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ROBOTIC PROCESS AUTOMATION FRAMEWORK

The implementation of Robotic Process Automation in Business
Processing Outsourcing Organizations

Ana Isabel Fernandes Gonçalves

Dissertation

presented as partial requirement for obtaining the master's degree Program in Statistics and Information Management

NOVA Information Management School
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ROBOTIC PROCESS AUTOMATION FRAMEWORK: THE IMPLEMENTATION OF ROBOTIC PROCESS AUTOMATION IN BUSINESS PROCESSING OUTSOURCING ORGANIZATIONS

by

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Dissertation presented as partial requirement for obtaining the Master's degree in Statistics and Information Management, with a specialization in Market research and CRM

Advisor: PhD Vítor Duarte dos Santos

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STATEMENT OF INTEGRITY

I hereby declare having conducted this academic work with integrity. I confirm that I have not used plagiarism or any form of undue use of information or falsification of results along the process leading to its elaboration. I further declare that I have fully acknowledge the Rules of Conduct and Code of Honor from the NOVA Information Management School.

Ana Gonçalves

Lisboa, 21/11/2022

DEDICATION

I dedicate my dissertation to my advisor, family, and friends. A special feeling of gratitude for my advisor, PhD Vítor Duarte dos Santos, who accompanied me throughout the thesis, always being available and with words of encouragement.

I also dedicate this thesis to my mother, Laurinda Fernandes, who always encouraged me, and to my boyfriend, Diogo Remígio, who was an important support in all the two years of my master's degree. And my best friend, Liliana Azevedo, who encouraged me.

Lastly, I dedicate this thesis to Catarina Ferraz, who has an essential role in my master's.

ABSTRACT

Digital transformation is the digitalization of earlier analogue machine and material processes, service operations, and organizational tasks to aggregate new value for clients and employees.

There is an increasing number of organizations that are taking advantage of digital transformation, competing in the market of the digital economy.

The advances of the global market in competitiveness trigger organizations whose ambition is to distinguish themselves to develop more efficient and effective processes, delivering distinctive services or products to their consumers.

When the Business Process Outsourcing (BPO) processes are automated with Robot Process Automated (RPA), the organization can raise cost efficiency, acquire efficiency advantages, and increase their rank in the market. Additionally, when repetitive and tedious activities are automated, human employees have time and opportunity to enhance their cognitive judgment, creative thinking, and social skills.

This research approaches the steps that lead to the elaboration of a framework that can be adopted in BPO processes, aiming to help in the knowledge of which processes are typical in BPO, and which of those processes can be fully automated, semi-automated or cannot be automated with Robotic Processing Outsourcing.

Afterwards, are revealed the assumptions that were the base of the artifact elaboration, following the description of each component and stage that constitute the framework.

Lastly, it is referred the validation of the framework by experts and the discussion of the obtained results, conclude the utility of the artifact as support to the automation of BPO with RPA.

KEYWORDS

Business Process Outsourcing (BPO); Robotic Process Automation (RPA); Robots; Digital Transformation

Sustainable Development Goals (SGD):

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LIST OF ABBREVIATIONS AND ACRONYMS

AI   Artificial Intelligence

API   Application Programming Interface

BPO   Business Process Outsourcing

DSR   Design Science Research

DSRM   Design Science Research Methodology

FTE   Full-Time Equivalent

FTE   Full-Time Employee

ICTs   Communication Technologies

IS   Information system

IT   Information Technology

ITeS   Information Technology-Enabled Service Provider

KPI   Key Performance Indicator

KPO   knowledge process outsourcing (KPO)

ML   Machine Learning

MNCs   Multinational Companies

RPA   Robotic Process Automation

PRISMA   Preferred Reporting Items for Systematic Reviews and Meta-Analyses

"There is nothing else than now. There is neither yesterday, certainly, nor is there any tomorrow. How old must you be before you know that? There is only now, and if now is only two days, then two days is your life and everything in it will be in proportion. This is how you live a life in two days. And if you stop complaining and asking for what you never will get, you will have a good life. A good life is not measured by any biblical span."

— Ernest Hemingway, *For Whom the Bell Tolls*

1. INTRODUCTION

This introduction comprises the contextualization of this research. Thus, this first section exploits primarily the perceptions and problem identification, secondly the specific purposes, and lastly, the concise structure's description.

1.1. BACKGROUND AND PROBLEM IDENTIFICATION

In the beginning, when global telecommunications infrastructure was settled and trustworthy, BPO activities usually demanded international providers. Although, many enterprises in diverse countries have specialized in different business processes and exporting services, the five greater BPO international has emerged worldwide: 1. India - specialized in Engineering and Technical; 2. China - specially dedicated to Manufacturing and Technical; 3. Mexico - focused on Manufacturing; 4. The United States - focused on Analysis and Creative; 5. The Philippines - concentrated on Administrative. These countries have complex economies that cover the entire spectrum of business activity, nevertheless from the BPO context they present comparative advantages in these activities mentioned above (Click & Duening, 2005).

Nowadays, organizations are suffering from a wide pressure to shift to a flexible and multinational position. Cost operation on the global market is higher because of the language and legal policies differences (Krysińska et. al, 2018). Globalization, competitive markets, fusions, and acquisitions are the elementary incentives for BPO. The primary goal of BPO is to provide the utmost value to each stakeholder and accomplish and maintain the maximum degree of productivity for an organization (Ghodeswar & Vaidyanathan, 2008).

Outsourcing currently includes BPO (Ghodeswar & Vaidyanathan, 2008). The contemporary type of outsourcing is designated BPO. The biggest difference from traditional outsourcing is the white-collar high-paying workforce, who have till newly been involved within the outsourcing world (Duan et. al, 2009). According to Click & Duening (2005), BPO is a movement of business processes from inside the enterprise to external service providers.

An increasingly crucial tool that promises to automate business processes that implicate routine activities, structured data, and deterministic outcomes is RPA (Aguirre & Rodriguez, 2017).

There are several definitions of RPA, for instance Jiménez et. al (2020) interpret RPA as :

"Robotic process automation (RPA) is a software solution for the creation of programs that mimic the behaviour of human workers when performing repetitive and structured tasks with information systems (ISs)." (Jiménez-Ramírez et al., 2020).

RPA is the robotic process automation's acronym. A robot is an object whose function is to mimic human activity. The process is a sequence of steps demanded to execute an assignment. Automation is an activity detached from the necessity of human interference (Gami et al., 2019). RPA includes the instruments and platforms that operate with structured data, and deterministic outcomes, and rules-based processes (Lacity & Willcocks, 2016). RPA admits the production of software whose function is to perform the same human activities while is working with digital systems. These activities embrace

"calculations, maintenance of records, entering data, logging in and logging out, collection of data from file or browser, etc." (Gami et al., 2019).

Moreover, it utilizes human interface to acquire and handle data. RPA systems result from a set of steps. Firstly, observe how a user performs particular tasks in the application's graphical user interface, and later execute the automation replicating those activities. Furthermore, RPA offers a platform to produce a virtual employee (Gami et al., 2019).

The robot operates repetitive activities, contributing to decreasing the effort required by humans of repeating the same task again and again, by reducing the high number of skilled human resources needed (Gami et al., 2019).

The RPA history reveals that the scope of this technology is extensive. RPA aids in performing maximum and optimum outcomes (Gami et al., 2019).

Concurrently to both BPO and RPA definitions, different authors clarify the boundaries where RPA could be employed in the BPO domain.

Some outsourcing with a traditional BPO providers is seeking to purchase service automation as part of an integrated service supplied by a traditional BPO vendors (Lacity & Willcocks, 2016). Furthermore, the new BPO providers are laser-focused on assisting clients to obtain knowledge and employ the new type of RPA tools (Lacity & Willcocks, 2016).

Jiménez-Ramírez et al. (2020) highligh that, in the BPO sphere, organizations perform processes that belong to another firm. When an enterprise decides to implement RPA concentrates its attention on human resources. Thus, workers benefit from lessons to acquire management knowledge and learn to resolve daily exceptions. Conversely, the RPA operation initiates with the automation of the simplest tasks rested on the acquaintance that the human labor has produced.

The phenomenon of swapping human workers to software robots allows companies to reduce their number of employees, save costs, and apply these savings to the client. The automation of these functions enables the management, by an organization, of the oscillations in demand by the enhancement or reduction of the robots orders' quantity operating, and cut on the expenses related to training and quality assurance (Barnett, 2015).

It is not clear how RPA can efficiently be employed in the BPO industry, to eradicate repetitive tasks still present in the daily work of BPO's workers. Besides, all the literature found about both concept BPO and RPA, as well as the transformation and impact that RPA can lead on the BPO sector. To fill this gap is vital to understand which areas of the BPO industry are possible to automate, semi-automate, and lastly, which ones have deeper complex processes becoming impossible to automate due to the demand of human workers.

1.2. SPECIFIC OBJECTIVE

This paper intends to design a framework for RPA implementation in BPO.

In order to accomplish this goal, the following intermediate objectives were defined:

1 - Study the theoretical literature of BPO and RPA.

2- Understand the scope of the implementation of RPA on BPO's processes.

3 - Comprehend which BPO's process can be automated or semi-automated or not.

4 - Design an RPA Framework for BPO

5 - Validation of the RPA Framework for BPO

1.3. STRUCTURE

This proposal is constituted of five different sections:

The **first chapter** is composed by the introduction, in its turn, decomposed into three distinct parts: background and problem identification, specific objectives, and the paper's structure. Background and problem identification, in its turn, present a theoretical description of BPO and RPA and a brief explanation of implementation's necessity of RPA in BPO and its advantages. Lastly, the specific objectives identify not only its goals but also its motivation to study and analyze those purposes.

The **second chapter** contains the Methodology chosen. Thus, Design Science Research (DSR) is theoretically examined, as well as their steps are succinctly analyzed.

In the **third chapter**, a Literature Review is presented and decomposed into two sections: Primarily, the literature review opens with the theoretical overview of the concepts of Digital Transformation, BPO, RPA, and the relationship of BPO and RPA. Secondly, a Systematic Literature Review is described.

The **fourth chapter** contains the RPA Framework, composed of 4 steps: identification of the necessities of BPO's clients; identification of the BPO processes that can be automated or semi-automated and cannot be automated; identification of the necessary RPA.

The purpose of the last chapter, the **fifth chapter** is to incorporate conclusions, limitations, as well as future advancements to academic and scientific inputs.

"The important thing is not to stop questioning. Curiosity has its own reason for existence. One cannot help but be in awe when he contemplates the mysteries of eternity, of life, of the marvelous structure of reality. It is enough if one tries merely to comprehend a little of this mystery each day.

—*"Old Man's Advice to Youth: 'Never Lose a Holy Curiosity.'"* LIFE Magazine (2 May 1955) p. 64"

— Albert Einstein

2.   METHODOLOGY

Ambitioning to obtain as output a framework for the use of RPA in BPO, and to facilitate the comprehension of both concepts RPA and BPO for those whose study area is not engineering, this study will have the support of the DSR Methodology.

Likewise, this thesis aims to obtain an artifact as output. According to Hevner and Chatterjee (2010), DSR is a research model characterized by a set of answers to the pertinent questions to human problems, aiming to enhance the organizational, group, and individual human productivity and effectiveness (Baskerville et al., 2018), through original artifacts. And thus, providing new knowledge to the range of scientific evidence. The designed artifacts are not only useful but also fundamental in the comprehension of the problem (Hevner & Chatterjee, 2010, p. 5).

DSR, a research phenomenon, plays an important role in the relevance and rigor gap of research. DSR adds to practical relevance by applying artifacts, and scientific rigor, raising design theories (Baskerville et al., 2018).

DSR research habitually has a problem statement, created deliberately, to resolve, which is considered a practical contribution (Hevner et al., 2015). Hevner et al. (2019) sustain that this provides, to DSR studies, some level of practical relevance in the area of study.

2.1.   DESIGN SCIENCE RESEARCH (DSR) METHODOLOGY

A methodology is a system of principles, practices, and procedures employed to a particular area of knowledge (Peffers et al., 2014).

Design science aims to improve solutions for practical dilemmas and, thus, achieve utility (Cleven et al., 2009).

DSR can be regarded as a different idea or an array of analytical techniques that support the occurrence of investigation in various areas. DSR desire to study, explore, and scrutinize the artificial and its conduct from an academic and organizational outlook. DSR is a meticulous process of designing artifacts to decipher problems, assessing what was designed, or what is operational, and conveying the outcomes (Dresch et al., 2015). In the current research the framework for the use of RPA in BPO can be seen as an artefact and so DSR is adequate for this propose. Moreover, DSR is important because of its rigor, novelty, complexity, and feasibility (Geerts, 2011).

The main objective of DSR is the development, design, and production of constructs, models, methods, and instantiations, and thereby, in this thesis enables to extend the boundaries of human and organizational abilities (Hevner et al., 2019), (Herselman & Botha, 2015), (Baskerville et al., 2018), (vom Brocke & Maedche, 2019). Moreover, DSR expects to produce design knowledge, namely, knowledge concerning pioneering solutions to real and practical problems (vom Brocke & Maedche, 2019), frequently by human agency (Hevner et al., 2019). So, DSR is a great contributor to digital improvement and, thus, foments keys to social challenges (vom Brocke & Maedche, 2019).

According to Hevner and Chatterjee (2010, p. 5), DSR is an approach that substantiates and performs research when the urged main is an artifact or a suggestion. The elementary principle of DSR concerns the creation and application of artifacts to the conception of knowledge and understanding

of a design problem and, lastly, coming up with solutions. Similarly, other authors consider artifacts as man-made object created to solve a particular problem (Herselman & Botha, 2015) in form of concepts, models, and/or methods, constructs, and instantiations, or better theory (i.e. applications of artifacts) that are advanced and worthful, offering research contribution (Teixeira et al., 2019), (Drechsler et al., 2016), (Herselman & Botha, 2015), (Dresch et al., 2015). Thereby, its utility can be rigorously demonstrated and scientifically evaluated (Hevner et al., 2015). Moreover, DSR takes design science as a basis, hence usually is realized from an academic perspective or organizational standpoint (Dresch et al., 2015).

Table 1 shows several categories of artifacts at different perception stages of knowledge influence based upon the maturities of the problem, field, and solution area. Therefore, based on Gregor and Hevner (2013) study, there are various DSR outputs as study variables, with three maturities of DSR artifact types. Moreover, a particular DSR research project can create artifacts on one or more of these levels varying from distinctive instantiations at Level 1 in the state of products and processes, to more general (abstract) supports at Level 2 in the way of emerging design theory (constructs, design principles, models, methods, techno-logical rules), to mature design theories about the events under analysis at Level 3 (Baskerville et al., 2018), (Gregor & Hevner, 2013).
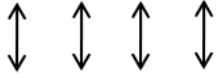
	Contribution Types	Example Artifacts
More abstract, complete, and mature knowledge	Level 3. Well-developed design theory about embedded phenomena	Design theories (mid-range and grand theories)
↕ ↕ ↕ ↕	Level 2. Nascent design theory - Knowledge as operational principles principles/architecture	Constructs, methods, models, design principles, technological rules.
More specific, limited, and less mature knowledge	Level 1. Situated implementation of artifact	Instantiations (software products or implemented processes)

Table 1 - Design Science Research Contribution Types (Gregor & Hevner, 2013)

Concurrently to these contribution types, Gregor and Hevner (2013) also present a 2x2 matrix (Figure 1) of research project circumstances and potential DSR research contributions (Gregor & Hevner, 2013). In Gregor and Hevner's (2013) framework, the x-axis exposes the maturity of the problem context beginning in high to low. Likewise, from high to low, the y-axis embodies the present maturity of artifacts that offer the potential to be a starting point for solutions to the research question (Gregor & Hevner, 2013).
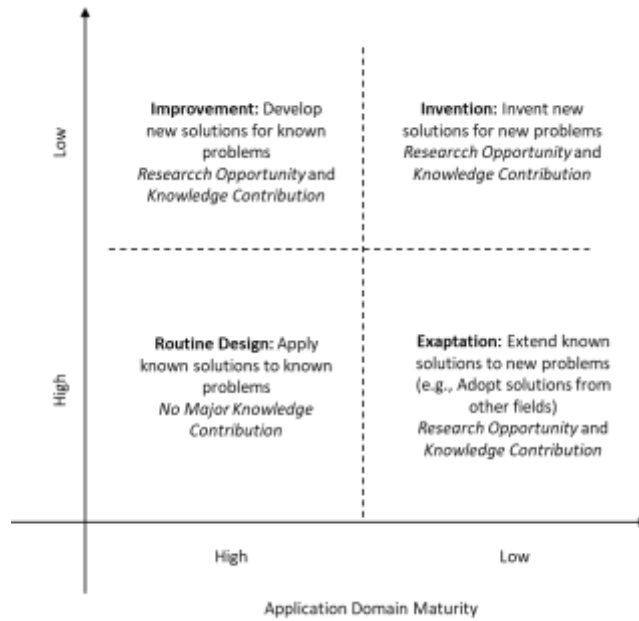
Figure 1 - DSR Knowledge Contribution Framework (Gregor & Hevner, 2013)

Herselman and Botha (2015), based on Cleven, Gubler, & Hüner (2009), summarized the artifacts variables and their elements (Table 2).

Variable	Elements explaining the variables
Approach	Qualitative
	Quantitative
Artifact Focus	Technical
	Organizational
	Strategic
Artifact Type	Construct
	Model
Function	Knowledge
	Control
	Development
	Legitimization
Method	Action research
	Case study
	Field experiment
	Formal proofs .
Perspective	Economic
	Deployment
	Engineering
	Epistemological
Position	Externally
	Internally
Time	Ex ante
	Ex post

Table 2 - Artifact variables and variables elements (Herselman & Botha, 2015)

The greater goal of a Design Science Research Methodology (DSRM) process is to deliver a mental model for the features of research outputs. A mental model is a small-scale model of reality that can be created from perception, creativity, or the understanding of conversation (Peffers et al., 2014).

DSRM is based on three motivations: 1 - deliver a nominal process for the conduct of Design Science (DS) research, 2 - develop earlier literature about DS in IS and source subjects, and 3 - offer researchers with a mental model or template for a structure for research outputs. Hence, the methodology applied in this thesis consists of Peffers et al. (2014)'s synthesis of those statements, namely, a process model comprising six activities in a nominal structure. According to Cleven et al. (2009) (Cleven et al., 2009), the enhancement process of DSR artifacts usually covers the phases problem identification, requirements specification, design, evaluation and communication (Cleven et al., 2009).

The nominal sequence of six activities is composed by (Figure 2):
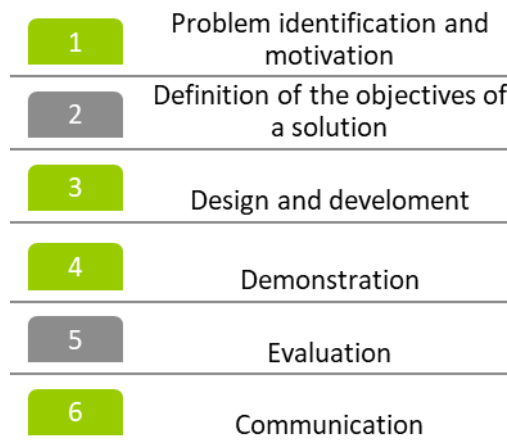
Figure 2 - DSR Method Adaptation (Peffers et. al, 2014) and (Geerts, 2011)

Regardless of these steps will be adjusted to this research, this section contains a brief description of each stage (Figure 3).

Problem Identification and Motivation

Each DSR project is a complex matter with many aspects that must be considered. DSR is an iterative process, starting with the identification of a problem in the problem space (vom Brocke & Maedche, 2019). Thus, firstly, the specific research is defined, and the value of a solution is explained. The problem definition will be utilized to create an artifact capable of presenting a solution. Hence, it is recommended to atomize the problem theoretically to its complexity can be acquired by the resolution. Additionally, the value of a solution is supported by the motivation of the study's researcher and the audience. They must follow the solution and agree with the resolution. It facilitates comprehending how the researcher understands the problem. This step demand resources such as knowledge of the state of the problem and the significance of its solution (Peffers et al., 2014).

Define the objectives for a solution

This step aims not only to conclude the goals of solutions of the previous problem definition but also to understand which ones are achievable. The objectives can be qualitative or quantitative (Peffers et al., 2014), (Hevner & Chatterjee, 2010).

Design and development

This section concentrates on the creation of the artifact, namely, *"constructs, models, methods, or instantiations (each defined broadly) (...) or new properties of technical, social, and/or informational resources."* (Peffers et al., 2014)

This step also comprises concerns about the artifact's performance, its architecture, and its production. The metamorphose of the objectives to design and development demands understanding the *a priori* theory acquainted (Peffers et al., 2014).

Demonstration

The fourth phase consists of demonstrating the way the artifact resolves the problem. For instance, this exemplification may be presented in a case study, proof, experimentation, simulation, etc. A precise understanding of how utilizing the artifact to resolve the problem is the resource required for this step (Peffers et al., 2014).

Evaluation

The penultimate stage commits to analysing and estimating the suitability of the artifacts to the problem's solution. To achieve this understanding, one should compare the initial objectives with the results. Depending on the conclusions, researchers can retreat to the third step, either attempting to develop the effectiveness of the artifact or maintaining communication (Peffers et al., 2014).

Communication

Finally, the approach of the last step is communication. Therefore, this activity establishes the importance of communicating the problem and its value, the artifact's innovation and usefulness, rigor, design, and effectiveness (Peffers et al., 2014).
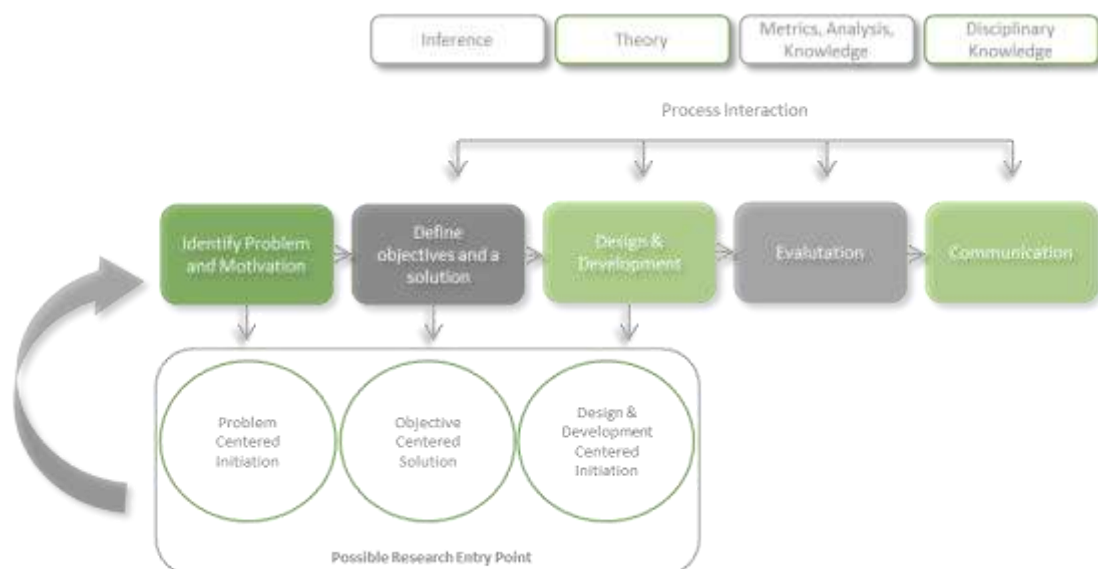
Figure 3 - DSRM Process Model (Peffers et. al, 2014)

2.2. RESEARCH STRATEGY

The previous topics approached the widespread application of DSR and DSRM. Whilst this section is committed to explaining how DSR will be applied in his research. The following model represents how the steps a priori announced will be applied in this study.
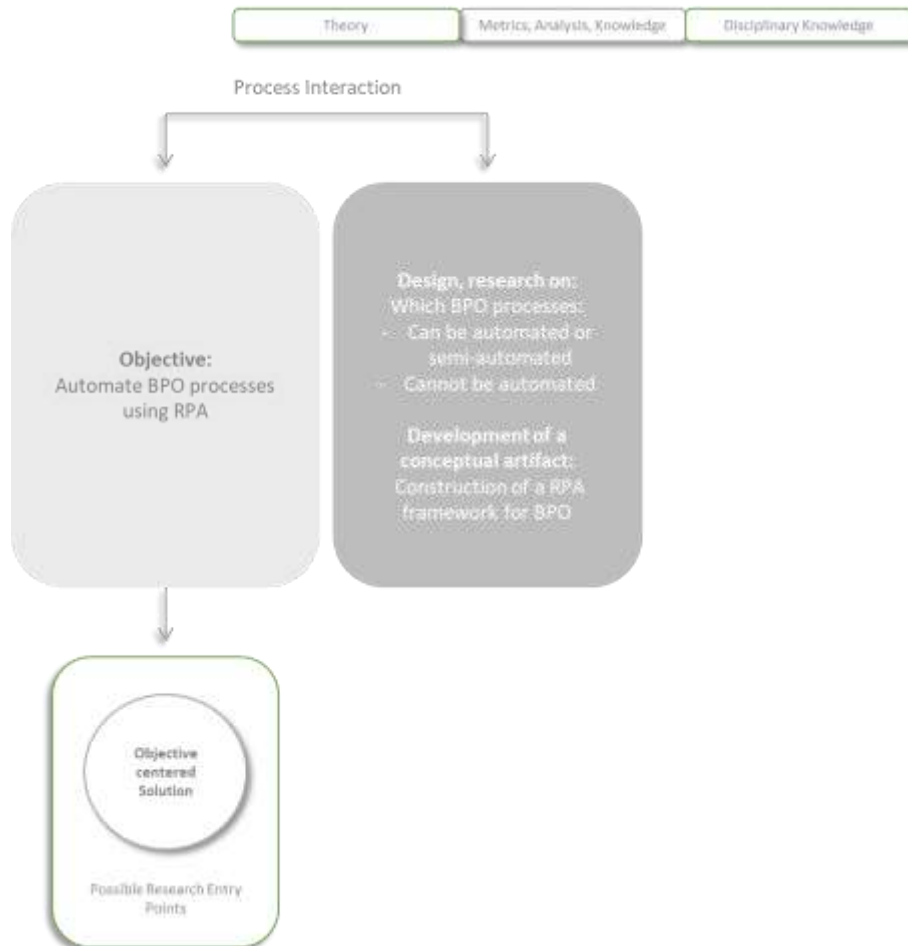
Figure 4 - DSR implementation strategy

As elucidated by figure 4, this thesis begins at design objectives herewith solution stages due to this study was triggered by the goal of automating the BPO using RPA.

Thereby, firstly, it was necessary to **define objectives and a solution** concerning the main problem recognized above, to identify the areas that this study should be based on, focusing on the solution's goal.

Design and development stages embody the research on BPO processes, aiming to understand which processes can be automated, semi-automated, or cannot be automated.

This stage was divided into two activities. Firstly, it was crucial to find out which are the traditional BPO processes, and the second task was to understand the availability of those processes being automated, semi-automated, or not being automated. Finally, in this last task, was indispensable to understand which processes could be semi-automated and broken down into activities.

After both tasks are completed, it was possible to create RPA framework for business process outsourcing.

The last stage is composed of **evaluation** or a considered better term in this thesis: **validation**.

Three interviews were made with (1) an employee of a BPO enterprise who works with RPA in his daily activities, (2) an RPA developer – who decided to not reveal the identity - , and (3) a teacher in Nova IMS whose investigation is new technologies.

Communication stage does not take part in the scope of this thesis due to lack of time.

Additionally, to prove the effectiveness of the artifact it is foreseen to publish this study.

"Igual que en el momento de venir al mundo, al morir tenemos miedo de lo desconocido. Pero el miedo es algo interior que no tiene nada que ver con la realidad."

— Isabel Allende, *The House of the Spirits*

3.   LITERATURE REVIEW

3.1. THEORETICAL OVERVIEW

This section aims to obtain a deeper insight into this research's theme. So, here is presented a theoretical overview of some crucial definitions, features, and an academic outlook of the impact of both BPO and RPA in organizations. The concepts analysed below are Digital Transformation, Outsourcing, BPO, RPA, relationship between RPA and BPO.

3.1.1.   Digital Transformation

3.1.1.1.   Digitization, digitalization, and digital transformation

Digitization, digitalization, and digital transformation are interdependent, although they are unlike (Fischer et al., 2020)

Digitization designates the transformation of information as a digital representation. In its turn, digitalization raised from digitization. It's because of the vaster information accessibility and the capacity to enable new opportunities for communication of digitization. Likewise, it allowed information technology (IT) crucial for both competitiveness and client satisfaction (Fischer et al., 2020). Hence, organizations progressively allied their strategies, operations, and structures with IT. This alliance generates numerous advantages, as enhancements in costs, performance, and service and product quality. Besides the limitations upon digitalization imposed by the business scenarios, as digital technologies link peoples, locations, and things to produce and study large amounts of data, digitization and digitalization fused to originate digital transformation. It modified both communication and connections among all stakeholders and redesigns the existent economic, social, and political landscape (Fischer et al., 2020).

3.1.1.2.   Digital Transformation Definition

Digital transformation is the digitalization of once analogue machine and service operations, material processes, and organizations tasks to add new value for both customers and employees and, thus, more advantageously compete in the world of the digital economy (Pagani & Pardo, 2017).

According to Fischer et al. (2020), digital transformation has an impact on societies and industries, and is powered by the conjunction of mobile, cloud, social, and clever technologies along with the rising necessity for automation or integration.

Pagani & Pardo (2017) advocate several types of digitalization:

For instance, the authors defend an activity-links-centred type of digitalization. It means that the digital resource is employed to enhance the current activities by promoting a more efficient, both easiest and costless, coordination among them. Internal or external activities beneficiate from better coordination due to digital technology (Pagani & Pardo, 2017). Thus, the application of digital systems does not essentially modify the essentiality of the activity among actors (exchange of information), although it improves efficiency (Pagani & Pardo, 2017).

Secondly, another type of digitalization pointed out by Pagani & Pardo (2017) is the network of a resource-ties-centred digitalization. This kind of digitalization is defined by a digital resource helping out on the creation of new activities conducted by people already present. Here, what one can observe is a partnership of the digital resources of an actor working with the resources of another actor, which triggers new activities to be born among these members (Pagani & Pardo, 2017).

Finally, Pagani & Pardo (2017) explain digitalization as an "*actor bonds-centred digitalization*". In this case, digital resources create new ties among actors. However, in this type of digitalization, there are new actors in the network.

3.1.1.3. Digital Market

The complex nature of the digital market triggers the necessity of building viable alliances and sustaining a value network with a convenient and advantageous partner (Pagani & Pardo, 2017). Indeed, Pagani & Pardo (2017) emphasize that in digital marked no one can supply a service to the clients with an end-to-end solution on its own. For that matter, partnership management potentialities must be a core skill acquired by the new business actors (Pagani & Pardo, 2017). Moreover, digital technologies are likewise reorganizing the format of social relationships, not only on the company, but also with the consumer (Pagani & Pardo, 2017). Additionally, Pagani & Pardo (2007) point out the rising embedded of both products and services in digital technologies. Hence, it's harder to detach business processes from their underpinning IT infrastructures. For that matter, Pagani & Pardo (2017) mentioned the emergence of value chain engineering was born from the challenge of digital transformation.

3.1.1.4. Digital Business Strategies

Significant value can be generated by reaching and exploiting the value of important knowledge within the network and carry over it to other points in the network where it is vital (Pagani & Pardo, 2017).

Digital business strategies, desiring innovation, and growth, create complex and dynamic ecosystems by deploying products, processes, and services domains (Pagani & Pardo, 2017). The integral value network is established by a certain value creating logic and its appliance results in strategic positions. Employing a network logic gives another perspective that is more suitable to enterprises (Pagani & Pardo, 2017).

Digital business strategies have been influencing the growth of supply chains into value networks and value ecosystems (Pagani & Pardo, 2017). According to Pagani & Pardo (2017), digital technologies are gradually remodelling organizations which have, nowadays, access to a bunch of digital systems that may help to handle their relationship within their network.

In accordance with Pagani & Pardo (2017), the value network has created a shift among the traditional perspective of value creation attached in a value chain vision to a modernized look of value creation sustained by the network perception.

Another outlook of the value network is that each product or service needs a group of value generating activities executed by different actors forming a value-creating system (Pagani & Pardo, 2017).

Fischer et al. (2020) highlight some requirements for digital transformation: digital strategy; agility; digital expertise; IT innovation; collaboration; and openness.

Digital strategy: Organizations may create a digital strategy that establishes goals and actions, considering governance and compliance;

Agility: The dynamic environment enables organizations to set up a flexible, adaptable, and responsive organizational structure counting on management support;

Digital Expertise: organizations must increment their IT-related abilities and stir their specialization;

IT Innovation: Business structures must have allied with emerging technologies to take advantages from both standardization and automation;

Collaboration: organization processes must work with technology, to bond and collaborate with internal and external stakeholders;

Openness: Organizations may have an open-minded culture that simplifies creativity and risk-taking, to guarantee the conversion's sustainability.

3.1.2.   Outsourcing

The definition of outsourcing employed in outsourcing studies is too vast consequently, it mentions the acquisition of any products or services by an external enterprise (Duan et al., 2009)

Outsourcing is an abbreviation for outside resource using (Yang et al, 2006) and its purpose is contracting a third party to execute a specific, and precisely defined part of a firm's operations (Krysińska et al., 2018). Outsourcing includes finding and utilizing a provider who supplies the finished good or service at the expense of buying the components and producing them in-house (Ghodeswar & Vaidyanathan, 2008).

Outsourcing means that a firm begins to externalize a process or an activity (Ray & John, 2011). Outside allows value creation from outside the organization, it means not inside of. This outside connection is a strategic position on external resources. Besides the importance of determining these external resources, they must be utilized by and for an enterprise to improve its importance in competition (Yang et al., 2006).

Outsourcing happens when a firm subcontracts a business function or process to an external supplier, whose responsibility is to deliver the requested services and goods that would have been made internally. This procedure date back to Industrial Revolution in the 18th century or sooner, as a usual practice (Duan et al., 2009).

Mentioning Deloitte's Global Sourcing Survey 2014, Ge et al., (2021) underline that the market habit of insourcing, as the internal sourcing of business activities, has changed after the 2008 recession. Parallel to this, in this era, outsourcing consumption increased. Outsourcing has been applied as a vital business strategy by organizations, in numerous industries, for a long time. Competitiveness has pressed organizations to face objectively and critically the business processes. Organizations have been outsourcing manufacturing operations, business, and the whole business lines productively for a while by now (Ciasullo et al., 2018).

Lately, beginning with the electronics and pharmaceutical industries, the contract manufacturing sector has profited from outsourcing. Above all the common industries, IT, payroll, logistics, and human resources management are industries highly outsourced. Outsourcing of main activities such as engineering, research and development, manufacturing, and marketing are being pondered by corporations. Improving the capacity to control and enhance critical competencies, regardless of if they are within the company is much more important than the ownership of capabilities. Both competitive pressures and the necessity for leveraged financial performance are impelling the proliferation in the scope, nature, and even scale of outsourcing through industries worldwide (Ghodeswar & Vaidyanathan, 2008).

3.1.3.   Business Process Outsourcing

BPO sector arose in Northern economies triggered by the deregulation and competitive pressures, stimulating enterprises to restructure, boost efficiencies, and increase shareholder value (Mann & Graham, 2016).

Work activities that used to occur within organizations emerged to be standardized and outsourced to outside firms. Work was initially relocated to lower salaries areas within national economies however by the early 2000s, modifying communications capacities had permitted this type of work to be offshored to countries such as India, the Philippines, and China, successfully founding a global marketplace for services (Mann & Graham, 2016). An international ranking of destination cities for BPO services measured by competitive human capital, promising business conditions, and infrastructures reveals the top ten list is led by India and the Philippines. Conversely, the global ranking of countries with the same measures indicates as leading nations Republic of Costa Rica, the Czech Republic, Ireland, Malaysia, and the Socialist Republic of Viet Nam (Bodwell et al., 2016).

The rising geographical diffusion of BPO originated from pressures to diminish costs and from the ambitions of multinational companies to spread risk through markets (Mann & Graham, 2016).

BPO has been regarded as a representative of very distinct facets of economic globalisations. BPO has been designated as presenting potential progressive benefits, letting developing economies advance industrialization, develop new abilities and capital, and join in a more regular and frictionless worldwide economy (Mann & Graham, 2016).

According to Mann & Graham (2016), the industry offers a strong illustration of how globalization has given opportunities not only for employment but also business creation in developing countries. Also, Deng (2015) emphasised that several advances such as globalization, more requiring and needy consumers, business reforms, and improvements in information and communication technologies have been vital triggers to BPO.

Nevertheless, Mann & Graham (2016) also point out that other authors highlight those benefits of BPO as doubtful and contingent, as well as, the globalization of services tends to benefit most skilled groups, whilst weakening the security, economic projections and negotiating power of less skilled workers. These authors stress the consequences of BPO in both developing countries and job losses (Mann & Graham, 2016).

Innovation, speed, quality, cost, and service have been acknowledged as part of the drivers for gaining competitive advantage. Globalization has and is still the trending issue that has kept the

business organizations on their toes always searching for better ways to achieve performance (Ejechi & Oshodin, 2019).

3.1.3.1. BPO definitions

BPO can be defined as the consignment of one or more IT-intensive business processes to an external supplier that possesses, administers, and manages the chosen process based on an agreed and measurable operation conduct. Alternatively, BPO can be considered as drawing up a contract with an external enterprise to be the main responsible for supplying a business process (Yang et al., 2006).

BPO is a method of assigning business processes to a service supplier (Mann & Graham, 2016) whose specialization is to manage and administrate certain IT-intensive processes by implementing predefined and measurable metrics (Deng, 2015).

According to Duan et al. (2009), the well-known meaning of BPO is the hiring of an external provider to work on one or more IT-intensive business processes. This external provider administers and manages the selected process based on defined and measurable performance criteria. These authors also emphasize the business process definition as *"a set of logically related tasks performed to achieve a defined the business outcome."* (Duan et al., 2009). Finally, after clarifying both definitions, Duan et al., (2009) describe by themself BPO as *"an action of delegating a set of related activities to an external service provider, who is responsible for the defined and measurable business outcome."*. Outsourcing can too be understood as an enterprise's denial to internalize a process (Duan et al., 2009).

BPO is a crucial piece of IT because of its qualified processes and its duty to complete a process and provide it to the consumer as a service (Gerbl et al., 2015)

Krstić and Kahrović (2015) underlined that BPO is considered a sociotechnical phenomenon. Thus, an efficient outsourcing project requires the commitment of the company's social and technical assets. BPO converts an enterprise and demands awareness of the social and human effects resulting from the organization's transformation. Simultaneously, one of the main characteristics of BPO is the range of technologies that have been developed to bond the world in a global communications network.

3.1.3.2. BPO adoption

The decision to shift all or part of an organization's business function to an external company is progressively more important in the strategy of enterprises. Conventionally outsourcing is deemed, by firms, a way to increase performance and reduce operating costs. However, currently, organizations are employing strategic and transformational outsourcing to pursue upgraded business focus, reduce risks, develop sustainable competitive advantage, improve technical capabilities, and free resources for core business purposes (Ghodeswar & Vaidyanathan, 2008). Currently, a big number of BPO organizations provide numerous services related to back-office activities (Krysińska et al., 2018). Moreover, there are two types of enterprises in a BPO process, specifically the consumer and the service supplier (Deng, 2015). An efficient BPO management demands a different group of competencies that is humanly impossible to be present in an only person (Krstić & Kahrović, 2015).

To raise the cost efficiency and to allow enterprises to concentrate firstly on their core competencies, several organizations decided to offshore part of their business operations to a third

party. Nevertheless, it is crucial to determine cleverly which business functions to outsource (Krysińska et. al, 2018). Krstić & Kahrović (2015) emphasize some BPO advantages such as cost reduction and cost restructuring, shifting fixed costs by variable costs related to services provided. Additionally, BPO contributes to the improvement of quality and higher specialization and contact with outside expert knowledge. BPO also motivates local employment via contracts with local organizations, standardization, and admission to scale economies. In parallel, BPO utilizes resources for other purposes and split the risk by flexibility of demand with the provider organization, enhancing management of complex tasks, and starting gate for modifications in the company (Krstić & Kahrović, 2015).

BPO are integrating the business world. BPO are the type of businesses where a firm subcontract some of the business tasks or processes to third-party service suppliers. These services providers are called BPO enterprises or IT-enabled service provider firms. Usually, functions outsourced by BPO organizations are finance and accounting, purchasing and disbursement, human resource management, payroll, cash and investment management, billing and collection, order entry, among others (Ray & John, 2011).

Companies principally have three types of processes: Core processes that provide a strategic advantage; critical non-core processes that are significant, although are not competitive differentiators; and, finally, non-core and non-critical processes that are required to create the environment work. Outsourcing non-core processes liberate the organization's time and resources for core functions (Ghodeswar & Vaidyanathan, 2008).

The organization's non-core business process involves corporate governance such as finance, public, and government relations, building services, management, and administrative support, legal, accounting, planning, and human resource management activities like hiring, training, recruiting, compensating, and discharging employees, technology, and process development such as automation, design or redesign of equipment maintenance, software, procedures, hardware, and technical skills (Nababan et al., 2020).

External service suppliers essentially work on operations, logistics, finance, accounting, customer care, legal services, and marketing. Nonetheless, there are some innovations that trigger transformation in the BPO, such as new technologies, delivery models, and a more challenging end-user (Yang et al., 2006). BPO concerns contracting the operations of a certain business process to an external service supplier. Some examples of outsourced areas are IT, human resources, financial guidance, accounting, procurement (Ge et. al, 2021) production, logistics, marketing, design, R&D, and human resources (Ciasullo, et al., 2018), (McIvor, 2016), training, and customer relationship management (Deng, 2015). Also, BPO developed due to the demand of enterprises for relocating assignment of customer service work, data entry, transcription, digitisation, auditing, content development, animation, legal services, engineering design and data analytics (Mann & Graham, 2016), and services to both local and offshore providers. Thus, BPO comprises knowledge-intensive services such as research and improvement, accounting, and legal support. In this way, BPO allows organizations contact with skilled labour pools, while they diminish progress hours in knowledge-intensive services (McIvor, 2016) (Gerbl et al., 2015).

According to Krstić & Kahrović (2015), the processes can be classified from the service supplier's perception. This classification separates BPO projects based on the type of product/service, comprising

front-office processing, middle-office processing, and back-office processing. Front-office BPO incorporates customer service and technical support services. In the case of middle-office processing, it involves services such as banking, insurance, transportation, and utilities. Lastly, Back-office BPO assists processes like human resources, technical support, customer service, finance, or accounting. Back-office processes are processes that small and large companies use to outsource to organizations specialized in those areas.

Suppliers acquire lower costs than consumers due to their focus on highly specialized conception and provision of services. Providers own the process development skills for remodelling and changing process performance which is inadequate in the consumer company. Instead of reproducing these expert abilities, usually, organizations utilize outsourcing to take advantage of the investments and process development skills of the supplier (McIvor, 2016). Skills in some areas such as managing business processes, technology are crucial for BPO project accomplishments or collapse. Hence, management aptitudes are also vital. Nevertheless, the BPO service supplier main focus is the level of their products and services, the BPO consumers are gradually developing their interest in service provider's abilities, for instance, the effective delivery of the service supplier's outcome, their availability, and their knowledge in the business of the consumer (Krstić & Kahrović, 2015).

Companies ponder outsourcing almost all the services they need in order to limit their employees to the core activities that constitute the firm's business. Among others, some services possible to outsourcing are printing, legal services, accounting and book-keeping, telecommunications, vehicle maintenance, security, payroll, recruitment (Ghodeswar & Vaidyanathan, 2008). A key to the success of BPO is communication. Therefore, clients should enunciate precisely their requirements to permit the service provider to suitably manage the outsourced business processes (Deng, 2015).

From Duan et al. (2009) perspective, there is a misunderstanding regarding outsourcing processes and the tasks made by external providers. In the other hand, Duan et al. (2009) clarifies that besides outsourcing is developing standard management training, the process ownership does not need to change. Likewise, the concept of abstention-based outsourcing means the organization's resolution to outsource the services for a process that has never been happened within the firm. The boundaries of what may or may not be outsourcing are significantly dynamic and dependent on the agreed practices at a given time (Duan et al., 2009).

BPO relies on outside service providers to be responsible for business processes that have been linked to a principal firm's organizational structure. This reality implies continuous coordination and adjustment for both sides. The major number of organizations believe that to achieve these expectations is vital to establish a cooperative and active collaboration with the supplier, as well as they must enhance their skills in provider management (Ge et al., 2021).

In parallel, quoting Deloitte Global Outsourcing Survey 2020, Ge et. al (2021) underline that customers must invest more in creating their supplier management abilities to handle the new normal and acquire maximum value from their service provider ecosystem in the post-COVID-19 era.

The outsourced processes can be categorized into two types: data and voice processes (Ray & John, 2011). Ray & John (2011) explain in a voice process the client call a full-time equivalent (FTE), obtaining the work completed (clarifications, inquiry, etc.). The client is put on hold when the FTE are attending other calls. As a rule, an automatic call distribution system supervises all calls, and the call is answered

by the FTE available for the utmost time compared to the FTE's set. Conversely, in data processes, the customer sends orders (mails, forms, sheets, etc.) via Internet to the BPO companies and obtains the processing concluded (Ray & John, 2011).

The international BPO market is going through an accelerated metamorphosis (Yang et al., 2006).

Yang et al. (2006) express their certainty that possibilities in the BPO market will have faster development, and suppliers recommended to delineate their role, adopt particular segments inside of the overall BPO market, settle a value proposition matched with their market necessities and strengths. At last, providers will need to cooperate strategically to benefit from opportunities. In the same way, organizations in demand ought to find out, within all businesses processes, which area they want to outsource to external suppliers. Likewise, enterprises must define the advantages and the disadvantages, they expected to obtain from BPO, as well as establish correct decisions (Yang et al., 2006).

BPO is a large complex arrangement that demands not only the organization but also the service provider to deliberate a group of doubts and examine precise characteristics to understand whether BPO is the right strategy or not. Before opting to BPO, the organization may recognize their objectives and aspirations, scope, operation model, and the better partner given the services supplied. In days gone by, organizations looked at outsourcing as a method to accomplish better service at a lower cost. In fact, outsourcing is carried out in the low-cost country or locals. Lately, at the expense of just concentrating on low-cost objectives, most companies began to focus on their performance and developing innovative business models. This new reality is related with the BPO benefits: cost reduction, radical transformation, access to superior abilities and expertise of the provider, the release of capacity for remaining finance function to provide business partnering, and increased innovation (Ghodeswar & Vaidyanathan, 2008).

Organizations outsource their operations for numerous purposes. The major reason is to opt for BPO, aiming to diminish and healthier manage costs. BPO presents greater competitiveness in terms of prices (Krysińska et al., 2018). To acquire competitive advantages is crucial that the major suitable business processes are executed more efficiently and effectively by external providers (Ghodeswar & Vaidyanathan, 2008). Instead of being only a way of recruitment, BPO progressively is being deemed as a tactic to transmute the practice of leading business to accomplish fast, sustainable development in the value chain level competitive performance (Duan et al., 2009).

BPO also includes some strategic processes that have till lately been retained within the firm. (Duan et al., 2009) highlight what is outsourceable has now drifted to main business functions and processes of the organizations.

Both business executives and owners perceived BPO as an opportunity to shift business processes that are not within the core competence of their enterprise. Click & Duening (2005) pointed out back-office functions, for instance, payroll and benefits administration, customer service, call center, and technical support, as examples of processes that organizations of all types or sizes have available to outsource to whom dominate those areas. Removing back-office activities from internal operations allows enterprises to reduce costs. With the rising of education levels worldwide, BPO's scope changed to complex work that demands extensive preparation and training. Click & Duening (2005) explains that initial adopters of outsourcing usually were searching for software development expertise or

technical expertise to staff help desks and call centers. However, now BPO embraces almost all business processes (Click & Duening, 2005).

In BPO's companies, incorporate skilled and experienced human resources and knowledge resources that can instruct new employees in case of necessity. Moreover, outsourcing enables staffing flexibility. So, organizations can decrease employment and keep just the experts and on core functions. This strategy enables companies to focus on their core competencies, enhancing them and boosting their rank in the market (Krysińska et al., 2018).

Modern business innovation usually encompasses not only technical but also a social component. Workforces utilize collaboration tools, for instance, instant messaging to talk with each other and work on projects; human resources administrators teach employees via e-learning systems, and executives monitor the organization consulting online balanced scorecards (Click & Duening, 2005).

On one hand, if BPO strategy were managed only by technical specialists, it would fail because they would ignore essential topics such as human relationships, change management, and organizational culture. Conversely, if nontechnical managers applied BPO plan, it would fail as a consequence of naive expectations upon the capability or limitations of the available technologies (Click & Duening, 2005).

The main characteristic of BPO is to be interdisciplinary innovation that demands several skills to be effective. The beginning and execution of a BPO project in an enterprise involve contemplating some human factors either inside of the enterprise starting the project or within the outsourcing vendor. These human/social issues must not be overlooked and may be managed accurately to the project prosper. In this way, Click & Duening (2005) highlight:

"*Developing various teams to manage the BPO initiative throughout its life cycle; reassuring staff of their role in company; training people on the way of doing business; dealing with job loss and/or reassignment; keeping morale high throughout the change process; encouraging people to participate in decision making; understanding cultural differences between the organization and BPO partner"* (Click & Duening, 2005).

Moreover, both the initiation and implementation of a BPO plan need attention to technical matters. Click & Duening (2005) emphasize some of them: compatibility of systems between the BPO customer and supplier; data and system security; data and knowledge management; data interface challenges and strategies; software and database compatibility challenges; backup and recovery procedures if the system fails.

Decision-making, strategy setting, service delivery, and practically every other business activity have, nowadays, socio-technical features, which means merging humans and technical systems: namely BPO characteristics (Click & Duening, 2005). Thus, BPO is a social-technical business innovation that facilitates obtaining a valued new source of competitive advantages. Accordingly to Click & Duening (2005), socio-technical means that BPO necessitates skilful management of humans and technology - hardware and software -. The manager who introduces a BPO strategy needs to realize the best ways to introduce people to technology and the other way around.

The implementation of BPO has a big barrier, namely, human decision-making problems. Ciasullo, et al. (2018) mention that, most of all, the efficiency of BPO is interweaved with the complex decision-making processes, particularly throughout the decisive situation of service provider selection and

election. In this way, business processes holders should delineate the utmost suiting parameters to obtain completed compliance among outsourcing and internal processes and should smoothly agree with the same conditions at the beginning of decisions.

This process is extremely complex due to the presence of various skills, expertise, experiences, and knowledge which are the main characteristics of business decision-makers. Ciasullo, et al. (2018) highlight the weight of qualitative features, as are the trust, values, or ethics for obtaining a complete strategy and organizational engagement of value chain included in BPO. Management is vital to establish models, methods, rules, and tools to solve those problems. Consequently, decision-makers may think of the alignment among organizational priorities and business processes promoting effective and continuous engagement to improve performance. Business processes should be designed and assessed regarding strategic priorities, establishing a bidirectional relationship between corporate plans (guidelines and objectives) and operational processes (Ciasullo et al., 2018).

In their study, Duan et al. (2009) assessed BPO by concentrating their attention on two process-level factors, that is, a process's strategic impact and ownership. They concluded that investors answer more favourably to BPO inserted to the area of primary business process rather than to the area of supportive processes. Additionally, they found out that existing process ownership highly develops an organization's development when BPO is used to primary processes. Contrarily, internal deployment just negatively impacts an outscoring enterprise's performance for supportive processes.

3.1.3.3. Onshore, Offshore, Nearshore

Onshore outsourcing or domestic outsourcing is the receiving of services from outside a company but inside the country. The main goal of onshore outsourcing is to facilitate a third party to handle nonessential activities that have business value despite of do not belong to the core business (Rosencrance, 2020).

There are various advantages to onshore such as: communication turning out easier, working with cultural differences is no need, savings costs becoming easier, quality control being more manageable, and the protection of intellectual property being guaranteed (Rosencrance, 2020).

With both technological advancement and better remote communication, the concentration of outsource processes increased in countries where the price per employee to quality ratio is at the lower possible cost. This tendency is known as offshore outsourcing. Hence, the outsourcing of processes to assistance providers situated outside of the country is offshore outsourcing (Ray & John, 2011).

According to Bodwelle et al. (2016) organizations involved in offshoring non-core businesses will progressively recognize the country's competencies to adapt to new technology and innovation, besides of any cost advantages stemming from low salaries.

Some vital factors are contributing to increment the offshore outsourcing. On the one hand, both telecom deregulation and an upsurge in bandwidth have enhanced the quality and stability of communication connections at a lower cost. On the other hand, the accessibility to graduated, and proficient human resources at lower cost also strengthen the offshore outsourcing expansion (Ray & John, 2011). Moreover, offshore outsourcing influences the existence of good competition between the BPO firms in third world nations. These enterprises may constantly increase both operational

effectiveness and efficiency. The improvement of effectiveness and efficiency embrace quality improvement, cycle time reduction, variability decrease, productivity enhancement, waste diminution, and exclusion of rework (Ray & John, 2011).

Organizations sign contracts with BPO partners and shift their non-value added functions/tasks and responsibilities to other places. Hired operations are frequently situated in the neighbouring country, namely, nearshore outsourcing (Krysińska et al., 2018).

For instance, American companies nearshore typically to Canada and Mexico and offshore to India, Argentina, and Eastern Europe. In turn, European organizations relocate their functions habitually to smaller European countries that are appealing precisely because of their low-cost, skilled human resources and less rigorous legal regulations. Main outsourcing centres are Bulgaria, Poland, Lithuania, Germany, and Romania (Krysińska et al., 2018).

3.1.3.4. Challenges of BPO

From Kolawole & Agha's (2015) viewpoint as occur in any restructuring activity and management decision making in business, there are some risks related to outsourcing that top management or procurement managers may ponder. Thus, for Kolawole & Agha (2015), depending on providers that could make switching costs to other suppliers, outsourcing can provoke prohibitively expensive costs in the future. On the other hand, a provider of outsourced service may jeopardize the confidentiality links of a company's concerns and cause a loss of intellectual property rights (Kolawole & Agha, 2015).

Also, according to Kolawole & Agha (2015), high prices are enforced because of the growing trends in outsourcing. The necessity for suppliers is increasing and, consequently, pushes the prices applied to the provider's rates (Kolawole & Agha, 2015).

In their paper, Kolawole & Agha (2015) recognized the ten most common challenges organizations face in the employment of outsourcing strategy. Hence, these are the (1) absence of commitment; (2) smallest awareness of outsourcing methodologies; (3) absence of an outsourcing communications plan; (4) lack of knowledge of outsourcing business risks; (5) fail to explore external sources of knowledge; (6) not offering the best internal resources; (7) rushing through the initiative; (8) not accepting cultural differences; (9) do not understand what can improve supplier productivity; and, finally, (10) weak relationship management program. Regarding to cultural differences, also, Bharadwaj and Saxena (2009) pointed out that another challenge in outsourcing is the cultural distinctions.

Humans, technology, and process together compose the BPO services. However, the processes are managed by both people and technology. In the lack of robust and scalable technology and expert humans, the service supplier will not be able to deliver value to the client and, thus, the BPO outcome will not be accomplished (Bharadwaj & Saxena, 2009).

From Kodwani's (2007) perspective, another BPO's challenge is the loss of personal connection with the employees.

BPO can cause drawbacks such as the loss of control, outsourcing can push disruption, the risk of proprietary data, the threat the innovation, and the danger of succession planning (Nababan, Purba, Muda, & Ginting, 2020).

3.1.4. Robotic Process Automation

3.1.4.1. RPA Definitions

RPA is a concept for tools that run on the user interface of other computer systems like a human would work. RPA intention is to override people by outside-in automation. This type is different from the typical inside-out approach. Outside-*in* allows information systems improvement, as guarantees that the information systems keep unmodified (Aalst et al., 2018).

IEEE Corporate Advisory Group interprets RPA as a *"preconfigured software instance that uses business rules and predefined activity choreography to complete the autonomous execution of a combination of processes, activities, transactions, and tasks in one or more unrelated software systems to deliver a result or service with human exception management."* (Hofmann et al., 2020)

Aalst et al. (2018) also introduced RPA as tools that perform [if, then, else] statements upon structured data, usually deploying a set of user interface interactions, as well as attaching to Application Programming Interface (API) to drive client servers, mainframe or HTML code. An RPA tool runs by mapping a process in the RPA tool language for the software robot to follow, with runtime assigned to execute the script by a control dashboard. RPA tools are applied to minimize repetitive tasks (Aalst et al., 2018).

Barnett (2015), referencing Institute for RPA, defined RPA as the application of technology that permits human staff, in an organization, to configure computer software or a robot to capture and interpret current applications for processing a transaction, managing data, triggering responses and communicating with other digital systems.

3.1.4.2. RPA Implementation

RPA is a proposition to automating operations inside of a bunch of diverse technologies for process automation, where each of them has various mechanisms and goals (Hofmann et al., 2020).

In the presence of a bunch of data in different software, RPA gets agents that work on various information systems to substitute humans. For instance, it's possible to manage easily that data applying AI and Machine Learning (ML). In this case, RPA agent consistently works at the moment the web interface of some applications modifies (Aalst et al., 2018).

To highlight the importance of RPA, Aalst et al. (2018) draw on a Pareto distribution: 80% of the cases may be explained by 20% of the case types (Figure 5). So, automation aspires to attend most usual case types (20% of all case types). The cost of automation explains why less frequent cases are not a target. Consequently, these 20% of the cases usually are managed by humans. Nevertheless, these 20% offset 80% of the case types, consume much more time than the habitual types (Aalst et al., 2018).
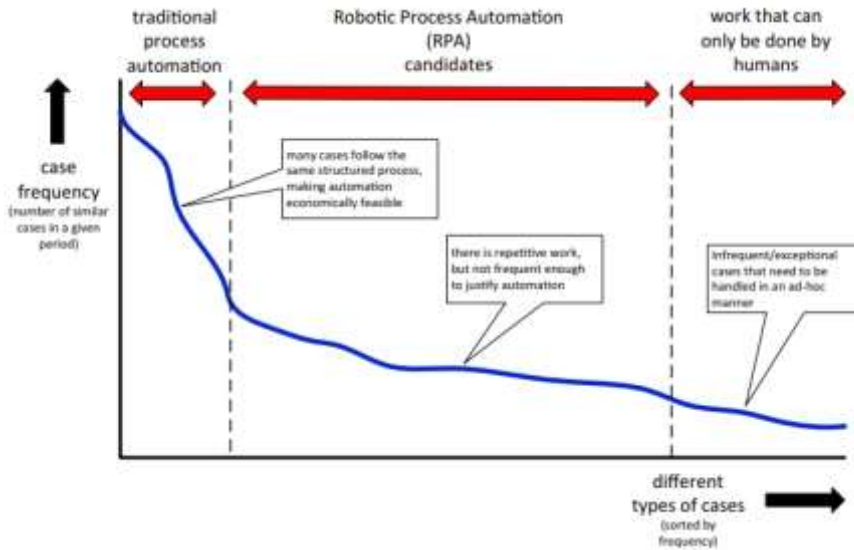
Figure 5 - Positioning RPA (Aalst et al., 2018).

Hofmann et al. (2020), designed the nature of RPA stressing out the main characteristics of RPA (Figure 6).
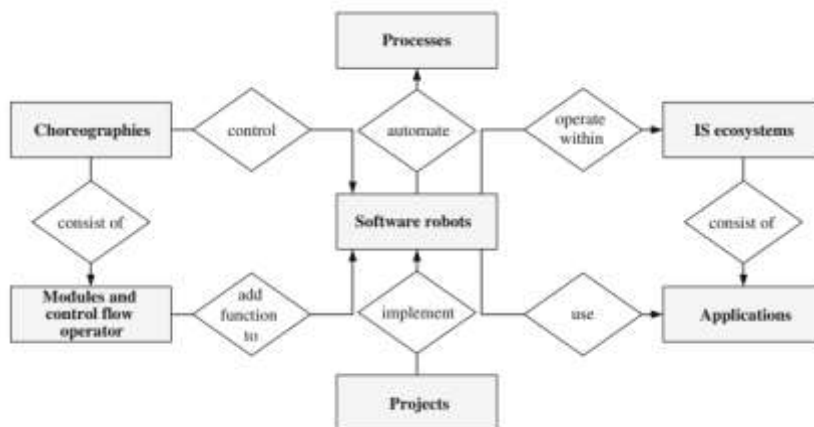
Figure 6 - The nature of robotic process automation (Hofmann et al., 2020)

Anagnoste (2017) emphasizes the major characteristics of RPA: taught by the users; identifies easily exceptions (against a database as well as based on a specific condition inserted in the code); undertake structured; computer based tasks; works with different electronic formats (e.g. PFD, MS Excel, etc; running with the consumer's user interface; logs are stored within the program but can be configured to be sent by email at a specific point, frequency or date; supplies a case for introduction of analytics; operates flawlessly with multiple systems; performs check and takes in consideration validations points according to a predefined set of rules; repeatable; operates 24/7 and during the weekends and holidays.

RPA projects usually depend on the documentation analysis, which can contain a lack of quality and may demand considerable effort to comprehend. Moreover, the designed robots are habitually employed in the production environments, where they cooperate with operational Information systems (ISs), which can trigger an inaccurate analysis (Jimenez-Ramirez et al, 2019).

So, RPA fills the gap between human labour and large-scale BPO whenever human work or architecture and implementation of business processes management systems are overpriced or not useful to business necessities. Therefore, these software robots connecting to the system may imitate humans or execute the assignments identically to humans (Hofmann et al., 2020). Organizations are progressively employing software to carry out routine business processes by mimicking the manners of people dealing with software applications. The quick prosperity of RPA reveals the importance of this emerging trend. For that matter, companies are embarking on using RPA conjointly with cognitive technologies such as natural language processing, speech recognition, and machine learning to automate perceptual and judgment-based activities once taken for humans (Schatsky et al., 2017). Moreover, the incorporation of cognitive technologies and RPA is expanding automation to new areas stimulating organizations to grow more efficiently and agile whilst they evolve to become fully digital businesses (Schatsky et al., 2017). The implementation of an RPA project also may have into consideration the human exception management boundaries concerning the autonomy of software robots (Hofmann et al., 2020).

RPA's advantages are vast. RPA help in the reduction of costs by cut out in staff, decreasing error rates, diminishing turnaround time, increasing the scalability of operations, improving compliance and enhancing service (Schatsky et al., 2017). Regarding human labour, after workers are released of repetitive and tedious tasks, they would engage their resources in assignments that request creative thinking, intellectual judgment, and social skills (Hofmann et al., 2020).

RPA tools connect with the current legacy system at the presentation layer with each robot allocated a login ID and password permitting it to operate along with human resources. Business analysts can work alongside business operations specialists to educate and set up the software. The non-invasive nature of the software lets it be installed without programming or disruption of the core technology platform (Schatsky et al., 2017).

RPA applies automation processes not only to the automation of a specific action, but also to different activities (Hofmann et al., 2020). For instance, according to Hofmann et al. (2020) a software robot is capable of open a new instance of Microsoft Excel, navigates to a particular spreadsheet, modifies values in specific cells, and saves the spreadsheet prior to shut down the application.

Hofmann et al. (2020) emphasize to understand the correct approach for automation of processes one may pay attention to some features like organizational potentialities, necessary time, and finances. Notwithstanding, to suit with RPA is crucial that the process pursues a standardized, rule-based structure, it means RPA do not demand awareness or cognitive skills. Moreover, the process must be driven by both, and manually by humans, as well as needs multiple-system access.

Mainly, these processes are characterized by repetitive tasks, like periodic reporting where it is possible to find some data analysis, data entry, archiving, creation of mass e-mails, and conversation of data configuration and graphics (Hofmann et al., 2020).

Hofmann et al. (2020) detach some advantages resulting from the autonomous execution of the choreography uninterruptedly of the software robots. So, RPA increases process performance, security, efficiency, auditability, scalability, and scalability. As well as it is easy to implement and chipper than traditional process automation (Hofmann et al., 2020). Therefore, RPA contributes to

enhancing process key performance indicators (KPIs), although software robots do not dedicate in developing the processes themselves.

Concerning mistakes, if software robots operate predefined process flows based on processes that have errors or inefficiencies, they will run inefficient process steps, provoking extra costs and useless resource utilization (Hofmann et al., 2020). Therefore, organizations ought to respect both process development and optimization a priori automation. Also, it is vital to retain RPA developments once deployed. Hofmann et al. (2020) suggest that an enterprise may pursue the Six Sigma methodology and determine for example a maximum error rate for the software robot to be successful.

Six Sigma is a strong methodology that diminishes variation, reduces costs, increases product and process quality in an enterprise, and maximizes customer satisfaction (Uluskan, 2022). Six Sigma is a concept that aids organizations in improving services, processes, and products. It is a management method where useful statistical tools are applied to enhance processes in corporations to guarantee excellence in operations, outputs, and products. Hence, various organizations continually aim for constant implementation of Six Sigma (Uluskan, 2022).

Moreover, RPA can be a handicap to the large-scale replacement of systems or initiatives integrations. However, robots are capable of execute just functions with clear-cut rules. It means, some processes that demand human judgment in complex cases cannot be automated just via RPA Hofmann et al. (2020).

Robots can be considered virtual workforce allocate to middle- and back-office processing centres. There are even applications for which software assists the front-office staff (Schatsky et al., 2017).

Schatsky et al. (2017) describe a common back-office process before and after applying RPA on Figure 7.
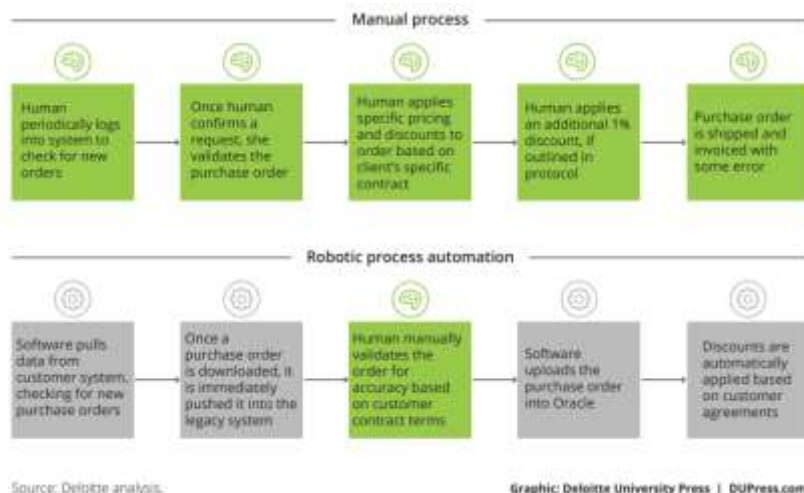
Figure 7 - Manual Process vs Robotic Process Automation (Schatsky et al., 2017)

Concerning to the validity of RPA, Schatsky et al. (2017) underline that validation of an RPA project can take two weeks; a pilot could be completed and start running within four to eight weeks, depending on complexity and scope. However, the entire commitment to setting up and incorporating robots differs according to an organization's specific circumstances and reality. It is a challenge when companies have just a few data available in digital form, or when processes are largely exceptions.

Some attempts to implement RPA fail when enterprises realize those processes may not be automated due to their characteristics or necessities or when the processes need a better design before being automated (Schatsky et al., 2017).

3.1.4.3. Robotic Process Automation Players

The most important RPA players are Automation Anywhere (USA), BluePrim (UK), UiPatch (Romania), RedWood (Netherlands), Workfusion (USA) and Openspan (USA) (Figure 8) (Anagnoste, 2017) (Jiménez-Ramírez et al., 2020)

Anagnoste (2017) mentioned the evaluations of the best RPA solutions in the Everest Group Report of 2017. This assessment was made in agreement with the market impact, vision, and capability (Figure 8).

Figure 8 - Vendors scored Everest's propriety scoring methodology (Anagnoste, 2017)

Both Uipath (a supplier from Romania) and Automation Anywhere (a supplier from the USA) are the main performers of this survey.

The most notable annually was Uipath which showed a remarkable improvement in terms of consumers, revenue, and human capital. Its development was also because of the right combination of pricing and strategic partnerships. Uitpath is located on five continents with offices nearby to main consumers, like BBC, J.P. Morgan, SAP, McDonald's, Vodafone, AXA (Anagnoste, 2017).

3.1.4.4. Challenges of RPA

Syed et al. (2020) revealed in their study some limitations related to the capacities of RPA. The major of these concerns is the comparison of human skills and robot competencies.

According to Syed et al. (2020), besides the computers' capabilities to work beyond human levels of intelligence, robots can not handle new situations, as well as robots do not have the skills to exercise subjective judgments and build empathy for customers. Hence, in Syed et al. (2020) perspective, abilities such as sensing emotions and creativity are complicated to automate. So, RPA is mostly about tactical quick successes, and it is not capable of renovating and re-engineering business processes (Syed et al., 2020).

The RPA implementation challenges are multidimensional together with technical, strategic, operational, and human scopes (Pramod, 2021).

Recognizing the processes and activities that can be automated is a challenge (Hindel et al., 2020) (Pramod, 2021) and attempts are necessary to understand if the business process includes any function that can be executed and completed without human mediation (Pramod, 2021). Furthermore, it is a tedious and costly (Hindel et al., 2020) activity to find out business processes that can be automated with software bots nevertheless it is a crucial characteristic of RPA (Pramod, 2021). Additionally, Pramod (2021) points out the employment of RPA demands lots of time and struggle and cannot reach the expected objectives consistently. Whether non-suitable processes are automated, costs can overshadow savings. The absence of human control and the lack of consciousness of software robots trigger countless weaknesses (Hindel et al., 2020).

Another challenge for business model change and the process is to create internal abilities and maturity models (Pramod, 2021). The absence of standardization and stabilization of the process is a major obstacle (Hindel et al., 2020) (Pramod, 2021).

On the other hand, the lack of technology utilization and digital resistance among stakeholders is the principal challenge (Hindel et al., 2020) (Pramod, 2021). It is vital to improve a culture that promotes innovation and technology adoption (Pramod, 2021). In parallel, there are ethical fears concerned to software robots taking the functions of humans (Pramod, 2021), reduction staff and provoking job losses (Hindel et al., 2020). Consequently, software robots can also be considered rivals by employees (Hindel et al., 2020).

The inclusion of RPA with a legacy system is the challenge enterprises always face (Patri, 2020). Besides, to Patri (2020) another challenges to be considered are lack of RPA professional skills, the reputational damage of the firm, outside and inside and security.

Lack of RPA professional skills: The current employees in the banking industry doesn't include the necessary ability for automation as the non-technical background of the staff (Patri, 2020).

The reputational damage of the firm, outside and inside: It is the social impact of automation that causes it an urgent reputational issue for organizations considering the creation and employment of RPA, this makes it even harder for the banking sector as they operate on the trust of society and inside of the organization, staff may have the apprehension of losing their positions because of evolutions in business processes (Patri, 2020).

Another main challenge in RPA implementation is security. For example, society believes that banks will preserve their money protected. This reliance will break readily if the bank has a security breach. As long as the quantity of cybercrime incidents grows, banks and financial services are appealing targets for those cybercriminals. In parallel, RPA offers those hackers a new attack surface, and the weakness of the robots is very high due to their necessity to have privileged access to all ERP modules of the organization (Patri, 2020).

According to Marciniak & Berend (2016), there are some challenges to be considered such as hidden costs, lack of real-time visibility, resistance from the customer's IT team, not significance itself as an independent technology, the resistance from employees, and some implementation experiences.

Hidden costs: some hidden costs can arise from the employment and maintenance generally (Marciniak & Berend, 2016).

Lack of real-time visibility: it is a back-office technology, and the user could not follow and manage each step of the process generally (Marciniak & Berend, 2016).

Resistance from the customer's IT team: some resistance can happen due to new and unknown technology generally (Marciniak & Berend, 2016).

Not significance itself as an independent technology: RPA can reduce the strategic impact of the technology inside the organization generally (Marciniak & Berend, 2016).

Resistance from employees: there can be resistance due to the loss of jobs generally (Marciniak & Berend, 2016).

Some implementation experiences: there are many successful examples of RPA, although these examples are not well documented, and the RPA is in experimental mode generally (Marciniak & Berend, 2016).

In Gami et al. (2019) perspective there are some important disadvantages of RPA to be considered such as if a robot can execute at a faster, more consistent velocity, employees can be afraid of being replaced by robots. Organizations must be conscious of the consequences of these fear such as humans giving up their jobs. RPA is not a cognitive computing solution, thus RPA cannot learn from experience (Gami et al., 2019).

According to the report of the Global RPA Survey 2019 - figure 9 - challenges at the organizational structure level comprise the inability to assess process priorities (40%), lack of risk management tools (28%), insufficient internal staff skills (24%), and the lack of sense of urgency (23%). At the technical risk rank, it is information and data security (40%), difficulty in achieving scale (37%), and selection of a suitable development platform (30%) (Choi et al., 2021).

The financial and regulatory characteristics include higher implementation costs (37%), inappropriate application scenarios (32%), and external legal regulatory requirements (30%)(Choi et al., 2021).
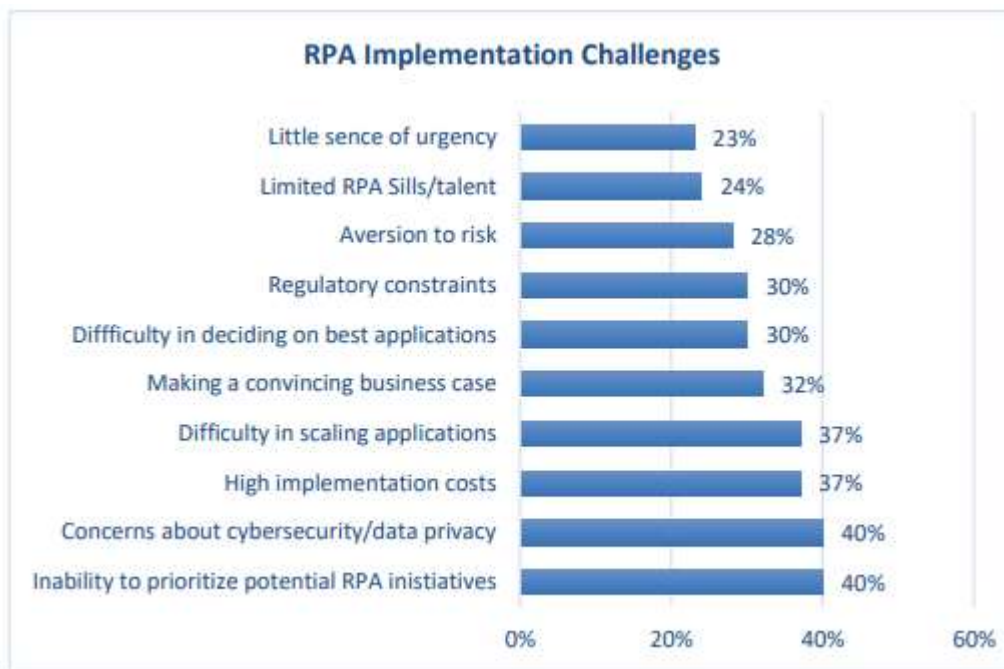
Figure 9 - RPA Implementation Challenges (Choi et al., 2021)

All inadequate choices of processes for the initial pilot cause failures in RPA implementation. Hence, a big challenge for RPA implementation can be establishing what is within the range of RPA and which processes should be automated and which routines should be automated (Choi et al., 2021).

3.1.5.   The application of RPA in BPO

Outsourcing and automation works toward development attempting to accomplish greater accuracy, productivity, efficiency, and cost reduction. Starting around early 2000, the RPA is a computer software configuration that substitutes human resources. Nowadays, automation in BPO industry concentrates on RPA, which is made to work with structured data and standardized processes. RPA automates repetitive functions, for instance, invoice matching and processing by adjustment of advanced rules-based processes which allow the enhancement of accuracy and compliance. Additionally, automation operates 20 times quicker than humans, with cycle time and waiting time diminution, decreasing errors rates that could occur in manual tasks. Nababan et al., (2020) explains that some findings prove that the bigger impact on some industries after the implementation of the automation technology is the development of work efficiency, reducing work routines, enhancing the quality of statements and management analysis, enriching motivation in learning and innovation, increasing IT and professional skills, and even boosting competition pressure (Nababan et al., 2020).

According to Jimenez-Ramirez et al. (2019), organizations that have implemented RPA have their employees and robots generally operating alongside within their back-offices. People are responsible for managing the processes that are not suitable for RPA or which still do not necessitate being robotized. To effectively perform their work, these people receive formal training, learning how to handle the issues that pertain to the process under their control. Likewise, in parallel, these human staffs receive training on the job, experiencing exceptions, undocumented situations, or process deviation daily (Jimenez-Ramirez et al., 2019).

Sullivan et al. (2021) highlight that the expense of a virtual RPA robot worker is between 10% and 19% of a local full-time employee (FTE) and approximately 33 and 50% of an FTE in an outsourced organization. These costs point out the savings propensity of RPA over the traditional ways of working (Sullivan et al., 2021).

Moreover, robots are a valuable sustainable solution when correctly financed and executed because robots do not let be affected by the physical, mental, and environmental constraints of a human worker (Sullivan et al., 2021).

Bodwell et al. (2016) sustain that new technology progresses, such as automation, have a profound influence on the development of the BPO sector, generating new competencies and changing employment outcomes. The application of automation in the BPO sector implies that computer programs execute repetitive activities. Consequently, the likelihood of occurring errors is lower than it would be when humans were executing those tasks (Bodwell et al., 2016).

Automation is capable of assuming leadership in BPO services like IT support, workflow processes, and other kinds of back-office functions with a high quantity of data and transactions, namely, in cases that queries and actions are foreseeable, recurrent, and suitable to automation. Moreover, automation helps contact centers in developing countries to reduce costs. They employ it in simple and repeatedly required services (Bodwell et al., 2016)

More complicated activities, although, to succeed must compel humans to support RPA. Furthermore, as long as basic services become automated, technological innovations develop the competencies of BPO tasks led by staff. This conversion to a higher value-enhanced BPO sector is called knowledge process outsourcing (KPO) (Bodwell et al., 2016). So, the BPO sector is demanding to raise competencies upgrading by investing in the human workforce and promoting non-inclusive development such as business process automation (Bodwell et al., 2016). BPO services are non-computational services, for instance, logistics, supply–chain, or IT delivery services. BPO is centered on the performance of business processes as services, delivering both partial or complete BPO (del–Río–Ortega et al., 2015).

According to Nababan et al. (2020), BPO can offer solutions for an organization to acquire the advantage of automation. A firm can have a service provider executing the automation in the organization's processing activities. The increment of RPA in the outsourced scope triggers the enhancement of outsourcing suppliers' productivity. As well as, the life of a contract can raise over 50% (Nababan et al., 2020).

According to Schatsky et al. (2017), BPO suppliers can see either opportunities or threats. The cost of RPA enables it to suggest different options to some BPO connections. Probability, robots can automate as much as 40% of BPO human labour using cognitive technologies. In parallel, organizations that work with BPO services are answering to the threat of automation by creating cognitive RPA skills themselves or together with their providers.

Ambitioning to obtain and present consistent results to shareholders the companies adopted RPA to face some usual challenges such as faster processes, quality increase, and cost reduction. Nowadays, RPA is seen as the next big trend for the BPO (Anagnoste, 2017).

The BPO's processes with the uppermost potential for automation are finance, supply chain, and human resource departments (Anagnoste, 2017).

That is to say that the dilemmas these businesses use to tackle are in their majority linked to excessive data entry volumes, high error rates, substantial rework, various manual processes, multiple non-integrated legacy systems, and huge turnover because of repetitive/low value added tasks (Anagnoste, 2017). A benefit of RPA is its possibility of being trained by the users to guarantee structured repeatable, computer-based tasks connecting at the same time with numerous systems while executing complex decisions based on algorithms. This way, a robot can recognize the exceptions for manual processing, dismiss inoperative times and maintain logs of actions completed. Another advantage is that robots are able to work 24/7, can be implemented fast, and can operate with the current architecture, as well as organizations can cut data entry costs by up to 70% and perform at 30% of the cost of a full-time worker, hence providing a fast and substantial return to organizations (Anagnoste, 2017).

3.1.5.1. Challenges of the implementation of RPA in BPO

RPA become particularly challenging in BPO scenarios since processes are outsourced because the back office and the ISs may be geographically dispersed. An outsourced process implies the company remains unaware of how the process will be executed. The BPO company is responsible for deciding whether a robot should be developed for any particular process. However, when a robot is to be implemented, there are some cases where the robot development team have no access to the test environment (Jiménez-Ramírez et al., 2020).

3.2. SYSTEMATIC LITERATURE REVIEW

3.2.1. Method

The earlier literature overview focused on the concepts of this research as well as identified suitable keywords for the given scientific issue. Therefore, the systematic literature review in this section seeks to comprehend the latest advances in BPO and RPA literature. Research questions were prepared to lead this process (Table 3):

LR RQ1:	What are the most common BPO processes?
LR RQ2:	Which are the BPO processes that can be automated and semi-automated?
LR RQ3:	Which are the BPO processes that cannot be automated?

Table 3 - Systematic Review's Research Questions

Aiming to answer these questions, the continuation of this section will contain a clear analysis of the most important and suitable papers. Thus, keywords were selected not only to improve the available literature but also to make an accurate selection of studies. In the literature already read was found some words used as synonyms: *"Outsourcing"* and *"BPO"*; *"Automation"* and *"RPA"; "BPO robot"* and *"RPA"*; *"RPA BPO"* and *"RPA"* (Table 4).

Keywords	Title
Outsourcing	BPO
Automation	RPA
BPO robot	RPA
RPA BPO	RPA

Table 4 - Systematic Review's Keywords and Synonyms

Boolean queries were constructed to contain, at best, one of the statements written in the abstracts, titles, or keywords of the searched articles. Just scientific papers were considered before January 31st 2022, and among 2017 and 2022 trying to deal with the recent improvements in the BPO and RPA scope.

The query row presents the following expressions: ("Outsourcing" OR "BPO") AND ("Automation" OR "RPA") AND ("BPO robot" OR "RPA") AND ("RPA BPO" OR "RPA"). The resources used in this research are assembled in Table 5.

Resources	Domain
ScienceDirect	https://www.sciencedirect.com/
Emerald Insight	https://www.emerald.com/
IEEE	https://ieeexplore.ieee.org/
Scopus	https://www.scopus.com/

Table 5 - Systematic Reviews' Resources and Domains.

This research has specific inclusion and exclusion criteria, intending to select the truly important studies (Table 6).

Inclusion Criteria	Exclusion Criteria
BPO processes that can be automate, semi-automate	Publications before 2017
BPO processes that cannot be automate	Language distinct to English
	Articles that review/overview
Evidence of employing RPA in BPO organizations	Non-Academic Papers (e.g., magazine's reports, newspapers)

Table 6 - Systematic Reviews' Inclusion and Exclusion Criteria.

3.2.2. Results

The prior section named the tools that will be applied in further examination and selection, underpinned on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Page et al., 2021).
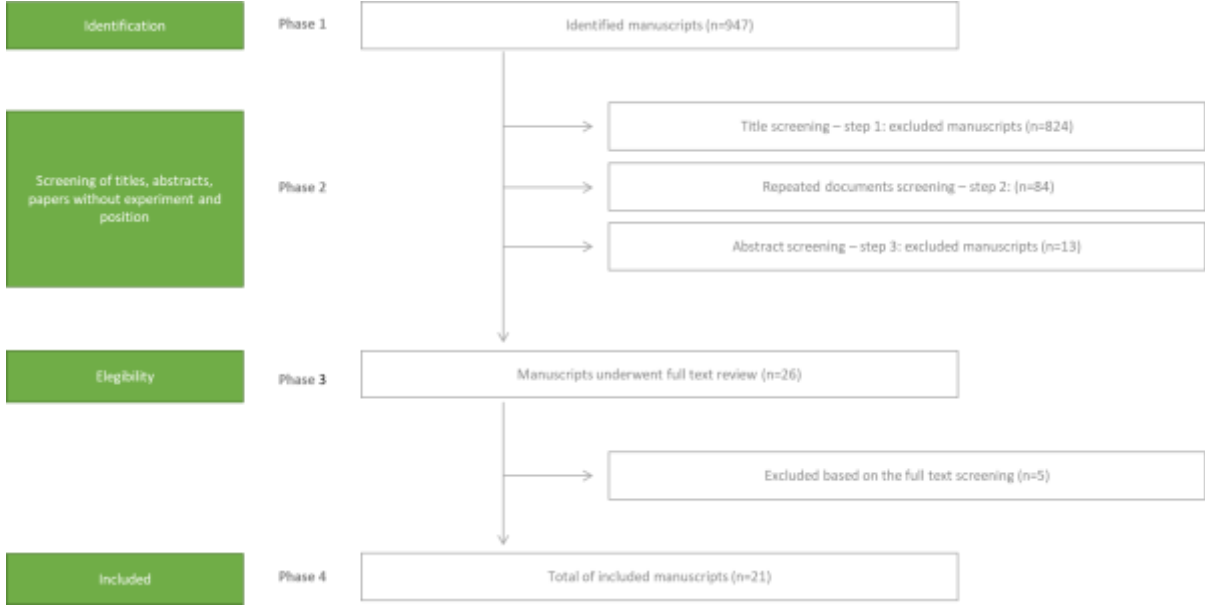

Figure 10 - PRISMA Flowchart

In phase 1 was applied the research string to all electronic repositories, above indicated, aiming to find papers published between 2017 to 2021, which resulted in 947 publications.

Phase 2 was comprised of a 3-step approach. Therefore, in step 1, a total of 824 papers were excluded based on their titles, enabling assess the remaining publications (n=123). Subsequently, in step 2, was excluded repeated documents (n=84). Finally, in step 3, were excluded manuscripts based on abstract screening, which resulted in 13 deletions. It resulted in a total of 26 papers to analyze in the next phases.

Lastly, in phase 3, manuscripts underwent a full-text reading and examination, which has 4 exclusions.

Consequently, this method gathered 21 articles to be integrated into this study, of which 20 were published in scientific journals, and 1 were conference papers.

These studies were allocated to the most common BPO processes (n=12) and the implementation of RPA in BPO processes (n=9). Besides some papers approach both subjects simultaneously, the authors' focus was on one of them specifically. Hence, the articles are more focused on the RPA and its application to BPO processes, than the most common BPO processes, their applicability in this paper will be the use of RPA in BPO processes.

Broadly, BPO activity lies in outsourcing selected business processes to an external supplier. Commonly, besides they do not belong to its core competencies or not being part of the main business

functions, they are from important areas for the company (Ławicka, 2021). The transferring organizational repeated non-core and core business processes to an outside company to accomplish cost reduction while developing service quality is the reality of the BPO sector (Kaur et al., 2020)

In addition, Ławicka (2021) sustains that BPO began as a contact center, however, nowadays, the sector offers several services, not only back-office support, middle and front-office processes, but also enhancing the quality of customer service. Complementing Ławicka (2021) idea, Kaur et al. (2020) give an example of customer contact staff of BPO. So, they delivery voice-based services to manage the clients of an enterprise. Their job profile comprises answering queries, inbound sales, inbound support, outbound support order taking, e-mail support, and technical support (Kaur et al., 2020).

In parallel, Cherian and Kamalanabhan (2019) supplement to the prior BPO's perspectives with the idea that BPO is a support sector helping in all customer business operations.

Concerning the issue which are the most common processes of BPO, Mazumder and Garg (2021) share that some common processes of BPO are services like call-center, finance, accounting, human resources, and design. In this way, Ponciano and Amaral (2020) perspective could not agree more with the Mazumder and Garg (2021) point of view. In Ponciano and Amaral (2020) perception BPO can be understood as the transferring of business processes, like accounting, human resources, and customer service to a third-party service supplier. Additionally, by Cherian and Kamalanabhan (2019) reckoning, firstly, BPO began as a voice-based call center supplying simple inquiry services. Later, BPO was developed to provide various services such as customer relationship management, insurance claims processing, payroll, inventory management, processing, credit-card services, employee leasing, finance, sales, and medical transcription support. Conversely, the way Ray and Thomas (2019) look at BPO in their research highlight that BPO is suitable for all assignments traditionally consigned to the business back office, like customer service, accounting, performance evaluation, tech support, and legal services. Similarly, Liu et al. (2017) comply with Mazumder and Garg (2021) and Ponciano and Amaral (2020). Hence, in Liu et al. (2017) understanding, the main types of BPO processes are customer service, finance and accounting, human resource, training, and procurement. Also, Asatiani et al. (2019) go along with Mazumder and Garg (2021), Ponciano and Amaral (2020) and Liu et. al (2017) in relation to the inclusion of accounting processes in BPO sphere: BPO includes accounting processes (Asatiani et al., 2019). In Asatiani et al. (2019) paper, the authors describe which processes can an organization outsource to BPO firms. Thus, in accounting, a company can outsource just payroll tax calculation and maintain control over the other payroll-related process, like payments and reporting to government agencies. Lacity and Willcocks (2017) very much resemble with Mazumder and Garg (2021), Ponciano and Amaral (2020), Liu et al. (2017) and Asatiani et al. (2019) opinion. Therefore, Lacity and Willcocks (2017) detach that a lot of companies outsource their administrative business services to BPO organizations, such as IT, human resources, procurement, legal, financial, and accounting service (Lacity & Willcocks, 2017).

The standpoint of Ge et al. (2021) closely correspond with the outlook of Mazumder and Garg (2021), Ponciano and Amaral (2020), Liu et al. (2017), Asatiani et al. (2019) and Lacity and Willcocks (2017). So, Ge et al. (2021) describe, as the referred authors, that BPO is a practice of contracting the operations of a particular business process to an external service provider, for instance, human resources, financial guidance, accounting, and procurement. Moreover, Ge et al. (2021) emphasize that IT is a usual process to BPO. In Chawla (2020) knowledge, BPO may work with any function, core

or non-core, outsourced by an enterprise. Thus, to Chawla (2020), BPO usually handle processes such as office Functions, invoice factoring support, underwriting processes, accounts & finance services, and human resources services. In addition, Meil and Salzman (2017) advocate BPO is an expert in the call-center process (Meil & Salzman, 2017). Furthermore, there are a strong resemblance between the Ellimaki et al. (2021) perspective and Ge et al.(2021), Mazumder and Garg (2021), Ponciano and Amaral (2020), Liu et al. (2017), Asatiani et al. (2019), Lacity and Willcocks (2017) and Chawla (2020) opinion. Hence, in Ellimaki et al. (2021) position, BPO is a popular possibility to externally hire the development of some service processes that should be performed internally, like procurement, accounting, legal services, payroll, or cloud processes.

In relation to industries, Mazumder and Garg (2021) in their paper focus on six industries related to BPO: auto, industrial, media, banking, telecom, and energy, and advocate the importance of enhancing their operational efficiencies and business processes while concurrently expanding enterprise-level innovativeness, advancement solutions, and prestige. In Ławicka (2021) study, there are close parallels with Mazumder and Garg (2021) research. Ławicka (2021) supports that BPO centers are offering much more services for their foreign consumers, and the IT sector is led by organizations working in the automotive, banking, and insurance industries. In turn, Sullivan et al. (2021) suggest that a lot of the large freight forwarders, namely logistics service providers, started working together with BPO centers. On the other hand, from Liu et al. (2017) perspective, in the BPO scope are various industries such as manufacturing, retail, services, and education.

Ponciano and Amaral (2020) comply with Ge et al. (2021) in relation to the IT processes. Ponciano and Amaral (2020) contribute in their article to the knowledge of a vital characteristic of the BPO: it relies on IT and expertise. Likewise, Sullivan et al. (2021) define BPO as a delegation of IT-qualified business processes to an external service provider.

With the advance in computer technology, back-office automation is enabling the BPO sector to transform existing business models and embrace consequent changes (Priyadarshi & Premchandran, 2022).

In turn, Ruiz et al. (2022) emphasize that medium and large-sized enterprises have been progressively implementing RPA in the past few years, aiming to automate their processes. They apply the "Robotic FTEs" to set a "Virtual Back-office" in order to execute manual orders without a direct human participation efficiently and quickly. Also, Mazumder and Garg (2021) understand that is vital to initiate a significant shift from labour arbitrage to automation. Consequently, Mazumder and Garg (2021) also argue the increasing tendency in the BPO industry for RPA, as a transformation instrument in service delivery.

In Ruiz et al. (2022) study, the principal appliance has been done in the back-office functions of administration and finance business scope. Some processes in this area are analysis and report of finances, management of sales, payments, receipts, taxes, and accounting in general. In Ruiz et al. (2022) opinion, these processes have vital characteristics in common to be good candidates for RPA such as they are systematic, have a high volume of cases, need an enclosed cognitive effort, and are performed on existing information systems through their user interface. Also, Kokina and Blanchette (2019) proposed the robot implementation for accounting and finance tasks. In this sense, Kokina and Blanchette (2019) support there are different areas in finance and accounting that cover tasks that interact with various systems, including high levels of transaction processing, and require periodic

decisions to be made, so there is a tremendous possibility for RPA. In the Pramod (2021) perspective RPA adoption is mostly examined in banking, financial, healthcare, agriculture, and manufacturing sectors. In its major, RPA is applied in banking, financial services, and insurance. Besides, the implementation in healthcare and manufacturing is moderate.

On the other hand, Sullivan et al. (2021) describe the context in which RPA is inserted in the logistics sector. In this sector, the staff are responsible for creating documents such as bills of lading or invoices. These documents are generally formed by directly copying analysed information from documents obtained from consumers and pasted into new templates. Hence, by robots mimicking the acts of these employees, it is possible to automate this process.

In Ruiz et al. (2022) research, they advocate that the prior back-office approach was spread to comprise the front processes. In front-office activities, humans try to respond as soon as to a request, for instance, in the processing phone or online queries and claims in a Customer Service Centre the consumers usually require a prompt response (Ruiz et al. (2022). For Ruiz et al. (2022), compared with the back-office functions, front activities habitually are uncomplicated and demand an instant solution, and comprise some huge combination of various actions, in a short period of time.

In relation to the employees in the automation process, Ruiz et al. (2022) focus on the domain of BPO, stressing the importance of identifying the human activities to make the landing area more efficient gradually, for example, to recognize "McDonaldized" tasks that could be automated in an RPA context inside of BPO sphere. Ruiz et al. (2022) point out the inaccurate or incorrect information due to the natural and historical resistance from humans to automation.

In parallel, Pramod (2021) gives some examples of processes automated with RPA, i.e., automated orders and payment processes in BPO organizations. Is possible to automate the relevant processes in human resources such as human resources strategy, talent acquisition, and operations. Another instance is the helpdesk automation and support centre automation (Pramod, 2021).

Willcocks et al. (2017) closely corresponding to Pramod (2021) share the application of RPA in the human resource sector in the repetitive, monotonous process. An example is the onboarding process: the human resource specialist must log on and off in multiple systems to set up new employees with benefits, payroll, email, voicemail, security clearance, office space, office furniture, computer, parking pass, expense account, identification badge, and business cards, with the human resource specialist following standard rules for each routine task. Another case is the insurance sector due to its huge amount of back-office, high-volume, repetitive data collection and processing tasks, many of them still manual, and many still taking data from non-integrated legacy mainframe systems (Willcocks et al., 2017).

According to Ruiz et al. (2022), human-robot partnership is the most natural strategy for RPA. The authors advocate that this collaboration, namely, hybrid RPA entail a vertical segmentation of process activities, i.e., several processes are performed by humans while robots execute others.

In their paper, Ruiz et al. (2022) define the hybrid process. From a technical standpoint, the method begins with the segmentation of the process - i.e., understanding which parts of the process should be on the human or the robot part - and the separation of each segment side. Later, an information system may be designed for the interaction between robots and humans. In this process Ruiz et al.

(2022) highlight the importance of the psychological perspective, in other words, humans must believe that they are a vital key in the process. Finally, the resultant hybrid process needs a supervision system that facilitates governance and control tools. Conversely, from an analytical outlook, the earlier activities are usually data-intensive and, hence, involve a data centralization activity that boosts all the generated data.

It is crucial to understand which tasks of the process may be in charge of humans, as well as which activities may be operated by robots. Concurrently, it is vital to facilitate strategies to avoid humans detouring or interfering with the robot's functions (Ruiz et al., 2022)

As stated in Ruiz et al. (2022) study, RPA has outstandingly developed in the enterprise software market, where RPA has aimed efficiently and automatically operate on extensive administrative and back-office processes.

Ruiz et al. (2022) describes RPA as a tool in the automation toolset of an enterprise that facilitate mimicking the human actions that are executed on the employer interfaces and, thus, conceding a higher level of automation. Ruiz et al. (2022) referenced that besides the initial fever and the billionaire investments, currently, organizations present more accurate expectations of RPA. So, in the Ruiz et. al (2022) opinion, these expectations go further than high savings and quickly returning of the reversal with fully automated processes. Moreover, the mature perspective of RPA begins by understanding that humans are the basis in the RPA scope.

In Ruiz et al. (2022) perspective, in the birth of RPA, the principal focus was on automating the exceedingly repetitive activities of a business process that were executed by the staff. For Ruiz et al. (2022) the frequent tasks that comprised a low level of exceptions, implicated an enclosed cognitive focus, and were subject to human error were fitting to automate with RPA. Ruiz et. al (2022) define this segmentation as horizontal segmentation and stress the horizontal segmentation of processes usually have minimal enforceability when these ideal activities - which should be completed automated - rarely arise (left side of Figure 11). Conversely, Ruiz et. al (2022) underline that a vertical segmentation of tasks results to be a more natural method. So, in the vertical segmentation some tasks are known as appropriate to automate while other activities should maintain processed by humans (right side of Figure 11). According to Ruiz et. al, (2022) the automation of these processes denotes the partnership among humans and robots and thus guiding to a hybrid sphere which, in the Ruiz et. al (2022) opinion, is precisely the approach most employed in the last years.
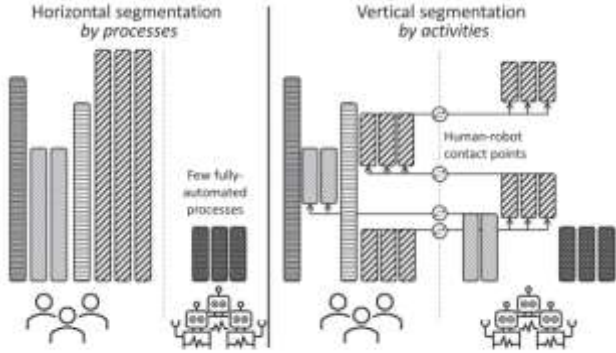

Fig. 1. Workload assignment to humans and robots in both horizontal and vertical segmentation approaches.

Figure 11 - Workload assignment to humans and robots in both horizontal and vertical segmentation approaches (Ruiz et al., 2022)

This cooperation involves applying the human-in-the-loop rather than end-to-end automation. Ruiz et al. (2022) emphasize that, nevertheless, it is interpreted as a human process with robotic tasks, or a robotic process with human activities, its challenges could be debated with both approaches asynchronous collaboration and synchronous collaboration.

In Ruiz et al. (2022) outlook, in asynchronous collaboration robots and humans maintain their activity queues which they process autonomously.

In this alignment, employees may send tasks to the robot queue and, thereafter, carry on with the further human activities. Whereas in synchronous collaboration the robot's responsibilities resides on on-demand tasks that may start once they are demanded. In this orientation, the staff may wait for the robot to solve its activities due the robot activities are required to conclude the employee activities Ruiz et al. (2022).

The most ordinary orientation is the asynchronous collaboration, in which the collaboration is completed in an unattended way. To exemplify this orientation, Ruiz et al. (2022) highlight processes where a robot collect data from different information systems without the help of humans. Thus, the robot groupings and delivers the information organised and structured and, therefore, humans can execute their cognitive duties. Ruiz et al. (2022) indicate that the human-robot interactions have outright control of the data, time, and activities necessary in the decision-making. Consequently, Ruiz et al. (2022) stand up for the cognitive work can be "McDonaldized". Conversely, this "McDonaldization" enables these activities to be more efficient with Machine Learning approaches or if-then rules.

"if before every action, we were to begin by weighing up the consequences, thinking about them in earnest, first the immediate consequences, then the probable, then the possible, then the imaginable ones, we should never move beyond the point where our first thought brought us to a halt."

— José Saramago, *Blindness*

4. FRAMEWORK FOR A ROBOTIC PROCESS AUTOMATION IMPLEMENTATION IN BUSINESS PROCESS OUTSOURCING

This chapter proposes a framework to support the implementation of RPA in BPO organizations. Hence, this section, firstly, refers to the assumptions applied as the baseline to the artifact elaboration. Following the framework elaboration, this topic presents its assessment and evaluation.

4.1. ASSUMPTIONS

Having based on the prior literature review whose spotlight is BPO, RPA, and the implementation of RPA in BPO enterprises, it is possible to state:

BPO is the transference of one or more IT-intensive business processes to an external supplier that, in its turn, administers and manages the selected process based on established and measurable performance criteria (Duan et al., 2009), (Deng, 2015), (Mann & Graham, 2016), (Yang et al., 2006).

BPO is understood as a socio-technical phenomenon, so an efficient outsourcing project involves the adherence to the company's social and technical resources (Krstić & Kahrović, 2015).

BPO presents several advantages such as cost reduction and cost restructuring, shifting fixed costs by variable costs related to services provided. Additionally, BPO promotes the improvement of quality and higher specialization and the connection with extern expertise. Besides, BPO stimulates local employment establishing contracts with local organizations, standardization, and admission to scale economies (Krstić & Kahrović, 2015).

RPA is a software solution for the designing of programs that may mimic the actions of human employees when executing repetitive and structured tasks with ISs (Jiménez-Ramírez et al., 2020).

RPA uses the human interface to receive and manage data (Gami et al., 2019).

The robot, working with repetitive activities, contributes to reducing human effort (Gami et al., 2019).

In this way, RPA eliminates the gap between employees and large-scale business process automation whenever human work and implementation of business processes management systems are expensive or not a priority to an organization (Hofmann et al., 2020).

4.2. FRAMEWORK FOR A ROBOTIC PROCESS AUTOMATION IMPLEMENTATION IN BUSINESS PROCESS OUTSOURCING

The presuppositions mentioned in the prior section led to the construction of a framework proposal, aiming to help with the implementation of RPA in BPO enterprises.
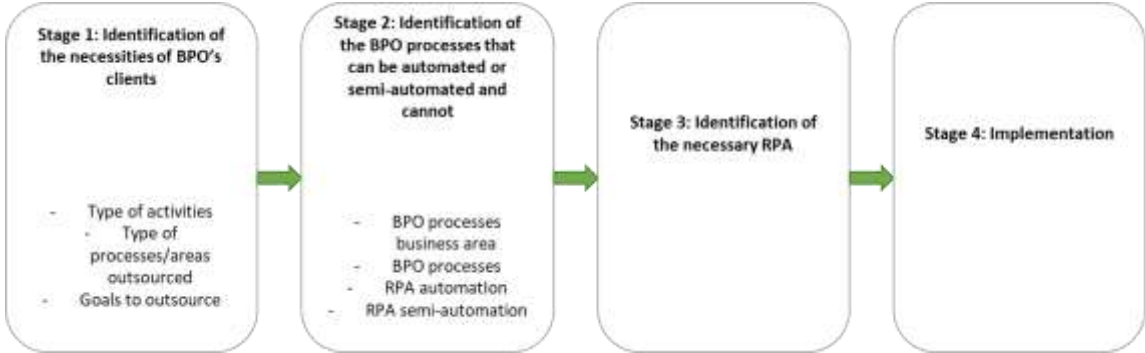

Figure 12 - Framework for the implementation of RPA in BPO organizations (created by the thesis's author)

A framework aims to aid in understanding the scope of the implementation of RPA on BPO processes and comprehend which BPO processes can be automated or semi-automated and cannot – Figure 12 -

The first framework's step is the survey of necessities, types of processes/areas outsourced, and the goals of an organization in adhering to outsourcing their processes to an BPO enterprise.

- **Stage 1: Identification of the necessities of BPO's clients.**

Figure 13 presents a flowchart to assist in the identification and assessment of the types of processes outsourced in each enterprise's department. The flowchart, also, exploits the necessities and goals in outsourcing. After verifying which processes are eligible to be outsourced to BPO organizations, the next stage is to identify possible processes to automate or semi-automate.

To understand which processes may be outsourced, a questionnaire (annex 1) is applied to the study organization, helping it to comprehend, smoothly, the characteristics of their processes and activities and within them which are the costly processes either in time or in costs.
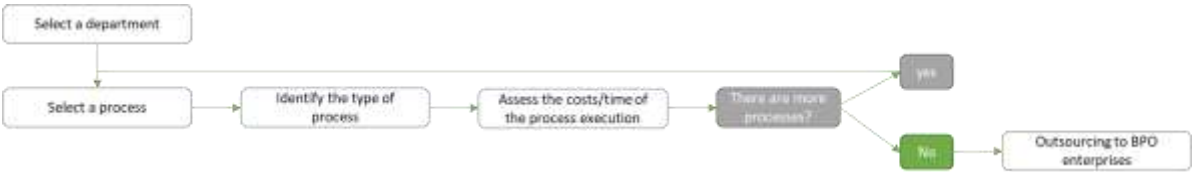
Figure 13 - Flowchart to identify the necessities of BPO's clients (created by the thesis's author)

Organizations are implementing strategic and transformational outsourcing to seek upgraded business focus, diminish risks, develop sustainable competitive advantage, enhance technical capabilities, and free resources for core business purposes (Ghodeswar & Vaidyanathan, 2008).

Nowadays, a great number of BPO organizations provide numerous services associated with back-office functions (Krysińska et al., 2018).

To increase cost efficiency and to let companies focus firstly on their core competencies, various firms chose to offshore part of their business operations to a third party. However, it is important to decide which business operations to outsource (Krysińska et al., 2018). Some BPO advantages such as cost reduction and cost restructuring, shifting fixed costs by variable costs related to services provided. Parallelly, BPO contributes to the advancement of quality and higher specialization and contact with outside expert knowledge (Krstić & Kahrović, 2015).

Organizations mostly have three types of processes: Core processes that deliver a strategic advantage; critical non-core processes that are significant, although are not competitive differentiators; and non-core and non-critical processes that are required to create the environment work. Outsourcing non-core processes release the organizations' time and resources for core functions (Ghodeswar & Vaidyanathan, 2008).

The organization's non-core business process consists of corporate governance like legal, planning, finance, and public and government relations, building services, accounting, management, and administrative support, and human resource management activities such as hiring, recruiting, training, compensating, and dismissing employees, technology and process improvements like automation, maintenance, design or redesign of equipment, software, hardware, technical knowledge, and procedures (Nababan et al., 2020).

Organizations consider outsourcing practically all the services they need to limit their staff to the core activities that constitute the corporations' business (Ghodeswar & Vaidyanathan, 2008).

Enterprises outsource their operations for numerous purposes. The main motivation is to decide on BPO, seeking to diminish and healthier manage the cost. BPO presents greater competitiveness in terms of prices (Krysińska et al., 2018). Instead of being just a method of recruitment, BPO progressively is being considered a tactic to transmute the practice of leading businesses to achieve fast, sustainable development in the value chain level competitive performance (Duan et al., 2009).

Withdrawing back-office activities from internal operations permits enterprises to decrease costs (Click & Duening, 2005).

BPO firms, incorporate experienced and skilled human resources and knowledge resources that can teach new employees in case of necessity. Similarly, outsourcing enables flexibility. So, organizations can reduce employment and hold only the experts and core functions. This strategy allows enterprises to focus on their core competencies, improving them and increasing their rank in the market (Krysińska et al., 2018).

- **Stage 2: Identification of the BPO processes**

In this step, the purpose is to define the typical BPO processes and from those processes which processes can be automated, semi-automated, or cannot be automated. To the second phase succeed, a questionnaire may be applied to the BPO organization (annex 2). Figure 14 demonstrates the flowchart linked to this phase.

Figure 14 - Flowchart to identify the BPO processes that can be automated, semi-automated, or cannot be automated (created by the thesis's author)

The processes may be categorized into three categories.

Automated: Employees set up one or more robots to acquire and interpret current applications for processing a transaction, managing data, triggering responses and communicating with other digital systems (Barnett, 2015). The robots mimic the behaviour of human workers when performing repetitive and structured tasks with IS (Jiménez-Ramírez et al., 2020).

Semi-automated: Processes with both tasks appropriated and not suitable to automate. Hence, that activities of the process that cannot be automated should maintain being handled by humans. The automation of these processes implies the partnership hybrid between humans and robots (Ruiz et al., 2022).

Not automated: Processes that demand human judgment in complex cases cannot be automated just via RPA (Hofmann et al., 2020).

This automation-level categorization of the processes is crucial to allowing the management efficiency and efficacy of a BPO organization in service delivery.

The automation level of the processes can variate its proportion according to the sector of business. Thus, RPA adoption has much more expression, for instance, in banking, financial services, insurance (Ruiz et al., 2022), and logistics (Sullivan et al., 2021). On another hand, RPA application is more moderate in Manufacturing sector (Pramod, 2021) – Figure 15 –. Additionally, for an RPA automation is vital to verify specific characteristics. So, the tasks must be systematic, contain a high volume of cases, need an enclosed cognitive effort, and need to be performed on existing information systems through their user interface (Ruiz et. all, 2022). Also, the activities may be standardized, and contain a rule-based structure, which signifies does not require awareness or cognitive skills (Hofmann et. al, 2020). For example, in finance and accounting processes various tasks interact with various systems, including high levels of transaction processing, and require periodic decisions to be made. So, there is a tremendous possibility for RPA (Kokina and Blanchette, 2019).

RPA Adoption BPO Sectors	Major adoption	Moderate adoption
Banking	X	
Financial Services	X	
Insurance	X	
Logistics	X	
Manufacturing		X

Figure 15 - Qualitative matrix of the adoption of RPA in BPO sectors (created by the thesis's author)

Besides the entire automation of the processes, in some operations, there is not possible for a robot to operate alone mimicking human behaviours. Hence, in this situation is feasible hybrid automation,

in order to some processes being performed by humans while robots execute others. The hybrid automation translates into a perception of higher awareness of the RPA application. So, one cannot just follow the features that enable automate the process, but one may segment the process understanding which parts of the process should be on the human or the robot part, and the separation of each segment side (Ruiz et al., 2022). Apart from the technical perspective, it is vital to contemplate a psychological standpoint, understanding how to create a smooth interaction between humans and robots in more complex functions (Ruiz et al., 2022). The natural and historical resistance from humans to automation is crucial to promoting methods to avoid humans from bypassing or interfering with the robot's operations - i.e., humans must feel that they are an important key in the process (Ruiz et al., 2022).

Figure 16 shows the common BPO processes and their possibility of being automated or semi-automated.

BPO Processes	Automated	Semi-automated	Cannot be automated
Accounting	X	X	
Call Center	X	X	
Credit-card services	X	X	
Customer relationship management			
Customer service	X	X	
Design			X
Employee leasing	X	X	
Finance	X	X	
Human resources	X	X	X
Information technology	X	X	
Insurance claims processing		X	X
Inventory management	X	X	
Invoice Factoring Support	X	X	
Legal services		X	X
Management of sales	X	X	
Medical transcription support		X	X
Payroll	X	X	
Performance evaluation			X
Processing	X	X	
Procurement			X
Receipts	X	X	
Taxes	X	X	
Tech support			X
Training			X
Underwriting processes			X

Figure 16 - Qualitative matrix of the adoption of RPA in BPO processes (created by the thesis's author)

Thus, BPO processes that have the possibility of being fully automated or semi-automated are accounting, call centres, and credit-card services. employee leasing, finance, human resource, information technology, insurance claims processing, inventory management, invoice factoring support, legal services, management of sales, medical transcription support, payroll, performance evaluation, processing, receipts, and taxes. However, some BPO processes that can be both automated and semi-automated contain tasks that cannot be automated such as human resources, insurance claims processing, and legal services. Conversely, some BPO processes cannot present the possibility of being automated, for instance, design, procurement, tech support, training, and underwriting processes.

Parallelly, figure 17 exposes the potential degree of different industries for RPA.

Figure 17 - Qualitative matrix of the adoption of RPA in BPO processes (Madakam et al., 2019)

- **Stage 3: Identification of the necessary RPA**

The third stage consists of identifying the necessary RPA. This step only is possible after the completion of the prior section, in other words, it is feasible to understand which RPA is necessary after determining the BPO processes that can be automated, semi-automated, or cannot be automated.

This led to the creation of another flowchart in this phase of the framework to the creation of an artefact – figure 18.

Figure 18 - Flowchart to the identification of the necessary RPA (created by the thesis's author)

This stage, also, refines the identified BPO area that can be considered for total or partial RPA implementation.

Comparing industrial robots with RPA robots, industrial robots rise production efficiency by intensifying production rates, increasing quality, and decreasing production expenses. RPA "robots" transform the perception of business processes, IT support processes, workflow processes, remote infrastructure, and back-office work. RPA offers bold improvements in accuracy and cycle time and enhanced productivity in transaction processing. At the same time, RPA contributes to eliminate dull and repetitive tasks (Kaya et al., 2019).

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The transformations generated by RPA enable, for instance, accounting to shift to strategic management accounting (Figure 19) (Kaya et al., 2019).

Accounting and finance processes are the processes more suitable to be processed by software robots (Jedrzejka, 2019). Many finance and accounting processes become appropriate for being carried over by software robots due to the concurrent exercise of modern and legacy software and the repetitiveness of manual tasks (Jedrzejka, 2019)

Accounting operations demand high accuracy, and consistency, as well as diverse of those processes implicate the manual execution of repetitive transactions. The staff regularly gathers data from numerous and fragmented systems, and afterward they manage the information (verifies, presents for acceptance) ahead of retaining them into an accounting system. Data collected and manipulated by employees expend a lot of time and is error prone. When robots process those tasks following prescribed rules and procedures, time is saved, and the error ratio is reduced. Simultaneously, automation supplies monitoring checks, approvals, and document management (Jedrzejka, 2019)

Automated accounting remarkably transforms the function of an accountant. A lot of time-consuming, manual process jobs are replaced with technology and robots, so accountants can concentrate on strategies and analyses. The implementation of RPA enables staff consumes more time on decision support, predictive analytics, and performance management. RPA also creates real-time to look at financial data, generation of reports and analyses simultaneously (Figure 19) (Kaya et al., 2019).

Vital processes like accounts receivables and account payables will be disappearing as the RPA technique will automatically enter data, and some accounting staff will be supervising paperwork. RPA can be employed in every step of accounting flow, in operational accounting, billing and collection. Thus, those tasks will be tracked and progressed by robots. Account reconciliations can be executed efficiently by applying automation. Accounts payables and accounts receivables will be managed by robots in one-way or two-way transactions with customers and suppliers (Figure 19) (Kaya et al., 2019).

All distributions and adjustments can be performed by RPA in general accounting. For example, after reconciliations of the bank, credit cards or credit recordings, and intercompany transactions, robotic programs can execute closing and consolidation tasks. And, for instance, finance processes such as treasury transactions can be monitored by RPA. Once the closing processes are completed, RPA is able to deliver improved financial reporting both for internal and external objectives (Figure 19) (Kaya et al., 2019).

In addition, accounting regulations and standards are subject to regular modifications (e.g. tax law). Robots offers the advantage of being fast retrained, in a centralized way, to carry out the current law. Additionally, RPA enables legacy systems lacking solutions allowing traditional automation (Figure 19) (Jedrzejka, 2019)

RPA can execute planning and budgeting tasks in the controlling processes, and provide diverse scenarios within a short deadline, which helps in the decision process. As well, long-term or short-term goals can be formed properly, due to the developed forecasting role of RPA (Figure 19) (Kaya et al., 2019).

The accounting processes and tasks that can be aided by automation in in their performance and accuracy comprise:

Period-end closing – general ledger, sub-ledgers closing, validation of diary entries, low-risk accounts reconciliation, consolidation (Figure 19) (Jedrzejka, 2019);

Reporting – monthly, quarterly close, internal performance, and management reporting (gathering and analysing financial and operational data), frequently reporting and external statutory (Figure 19) (Jedrzejka, 2019);

Accounts receivable and accounts payable – retaining (updating, vetting) customer/supplier data, developing/processing/delivering invoices, automating authorizations, validating, and posting payments, collections, billing, fitting invoices vs sales and purchase orders (Figure 19) (Jedrzejka, 2019);

Cash management, general ledger accounting, intercompany transactions, inventory accounting, travel, and expenses – refund requests, audit and document expense reports, payroll, fixed asset accounting, and tax accounting (Figure 19) (Jedrzejka, 2019).

The processes usually selected for RPA comprise purchase-to-pay, record-to-report, and internal performance reporting, due to their routine-based and their no necessity for human judgment or complex decision-making. The objective is the replacement of the humans by robots in manual bookkeeping and assist them in complex, multifaceted processes, like in the financial close (Figure 19) (Jedrzejka, 2019).

The teamwork between RPA and accounting professionals will convert inadequate accounting processes in more strategic operations in the sphere of Strategic Accounting Management (Figure 19) (Kaya et al., 2019).

BPO Process: Accounting processes	
Automate (i.e. Do not need human interaction)	Accounts receivable and accounts payable – retaining (updating, vetting) customer/supplier data, developing/processing/delivering invoices, automating authorizations, validating and posting payments, collections, billing, fitting invoices vs sales and purchase orders
	Reporting – monthly, quarterly close, internal performance, and management reporting (gathering and analysing financial and operational data), frequently reporting and external statutory
	Cash management, general ledger accounting, intercompany transactions, inventory accounting, travel, and expenses – refund requests, audit and document expense reports, payroll, fixed asset accounting, and tax accounting
	Period-end closing – general ledger, sub-ledgers closing, validation of diary entries, low-risk accounts reconciliation, consolidation
Hybrid (i.e. It can be automated but needs human interaction)	Performance assessment
Not automated (.ie. It need human decisions, judgments and cognitive knowledge)	Cash management, general ledger accounting, intercompany transactions, inventory accounting, travel, and expenses – refund requests, audit and document expense reports, payroll, fixed asset accounting, and tax accounting

Figure 19 - Examples of accounting processes that can be automated, semi-automated, or cannot be automated, adapted by (Kaya et al. 2019) and (Jedrzejka, 2019)

- **Stage 4: Implementation**

The fourth stage concentrates in the implementation. To the implementation is crucial to do the requirement analysis, RPA Design, RPA development, and test it.

In the RPA implementation step is vital to understand which is more advantageous, outsourcing the processes to a BPO enterprise, letting it automate those processes, or deploying RPA within the organization, giving up the outsourcing, and automating the processes on its own.

The error makes part of the nature of human work. The risk of malfunction, mistake, and scam in manual systems is invariably higher than in automated techniques. Robots are reliable, constant, and inexhaustible. They are programmed to complete the same task with the same routine without error or fraud. RPA enhances abilities that increase organizational capacity (Kaya et al., 2019). Software robots always and strictly obey the established rules and protocols. It minimizes the quantity of deliberate or involuntary mistakes employees make while processing data manually (transcription, digit transposition errors). Robots can validate the information ahead of notifying or using them (Jedrzejka, 2019).

On the other hand, a robot can be configured to perform a single process or execute numerous tasks of various processes in sequence. The capacity of working 24 hours a day can triple the available time for processing, when compared with human employees' work (Jedrzejka, 2019).

Process automation enables assembling and collecting data more effortlessly, thus an organization can forecast future outcomes and optimize its processes. Developed analytic techniques can produce a feedback loop. The analysis defines areas of advance, and the improved processes, conversely, create more precise data that contributes to the additional enhancement of operations and higher levels of efficiency. Refined analytics is a crucial component in reaching regulatory compliance, cost-effective growth, and optimized operations (Kaya et al., 2019). RPA promote efficient control over automated assignments, due to all operation being fully tracked and logged. The gathered analytical data is more detailed. Estimating improvement and forecasting completion times are more effortless when all automation work is monitored centrally. The information obtained can be applied to catch anomalies and backup issues, which enable the optimization of the current processes (Jedrzejka, 2019).

The RPA application promotes fundamental shifts in management practices. The decrease in direct labour enables the elimination of product cost from the meaning of conventional prime cost. The advancement of Industry 4.0 forces the remaining blue-collar laborers to enhance their technical skills. Cross-functionality will overpower this new knowledge of work routine (Kaya et al., 2019).

RPA can produce a 25-50% cost savings, enables a 24x7x365 performance, allows error-free work, and is not expensive if compared with human labour and capability. A software robot can cost one-third of the cost of a full-time offshore employee and one-fifth the price of an onshore FTE. Prior to automation, BPO used their insurance benefits and employed full-time human employees who had the capacity to complete the process in an average of 12 minutes. With the automation software application, BPO can complete the process one-third of the time, tripling the transaction volume for one-tenth of the FTE (Kaya et al., 2019). Savings will vary with the type of the operations to automate, and the kind of RPA method used. Assisted robots presents moderate returns, while unassisted and centrally controlled robots generate higher returns. Robots, when employed on a large scale, contribute greatly to the decrease of the processes' costs. Generally, a robot can substitute two to five full-time human workers (Jedrzejka, 2019).

From a strategic predicting perspective, organizations may assign substantial funds for improvements to enhance or revise the RPA systems. On the other hand, those funds should use for maintenance and support. However, the traditional cost management systems will become obsolete if the enterprises do not carry out preventive measures to adjust their strategies to this new era (Kaya et al., 2019).

Parallelly, the robotic software eradicates employees' dependency by liberating them from these regular functions. Thus, human workers can focus on core business objectives and operations (Kaya et al., 2019). Besides, software robots complete the activities faster than employees. Robots are not susceptible to distractions, tiredness which helps to bypass delays (Jedrzejka, 2019).

Additionally, robots can reproduce human tasks, turning up automation less risky. Currently, employees operate with various tools such as ERP, CRM, project management software, spreadsheets, and other company-tailored applications. RPA can operate on top of existing systems, interfering slightly on them. Employees need just some months of training to start the configuration of software robots and automate manual tasks, and they do not need to have software engineering or programming skills. Therefore, RPA fills the gap between manual work and full automation (Jedrzejka, 2019).

Apart from those characteristics, robots can be implemented on centrally controlled servers and perform without pauses. They can operate in multiple business zones during the day, eradicating problems resulting from time-zone disparity, or language and cultural obstacles (Jedrzejka, 2019).

Also, repetitive, ordinary assignments carried out by robots liberates employees' time. They can turn their attention to higher value-added duties. This can ease the routine and enhances job fulfilment. There are more possibilities to take benefit from employees' knowledge and experience. Conversely, giving to the staff the control of robots will give a sense of empowerment and the capacity to discover new methods to robots solve business problems. The most influential motivation for corporations employing RPA includes the ease of implementation and its lower expenses and skills demanded when compared to conventional, fully integrated automation. Both factors generate shorter deployment times and quicker returns (Jedrzejka, 2019).

Returning to the bigger question to discuss in this section, in other words which model of RPA implementation should organizations decide to undertake: automation in-house or fully outsourced process automation.

Outsourcing and automation works toward development attempting to accomplish greater accuracy, productivity, efficiency, and cost reduction. (Nababan et al., 2020).

- **Automation in-house**

Implementing RPA in-house requires a great investment at the start of the project. Hence, when an organization considers in-house automation, it needs to analyse the cost of buying an RPA software license, creating or developing an IT structure for in-house robot maintenance, investing in an IT Centre of Excellence team which maintains the infrastructure, platform, and automation tools. The organization, also, is advised to create a team of RPA developers who develop tests, and, when required, reconfigure robots after the deployment (Grzelak, 2020).

Most suppliers offer licenses that must be purchased for at least one year. Habitually, there is a set minimum of licenses that need to be acquired (Grzelak, 2020).

To reach a level of successful in-house implementation, a firm must contain RPA experts on its team and a separate Centre of Excellence. Popular RPA platforms turn feasible for robots to be developed and tested by people without any IT background. Regardless of the lack of IT experience, these employees still need to be properly trained and prepared for new duties. The in-house implementation, likewise, needs a substantial involvement of the IT department, which must help the Centre of Excellence and organize and support the necessary infrastructure (Grzelak, 2020).

From its beginning, in-house automation demands hiring fresh talents or producing a trustworthy reskilling program. It also needs considerable investments in IT and licenses. After the implementation, the in-house Centre of Excellence is in charge of robot maintenance and reconfiguration and the creation of new robots (Grzelak, 2020).

- **Fully outsourced process automation**

In contrast to the implementation of automation in-house, there is a fully outsourced process automation.

Total outsourcing, or renting robots, gives an alternative for organizations that do not desire to create in-house RPA competencies or whose automation does not legitimate the necessary investment. In RPA outsourcing, an external supplier oversees the robot development and testing as well as the maintenance and the required reconfiguration. The engagement of the IT department and teams who are implicated in automated processes is restricted to the essential necessary minimum (Grzelak, 2020).

When a firm chooses to rent robots, it does not have to worry about selecting an RPA platform, organizing infrastructure as well as making a Centre of Excellence. The organization may instantly start to identify its automation potential with the support of experienced analysts and choose the processes to automate (Grzelak, 2020).

In RPA fully outsourcing, it is not necessary to apply precise process mapping, documentation, or any type of complex preparations. Enterprises just need to exhibit to the experts what their employees do. Generally, some hours of a workshop are acceptable to start, although a fully operating robot can be created based on a recording that shows how the process is accomplished (Grzelak, 2020).

When an organization rents robots, its IT department does not need to redevelop or reconfigure environments. Robots operate the same applications their employees utilized before automation. The IT fellows must engineer a safe connection between robots and the working environment. Likewise, robots have access to applications, also to when the team prepares a working environment for a new employee (Grzelak, 2020).

After the robots are developed, tested, and implanted, the supplier is responsible for their maintenance. When there are modifications to made in the automated processes or applications, an external team of skilled experts reconfigures the robots in order to they can still complete their duties and so that the process can flow without interruptions (Grzelak, 2020).

Renting robots enables the enterprise to focus on its core business and highest priorities. Fully outsourced automation does not demand time-consuming and costly preparations, in contrast to in-house implementation. Robots are already programmed and trained and they are able to execute their assignments almost without supervision (Grzelak, 2020).

- **Which model to choose?**

The final question would be which model should an organization chooses.

In-house employment is normally suggested for bigger organizations that are able to potentially automate hundreds of FTEs. With the substantial investment in the origin of the project and the needed preparations, the benefits of automation can compensate these firms with a return on investments, and the reach of expected objectives (Grzelak, 2020).

For corporations with smaller profitability, in-house automation is not an investment feasible economically, and automation can be tough to implement. Nevertheless, medium-sized and smaller businesses have the possibility to support and benefit from Robotic Process Automation advantages. It is more beneficial for those types of organizations to rent robots. Hence, those companies can implement RPA into their departments in a suitable way and achieve time and trained digital employees (Grzelak, 2020).

4.3. VALIDATION

Expert analysis was conducted to validate the RPA Framework proposed, following Peffers et al. (2014) DSR process model. DSR is a meticulous process of designing artifacts to decipher problems, assessing what was designed, or what is operational, and conveying the outcomes (Dresch et al., 2015), so the artifacts of this thesis were analysed by automation experts who answered four quality validation questions. The methodology used for these validation sessions was individual interviews. Each expert was interviewed separately and accepted the recording of the interview to allow its transcription.

Interviews description

The interviews were realized between 11th October and 24th October. Additionally, two experts agreed to be identified, and one decided to stay anonymous, being this last interviewed be called, in this thesis, by *its* job title. Hence, the experts interviewed were:

Jorge Carrola Rodrigues (JCR): NOVA IMS Professor who studies enterprise software as a service impact in value and firm performance and lectures several information systems chairs.

Luis Leal (LL): Logistical Coordinator in Latin America markets. Works in a BPO company, managing services to Nokia Latin America.

RPA Assistant Developer (AD): Works in NTT Data as RPA Assistant Developer.

Each interview was guided by the artifacts' presentation (Annex 3) and comprised four questions:

- **Question 1 (Q1):** Do you consider the proposed Model and Framework useful and why? If not, why do you believe it is not?
- **Question 2 (Q2):** Do you have any criticism towards the proposed Model and Framework? Please explain.
- **Question 3 (Q3):** Would you consider it is possible to implement the proposed framework? Please clarify why/ why not.
- **Question 4 (Q4):** Do you have any recommendations or suggestions for further improvements of the proposed framework?

All interviewees consented to being recorded to allow the interview transcription. The three individual interviews were hence transcribed (Annex 4).

4.4. DISCUSSION

The interviews accomplished to validate the RPA Framework presented and proposed in the present thesis facilitate a discussion concerning these artifacts' utility, quality, and contribution to BPO processes automation with RPA, or even the processes automation in organizations employing RPA.

Q1: Do you consider the proposed framework as useful and why? If not, why do you believe it is not?

All interviewed agreed that the proposed RPA Framework is helpful.

JCR highlights that the present framework is useful, and its usefulness can be observed from two perspectives.

On the one hand, regarding the BPO organizations' point of view, in the moment of select technologies such as ERP to support their business process, this framework can be useful to understand in what way the suppliers or potential suppliers can automate their processes.

On the other hand, smaller suppliers, called local suppliers, will easily comprehend which processes are useful to automate with RPA.

In his turn, LL drew attention to the necessity of the processes being without details, but with general data. When the processes are not widespread, the automation will be not easily applied because of the specificities.

Also, AD thinks the framework is useful because of the good discrimination of the three points of automation, in the other words the framework reveals the processes that cannot be automated and the processes that can be fully or semi-automated.

Q2: Do you have any criticism towards the proposed framework? Please explain.

Concerning criticisms, any interviewed had any criticism of the framework.

JCR seized the question to emphasize that in a framework there are always some things to add. Thus, one can analyse the solutions already available in the market and implement them in the framework. In addition, JCR referred that the question of the time can, also, be added to the framework. To the processes that are already possible to fully automate or semi-automate, in one or two years, will join more processes. These updates should be aggregated continuously into the framework.

LL, without point any criticism, highlight that in the detailed processes humans cannot be replaced by robots.

Q3: Do you consider it is possible to implement the proposed framework? Please clarify why/ why not.

All interviewed considered it possible to implement the proposed framework in BPO organizations.

JCR agreed that the framework is implementable, in particular by BPO companies.

Being a main goal of a thesis with DSR methodology the phase communication or divulgation, this framework should be communicated to BPO organizations, in order to this companies have the possibility to employ this framework to understand which technologies and solutions will support the organizations' services and which processes should automate.

LL recommends avoiding detailed processes because automation demands repetitive processes.

AD believes the framework can be implemented due to the three hypotheses of automation and various areas being present in the framework.

Q4: Do you have any recommendation or suggestions for further improvements of the proposed framework?

Regarding recommendations or suggestions, JCR suggests keeping the framework alive. It is important to maintain this work overtime, revisit this study, and preserve actualized the framework.

The framework can be applied as a base, for example, to medium-sized companies that have already some standardized processes. Conversely, the framework can be customized to sustain the choice of solutions in organizations with processes more complex and vertical. Some examples of these organizations could be energy organizations and oil & gas organizations such as oil companies. They have complex processes. The framework needs to be adapted to each industry. Hence, the framework can start with a base, and then adjust to each sector of activity.

"Certainly. When you find a diamond that belongs to nobody, it is yours. When you discover an island that belongs to nobody, it is yours. When you get an idea before any one else, you take out a patent on it: it is yours. So with me: I own the stars, because nobody else before me ever thought of owning them."

— Antoine de Saint-Exupéry, *The Little Prince*

5. CONCLUSION

This chapter summarizes the research developed in the scope of the present thesis, presents the main conclusions, and also describes what will be realized in the future.

Firstly, it is crucial to briefly explain the essential concepts that are related to this research: digital transformation, BPO and RPA.

Both the information accessibility and the new opportunities for communication of digitization instigate information technology to enhance competitiveness among companies. This reality rocked the organizations' strategies, processes, and structures, cooperating directly with information technology. Later, the concepts of digitization and digitalization originate the digital transformation.

Regardless of the different definitions of digital transformation, it has a great contribution to the competition in the digital economy, where a digital market born, demanding bold alliances and strategic partnerships in order to offer to their consumers distinct final services or products. This network was considered crucial in digital business strategies, where various sectors work together to create a better product or service and achieve the expectations of the clients.

In the global village, also a product of digital transformation, outsourcing was another strategy raised by the necessity of an organization contracting an external company to execute its processes, services, or products. There are different motivations for an organization to decide to outsource the production of goods or services, although the main goals could be to have a more competitive advantage in the market and increase profits.

A specific type of outsourcing is BPO. The rising necessity of the organizations distinguish in the market due to some historical facts of the Mundial economy such as deregulation and competitive pressures of the market, globalization, consumers necessities, and evolutions in information technologies contributed to the BPO emergence.

BPO has diverse definitions, although both explanations that adapt to this study are from Yang et al. (2006) and Krstić and Kahrović (2015). Hence, Yang et al. (2006) describe BPO as the assignment of IT-intensive business processes to an external provider that owns, administers, and manages those processes based on an approved and measurable procedure. Additionally, Krstić and Kahrović (2015) emphasize BPO as a sociotechnical conception. Hence, an efficient outsourcing contract needs the commitment of organizations either in social or technical aspects. BPO changes an enterprise and requires an understanding of the social and human effects, resulting from these shifts. Besides, one of the main features of BPO is the range of technologies that have been developed to link the world in a global communications network.

Striving to survive, differentiate from the competition, and reduce costs, organizations decide mainly to outsource their non-core processes to BPO companies. In this way, it is also possible for those organizations to concentrate their resources and time on the core processes. Moreover, the outsourced processes will be executed by higher specialized staff who work in BPO, improving the quality of these processes.

Finance and accounting, purchasing and disbursement, human resource management, payroll, cash and investment management, billing and collection, building services, management, and

administrative support, legal services, logistics, customer care, marketing, banking, insurance, transportation, and utilities are some examples of common processes processed by BPO.

Although BPO presents some challenges such as the loss of intellectual property rights, higher prices are applied by BPO companies due to their growing tendency. Other examples of BPO challenges can be the absence of commitment, the smallest awareness of outsourcing methodologies, the absence of an outsourcing communications plan, and the lack of knowledge of outsourcing business risks. The resistance to cultural differences, also, is another challenge.

The increasing necessity to reduce costs, raise cost efficiency, boost a ranking in the market, and achieve competitive advantages in a global market is increasingly crucial to organizations executing their business processes more efficiently and effectively. This study defends that these objectives are possible to acquire through the integration of the RPA in BPO companies.

RPA is understood as the application of technology that allows humans, in a company, to configure computer software or a robot to capture and analyse current applications for processing a transaction, managing data, triggering responses, and communicating with other digital systems (Barnett, 2015). Hence, robots are taught by the users, being configured to mimic the humans' actions, being available to operate 24/7, and tirelessly repetitive.

RPA fills the gap between human labour and large-scale BPO, helping to reduce costs by dismissing employees, diminishing error rates, reducing turnaround time, improving the scalability of operations, enhancing compliance, and improving service. In terms of human work, when employees are free from repetitive and tedious activities, that can be automated, they can use their creative thinking, intellectual judgment, and social skills to improve those processes that cannot be automated.

Even if robots cannot handle new situations, emotions and creativity cannot be automated by using RPA. Also, is hard to recognize the processes and activities that can be automated, semi-automated, or not automated. Other RPA challenges important to refer to are the lack of RPA professional skills, security, hidden costs, lack of real-time visibility, and resistance from employees.

The concepts of digital transformation, BPO, and RPA generate, consequently, the debate of the capacity of the robot to one day substitute the human, having into consideration all the analysed benefits to the companies of hiring robots.

Although, after reading and studying the literature review, the Man will certainly always be essential, and the machine will certainly not be able to replace him. Also, the evolution of robots will depend on the evolution of the Man in technology and the more advanced robots are, the more the Man will be able to develop the processes in his companies either in automated processes or in those activities that depend exclusively on Him.

Lastly, related to the advances of humans in technology, what was once a utopia is now a reality. What in the present is still a dream, in the future may be achievable.

5.1. Synthesis Of The Developed Work

Despite the existence of a literature review on BPO and RPA being extensive, the application of RPA in BPO organizations exhibits a lack of information.

Aiming to fill the gap between RPA and BPO and build a more consistent bridge between both concepts, an investigation was conducted. Hence, ambitioning to obtain as output a framework for the use of RPA in BPO and to enable the comprehension of both concepts RPA and BPO for those whose study area is not engineering, this research was supported by DSR Methodology.

Also, this study aimed to obtain an artifact as output. In Hevner and Chatterjee (2010) opinion, DSR is a research model represented by a group of answers to the questions of human problems, aspiring to improve the organizational, group, and individual human productivity and effectiveness (Baskerville et al., 2018), through original artifacts, and thus, providing new knowledge to the range of scientific evidence.

Furthermore, the framework created in this thesis follows the activities of Peffers et al. (2014).

This research started with recognizing the research problem identified and explaining the value of the RPA framework proposed to be applied in BPO organizations. Thereafter, were selected the three research questions: *"What are the most common BPO processes?", "Which are the BPO processes that can be automated and semi-automated?",* and *"Which are the BPO processes that cannot be automated?".* Then, keywords selected by the literature review allowed the creation of Boolean queries to obtain the right information from abstracts, titles, or keywords of the searched articles and, finally, create the systematic literature review.

The systematic literature review enabled the identification of a set of assumptions that led to the elaboration of a framework of 4 steps to be adapted to the BPO organizations.

The proposed artifact aspires to follow all the necessary steps to identify which are the necessities of the BPO's clients and to identify the BPO processes that can be automated or semi-automated or cannot. This artifact, also, aims to identify the necessary RPA, trying to understand if it is more beneficial to outsource the processes letting them be automated by BPO organizations with RPA, or if it is more valuable to implement RPA inside of the company, performing in-house automation.

Flowcharts and some examples are included in a detailed explanation of all the artifact's steps, seeking to clarify all the stages and exemplify the results.

Lastly, the framework was validated by interviews with automation experts, in order to assess the framework usefulness.

5.2. Limitations

This research suffered some limitations that restricted the quality of the information in both the literature review and the systematic literature review, and consequently the results of the framework.

There is a big lack of information related to the introduction of RPA in the BPO organization, in particular how the BPO processes are automated in RPA. The authors only refer briefly the processes,

giving some examples of the processes that can be automated with RPA, nevertheless, the processes that can be semi-automated or cannot be automated there is almost no information.

Additionally, in hybrid automation, there is no information on how to split the process and are rare examples of it.

Another limitation is the absence of the application of the framework in a particular study case. Although the artificial was made by a literature review and a systematic literature review, its application can report problems not identified either by the literature review or by the experts.

The last limitation is the absence of the communication step due to the lack of time, but it is intended to publish this thesis.

5.3. FUTURE WORK

In this topic, future work proposes will be presented to this thesis does not fall into oblivion. Also, this research can contribute to other studies, either following the present subject or deepening other topics derived from this paper.

Concerning future work, it is desired to communicate this research to BPO organizations to understand the limitations of the framework and to use the framework as a basis and adapt it to each process. Being a base, this framework needs to be adapted to each process and its complexity. So, it is crucial to consider, for instance, in a specific project:

- Level of seniority of the project. i.e., the years or months the project has.
- Number of employees working on it,
- Skills of the staff
- Complexity of the project
- Resistance of the workers to the automation, and so on.

Each process may split the tasks to understand each one can be automated, hybrid or cannot be automated. Also, the automation of those activities should be adapted to the reality of the project and its complexity.

Another goal is to collaborate with engineers to help them to implement the framework in a practical and real application. In this way, could be possible to keep the framework alive and update it over the years and contribute to the evolution of the BPO processes automation applying RPA.

Another theme that could be important to extract from this thesis is the importance of Humans in their workplace. As proved in this paper, robots are capable of, for instance, helping to improve productivity and reliability, as well as robots operate with efficiency and efficacy. Although, many human characteristics are essential in the organizations, such as emotional intelligence and cognitive ability, human control, critical analytical capability, or sensibility.

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ANNEXES

ANNEX 1 – QUESTIONNAIRE OF THE STAGE 1

This questionnaire is designed to be applied in the first step of the framework in order to understand which processes contain activities that spend excessive time to complete and also demand to support the costs of more employees to be executed quickly.

Within those processes, which should be outsourced to BPO organizations.

1 - What are the departments of the organization?

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2 - What are the processes of those departments?

Department	Processes

3 - Please split the main activities of those processes.

Processes	Activities

4 - Among those processes, identity the core processes and the non-core processes.

Core processes	Non-core processes

5 – Which are the processes with elevated costs of operation?

Processes	Costs of operation

6 – Which are the processes with excessive time of execution?

Processes	Time of execution

ANNEX 2 – QUESTIONNAIRE OF THE STAGE 2

This questionnaire is designed to be applied in the second step of the framework in order to understand which processes can be automated, semi-automated, or cannot be automated. In this step, the processes to outsource were already chosen.

For processes that can be fully automated or semi-automated it is necessary to choose the necessary RPA. In hybrid processes, a split may be done between the activities suitable for automation and those that cannot be automated.

1 - What are the processes of those departments?

2 - Please split the main activities of those processes.

3 -To understand which processes can be automated, semi-automated or not, within those activities, identify which tasks are:

- Standardized

Integrally	Not integrally	It is not standardized

- repetitive and tedious

Yes	No

- not complex

Yes	No

- present a rule-based structure

Yes	No

- do not depend on the cognitive skills of the employees

Integrally dependent	Not integrally dependent	Integrally independent

- do not demand integrally human judgment

Integrally dependent	Not integrally dependent	Integrally independent

4 – After the prior answer, please split the processes to fully automate, semi-automate or cannot automated

Automated	Semi-automated	Cannot be automated

5 – For those hybrid processes, please split the processes that can be automated or semi-automated.

Automated	Semi-automated

6 – Among those processes that can be automated, which are the necessary RPA

Process	RPA

ANNEX 4 – INTERVIEWS TRANSCRIPTION[1]

First interview with Jorge Carrola Rodrigues on 24th October 2022:

Q1: Do you consider the proposed framework as useful and why? If not, why do you believe it is not?

"Yes, I do. I do consider this a helpful framework. The usefulness of the framework can be regarded from two perspectives.

From the BPO organizations' standpoint, when they need to choose technologies such as ERP to support their business processes can use this framework to verify in what way the suppliers or potential suppliers are able to automate their processes, in the framework's viewpoint.

Alternatively, to suppliers, I think this is also helpful, not so much to bigger suppliers due to the ample number of processes and activities already automated with RPA expectable. But, to the smaller suppliers, named local suppliers, not those global. Thus, they can understand which processes are useful to automate with RPA."

Q2: Do you have any criticism towards the proposed framework? Please explain.

"I do not have any criticism. In the framework, something can always be aggregated. But I do not have any criticism.

In my opinion, the framework is well structured.

In the line of thinking of having more elements, one should analyse what already is available in the market and implement those solutions in the framework. Or the matter of time also will add information to the framework. To the processes and activities, one day, more or less automated, fully automated, or semi-automated will join in more, in one or two years. And those will be added to the framework. Although I think the base is good, I do not have any criticism."

Q3: Do you consider it is possible to implement the proposed framework? Please clarify why/ why not.

"I think the framework is implementable, and it should be implemented, in particular by BPO organizations.

One of the main goals of the thesis with DSR methodology is the phase called communication or divulgation. Hence, this is a work to be published and, in this particular case, it should be communicated to BPO organizations, to this organizations have the opportunity to implement this framework helping out with the technologies selections and solutions whose function is to support the organizations' services, and, finally, understand if they want those functionalities or not."

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[1] All the interviews were translated from Portuguese to English and Spanish to English

Q4: Do you have any recommendations or suggestions for further improvements of the proposed *framework?*

"My suggestion is to keep the framework alive. For the future work chapter, you can suggest that someone could continue this work overtime, revisit this study, and maintain actualized the framework.

The framework can be applied as a base, for instance, to medium-sized organizations that have already a set of standardized processes. On the other hand, the framework can be customized to support the choice of solutions in organizations with processes more complex and vertical.

Energy organizations and oil & gas organizations such as oil companies are some examples of companies that have complex processes. The framework should be adapted to each industry. Thus, the framework can start with this base, and then adjust to each sector of activity that has processes with big specificities.

I see RPA mainly linked to management solutions and, namely when we refer to management solutions we are talking about CRM, etc, but also ERP."

Second interview with Luis Leal on 11th October 2022:

Q1: Do you consider the proposed framework as useful and why? If not, why do you believe it is not?

"The framework is good. You just have attention to some points. The process cannot be detailed. All the processes can be automated when the data is very general. If the processes are not general, they will be not easy to automate due to their particularities."

Q2: Do you have any criticism towards the proposed framework? Please explain.

"As you have, now, it seems perfect. You are explaining step by step how to automate the processes of all the work. If I understand you are explaining that robots cannot replace humans. The detailed work, as I explained before, cannot be made by robots but by humans.
I have no criticism of your work. It is very complete."

Q3: Do you consider it is possible to implement the proposed framework? Please clarify why/ why not.

"I would recommend analyzing the very detailed processes. The automation will perform better if the process is repetitive."

Q4: Do you have any recommendation or suggestions for further improvements of the proposed framework?

"*No, I haven't. Your framework is very complete*."

Third interview with RPA Assistant Developer on 12th October 2022:

Q1: Do you consider the proposed framework as useful and why? If not, why do you believe it is not?

"I think the framework is useful. I think it discriminates well between the three topics of automation: fully automation, hybrid automation and processes that cannot be automated."

Q2: Do you have any criticism towards the proposed framework? Please explain

"As constructive criticism, I believe the example of hybrid automation is not clear: Performance assessment. I think the other examples are well discriminated. But, after reading the thesis is possible could be possible to understand the hybrid automation example."

Q3: Do you consider it is possible to implement the proposed framework? Please clarify why/ why not.

"Yes, I think it can be implemented because the framework summarizes the three hypotheses and various areas."

Q4: Do you have any recommendation or suggestions for further improvements of the proposed framework?

"I only point out improvements in the hybrid example performance assessment. I think everything is well-schematized and perceptible."