to Business Process Management with emphasizes in BPM Lifecycle and BPMN (Business Process Model and Notation) modelling language. Lastly, it is introduced the RPA technology, particularly its main concepts, such as, the best practices in RPA implementation, benefits and challenges, tools and advances made in the Automated after-sales workflow systems.

3.1. AFTER-SALES AT TELECOMMUNICATIONS COMPANIES

3.1.1. Overview

“After sales service entails all of the activities that take place during the product use cycle – from the time of purchase to the time when a product is taken out of service by the customer.” (Murali, Pugazhendhi, & Muralidharan, 2016, p. 69).

After-sales services (ASS) describes the services that are provided subsequent to the delivery of the product and/or service, in the particular case of telecom companies, these services are composed by activities to provide technical advice, maintenance and repair solutions to their customers. (Ashfaq, 2019; Nawaz, 2018).

The quality of telecom services often rely on devices located at customer’s site, as a result the after-sales services can also be called as “field services” when it’s required to provide repair or maintenance to those devices or structures (Nawaz, 2018).

3.1.2. Company Point of View

3.1.2.1. Goals

According to Murali et al., (2016) the main objective of every business is to satisfy the existing customers and attract new ones, hence, the customer satisfaction is vital, and it cannot be considered as a separate function in business, consequently *“Every organization is trying to differentiate itself in the market by providing value-added services according to the customers’ needs and wants.”* (Ashfaq, 2019, p. 32).

Therefore, as stated by Nawaz (2018), companies worldwide are more concerned with the customer satisfaction as they face increasing competition, slower growth rates and strengthened price pressure, consequently, satisfaction has developed into an *“... important determinant of customer retention which, in turn, has a very strong effect on profitability.”* (Nawaz, 2018, p. 1).

Customer satisfaction relevance led after-sales service to *“become an essential factor for all organizations nowadays, organizations are merging several marketing mixes in different ways to enhance customer satisfaction and loyalty. Organizations are trying to provide excellent after-sales service to customers and using several techniques to retain them as loyal.”* (Ashfaq, 2019, p. 32).

Overall, as stated by Ashfaq (2019), after-sales service can be considered as a main competitive differentiator and major revenue generator.

3.1.2.2. Challenges

One of the challenges is the possibility of the company *“Failing to realize the importance of the factors may result in a disastrous business relationship since this kind of lack of understanding may lead dissatisfied customers switch to a competitor or the company lose potential for new customers due to negative word-of-mouth effect. Hence, it becomes pertinent for every business to know the importance of the different ASS factors so as to devise strategies to improve CS and to make them loyal.”* (Murali et al., 2016, p. 70)

Providing valuable after-sales service to customers can be challenging, particularly in the telecommunications sector since *“It needs a strong follow up of customers complain, skilled technical staff, to fix the customers complaint, and to upgrade the Internet service consistently.”* (Ashfaq, 2019, p. 32).

3.1.3. Customer Point of View

“Customers expect high quality ASSs and good ASS quality leads to long-term customers’ relationships reflected in re-patronage by customers, as customers recommend the service to others.” (Murali et al., 2016, p. 70).

This belief was reinforced by Nawaz (2018) that affirmed that positive perception of quality by customers leads to the attraction of new customers through word-of-mouth and recommendations as well as, to improve the relationship between the company and its customers by making them more loyal and committed.

According to the results obtained by Ashfaq (2019) the after-sales dimensions evaluated (i.e., delivery, installation, warranty, telephone and online support, upgradation and complaint) affected both directly and indirectly the customer loyalty through the overall satisfaction with the company. The result obtained by the author confirms the importance of after-sales service in the satisfaction and loyalty of customers, especially in service sector organizations, such as the telecom sector.

3.2. BUSINESS PROCESS MANAGEMENT

3.2.1. Overview

In order to fully comprehend the relevance of Business Process Management (BPM) is necessary to understand the concept of business process since they are core point of BPM as stated by Dumas et al., (2018).

According to Weske (2019) a business process is a set of activities performed in coordination to achieve a business goal, these activities take place in an organizational environment, but it may interact with business processes of other organizations. In a more in-depth description, a business process is considered as *“a collection of inter-related events, activities, and decision points that involve a number of actors and objects, which collectively lead to an outcome that is of value to at least one customer.”* (Dumas et al., 2018, p. 6).

Both definitions describe the importance of business processes to achieve business goals and improve customers' perception of value. The processes can occur only inside one organization or can surpass that barrier and interact with other organizations, therefore the processes need to be coordinated and optimized, thus, is necessary to correctly manage those processes through Business Process Management.

Business Process Management is, according to Dumas et al., (2018), a cluster of several methods, techniques, and tools which the main goal is to optimize business process performance through their proper identification, discovery, analysis, redesign, execution, and monitoring. But the author goes further and considers BPM as *“the art and science of overseeing how work is performed in an organization to ensure consistent outcomes and to take advantage of improvement opportunities.”* (Dumas et al., 2018, p. 1). Both authors understanding of BPM reflects the definition applied by the Association of Business Process Management Professionals International (ABPMP) where they stated that *“Business Process Management (BPM) is a management discipline that integrates the strategy and goals of an organization with the expectations and needs of customers by focusing on end-to-end processes. BPM comprises strategies, goals, culture, organizational structures, roles, policies, methodologies, and IT tools to (a) analyze, design, implement, control, and continuously improve end-to-end processes, and (b) to establish process governance.”* (ABPMP, 2013, p. 27).

Furthermore, as Weske (2019) stated, organizations must focus their attention in the processes in order to organize the change and optimize to the fullest the degree of automation, therefore, process models are crucial instruments to automate business process, through the understanding, evaluation and improvement of the processes.

Nowadays, BPM is further relevant since its *“concepts and techniques has also been fueled by the digital transformation that continues to impact many aspects of how businesses are run today.”* (Weske, 2019, p. IX).

3.2.2. BPM Lifecycle

Szelągowski (2018) portrayed BPM lifecycle as an overview that combines how to implement and manage business processes in an organization and the main goal is to present in a simple and comprehensive way, the main idea and guiding principles to which the processes should be managed.

This lifecycle is a demonstration of one BPM Core Concept introduced by ABPMP (2013), that declares that *“Business Processes should be managed in a closed-loop cycle to maintain process integrity and enable continuous improvement”* (ABPMP, 2013, p. 43).

ABPMP (2013) designated as BPM lifecycle phases: Process Modeling, Process Analysis, Process Design, Process Performance Management and Process Transformation but many others developed other versions of BPM lifecycle that, despite the number of phases that compose them, and the nomenclature used to define their phases, most of the BPM lifecycles developed by other authors can be mapped to the Plan, Do, Check, Act (PDCA) Cycle developed by Dr. W. Edwards Deming in the 1950s.

Deming’s PDCA cycle (see Figure 3.1) is composed by four phases described by ABPMP (2013) as:

- **Plan Phase:** has the goal to guarantee that business process context and internal process design are aligned with the strategic objectives of the organization (i.e. Process Planning and Definition);
- **Do Phase:** has the goal to deploy the process according to the specifications established in the Plan Phase and to commit the process to operations (i.e. Detailed Process Design, Build, and Deployment);
- **Check Phase:** has the purpose to measure and compare the process performance against performance expectations (i.e. Performance Monitoring and Reporting);
- **Act Phase:** has the purpose of revise and react accordingly to the process performance data, collected in the “Check” phase. It allows the preservation of process integrity and ensures that the process can be continually enhanced to meet new performance goals (i.e. Response to Change and Continuous Improvement).

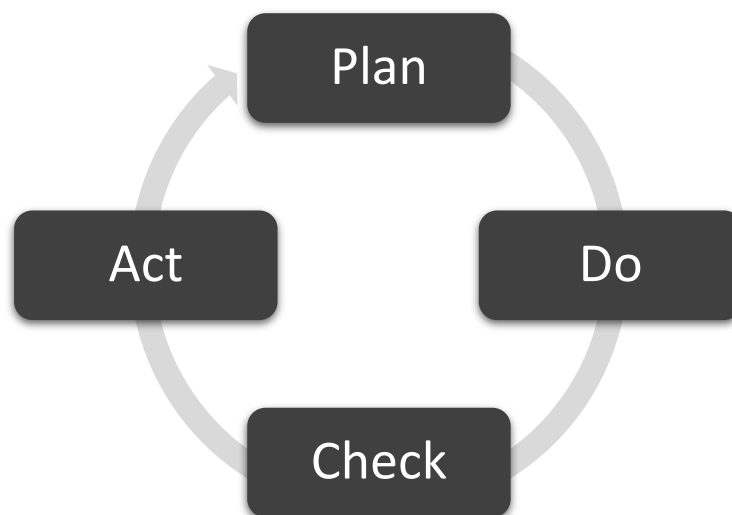


Figure 3.1 - Deming's Plan Do Check Act (PDCA) Cycle

Source: Adapted from (ABPMP, 2013)

The workplan of the project is developed based on Dumas et al., (2018) Business Process Management lifecycle, involving the following six phases (see Figure 3.2):

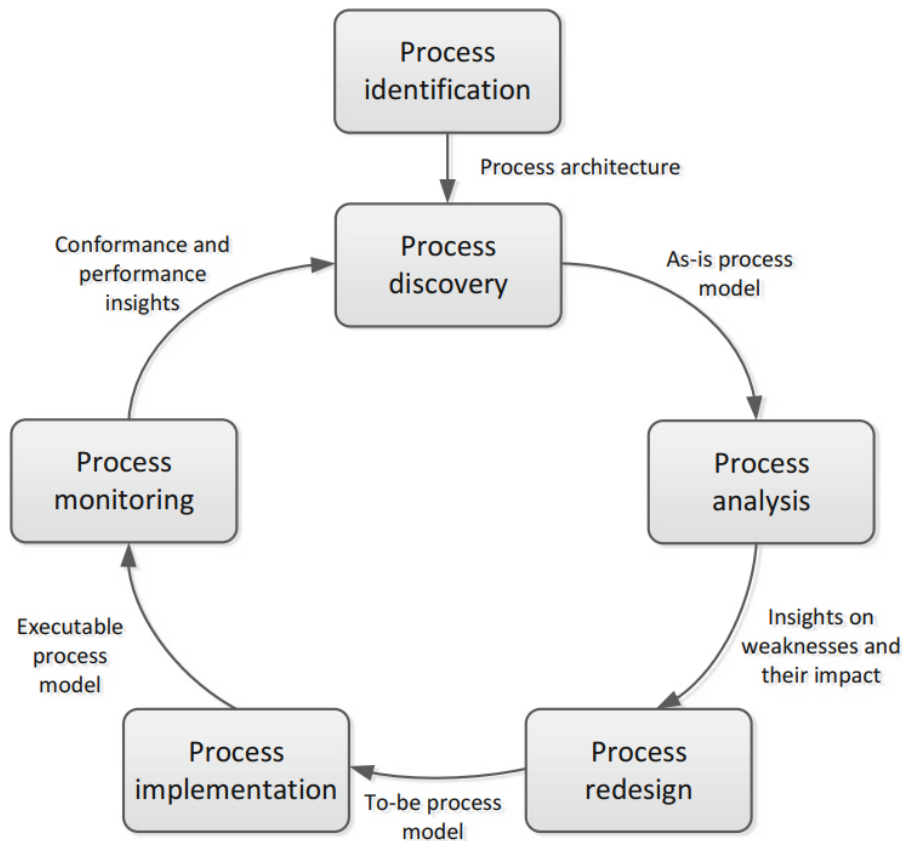


Figure 3.2 - BPM lifecycle

Source: (Dumas et al., 2018)

3.2.2.1. Process Identification

The first step into BPM is Process Identification, according to Dumas et al. (2018) in this phase the business problem is presented and the processes that are relevant are identified, bordered, and inter-related, resulting in a process architecture that will provide a high-level overview of the processes, the organization, and their relationship, which will also allow to establish criteria for selecting processes for improvement.

Dumas et al. (2018) also stated that Process Identification is achieved in a two-step method: firstly, the process architecture is defined, and an initial list of processes and their architecture is obtained, afterwards the criteria for assessing performance are defined in order to prioritize the business processes for improvement. The criteria for assessing performance can be developed using process performance measures in combination with other criteria such as strategic importance and feasibility.

Process Performance Measures will be discussed in more detail in section 3.2.3. of this paper.

3.2.2.2. Process Discovery

This phase is also referred by Dumas et al. (2018) as “*as-is process modelling*” as it is the stage where the relevant processes are documented.

Dumas et al. (2018) identified two crucial roles to the development of this phase, the Process Analyst which is the person responsible for the information gathering and process modelling and the Domain Expert which can be one or more persons that possess the necessary *know-how* to explain the process and its particularities. Therefore, both roles serve a place in process modelling stage as according to ABPMP (2013), the purpose of this phase is the development of a representation that describes the process in an truthful and adequate way (hence the necessity of Domains Expert) for the purpose it is necessary, therefore the model can be adapted to be simple and high-level or complex and low-level (hence the necessity of a Process Analyst to develop the model according with the objective).

To model the process is used a modeling notation. A notation is a “*A standardized set of symbols and rules that govern how the symbols represent something else.*” (ABPMP, 2013, p. 93) which indicates that the model is structured by symbols and rules. ABPMP (2013) suggests the use of modeling notations that follow standards and well-known practices in oppose to other approaches as it allows a more consistent understanding and universal way to communicate, hence allowing a simpler method to apply the BPM lifecycle. The modeling notations will be described in more detail in section 3.2.4..

While performing the process discovery, three main challenges may arise according with Dumas et al. (2018):

1. The fragmented process knowledge, where the knowledge of the process resides in different resources therefore is necessary to gather the process details with multiple Domain Experts that usually have an abstract understanding of the general process, which is a challenge when combining all the Domain Experts view into one single process;
2. The Domain Experts think of processes on a case level instead of high level, which can lead to problems when trying to understand the process in general;
3. The Domain Experts have no familiarity with BPM languages which can lead into difficulties to come to an agreement about the process modelling.

3.2.2.3. Process Analysis

According to Dumas et al. (2018), after the as-is process is modeled, the issues are identified, documented, and measured according to their impacts on performance and through this analysis a structured set of issues is gathered, and will be later prioritized based on their potential impact and effort expected to solve them.

ABPMP (2013) states that through the monitoring of metrics is possible to indicate if the process is too expensive or is underperforming, thus this analysis provides measures to understand the effectiveness and efficiency of the process.

Dumas et al. (2018) considers that Process Analysis has two pillars: Qualitative analysis and Quantitative analysis and describes Qualitative Analysis as an approach to identify possible inefficiencies of the process through different techniques such as Value-Added Analysis, Waste Analysis, Stakeholder Analysis, Issue Register and Root Cause Analysis and considers Quantitative

Analysis as the analysis of the process in terms of performance measures (see section 3.2.3.) such as Cycle Time, Waiting Time and Cost Measures with techniques such as Flow Analysis, Queueing Analysis and Simulation.

In conclusion, according to ABPMP (2013) this phase produces a valuable management resource as the management can ensure that the processes are optimal to attain the business objectives through the gathering of information and analysis of measures.

3.2.2.4. Process Redesign

This phase is also referred by Dumas et al. (2018) as “*process improvement*” as the main goal of this phase is to identify changes to the process that would help to solve or mitigate the issues identified in the previous phase and consequently allow the organization to achieve the performance objectives.

ABPMP (2013) provides a similar point of view as it states that the design/redesign phase focuses on the improvement of efficiency, effectiveness, quality and consistency of the process while taking into account the aspects of the current operation and its requirements and the concerns and opportunities that exist in the process.

Numerous changes can be considered to address a single issue and later those changes are evaluated and compared in terms of performance gains.

Process Analysis and Redesign are closely related as this phase is responsible to provide a solution to the issues encountered in Process Analysis since the output of this phase is a to-be process model containing the most promising shifts proposed to solve those issues.

3.2.2.5. Process Implementation

In this phase, the work put into “paper” (also described by Dumas et al. (2018) as “*conceptual process model*”) is brought to reality through the preparation and execution of the changes required to transform the process itself from the as-is to the to-be model.

According to Dumas et al. (2018) this phase requires the consideration of two aspects: Organizational Change Management and Automation. The set of activities that are required to transform the way of working of the involved participants in the process is Organizational Change Management whereas the Process automation, on the other hand, refers to the development and deployment of IT systems (or enhanced versions of existing IT systems) that support the to-be process.

3.2.2.6. Process Monitoring

Dumas et al. (2018) pronounces this phase as subsequent to the implementation of the redesign process (to-be process), and described it as the phase which the relevant data is collected and analyzed to determine the process performance and, some behavior issues – such as errors and bottlenecks – are detected and corrective actions are put in place.

Dumas et al. (2018) also stated that new issues may arise afterwards, therefore this requires a cyclic approach to be executed on a continuous basis to keep the continuous improvement of the process.

3.2.3. Process Performance Measures

According to Dumas et al. (2018) the main Process Performance Measures often are: Time, Cost, Quality and Flexibility, as any organization want a faster, cheaper and better process. While ABPMP (2013) also considers Capacity as a measure instead of Flexibility.

These dimensions are described in more depth as follows (ABPMP, 2013; Dumas et al., 2018):

- **Time** – this dimension is associated with process duration.
 - Cycle time (or throughput time) is a measure that represents the time it takes from the start of the process until its completion;
 - Processing Time (or service time) is a measure that reflects the time actually spent by process participants handling the case;
 - Waiting Time (queueing time) is the measure that reflects the time a case spends in idle mode;
- **Cost** – this dimension is associated with the cost of a process, it is normally monetary cost but it can be also consider other types of costs (e.g. Resource costs)
- **Quality** – this dimension has two point of view: Clients and Process participants.
 - Client PoV – the most common measures are Service Level Agreements (SLAs); Churn Rate (to understand how many clients don't complete the interaction successfully); Net promoter score (how far customers would be willing to recommend a product or service)
 - In the case of Process participants the quality concerns the level of control the process participant feels over the work performed or if the work is challenging, among others.
- **Flexibility** – this dimension reflects the ability of a process to react to changes, and can assume different forms such as: ability of resources execute different tasks in the process, ability of the process to handle various cases; ability of the process to change according with the market and business partners needs.
- **Capacity** – this dimension is associated with the volume of outputs originated by a process.

3.2.4. Business Process Modelling

Business process models are according to Dumas et al., (2018) relevant at many stages of the BPM lifecycle, and there are many languages that are used to model processes such as Business Process Model and Notation (BPMN), IDEF/3 (Integrated Definition for Process Description Capture Method), UML Activity Diagrams, Event-driven Process Chains (EPCs) and the most rudimental, flowcharts.

Dumas et al., (2018) also refers that modelling a process is a helpful way to understand processes and to share that insight with others. As seen previously, modelling is required to be able to acknowledge the inefficiencies of the process, i.e. analyze the process, as it is needed to define the to-be process, i.e. redesign, in order to improve it in the greatest way possible, for example through automation.

3.2.4.1. Business Process Model and Notation (BPMN)

In this project the modelling notation used was BPMN. As According Dumas et al., (2018), BPMN it's a widely-used standard for process modelling and the latest version available of this standard language is BPMN 2.0.2., released in December 2013 by Object Management Group (OMG).

According to Object Management Group (2011) Business Process Model and Notation provides to the organizations the capability of understanding their internal business processes in a graphical notation and gives them the ability to communicate these procedures in a standard manner.

A BPMN model has five basic categories of elements (see Appendix A.):

1. Flow Objects:

- Activity: Capture units of work in a process;
- Events: Define the start and end of a process, and signal something that happens during the execution of it.
- Gateway decision: Model exclusive or inclusive decisions, merges, parallelism and synchronization, and repetition.

2. Data:

- Data object: Captures a physical or an electronic business object required to execute an activity or trigger an event, or that results from the execution of an activity or an event occurrence.
 - i. Data Inputs: Capture data that is required by the task to be executed.
 - ii. Data Outputs: Capture data that is produced by the task upon completion.
- Data Stores: Contains data objects that need to be persisted beyond the duration of a process instance;

3. Connecting Objects:

- Sequence Flows: Connect activities and control nodes are by means of arcs to determine the order in which the process is executed;
- Message Flows: Represent the flow of information between two separate pools;
- Associations: Dotted line used to associate artifacts with flow objects. They are used to show the inputs and outputs of activities;
 - i. Data Associations;

4. Swimlanes:

- Pools: Generally model resource classes;
- Lanes: Used to divide pools. The interaction between pools is captured by message flows. Message flows can be attached to the boundary of a pool, should the details of the interaction not be relevant.

5. Artifacts:

- Used to provide additional information about the Process, such as Group and Text Annotation.

3.2.5. Process and Workflow automation

According to Harmon (2019), automation has progressively become a crucial part of process redesign effort, subsequently the automation of processes and workflows can be introduced as an output of the Process Design or Redesign, since it refers to a *“major effort that is undertaken to significantly improve an existing process or to create a new business process.”* (Harmon, 2019, p. xxxii).

Harmon (2019) also considers ERP and CRM applications as examples of automation as he refers to Process Automation as the *“use of computers and software applications to assist employees or to replace employees in the performance of a business process.”* (Harmon, 2019, p. xxxii), such as BPMS tools, workflow systems and XML business process languages and nowadays, RPA.

3.3. ROBOTIC PROCESS AUTOMATION

Robotic Process Automation (RPA) is a software-based solution that can be configured to perform the work previously done by people (Willcocks, Lacity, & Craig, 2015). Schmitz, Dietze, and Czarnecki (2019) considered this system an innovative approach that enables the transformation of process execution, without changing the application systems that support the process.

Gartner (2020) defines RPA as a licensed software tool that automates repetitive human tasks by emulating the same human steps by using a combination of User Interface (UI) interactions and Application Programming Interface (APIs) to merge and transcript data between different enterprise applications.

According to KPMG (2019) RPA has become the second most important technology for business transformation and Gartner (2020) estimates that 90% of large corporations globally will implement RPA by 2022.

3.3.1. Main concepts

RPA is a technology with many concepts required to ensure the success of an automation project inside an organization. These concepts and their importance are described below.

3.3.1.1. RPA-ready Processes / Select Processes to Automate

The initial step to ensure that an RPA initiative is successful within an organization is the ability to decide on the processes that are suitable to automation. Painter (2019) states that this phase is crucial to guarantee the highest and faster possible Return on Investment (ROI) and demonstrate the efficiency of RPA to the project sponsors.

According to Ostdick (2016), there are five considerations to take into account when choosing the processes suitable to automation: Employee involvement in the process, Process complexity, Volume of transactions, Standardization and Stability of the process and Difficulty of outsourcing.

Painter (2019) believes that the best approach is to primarily consider the processes that will provide a higher ROI, but also recognizes that is easy to be misled into selecting a larger process to automate. Therefore, is necessary to understand the trade-off between the ROI and the time needed of achieve the implementation of automation, since a larger process can have a greater return but may also take more time to implement due to its complexity, and thus not reflect the full capabilities of RPA and block the adoption of the technology inside the organization.

For those reasons is essential to select mature, well-defined and rule-based processes that are quick-wins, i.e. processes that allow for faster returns on investment, while also being processes that are highly manual, repetitive, time-consuming and also reliant on few systems that are stable with low

exception rates, and finally should have high volume to justify the cost of building a robot (Joseph & Le Clair, 2020; Josephson, 2020; Painter, 2019; UiPath, n.d.-a).

These characteristics are covered by Forrester's "Rule of five" introduced by Le Clair (2018), which is composed by three rules to find a process suitable for automation: the process should have less than five decisions, should use less than five applications and should take less than five hundreds actions to complete.

Ostdick (2016) also considers the difficulty of outsourcing as a factor to consider when selecting a process to automate since many business activities require regulatory compliance which can become an obstacle to outsourcing as companies have less control of the operations, therefore RPA allows the companies to be in control and to execute those processes in-house while being able to be compliant with the regulations, though the log and management capabilities of RPA.

All of these factors demonstrate that many operational processes with these characteristics can be suitable for automation, such as order and claim processing and data entering and migration into a database, which will allow for faster and more accurate activities and will let employees focus on more relevant and demanding activities such as customer interaction (Ostdick, 2016).

3.3.1.2. Types of RPA

RPA has two main forms of automation available, based on the objective to which it is developed. Is possible to develop automations to work autonomously or to work with human intervention, thus is critical to understand what is the goal of the automation and if the process or task to be automated requires any human intervention.

When an automation requires human intervention is known as an Attended automation. These automations run on the human workstation and helps to complete tasks that are being performed. According to Mullakara & Kumar Asokan (2020), this type of automation is frequently used in call centers to support agents in their activities and therefore reduce the average handling times and consequently improve the customer experience.

The automations that work autonomously are called Unattended automations. As they usually run on virtual environments, it allows for a 24/7 availability and is able to work under a predefined schedule. According to Mullakara & Kumar Asokan (2020) this type of automation should be used in tasks that are structured and fully planned throughout, in processes where the objective is to replace entire functions or to automate back-office tasks such as gathering, sorting, analyzing and distributing large amounts of data.

Unattended automation is endorsed by control rooms functionalities, since it allows to allocate processes to a certain robot, to adjust priorities, manage queues and handle malfunctions and performance issues (Mullakara & Kumar Asokan, 2020).

3.3.1.3. RPA Implementation

One of the advantages of RPA is the fast implementation it allows, but it depends on the requirements set by the client, the complexity of the process and the methodology used in the organization, as a result, RPA implementation can have different timeframes (Anagnoste, 2017).

In Agile Methodology, the implementation of RPA follows these steps, also called *sprints* (Anagnoste, 2017) (see Figure 3.3):

- **Proof of concept (PoC)** – Developed to demonstrate the RPA capabilities on clients’ premises. Not all the exceptions are handled. This usually takes 3 to 5 weeks;
- **Initial Pilot** – Perform an RPA mission only for a part of the process in order to confirm that the business case is viable. This usually takes 6 to 8 weeks;
- **Scale pilot** – Performing RPA according to the developed business case. This can take 8 to 12 weeks.

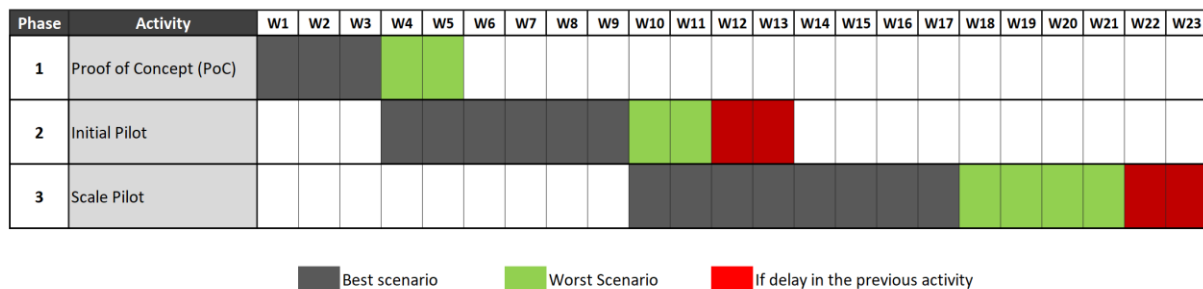


Figure 3.3 - Implementation Chronogram

Source: Prepared by the author

Everest Global (2018) established four key phases for every journey in RPA:

- **Phase 1:** Planning;
- **Phase 2:** Piloting;
- **Phase 3:** Scaling-up;
- **Phase 4:** Steady-state.

The three initial phases presented by Everest Global (2018) are similar to the ones introduced by Anagnoste (2017), the substantial difference is the definition of a Phase 4: Steady-state. This last stage takes the implementation one step forward, taking into account the institutionalization of the model, the continuous improvement and the further identification of new opportunities for automation and innovation (Everest Global, 2018).

3.3.1.4. Center of Excellence (CoE)

The implementation of automation should be supported by the introduction of a CoE (Centre of Excellence) to “established the supervision of all robots and future projects or changes that existing robots need can be tackled in a Lean methodology, assuring that organization’s performance is not disturbed.” (Anagnoste, 2017, p. 677).

According to Everest Global (2018), the CoE provides a centralized structure, governance entity and standards for several automation aspects, it also encourages the reuse of robot assets and code and offers automation expertise combined with the knowledge about the organization's business processes. The deployment, application management and control tower can be on the scope of the Center of Excellence, however, a balance is crucial because too many responsibilities can lead to a bottleneck in the CoE and deviate it from the purpose it was built for (Everest Global, 2018).

3.3.2. Benefits and Challenges of RPA

In addition to the rapid implementation and substantial increases in workflow efficiency (Schmitz et al., 2019) that RPA technology provides, one of the main benefits of RPA is the capacity that organizations obtain when develop automations of several back office and front office activities and allowing the people to be relocated to high-value added tasks (Anagnoste, 2017).

Therefore, RPA is a suitable solution to the organizations that want to replace humans in "swivel chair" processes, i.e. processes where workers take inputs from one or more systems, process those inputs using rule-based decisions and then enter the corresponding output into the organizations systems, such as Enterprise Resource Systems and others (Willcocks et al., 2015).

Also, it is not required major expertise in programming to automate processes which therefore, makes the implementation much less expensive, since an IT team is not necessary to develop the automation, as some members of each team can be trained to automate their own tasks (Lacity & Willcocks, 2016b; Willcocks, Lacity, & Craig, 2017) thus resulting in cheaper human resources (in comparison to other implementations), faster developments and overall savings in costs and time.

Robotic Process Automation also provides improved and faster services and allows for 24/7 availability while also being compliant with the procedures and fit for further scalability (Lacity & Willcocks, 2016a).

Regarding the challenges faced with RPA, Syed et al., (2020) considered that the readiness of the organization is a common challenge since in the beginning of the automation path it is difficult to identify where to deploy RPA, this challenge can derive from three organizational characteristics:

- Business drivers (i.e. is the business ready?);
- Nature of existing technology (i.e. we have the correct infrastructure/systems to support the automation?);
- Degree of RPA maturity (i.e. we have the right resources and mindset to support RPA?).

The selection and prioritization of the processes to automate is another challenge of RPA, since there are many variables to take into consideration, such as, the complexity of the task, the level of standardization, the volume of iterations and level of human interaction.

The process complexity can be a drawback if it requires a lot of exception handling or if it is working upon instable programs that, as a result, can cause the robot to stop working and require further human intervention.

An additional challenge considered by OSMAN (2019) is the performance obtain by RPA, since front-end automation represents a considerable loss in performance compared with back-end system

automation, it is a tradeoff between time lost in the process and time devoted to the development of the solution.

From a socio-technical approach, RPA can be seen by many as a “replacement” of workforce, this can lead to crises inside the teams or even in the organization, this requires the workforce to be better understood, managed, and recognized through an effective change-management within RPA implementations.

3.3.3. RPA Tools

Ray et al. (2020) considered that the 10 largest RPA software vendors represent a total of 70% of market share of RPA market.

As demonstrated in Figure 3.4, as of June 2020, the Leaders were UiPath, Automation Anywhere, Blue Prism and Work Fusion. Vodafone offers two RPA software’s, UiPath and Blue Prism.

This project was developed using UiPath since it has a larger product portfolio, provides a larger range of partners comparing to Blue Prism and has better user interface experience throughout.



Figure 3.4 - Gartner's Magic Quadrant for Robotic Process Automation

Source: (Ray et al., 2020)

3.3.4. Automated After-sales Workflows Systems in Telcos

There are many use cases suitable to automation in the telecommunication industry after-sales, since this market, as in many others (e.g. utilities, banks, insurance companies and major retailers), has many customers, and consequently, has several large-scale back-office processes to support the business (Lacity & Willcocks, 2016b).

Some examples of telecommunications companies that carried out RPA into their business are:

- **Telefónica O2:**
Started RPA journey by automating two pilot after-sales processes: a SIM swap process – the process of replacing a customer’s existing SIM card with a new one but keeping the same number – and the submission of pre-calculated credit to customers’ account. In total automated fifteen core processes that, in 2015, represented about 35% of all back-office processes, among them were the automation of SIM swaps, credit check, order processing, customer reassignment, unlocking, porting, ID generation, customer dispute resolution and customer data updates.
- **Deutsche Telekom:**
Developed a field service app with the objective to aggregate into one app, the most important tools for field service technicians, this process was streamlined and automated using RPA. Automated a Proactive problem solving that uses big data and geographical analytics in integration with RPA to allow the prediction of whether a client service might be affected by a thunderstorm and will send a text to the client recommending the disconnection of their devices to avoid technical issues.

As stated by Lacity & Willcocks (2016b), Telefónica O2 began its RPA journey in 2010, and in April 2015 it had more than 160 robots deployed that translated into a volume of transactions between 400.000 and 500.000 *per month*, and it was estimated that those values supported for a three-year Return On Investment (ROI) between 650% to 800%, hundreds of FTEs (Full-time equivalent) saved or reallocated and a *payback period* of 10 to 12 months. Another benefit where that three-year business cases estimated zero net financial benefits with the use of BPM and nearly £1 million with the implementation of RPA (Lacity & Willcocks, 2016b).

Schmitz et al., (2019) stated that Deutsche Telekom DT’s technical field service operations (DTTS) started the RPA journey in the last quarter of 2015 and within 6 months they already performed their first automatic transactions. By March 2016 – the first month of fully implementation – there were already 229,000 transactions successfully attained and, as Telefónica O2, that number was increasing significantly. In one year, the transactions surpassed the one million mark. DTTS implemented a multi-solution platform with more than 1000 RPA clients, that allow a saving of 800 FTEs. This saving led to a ROI of 3 months and allowed a 60%-80% of cost saving in the areas which RPA were implemented (Schmitz et al., 2019).

Telefónica O2 and Deutsche Telekom were able to improve the customer experience through RPA, with the development of several after-sales workflow systems (Lacity & Willcocks, 2016b; Schmitz et al., 2019).

4. PROJECT

This project is composed by six major phases that are described in depth in this chapter.

4.1. PHASE 1: PROJECT *KICK-OFF*

The Support to Clients is inserted in the Customer Operations Department of Vodafone Portugal, therefore the focus of this Project will be developed in this particular area of the organization.

This Project Kicked-off with the solely objective of automating Enterprise Technical Support (16916) processes, as this area is, in general, one of the costliest in the organization, since it has costs with the delivery of support to the clients and in the major part there is no payment from it.

Enterprise Technical Support provides support to Vodafone Business clients, and as Vodafone provides a vast offer, this team also covers a vast spectrum of issues and responsibilities, hence the team has a massive workload daily, which was the major trigger to automate processes since it affects the customer experience. This fact combined with the challenges that support teams face, requires reduction of the work by automating manual and normalized processes, allowing the support teams to focus on more urgent and distinct matters.

Throughout the Project, this approach and its advantages were acknowledged by other areas inside the department, such as the Field Service Management and Personal Clients After-Sales Support, these areas became internal clients for the automation of processes, which made the scope of this project expand and earn more visibility.

The final scope of the Project is presented below in the Figure 4.1.

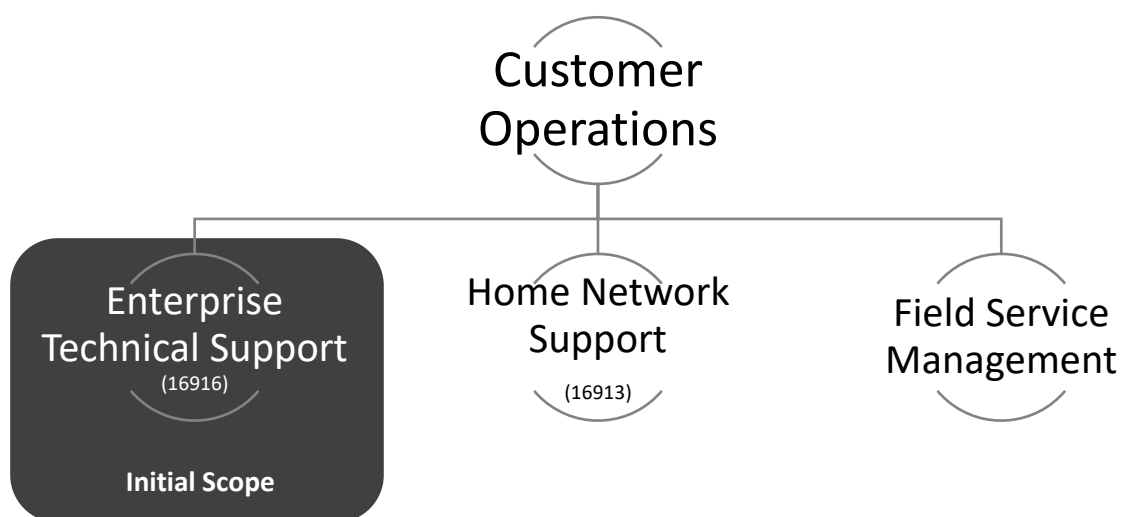


Figure 4.1 - Project Scope

Source: Prepared by the author

The processes that were considered suitable to automation in the areas where the project will be developed, are introduced in the Phase 3 of the Project Lifecycle.

4.2. PHASE 2: COLLECTION OF LITERATURE FRAMEWORK FOR DECISION SUPPORT

This phase is a work-in-process throughout the Project Lifecycle that comprises a collection of scientific works developed regarding Business Process Management and Robotic Process Automation, to develop a framework that supports the decisions made along the Project.

The Literature Framework collected during this phase was introduced and analyzed in the Literature Review.

4.3. PHASE 3: AS-IS MODELLING

This project was a bottom-top approach where the areas suggested possible automations to be developed to the CoE for approval.

At this stage, managers and coordinators of the areas inside the project scope have made a pre-assessment and identified processes that could be fit for automation and the processes were already CoE approved, this stage represents the Process Identification stage in BPM lifecycle introduced by Dumas et al., (2018) (see Figure 3.2).

This phase indicates the beginning of the project core objective by initiating the process *as-is* modelling to allow for further analysis and improvement.

4.3.1. IP Alarmistic

The Table 4.1 summarizes the process IP Alarmistic by introducing the team responsible for the process execution, an overview of the process and the main applications and tools used.

Team Responsible	16916 Technical Support
Overview	This process consists of notifying the client of a connection unavailability with the CPE (Customer Premises Equipment) and ask for the best contact to proceed with the troubleshoot.
Applications/Tools	1. Siebel CRM; 2. Vodafone Frontend; 3. SMS Broadcast.

Table 4.1 - IP Alarmistic Process Overview

Source: Prepared by the author

As stated in Figure 4.2, this process occurs after SAC-FO team – that monitors the connection with CPEs (Customer Premises Equipment's) – encounters a connection down for more than 15 minutes or an equipment with fluctuating status.

Moreover, the team opens an SO (Service Order) automatically in Siebel CRM to 16916 Technical Support team to inform the client and perform troubleshoot.

Upon availability, 16916 searches for new Alarm SOs in Siebel CRM, and obtains the CPE hostname to perform connectivity tests to re-check the CPE status, if the CPE connection is up the SO is closed with the reason, otherwise the agent will search for the most suitable contact in Vodafone Frontend, and sends an SMS via SMS Broadcast – a messaging system from Vodafone – and updates the ticket (SO) with that information and add a new follow-up in the system.

For the following 48h after the SMS was send, the team recurrently (upon availability) checks, in SMS Broadcast, for responses to the SMSs sent.

If a response is received, the SO proceeds to further resolution inside or outside 16916, depending on the scope of the issue. If no response is received, the SO will be closed due to absence of clients' response.

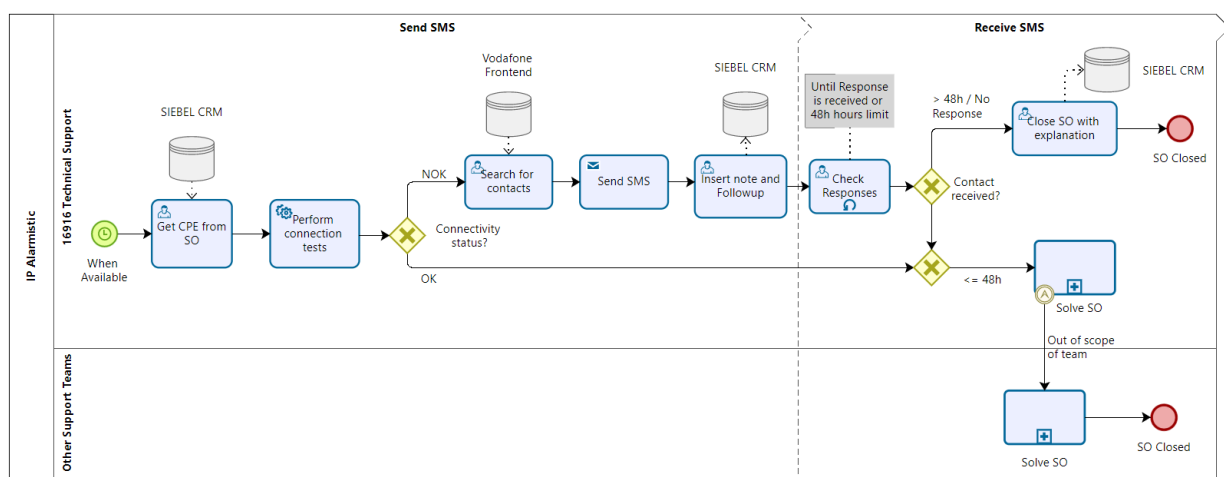


Figure 4.2 - IP Alarmistic Process (As-Is)

Source: Prepared by the author

4.3.2. Credit for Fixed Service Unavailability

The Table 4.2 summarizes the process Credit for Fixed Unavailability by introducing the team responsible for the process execution, an overview of the process and the main applications and tools used.

Team Responsible	16913 Technical Support
Overview	This process consists of giving credit to the client due to Fixed Service unavailability and send them an SMS to inform.
Applications/Tools	1. Microsoft Excel; 2. Siebel CRM; 3. Vodafone Messaging.

Table 4.2 - Credit for Fixed Service Unavailability Process Overview

Source: Prepared by the author

This process is performed, daily, by 16913 Technical Support and has as input an e-mail containing a daily report (MS Excel file) with the credits to apply.

Initially, the agent validates the daily report obtained via e-mail with the list of credits to execute, then, for each credit the agent verifies the Average Response Time (ART), if the ART is less than 24 hours, the client is not fit for credit, if the ART is 24 hours or more the client will be credit in Siebel CRM, through the following instructions presented in Table 4.3:

ART (hour)	Credit Value (€)
24 <= ART < 48	8,130 €
48 <= ART < 120	16,260 €
120 <= TMR	28,455 €

Table 4.3 - Credit criteria for Credit automation

Source: Prepared by the author

Later, the agent validates in Siebel CRM the preferred contact and will send an SMS via Vodafone Messaging, informing the client of the credit applied (see Figure 4.3).

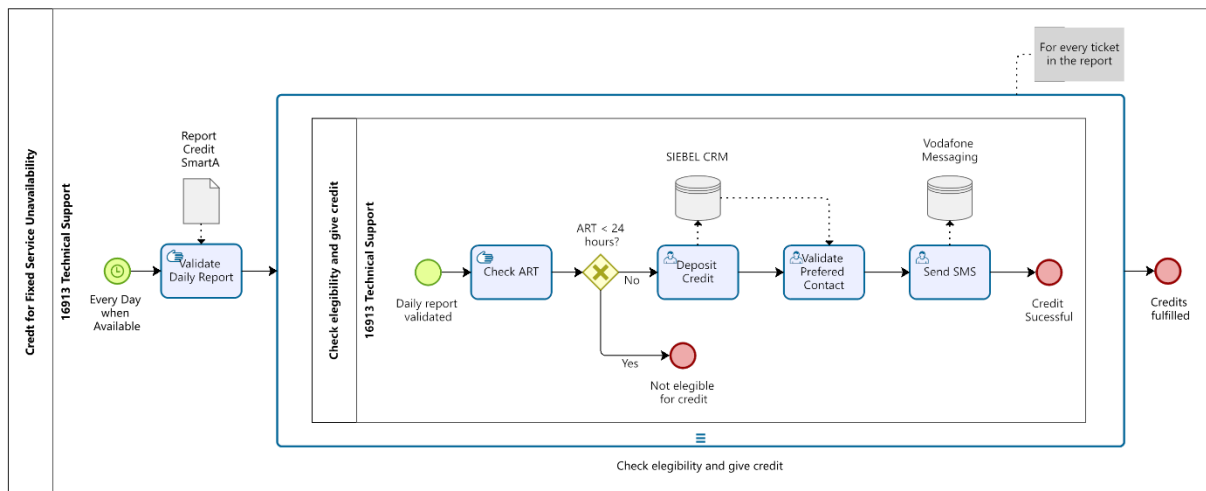


Figure 4.3 - Credit for Fixed Service Unavailability Process (As-Is)

Source: Prepared by the author

4.3.3. Field Service Availability Report

The Table 4.4 summarizes the process Field Service Availability Report by introducing the team responsible for the process execution, an overview of the process and the main applications and tools used.

Team Responsible	Field Service Coordination Team
Overview	This process consists of building a daily report containing the next 14 days availabilities for each Field Service team operating in Portugal.
Applications/Tools	1. Microsoft Excel; 2. Siebel CRM.

Table 4.4 - Field Service Availability Report Process Overview

Source: Prepared by the author

This process is performed, ideally, daily, from Monday to Friday, by the Field Service Coordination Team, where the employee responsible validates the list of Field Service teams working in Portugal (approx. 380 teams), which are presented in the report, and iterates through each team, searching for its next fourteen days availabilities in Siebel CRM to then store the data in the daily report (see Figure 4.4).

This data is required to evaluate the Field Service and, if necessary, take measures in conjunction with the partner responsible for each team to mitigate the shortage of Field Service availabilities in the corresponding period.

Due to the number of teams and the performance issues of the application (Siebel CRM) when retrieving the data, this process suffers a delay, and its periodicity is not completely accomplished. This impacts management decisions regarding the availabilities required to provide a precise Field Service, due to the lack of timely information.

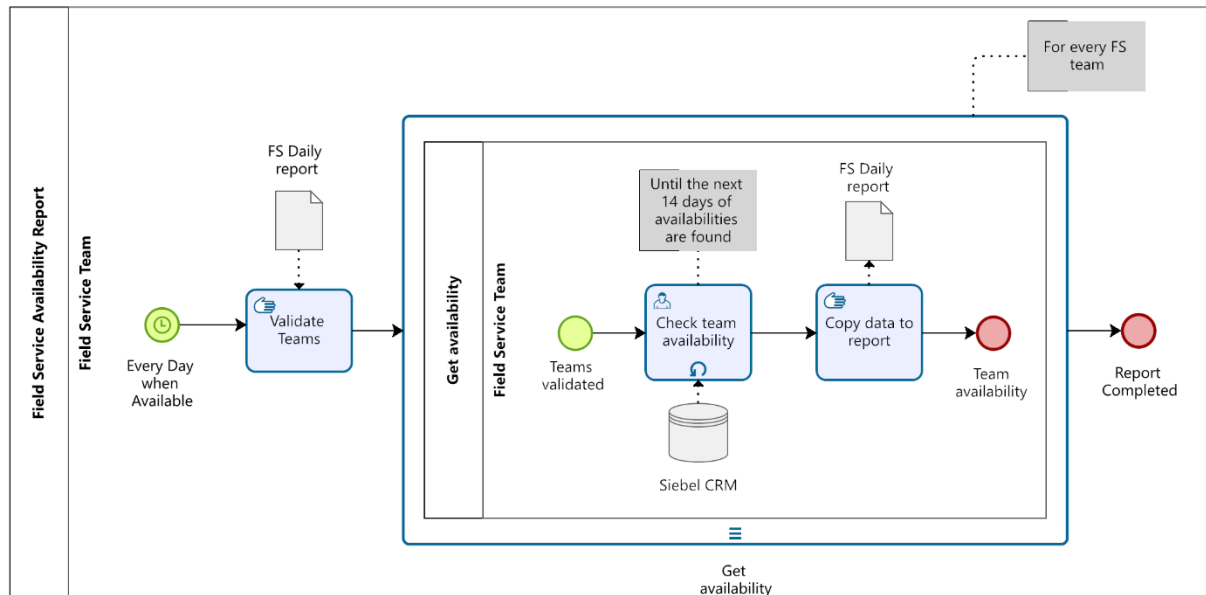


Figure 4.4 - Field Service Availability Report Process (As-Is)

Source: Prepared by the author

4.3.4. Communicate intervention in Vodafone Network

The Table 4.5 summarizes the process Communicate intervention in Vodafone Network by introducing the team responsible for the process execution, an overview of the process and the main applications and tools used.

Team Responsible	16916 Technical Support
Overview	This process consists of notifying customers, in a timely manner, of upcoming network interventions that will cause temporary unavailability to their services.
Applications/Tools	1. Microsoft Excel; 2. Vodafone Frontend; 3. eGain;

Table 4.5 - Communicate intervention in Vodafone Network Process Overview

Source: Prepared by the author

This process is triggered when 16916 Technical Support Team receives an email with details of future interventions in Vodafone's Network and the clients affected by the intervention. As in IP Alarmistic Process, due to the workload of the team, this process is also dependent on the team availability to fulfil it.

Upon availability, the agent validates the report and for each CPE affected, the contacts are obtained through VFE (Vodafone Frontend) and if the client has a valid email for that site, the agent sends the email through eGain, informing the client of the intervention by providing information regarding its date and duration and which site its affected. Otherwise, if the client has no valid email, the agent proceeds to the next affected site.

Once all the affected CPEs are handled, the process ends (see Figure 4.5).

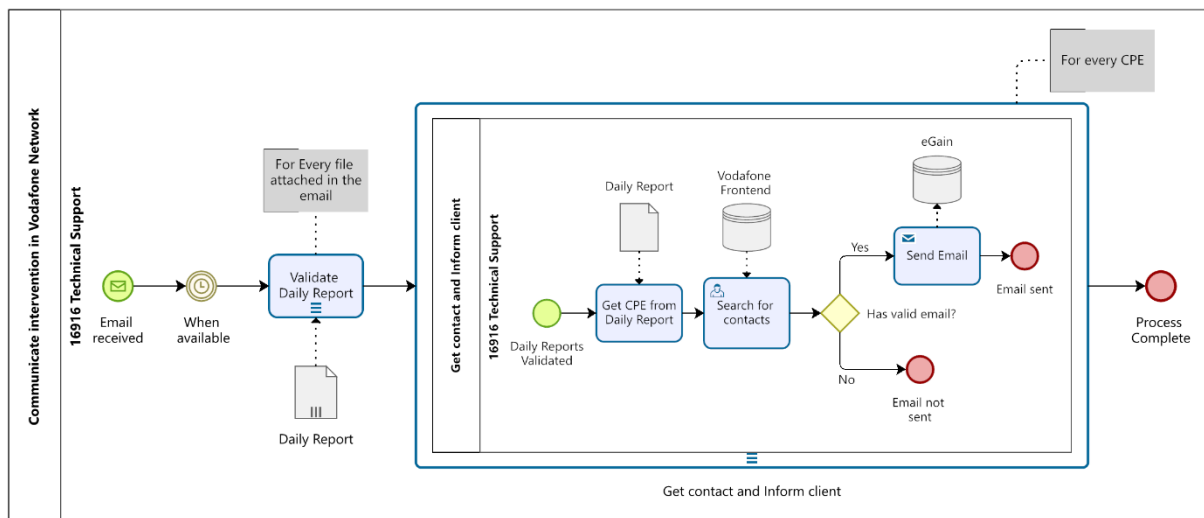


Figure 4.5 - Communicate intervention in Vodafone Network (As-Is)

Source: Prepared by the author

4.4. PHASE 4: ANALYZE PROCESSES AND PRIORITIZE AUTOMATIONS

In this phase of the project, the processes described in Phase 3 will be analyzed and the automations will be prioritized.

To analyze the processes, the aspects introduced in section 3.3.1.1. of this project will serve as standards to evaluate the suitability of the use of RPA technology in these processes. The main criteria are (Joseph & Le Clair, 2020; Josephson, 2020; Le Clair, 2018; Ostidick, 2016; Painter, 2019; UiPath, n.d.-a):

1. Process Complexity:

The complexity of a process can be assessed through the number of applications/tools used in the process, the number of steps required to fulfil the task, the need for human intervention (i.e. cognitive requirements), and many other aspects that increase the complexity of automation;

2. Volume of transactions;

3. Standardization and Stability;
4. Time-consumption;
5. Level of manual work;
6. "Rule of 5".

Also, it will be considered the potential of the Operational Benefits obtained through the automation of each process, to allow a more strategic approach to the prioritization stage of the project.

4.4.1. IP Alarmistic

As previously stated, 16916 Technical Support Team has a massive workload, this caused this process to be put on the side.

This process is only performed upon availability of the team, which frequently occurs after some hours of the ticket opening. Consequently, the waiting time of the process is a major source of waste, according with the Waste Analysis. This fact also applies to the search for responses that is also performed upon availability of the team.

RPA is a valid solution to eliminate the waste, since it is available 24/7, allowing a quicker response to the Service Order.

4.4.1.1. RPA-ready Analysis

Evaluating this process from an RPA-ready perspective, involves analyzing the criteria defined previously.

1. Process Complexity:

This process interacts with three different applications – Siebel CRM, Vodafone Frontend and SMS Broadcast – and it does not require much cognitive capabilities since it is composed by very simple tasks (Gathering information, simple troubleshoot and send SMS).

2. Volume of transactions:

This process has approximately a volume of 140 tickets (Service Orders) *per* week, which represents a large amount of workload for the team.

3. Standardization and Stability:

This is a rule-based process with a well-defined workflow. It uses stable applications, since they do not have huge updates frequently and do not require major exception handling to automate.

4. Time-consumption:

This process takes in average 15 minutes *per* ticket (and 2,5 minutes more when a response is received) and has an average take time (waiting time) of 4 hours.

5. Level of manual work:

This process is fully manual.

6. “Rule of 5”:

The process has less than five decisions, uses only three applications which is less than the five applications stated by the rule and on both scenarios – with response to SMS from client or non – has less than five hundred actions to complete, 94 and 74 actions, respectively.

Through the evaluation of the six criteria used in this project, it is possible to conclude that the process IP Alarmistic is RPA-ready.

4.4.1.2. Operational Benefits

This process has an average of 140 transactions *per* week and each transaction first milestone (Send SMS) takes in average 15 minutes to complete, which represents a saving of approximately 35 hours of work weekly. Additionally, the second milestone (Receive SMS) can take up to approximately 2,5 minutes *per* transaction, which can represent up to near 5 hours weekly. Therefore, the automation can save approximately one full time equivalent (FTE).

In financial terms, these savings allow an OPEX reduction of 2800 € *per* month, which is the total cost *per* FTE.

Furthermore, the automation allows a severe reduction of the waiting time since it can be scheduled to process the tickets within certain time criteria with 24/7 availability.

Considering a time trigger of 15 minutes, which indicates that every 15 minutes the process will run automatically, the saving is a reduction of the average take time of 4 hours *per* ticket to 15 minutes (in the worst case scenario) and consequently, an intangible improvement of the Customer Experience, since it shortens the gap between the incident and Vodafone’s response to the incident itself, while also providing a timely notice regarding the failure to the customer, which can reduce the overall downtime of the service, as it allows for a faster resolution.

4.4.2. Credit for Fixed Service Unavailability

Similar to IP Alarmistic process, this process also depends on the team’s availability to be performed, although there are efforts to comply with the daily schedule of the process.

The dependence of the team’s availability is a source of waste according with the Waste Analysis. This inefficiency of the process can be removed with the use of RPA, since it is available 24/7, allowing a quicker credit to clients and consequently improving the client experience.

4.4.2.1. RPA-ready Analysis

Assessing this process from an RPA-ready perspective, involves analyzing the criteria defined earlier.

1. Process Complexity:

This process interacts with three different applications – Microsoft Excel, Siebel CRM, and Vodafone Messaging – and it does not require much cognitive capabilities since it is composed by very simple tasks (Copy Paste information, manually insert data and send SMS).

2. Volume of transactions:

This process has approximately a volume of 3000 tickets (Service Orders) *per* month, which represents a large amount of workload for the team.

3. Standardization and Stability:

This is a rule-based process determined on the ART of the Service Order and has a well-defined workflow. It uses stable applications, since they do not have huge updates frequently and do not require major exception handling to automate.

4. Time-consumption:

This process takes in average 1,5 min *per* ticket.

5. Level of manual work:

This process is fully manual.

6. “Rule of 5”:

The process complies with the “Rule of 5” since it has less than five decisions, uses only three applications which is less than the five applications stated by the rule and has 48 actions *per* transaction which matches the rule of less than five hundred actions to complete.

Through the evaluation of the six criteria used in this project, it is possible to conclude that the process Credit for Fixed Service Unavailability is RPA-ready.

4.4.2.2. Operational Benefits

This process has approximately 2925 transactions *per* month and each transaction takes in average 1,5 minute to complete, this represents a total of approximately 73 hours *per* month that can be saved using RPA.

In financial terms, these savings, allows an OPEX reduction of approximately 877,5 € *per* month, which represents 10530 € annually, since the cost of an FTE is 0,20€/minute.

Furthermore, the automation allows for a major intangible improvement in the Customer Experience, since it will allow the credit issued for the inconvenience caused by the downtime of the service, to be carried out in a timely manner, therefore allowing the image of the company to be preserved and/or amended in a crucial moment of the customer journey.

4.4.3. Field Service Availability Report

4.4.3.1. RPA-ready Analysis

Evaluating this process from an RPA-ready perspective, involves analyzing the criteria defined previously.

1. Process Complexity:

This process uses two different applications – Microsoft Excel, Siebel CRM – and it does not require much cognitive capabilities from its agent since it is basically composed by copy and paste activities and some awareness to the availabilities presented in the application.

2. Volume of transactions:

This process assesses the availability of approximately 380 teams daily, which represents a large amount of workload for the team.

3. Standardization and Stability:

This is a rule-based process determined by the number of availabilities and has a well-defined workflow. Both, Microsoft Excel and Siebel CRM can be considered stable applications, as they do not have massive updates frequently and do not require major exception handling to automate.

4. Time-consumption:

This process takes approximately 8 hours to complete, representing 1 FTE.

5. Level of manual work:

This process is fully manual.

6. “Rule of 5”:

The process complies with the “Rule of 5” since it has less than five decisions, uses only two applications which is less than the five applications stated by the rule and has 30 actions which are less than five hundred actions to complete.

Through the evaluation of the six criteria used in this project, it is possible to conclude that the process Credit for Fixed Service Unavailability is RPA-ready.

4.4.3.2. Operational Benefits

This process has about 380 transactions *per* day and represents the entire available time of an FTE (8 hours/day).

In financial terms, these savings, allows an OPEX reduction of approximately 2000 €/month since it represents the total cost of the FTE allocated to this process.

Furthermore, the automation allows for a key intangible improvement in the ability of managing the Field Service teams, since it will allow the data to be gathered in the morning in a timely manner, whereas in the manual process, the data gathering is only completed in the end of the day, causing a delay in the decision making and arrangement of necessary measures.

4.4.4. Communicate intervention in Vodafone Network

4.4.4.1. RPA-ready Analysis

Evaluating this process from an RPA-ready perspective, involves analyzing the criteria defined previously.

1. Process Complexity:

This process uses two different applications – Microsoft Excel and eGain – and it does not require much cognitive capabilities from its agent since it is basically composed by copy and paste activities.

2. Volume of transactions:

The volume of transactions in the process is inconstant as it depends on the interventions scheduled by Vodafone, and it can range from approximately one hundred transactions to more than one thousand, depending on the number and extent of the interventions to be performed.

Despite the volume fluctuation, this is considered a core process since it will affect the service provided to the customers.

Through RPA it is possible to notify the customers of those interventions in a timely matter, allowing Vodafone to improve the company's image.

3. Standardization and Stability:

This is a rule-based process determined by the existence of a clients' valid email.

All the applications can be considered stable, as they do not get massive updates frequently and do not require major exception handling to automate.

4. Time-consumption:

This process takes approximately 3 minutes *per transaction* to be performed.

5. Level of manual work:

This process is fully manual.

6. "Rule of 5":

The process complies with the "Rule of 5" since it has less than five decisions, uses only three applications which is less than the five applications stated by the rule and takes 60 actions to complete which is less than five hundred actions to complete.

Through the evaluation of the six criteria used in this project, it is possible to conclude that the process Credit for Fixed Service Unavailability is RPA-ready.

4.4.4.2. Operational Benefits

This process had an average of 953 transactions *per* month (considering the last two months), with a time-consumption of 3 minutes, which represents approximately 48 hours worked/month.

In financial terms, these savings, allow an OPEX reduction of approximately 765 €/month.

Additionally, the automation allows for a key intangible improvement in the capacity of notifying all the customers of future interventions in a timely matter.

Currently, the notifications cannot be ensured with the manual process due to the massive workload that 16916 team faces. The lack of capacity to proactive notify the customers can result in more workload arriving to the team, as the clients are not aware of the interventions, and may reach to 16916 to obtain some help on the matter.

4.4.5. Prioritize Automations

Following the analysis, it is necessary to correctly prioritize the automations, through the comparison of the results obtained previously (see Table 4.6). This prioritization phase will consider the estimated savings regarding time and costs, as well as the strategic objective of this project, which is to grow the number of in-house automations, therefore the priority is to gain relevance by acquiring internal clients, and also the availability to automate, as this project is being developed by one person.

As mentioned in section 4.1. the initial scope of the project was Enterprise Technical Support Team (16916) therefore the IP Alarmistic was the Proof of Concept (PoC) applied in this project. This process was simple and repetitive while also providing considerable savings to the team with the use of automation, therefore was a top candidate to the PoC.

As previously stated, after the development of the PoC, the scope of the project was extended, through the inclusion of two more teams of the Customer Operations Department of Vodafone, as Internal Clients of the project.

Both the teams introduced the process they considered to be most relevant to automate. The Home Support Network Team introduced the process of Credit for Fixed Service Unavailability, and the Field Service Management Team presented the process responsible for the development of the Field Service Availability Report.

In this case, both processes were waiting to be automated it was crucial to prioritize and automate the right process, which is the process that is estimated to provide greater savings to the organization. As described in the table below (see Table 4.6) the process with most estimated savings is the Field Service Availability Report, therefore this was the next process to be automated, followed by the Credit for Fixed Service Unavailability.

Lastly, after the implementations of the internal clients' automations, it was possible to automate another process inside the Enterprise Technical Support, the process to communicate to customers upcoming interventions in Vodafone Network that may affect their service, this process was automated at last due to the highly variance in volume, since it depends on the intervention and the extent of clients affected.

		Automation Standards						Estimated Savings	
		Process Complexity	Avg. Volume of Transactions (month)	Standardization and Stability	Avg. Time Consumption	Level of Manual Work	"Rule of 5"	Time Savings (month)	Cost Savings (month)
Process	IP Alarmistic	3 Apps	Aprox. 600	Rule-Based Stable Process Stable Apps	15 min + 2,5min (per transaction)	Full	Comply	Aprox. 176h	2800 €
	Credit for Fixed Service Unavailability	3 Apps	Aprox. 3000	Rule-Based Stable Process Stable Apps	1,5 min (per transaction)	Full	Comply	Aprox. 73h	877,5 €
	Field Service Availability Report	2 Apps	Aprox. 8400	Rule-Based Stable Process Stable Apps	1,25 min (per transaction)	Full	Comply	Aprox. 176h	2000 €
	Communicate intervention in Vodafone Network	2 Apps	Aprox. 953 (Fluctuates with the number of interventions)	Rule-Based Stable Process Stable Apps	3 min (per transaction)	Full	Comply	Aprox. 48h	765 €

Table 4.6 - Process Analysis summary

Source: Prepared by the author

4.5. PHASE 5: *TO-BE* MODELLING

This phase represents updated processes that were developed according with the analysis previously made and the inefficiencies discovered in the *As-Is* process.

These models correspond to the way the processes should be performed to achieve better efficiency and provide better results.

4.5.1. IP Alarmistic

The IP Alarmistic process presented two major inefficiencies: The Waiting Time of approximately 4 hours in the beginning of the process and the Waiting Time to verify the responses obtained from the customers throughout the next 48 hours after the SMS is sent to the customer. These inefficiencies cause the Lead Time (also known as Throughput Time) to be almost three full days despite the incident possibly being a critical matter to the customer. With the automation running in Unattended mode, it is possible to schedule the process to run in precise intervals of time without any human intervention.

In this case it was considered by the team that 15 minutes was the best scenario, this update alone can reduce the Lead Time, by at least 4 hours, in average, by ensuring the Waiting Time is, in the worst-case scenario, no more than 15 minutes. This time trigger makes this process almost fully compliant with the “Case-based work” heuristic redesign, since it mitigates the need of processing batches of tickets, due to backlog.

Since this process will be automated, another way to improve it is to use a daily report to keep track of all the data regarding each transaction of the robot. Therefore, it is possible to have complete and structured data to analyze and obtain the KPIs further established for this process and to have a centralized repository to the coordinators/managers.

Due to the minimal Waiting Time obtained with the automation and some restrictions applied by Vodafone Security Team the task “Perform Connection Tests” was left out of this automation, hence it is assumed that the CPEs with IP Alarm tickets open are still with connection issues upon the take of the ticket by the robot.

This robot will also use a Triage approach, to reduce at maximum the workload, this approach will be introduced in the first two tasks of the process. Firstly, the robot will gather only the tickets (SOs) with a valid CPE, this rule will allow the robot to find SO that were incorrectly introduced in Siebel CRM, since all IP Alarm tickets have the CPEs hostname in their description. Secondly, the robot will validate the contacts for the site here the CPE is located, and if there is no contact, the process will end.

Another improvement made to the process is the ability of the bot to assess if the response is valid, i.e. if it contains the ticket ID to make the match between the SMS and the SO. If it is not compliant the bot will send a second SMS informing the client of the missing information. In both cases, the team will be able to recognize that those SOs require human intervention, since all the tickets processed by the robot will be put in a “Pending” state, allowing both parts to work together, without any restrain.

All these adjustments to the process are summarized in the model of the *to-be* process introduced in the figure below (see Figure 4.6).

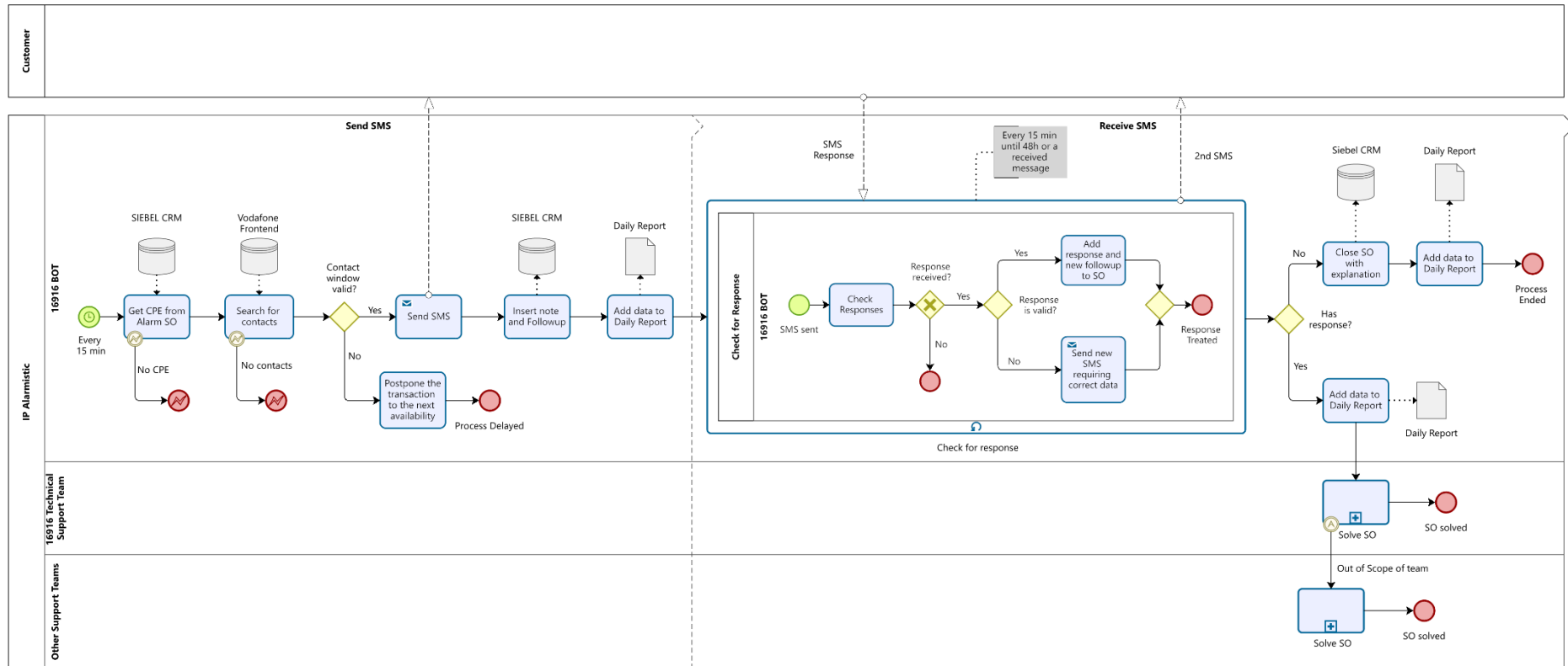


Figure 4.6 - IP Alarmistic Process (To-Be)

Source: Prepared by the author

4.5.2. Credit for Fixed Service Unavailability

Similar to IP Alarmistic Process, the major inefficiency encountered in this process was it being dependent on the teams' availability to be performed, keeping it on hold and consequently forming process backlog. Hence, with the automation, the process will allow a reduction in the team workload since it can run on a determined time, regardless of the teams' availability, while also allowing the credits to be processed in a timely matter in addition to eliminating the backlog existent from the manual process.

Regarding the other tasks implicated in the process, they all add value either to the business or to the customer, therefore were kept in the *to-be* model, keeping the process very similar to the *as-is*.

This process was developed to allow the addition of other similar credits to be performed due to other unavailability.

Although, considering the automation of the process, it was added a new task to the process, where the robot will add, to the daily report, the information regarding the status of each transaction performed, to allow the team to have effortless access to the robot performance.

The Figure 4.7 represents and describes the process with the adjustments previously contemplated.

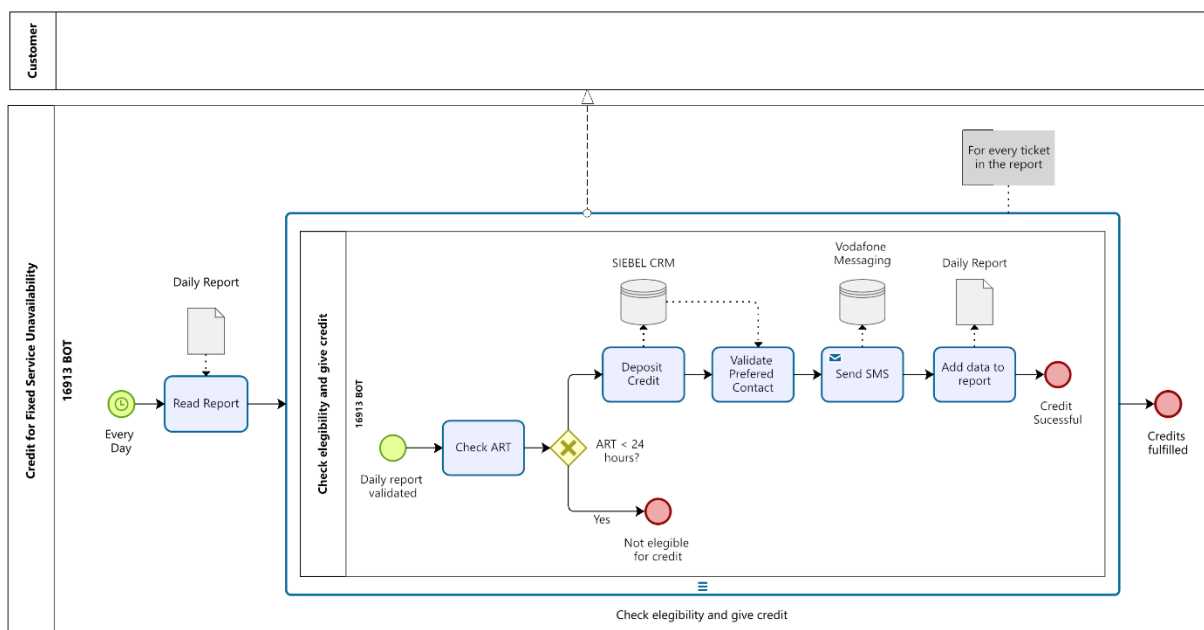


Figure 4.7 - Credit for Fixed Service Unavailability Process (To-Be)

Source: Prepared by the author

4.5.3. Field Service Availability Report

In this process, particularly, the inefficiency of it being dependent on the teams' availability to be performed, keeping it on hold, had a critical impact since it affected the ability of the team to do management decisions with the partners responsible for the FS teams, in a timely matter.

By automating the process, it can be performed on a defined time, regardless of the teams' availability, while also allowing the data of each team to be gathered in a faster way, granting that the decisions are made in a timely matter.

This process is simple, and the tasks were kept the same, but performed via automation.

All the modifications to the process are presented in the model below (see Figure 4.8).

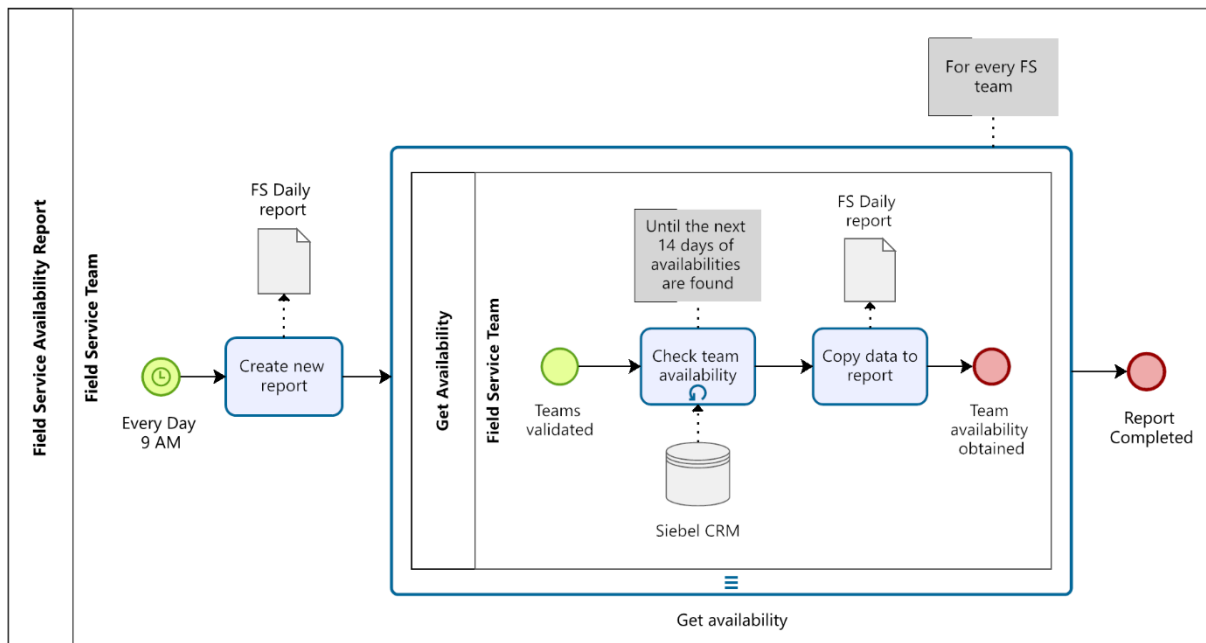


Figure 4.8 - Field Service Availability Report Process (To-Be)

Source: Prepared by the author

4.5.4. Communicate intervention in Vodafone Network

As represented in the figure further down (see Figure 4.9), this process was kept identical to the *as-is* process, as all tasks are adding value to the business or the customer.

The only modification is the process being automated, where the trigger that is now consistent and is prompt daily.

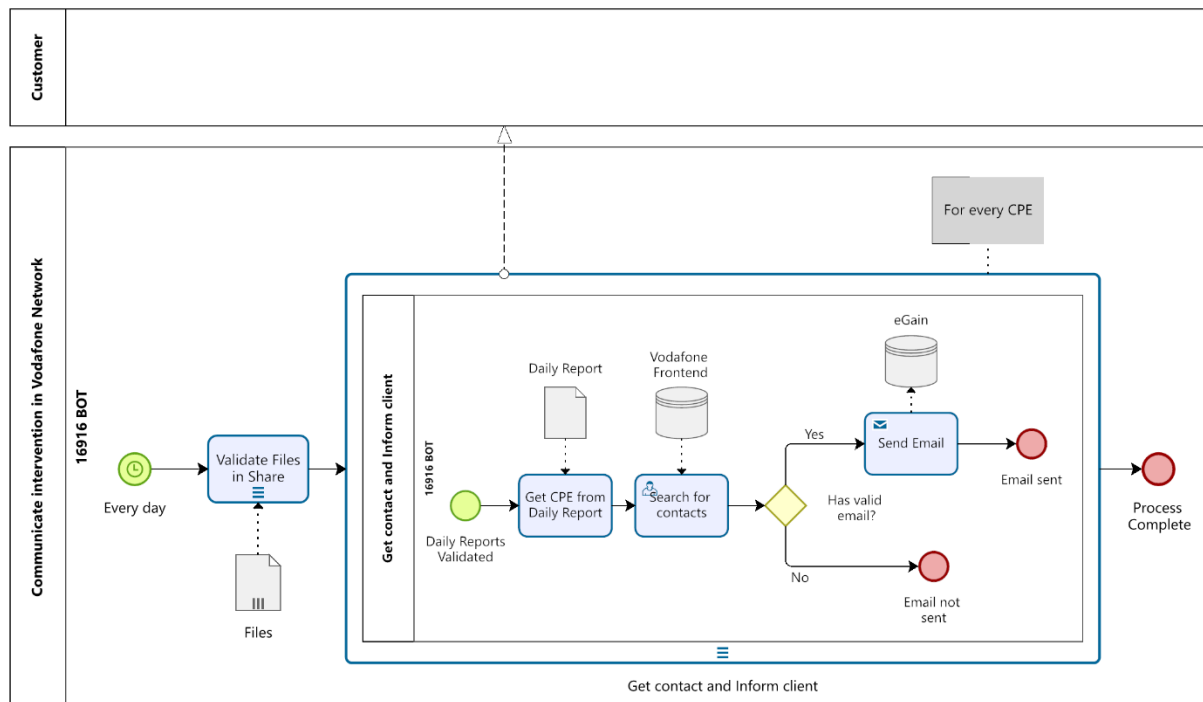


Figure 4.9 - Communicate intervention in Vodafone Network (To-Be)

Source: Prepared by the author

4.6. PHASE 6: DEVELOP AND IMPLEMENT RPA

In this phase of the project, it is described how the RPA was developed using UiPath automation tool and how every process was implemented.

For every process, Vodafone Guidelines were followed, and the processes are developed using small processes to ensure the ability to reuse some parts to other processes, for example, do Login into Siebel CRM.

4.6.1. IP Alarmistic (v1)

This process as described in the As-Is modelling phase, has two major milestones: Send SMS to the client and Receive response to SMS.

Therefore, to develop this automation the process was decomposed into five sub-processes, that together create a system able to fully process new tickets and received responses from clients.

Due to the number of sub-processes of this automation, this process used the Robotic Enterprise Framework to make sure all the scenarios were easily automated.

To develop this automation, it was required three queues in Orchestrator: one to store new SOs transactions to perform, another to store new responses from clients and finally, one to store the transactions to be closed after 48 hours, if applicable.

There are two dispatchers in the process: one gathers new SOs from Siebel CRM and stores it in orchestrator queue, another gathers the responses to SMS and stores it in another orchestrator queue. For every dispatcher exists a performer that will process all the transactions added by the dispatcher to the correspondent queue. Finally, the last subprocess is responsible for the closure of the SO, after 48 hours, if no response to the SMS is received.

The triggers for this process are distinct depending on if the process is dispatcher or else. In the case of the dispatcher processes, there is a time trigger for every 15 min, otherwise the trigger is related to the queue, and whenever there is a transaction to be processed, the process will start.

This automation is performed by a “robot” user, that has limited access granting the security needed to the organization.

4.6.2. IP Alarmistic (v2)

After the implementation of IP Alarmistic (v1), this process suffered a feature enhancement, where the ability to send emails to the clients, via eGain web application, was inserted in the process. This improvement is presented in high-level overview in Figure 4.10.

This improvement allowed a less invasive type of communication that is appropriate during the hours that customers are not available to receive further communications, while also achieving the same goal, which is to provide a timely notice, regarding the service incident, to the customer.

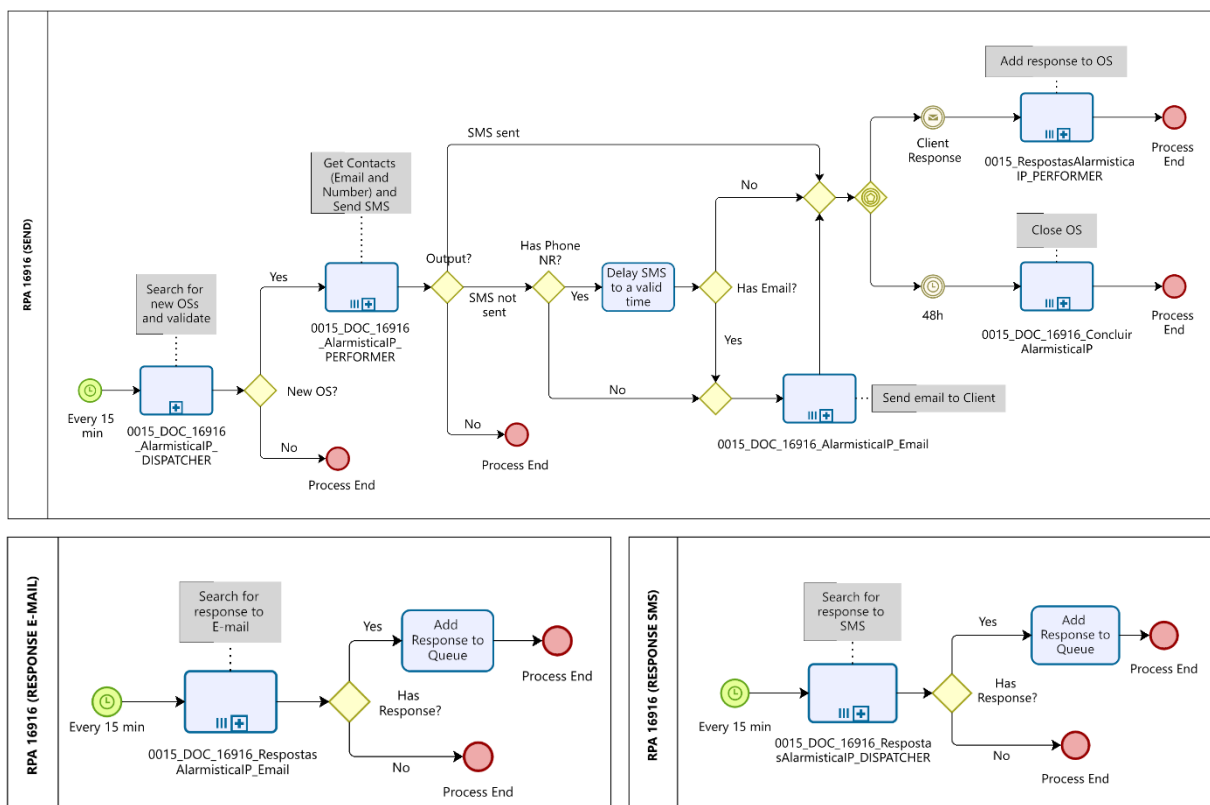


Figure 4.10 - High-Level Overview of IP Alarmistic Process (v2)

Source: Prepared by the author

Also, this improvement provides another form of communication in situations where no valid phone number is obtained to a specific client, thus reducing the exception rate of the process, caused by the lack of valid contact.

Regarding the implementation, this update involved the addition of another queue in UiPath Orchestrator, to store all the transactions to send an email and the addition of two sub-processes responsible for the dispatching of the email and the finding of the responses to the emails in eGain.

In total, the upgraded process has seven sub-processes and four queues.

4.6.3. Credit for Fixed Service Unavailability

This process was developed using REFramework to ensure the compliance with the best practices implemented by Vodafone.

The use of REFramework in this process was a challenge since the process will be maintained by team workers that had no expertise in UiPath and either the Framework, therefore the approach of Ifs and Elses were simpler and easier to understand.

However, due to the compartmentalization in different and smaller components, the process remained simple and easy to comprehend by the team.

The process is running in attended mode, on the worker Citrix machine and it has no queues in orchestrator, as it uses the Excel file as input and as a work queue.

4.6.4. Field Service Availability Report

This process was developed using Robotic Enterprise Framework and runs in attended mode, on the worker Citrix machine, it did not require any orchestrator queue as it uses the Excel file as input and as a work queue.

Some parts of this automation were reused from IP Alarmistic process since it also uses the Siebel CRM application. This approach accelerates the development of the automation.

4.6.5. Communicate intervention in Vodafone Network

This process automation was developed using Robotic Enterprise Framework and has a Dispatcher and a Performer, both run in Unattended mode.

The development of this automation was quick, as it was mostly comprised of pre-existing and reusable components from IP Alarmistic (v2).

The trigger of the Dispatcher process is a time trigger for every day at 12 AM, to be able to use the same license as IP Alarmistic without compromising the performer of the process.

The trigger of the Performer is a queue trigger that will be prompt if any new transactions are waiting to be processed in the queue.

4.7. SUPPLEMENTARY PROJECTS (QUICK FIX AUTOMATIONS)

Along with the automations introduced previously, it was developed multiple “Quick Fix Automations”. These smaller projects were developed to provide quick solutions to several issues the organization encountered during the duration of this project, therefore can be considered as “Quick Fix Automations”.

This is not the usual and neither the most recommended use case for Robotic Process Automation, but with the quick implementation that RPA enables, this technology was considered the best approach to solve these issues in a timely matter.

Over the course of this project there were three developments of this sort:

1. Close “In Progress” migration tickets;
2. Obtain contacts for critical customers (COVID-19 Governmental Measure);
3. Change CPEs configurations with Mediatrix.

4.7.1. Close “In Progress” migration tickets

This process was critical since it had a deadline imposed by a Siebel Uplift project that required all the migration tickets backlog to be closed until the upgrade date.

The development of this automation was 1 week and allowed the problem to be solved respecting the available schedule.

This automation was responsible for the closure of 11654 tickets with a rate of 200 tickets/hour, what resulted in the problem being solved, eliminating all the backlog of the process, in 58 hours of automated work.

This process was later adapted to the new version of Siebel CRM to reduce the backlog present in the process. In this second version the automation handled 409 tickets with a higher processing rate of 300 tickets/hour, allowing the backlog to be eliminated in less than 1 hour and 30 minutes.

4.7.2. Obtain contacts for critical customers (COVID-19 Legislative Measure)

Due to COVID-19 pandemic, the Portuguese Government implemented a measure to guarantee the availability of network services provided to country critical infrastructures, such as Fire Departments, Hospitals, Schools, among others.

This measure had to be implemented as soon as possible, thus RPA was the ideal solution to comply with this measure. This implementation was simple and fast, since the main components were reused from the IP Alarmistic Process, allowing the development to be finalized in less than 1 week.

The automation developed was able to retrieve all the contacts for the Vodafone clients considered as critical for the country, which represents approximately 1500 transactions (Tax Numbers) processed.

Each client tax number generally has services in more than one local, as they are B2B clients, this implicated the search within each client site, with an average of 15 seconds *per* local.

4.7.3. Change CPEs configurations with Mediatrix

This project was prompted by the acknowledgement of incorrect configurations in some clients CPEs. Therefore, it required a quick correction to the CPEs configurations to ensure a proper usage of the services provided by Vodafone, since these configurations often caused service malfunction to the customers.

This process was critical since it was affecting hundreds of equipments, making it difficult to the team responsible to provide a fast response to the issue. As this process required only the connection to a web application (Mediatrix) to modify the configurations of each equipment, RPA was considered the best approach to tackle this issue.

The implementation of this automation was simple and fast, since the process was simple as it required few steps, allowing the development to be finalized in less than one week.

With this automation it was possible to rectify the configurations of 374 available equipment's at an average time of 28 seconds *per* transaction, allowing the issue to be rectified in these CPEs in less than three hours.

5. IMPACT EVALUATION: RESULTS AND DISCUSSION

To evaluate the impact of this project a survey was conducted with the intent to understand the impact that the automations developed in this project had for each person that interacted with the automation itself.

The survey titled “The Impact of RPA”, had a total of seven questions with six mandatory answers with different types of responses (multiple choice, single choice and open text). From the total of questions, four were designed to understand the individuals’ feedback on the impact of RPA in their team, and the remaining three questions were design to properly identify the individual responding to the survey (see Annex A).

The target of this survey was the employees who interacted with, at least, one of the developed automations.

5.1. SURVEY: PERSONAL CATEGORIZATION ANALYSIS

The survey was responded by 12 individuals from different teams inside the Customer Operations department of Vodafone Portugal. The pool of responses of the survey was composed by 11 male (92%) and 1 female (8%) individuals, from 4 different teams:

- Technical Call center (16913);
- Projects;
- Enterprise Solutions Support (16916) – 1st and 2nd line of support;
- Field Service.

As presented in the Figure 5.1, the number of responses obtained per team were: 6 from both 16916 1st and 2nd line of support (corresponds to 50%), 3 from Field Service (corresponds to 25%), 2 answers from 16913 (corresponds to approximately 17%) and 1 answer from Projects team (corresponds to approximately 8%).

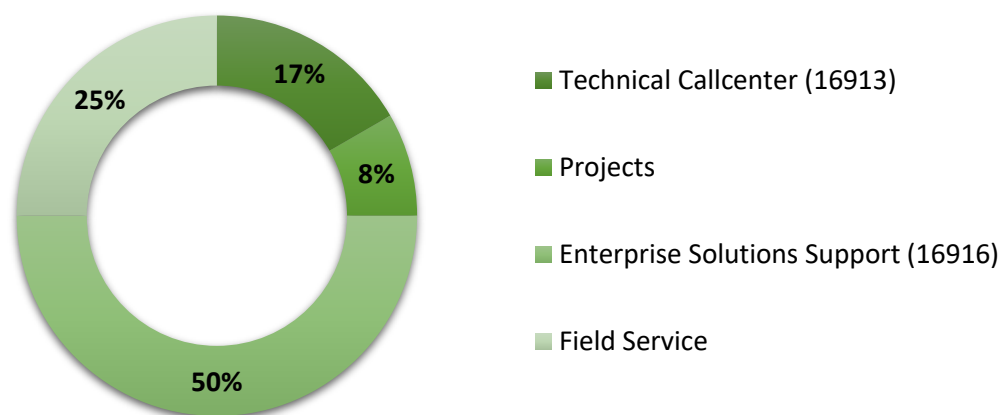


Figure 5.1 - Total of responses *per* team

Source: Prepared by the author

The number of responses per team can be explained by the time that the automation is in production, making the automation more familiar or by the number of automations developed per team, or also by the importance of the process automated to the team performance.

The Enterprise Solutions Support (16916) represents the major group of responses since it has the first automation developed during the project – IP Alarmistic – therefore making the automation more familiar to the team. Also 16916 had another three automations developed during this project: Communicate interventions in Vodafone Network, Obtain contacts for critical customers (COVID-19) and Change CPEs configurations with Mediatrix.

In the case of the Projects team, this survey had only one response since the automation developed was a supplementary project – Close “In Progress” migration tickets – with only one person from the team directly involved in the development.

The other levels of response are consistent with the importance and prioritization of the automation, as the automations that were earliest developed have produced more responses to the survey than the automations developed later.

Regarding the roles performed by the individuals that responded to the survey, each role had a total of 4 responses and as demonstrated through the Figure 5.2 the distribution of the roles per team is as follows:

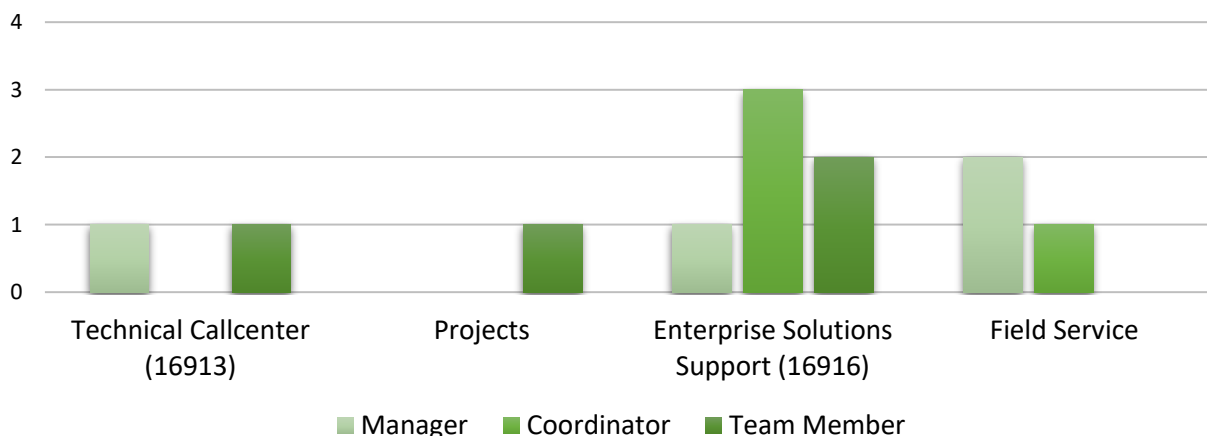


Figure 5.2 - Distribution of roles *per* team

Source: Prepared by the author

Through Figure 5.2 is possible to infer that, all the teams in charge of the processes which originated the main automations developed throughout the project (16916, 16913 and Field Service) have at least one of the responsible parties – Manager and/or Coordinator – represented in the survey. With this sort of higher-tier feedback, it is possible to understand the impact that the automation had at more managing level.

5.2. SURVEY: ANALYSIS OF AUTOMATION IMPACT

To determine the impact that the automations developed had in each team it has presented four questions:

1. *The automation developed for your team has brought some benefit to the process?*
2. *Which benefits? (if answer to question one is favorable)*
3. *If you are in a Management/Coordination role, after the RPA implementation, which was the approach regarding the FTEs saved? (If you are a team member skip the question)*
4. *Do you consider that the automation fulfilled its main purpose? (Saving costs, Improve Customer Experience, ...)*

Regarding the first question, as presented in Figure 5.3, the responses were unanimous as all the individuals considered that the automation(s) developed for their team has brought some sort of benefit to the process automated, therefore with these inputs is possible to conclude that all the automations had a positive impact to the process.

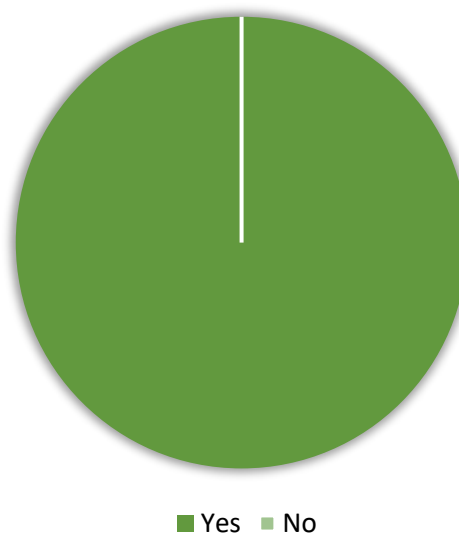


Figure 5.3 - Distribution of Q1 answers

Source: Prepared by the author

As all the responses to the first question were affirmative, it was also obtained a total of 12 answers to the second question. Through the figure below (see Figure 5.4), it is possible to conclude that one of the benefits is unanimous, since all the individuals considered the speed of the automation a benefit, hence achieving a quicker process. Furthermore, 10 individuals considered the Reduction of Workload to be a benefit obtained via automation, also 8 individuals considered the saving of FTE (Full Time Equivalent) to be another benefit, 7 individuals considered that automation allowed the process to be performed in a timely matter, and finally, 5 individuals considered both Reduction of Errors and eliminating backlog as benefits attained with RPA.

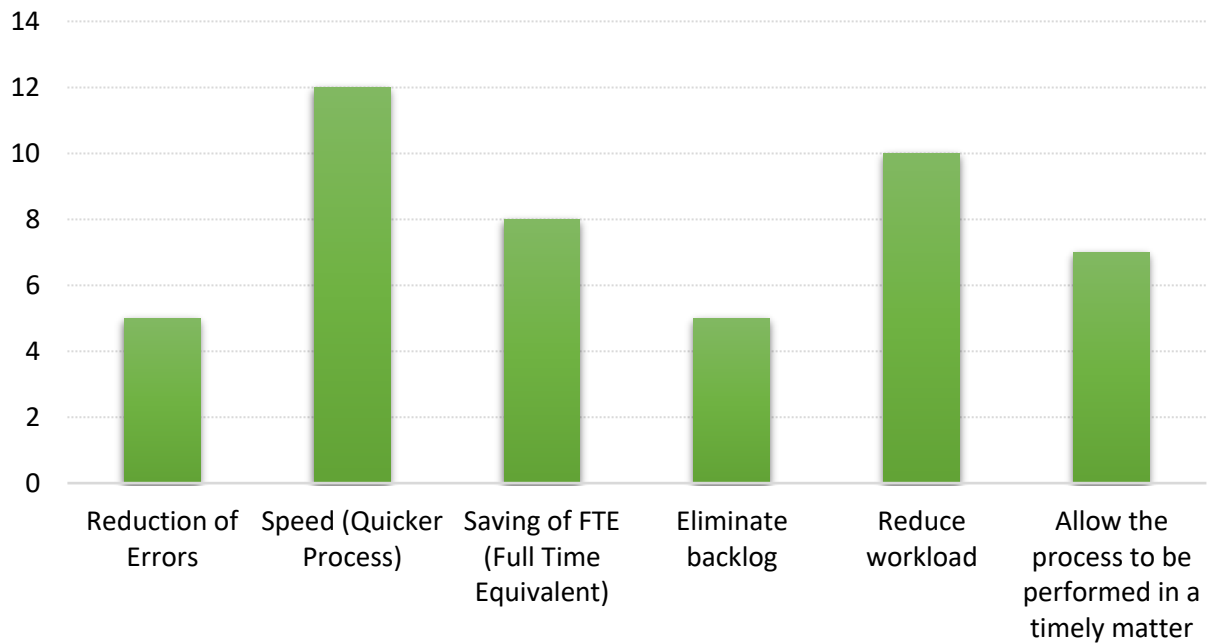


Figure 5.4 - Distribution of Q2 answers *per* option

Source: Prepared by the author

It is also relevant to evaluate the responses to this question *per* team and *per* role. The analysis *per* team is applicable, as it will allow a more in-depth analysis on the relevance of the automations developed *per* team, and assess the key benefits obtain by each one. As for the analysis *per* role, it will allow an understanding of the benefits recognized from both the management (Managers and Coordinators and the operational (Team Members) point of view.

Through Figure 5.5, it is possible to examine at the answers given by the members of each team and to extrapolate conclusions regarding the impact that the RPA initiative had on the automated process(es):

All the members of Technical Callcenter team (16913) unanimously agreed that the automation developed allowed an improvement in speed, allowing the process to be quicker while also granting a workload reduction. Also, one of the members (50%) considered that the automation also decreases the number of errors in the process, while saving FTEs, eliminating backlog and allowing the process to be perform in a timely matter. Therefore, is possible to conclude that although just two benefits were unanimous, to one of the individuals, every benefit in question was achieved through the automation of the process.

Regarding the Projects team responses, is possible to conclude that the responder considered that four benefits were achieved by the automation of the process. Those benefits were the process speed (Quicker Process), the saving of FTE, the elimination of backlog and the reduction of workload.

The Enterprise Solutions Support (16916) participants collectively agreed that the automation initiative provided improvements regarding the speed of the process and the workload reduction. Moreover,

five members (aprox. 83%) considered that automation also allowed the process to be performed in a timely matter, four participants (aprox. 66%) considered that the automation initiative allowed a saving of FTE in the team, and at last, three participants (50%) considered that the automation reduced the errors and eliminated the work in backlog. In conclusion, all the benefits given were considered to be accomplished through the RPA initiative by at least 50% of the team responders.

As all the other teams, the Field Service team also considered, unanimously, that the speed of the process was a benefit obtained with the automation, as the process became quicker. Additionally, two responders (aprox. 66%) also considered that the automation allowed savings in FTE, while one responder (aprox. 33%) considered that it also allowed the reduction of errors, a reduction in workload and allowed the process to be performed in a timely matter.

In summary, the teams covered by the project have all considered that automation brought benefits to the processes and considered as the top 3 benefits the speed improvement, the reduction in workload and the saving of FTEs (see Figures 5.4 and 5.5). Furthermore, it is possible to conclude that the RPA initiative had a positive impact in every automation developed and that those benefits were successfully recognized by each team, even with the social-economic influence that is recognized to be a concern in the RPA implementations.

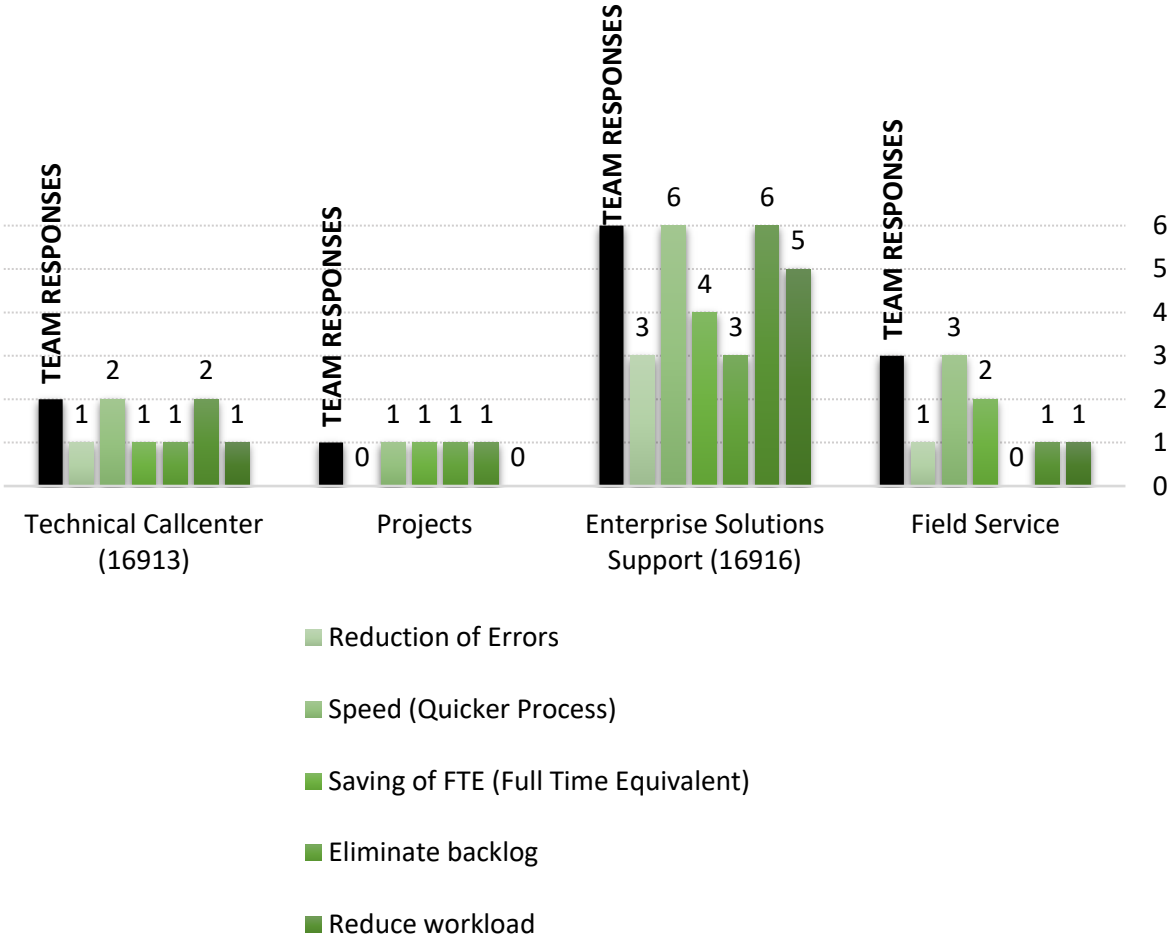


Figure 5.5 - Distributions of Q2 answers *per team*

Source: Prepared by the author

Through the chart in Figure 5.6, is possible to analyze the answers given by each role and to infer conclusions regarding the impact that the RPA initiative had on the automated process(es).

In this analysis the three categories will be aggregated into two groups: Management (Managers and Coordinators and Operational (Team Members). This partition allows for a comparison between the workforce and the management points of view because it is relevant to distinguish both beliefs, to acknowledge if the concerns regarding the social-economic consequences of automations have affected the benefits recognized by the Operational group.

As presented prior, all the responders have considered, unanimously, that the automations have improved the process speed, therefore it is possible to conclude that both the Management and Operational had a common understanding about this matter. Both the saving of FTE and the reduction of workload were recognized as a benefit by the majority (75%) of the Management group. In comparison, in the Operational group those benefits were acknowledged differently, with only 50% of the responders considering that the automation allowed the saving of FTE even though all the team members considered that the automation reduced the workload. Taking into account that the automation was considered to be reducing the workflow it should consequently save FTEs as the workers are no longer involved in the process. This discrepancy in the responses can represent an apprehension of the workers to realize that their work is being substituted by a software robot, even though they recognize the benefits obtained.

Another major discrepancy between both groups is the recognition of Reduction of Errors through automation as most of the Management group (62,5%) considered that this benefit was attained with automation, while none of the members of the Operational group considered this as a benefit. Similar to the topic regarding the saving of FTE, this inconsistency can be related also to an apprehension of the workers to be substituted by a software robot, as this benefit assumes that errors occurred in the manual process, which require the Operational group to recognize the errors made by themselves, making this benefit a recognition of the human flaw.

A comparable situation occurs with the benefit regarding the elimination of backlog, where 50% of the Management group have considered it a benefit, whereas only 25% of the Operational seem to agree with that statement, since this benefit also represents the lack of capacity that the humans have in comparison with a robot that can work 24/7 and can be scaled to accommodate the variances in workload.

Lastly, even though at least 50% of each group considered "Allow the process to be performed in a timely matter" as a benefit it presented a difference of 12,5% in both groups, with 62,5% of the Management group and 50% of the Operational group considering it a benefit. Although the percentage is not equal in both groups, is possible to conclude that at least half of the members in each group have considered that the automation allows the process to be performed in a timely matter, therefore is possible to assume that both groups agree to some extent with this benefit.

In conclusion, although all the benefits were considered to be attained by at least five members in the global pool of responders, it is possible to understand that the benefits differ depending on the automation developed, since it was obtained different responses per team. Regarding the analysis per role, it was possible to conclude that some benefits presented major discrepancy between the

Management and Operational groups and that those discrepancies seem to be created by the social-economic effects partaken by automation initiatives, such as the fear of unemployment.



Figure 5.6 - Distribution of Q2 answers *per* role

Source: Prepared by the author

The third question was intended for the Management and Coordination roles only, since it aims to comprehend the approach adopted regarding the FTEs saved. Therefore, all responses given wrongly by team members were discarded from this analysis, which results in eight valid responses. From those responses four considered that the work was readjusted and the other four considered that the FTEs saved were reallocated to other tasks (see Figure 5.7).

It is also possible to conclude through Figure 5.7 that 16913 team opted to Reallocate the FTEs saved, the 16916 1st and 2nd line of support opted to readjust the work and reallocate the FTEs saved while the Field Service team opted to readjust the work.

The different choices presented in 16916 responses are caused by the automations developed for both 16916 lines of support that are coordinated by different individuals, and also because of the various automations developed (both core and supplementary projects) which led to different out. The Projects team had no management input since the only automation developed was a supplementary project (Quick Fix Automation), which only required the involvement of one team member.

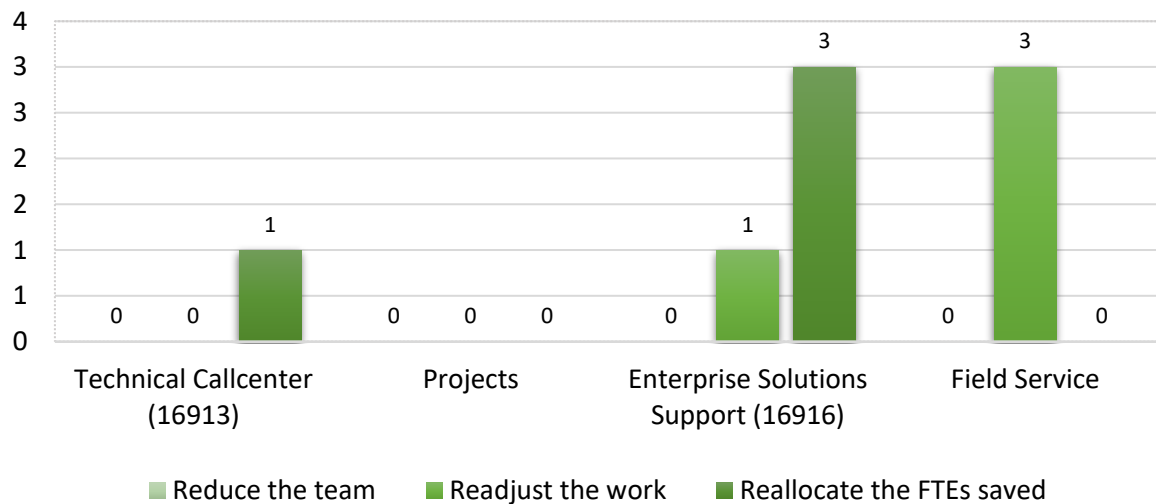


Figure 5.7 - Distribution of Q3 answers *per* team

Source: Prepared by the author

Lastly, the fourth question was intended to understand if the individuals considered that the automation accomplished its main purpose, either to save costs, improve customer experience or others such as the ones mentioned in this project. With the figure below (see Figure 5.8) is possible to conclude that all the responders considered the purpose was achieved therefore the automations had the impact expected by the responders.

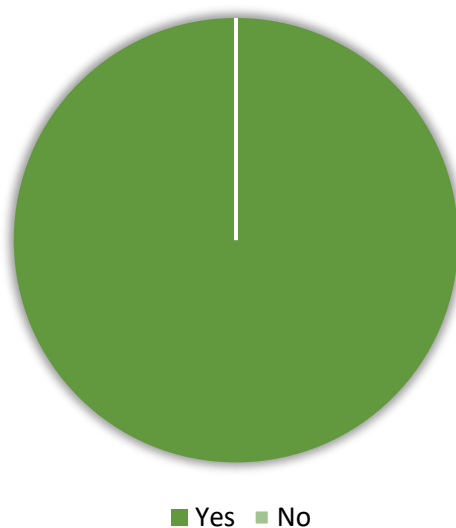


Figure 5.8 - Distribution of Q4 answers

Source: Prepared by the author

In conclusion, with the survey it was possible to recognize that all automations had a positive impact in their team as all were considered to produce multiple benefits to the process. Those benefits were more noted by the management group, as the operational group have considered less benefits, those differences between the groups responses were expected to be caused by social-economic implications commonly addressed in automation initiatives.

5.3. PROJECT OPERATIONAL BENEFITS

The impact of the project was also assessed through the operational benefits obtained with the automations.

All the saving estimated during the Analysis and Prioritization phase of the project were reached as all the automations fulfilled the objective and replaced the humans in the process (see Table 5.1).

		Savings	
		Time Savings (month)	Cost Savings (month)
Process	IP Alarmistic	Aprox. 176h	2800 €
	Credit for Fixed Service Unavailability	Aprox. 73h	877,5 €
	Field Service Availability Report	Aprox. 176h	2000 €
	Communicate intervention in Vodafone Network	Aprox. 48h	765 €
	TOTAL	Aprox. 473h	6442,5 €

Table 5.1 - Project Operational Benefits (Time and Cost) by Process

Source: Prepared by the author

In total, the automations developed during the project granted monthly OPEX savings of approximately 473 hours of work *per* month, that corresponds to approximately 3 FTEs and 6442,5 €.

In addition, the automations also conferred a reduction in the Cycle Time (or Throughput Time) as the process became faster and the Lead Time as the Waiting Time was reduce as the processes are scheduled to start automatically (in the case of unattended) or are initiated by the team early in the morning or when needed (in case of attended), on all processes that resulted on improved Operational KPIs regarding time and volume of work completed, which represents an improvement in the process efficiency.

A concrete example of this improvement is the IP Alarmistic process that had a reduction of the average waiting time from 4 hours to a maximum of 15 minutes, corresponding to a reduction of, at least, 93,75% in ticket take-time (Vodafone's terminology for waiting time), and this can be improved even more, if the triggers applied to the process are modified to be a more frequent schedule.

In addition, in Table 5.2, is possible to understand the savings regarding Cycle Time, obtained through automation. On all four processes, the Cycle Time is greater than 70% faster, this measure allows for an understanding of the efficiency achieved by this initiative and its potential.

With quicker processes is much simpler to handle peaks and fluctuations on the volume of work, to avoid creating backlog and causing bottlenecks in the process.

		Cycle Time (per transaction)		Savings
		Manual Process	Automated Process	
Process	IP Alarmistic	15 min + 2,5 min	4 min 12 sec	76 %
	Credit for Fixed Service Unavailability	1 min 30 sec	26 sec	71,2 %
	Field Service Availability Report	1 min 15 sec	19 sec	74,6 %
	Communicate intervention in Vodafone Network	3 min	44 sec	75,6 %

Table 5.2 - Cycle Time Comparison

Source: Prepared by the author

As regards to the Supplementary Projects, as described previously, they were serving the purpose of being Quick Fixes to problems (Backlog and Critical Matters) within the Department, that allowed the operation to save time as all the work was performed automatically, and to fix the issue faster. The time savings were presented in detail earlier, in section 4.7.

6. CONCLUSIONS

6.1. SUMMARY OF THE DEVELOPED WORK

This project initiated with the purpose of implementing automated after-sales workflows systems (via RPA) in some processes of 16916 Enterprise Technical Support team to improve the Customer Experience. As the impact of the project started to materialize, other teams also encountered processes that could benefit from this initiative, which resulted in the addition of two other teams of Customer Operations department of Vodafone Portugal to the project scope.

To ensure this project followed the best practices in the field, it was necessary to research the existent literature about the technologies, methodologies and approaches involved in the development. Hence, it was understood that four steps were necessary in the development of the project:

Initially, it was required to understand the processes that were considered fit for automation by the process owners. Therefore, it was essential to gather information about each process and to model it *As-Is*. The process modelling approach allows for a collective view of the process, as it is a combined effort between all the people involved in the process (Domain Experts) and the Process Analyst. The model of the process is required to further analyze it and decide if the process is fit for automation by the guidelines stated in literature. The modeling phase was developed using the latest version of BPMN in Bizagi Process Modeler tool.

Moreover, with the established process model is possible to analyze it according with the aspects stated in literature as crucial to process automation: Process Complexity, Volume of transactions, Standardization and Stability, Time-consumption, Level of manual work and “Rule of 5”. The conclusion of the assessment allowed a comparison between the processes to ensure that the automations developed are correctly selected and prioritized. This phase is crucial to obtain the highest ROI and to demonstrate the effectiveness of the technology to the sponsor.

After prioritizing the processes, an updated and optimized model (*To-Be* Model) was developed for each process. This model combines the previous model (*As-Is* Model) with viable improvements to eliminate or mitigate the inefficiencies discovered in the *As-Is*. Even though automation is used to improve processes, it is vital to utilize it in optimized processes, as the automations can create the opposite effect and aggravate the process limitations if they are not resolved.

Finally, it was possible to automate the processes using RPA via UiPath Studio tool. Ultimately, this four-step approach allowed for a data-driven selection and prioritization, thus ensuring the decisions made were accurate throughout the project. Also, though the enhancement of the processes prior to the automation development was possible to guarantee a higher ROI, since the automations were developed on previously optimized processes.

The project main objective was achieved through the implementation of five automations and three supplementary projects, driven by the success of the milestones established originally. The automations developed were considered, by the teams, to be beneficial and the top 3 benefits acknowledged were the speed improvement, the reduction in workload and the saving of FTEs. Those benefits impact the Customer Experience as the first two stated relate directly to the capacity of the organization to

respond and resolve open tickets. While also, the saving of FTEs can indirectly improve the Client Experience in the future, with the possibility of service cost reduction due to the savings in OPEX.

6.2. LIMITATIONS

This project was mainly restricted by Technological Barriers inside the organization that affected the planning and the development of the automations.

The first barrier to be encountered in the project was caused by the organization's dimension and the sort of use cases promoted by the Customer Operation teams to be automated, as the use cases that were expected to be automated were regarding processes in finance and other departments where most of back-office operations relied only in applications such as Siebel CRM and SAP. The development of automation in unexpected areas, that required other applications to be used, caused some difficulties to initiate this project because it required accesses and permissions to applications that the Virtual Machines (Citrix) where the RPAs were allocated did not had yet.

Another barrier was caused by the lack of support for some UiPath studio features due to security compliance. This barrier was overcome through a workaround developed in a chrome extension (Wizdler) to fulfil the objective of sending SMS via SOAP request to Vodafone's SMS Broadcast webservice, as this capability was interdicted in UiPath software itself.

6.3. FUTURE WORK

As the RPA technology is acknowledged by the organization this project has the potential to evolve, through the automation of more processes or through the improvement of the existent automations to make them do more work.

The IP Alarmistic process was the most ambitious process to be automated as it can evolve into a much multifaceted and complete system. Currently, the automation has the ability of managing and processing the IP Alarm tickets of 16916 team with only the failure information obtained from Siebel CRM, which means that the problem is known but not assessed by the automation. Therefore, one of the improvements that can be developed in the future is the addition of SSH Access to allow the RPA to check the equipment (CPE) connectivity and troubleshoot to assess the problem and possible solutions. This will allow the automation to become a primary source to the problem resolution, firstly because it will be able to solve the simplest problems or if the problem requires human intervention, to report directly into the notes of the open ticket (in Siebel CRM) the gathered data from the troubleshoot and even possible solutions to the problem, and potentially send the ticket to the most appropriate team to handle it (if applicable). The improvement would allow the simplest cases to be solved through automation, leaving only the complex cases that require human intervention to be handled by humans. With this first improvement, the system would also be able to recognize through the troubleshoot output if the problem required the use of Field Service and if so, the automation could also be responsible for the scheduling of the Field Service with the client through email or SMS. Another possibility is to scale this process (or parts of it) to other teams, for example, the support team of TOP clients, has the same process as IP Alarmistic and therefore can benefit from the automation of the process.

Also, another opportunity is to recognize other potential operations to the processes, as two processes were developed to ensure their usability with other inputs. For example, the process Credit for Fixed

Services Unavailability can be used with other causes of unavailability as input, therefore the automation can be applied to many forms of the same process. This approach also can be implemented in Communicate intervention in Vodafone Network process as this process is also prepared to send communications regarding different types of intervention without demanding an automation update.

Lastly, the scalability can be applied to all the processes developed through the implementation of the automations by other teams or other departments, as the benefits tend to be more recognized.

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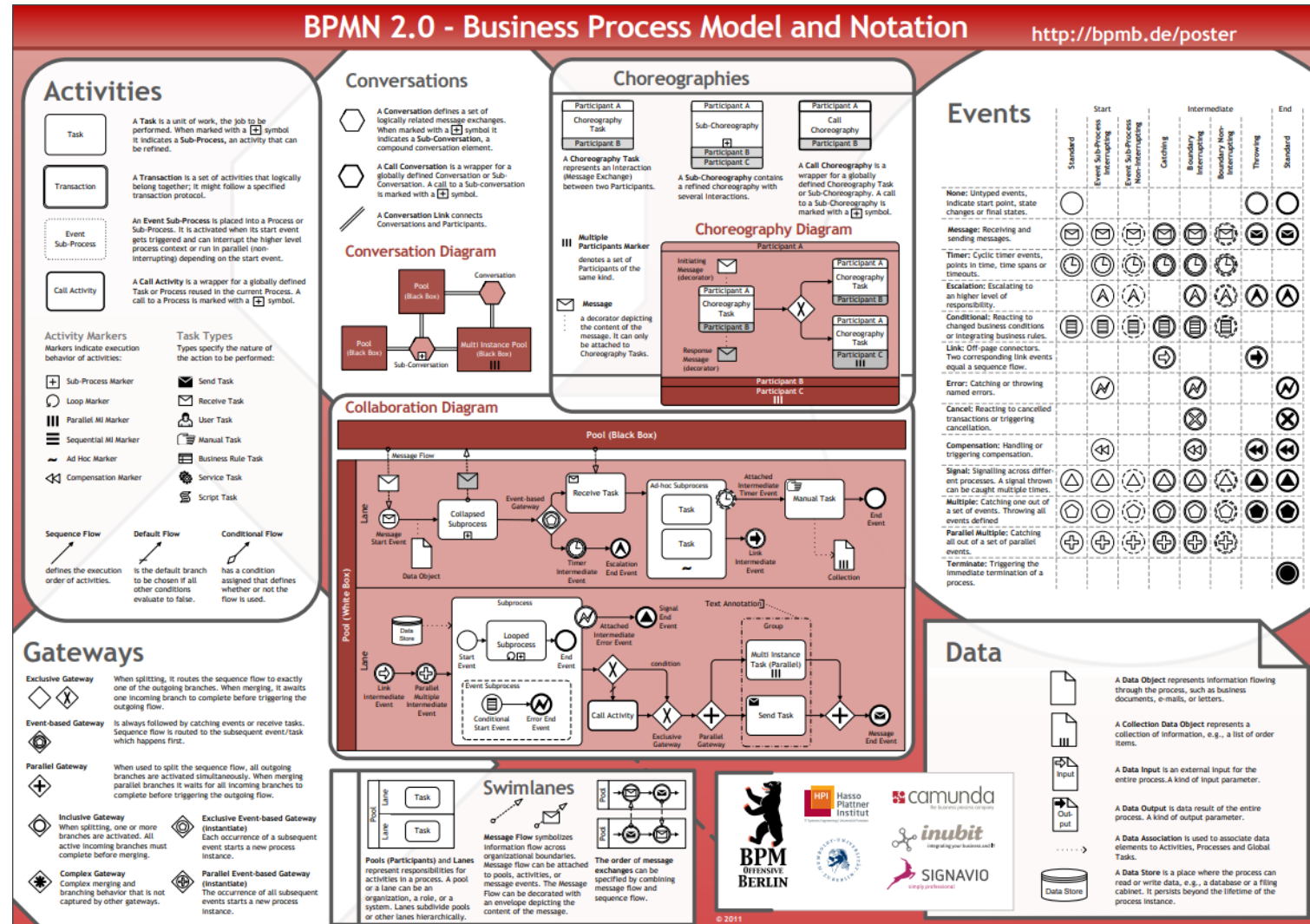
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APPENDIX

A. Business Process Model and Notation Poster

Source:

http://www.bpmn.de/images/BPMN2_0_Poster_EN.pdf



ANNEXES

A. Survey: The Impact of RPA

The Impact of RPA

This survey aims to understand the impact that the use of Robotic Process Automation technology had within each team where at least one project was applied.

Therefore, if you received this form, one of the projects developed affected your team, and I kindly ask you for your input regarding the impact it had.

* Obrigatório

1. The automation developed for your team has brought some benefit to the process?

*

☐ Yes

☐ No

2. Which benefits? *

☐ Reduction of Errors

☐ Speed (Quicker Process)

☐ Saving of FTE (Full Time Equivalent)

☐ Eliminate backlog

☐ Reduce workload

☐ Allow the process to be performed in a timely manner

3. If you are in a Management/Coordination role, which was the approach regarding the FTEs saved?

☐ Reduce the team

☐ Readjust the work

☐ Reallocate the FTEs saved

4. Do you consider that the automation fulfilled its main purpose? (Saving costs, Improve Customer Experience, ...) *

☐ Yes

☐ No

5. What is your gender? *

☐ Woman

☐ Man

6. What is the team you work? *

7. Which is your role? *

☐ Manager

☐ Coordinator

☐ Team member

