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Master Program in Information Management

**A PROPOSAL FOR THE IMPROVEMENT OF FINANCIAL
ACADEMIC PROCESSES**

Process Modeling and analysis in NOVA IMS

Filipe Aparício Oliveira

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

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Instituto Superior de Estatística e Gestão de Informação

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ABSTRACT

Business Process Management is known for the improvement it causes in processes, such as cost and resources spending reduction. Providing the capability to understand processes this technique is an added value for every company. It can also be a base for future implementations such as the use of new technologies as Robotic Process Automation. The RPA comes with the potential of reducing manual, simple, recurrent, and time-consuming tasks, existent in every process, changing them to automatic actions. This work project will analyze the state of Financial Services from NOVA IMS, a faculty from Universidade Nova de Lisboa, along with its possible inefficiencies. Therefore, the objective of this work is to apply BPM technologies and techniques and acquire knowledge about the financial processes and conclude with some improvement critics based mainly on the use of Robotic process automation.

KEYWORDS

Business Process Management, Processes modeling, Financial Process, Automation, and Robotic Process Automation.

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LIST OF ABBREVIATIONS AND ACRONYMS

A3ES	Agência de Avaliação e Acreditação de Ensino Superior
AI	Artificial Intelligence
BPM	Business Process Management
BPMN	Business Process Management Notation
IDEF	Integration DEFinition
OCR	Optical Character Recognition
RPA	Robotic Process Automation
SaaS	Software as a Service
UML	Unified Modelling Language

1. INTRODUCTION

1.1. BACKGROUND

“Over the last decade, there has been a shift from “data-aware” information systems to “process-aware” information systems.” (Van der Aalst, 2003). Every organization has business processes from the attraction of customers until the products delivered to the consumers. A business process is a set of activities that needed to be completed in order to achieve a goal or a certain output. For example, a business process for a car selling company involves activities as client acquisition, presentations of products, the budget definition and a lot more. All the activities are linked and chronological organized and, in this example the input is the client information and the output the sale.

Business Project Management (BPM) is nowadays used in many different areas and cases but with the same propose - improve processes. The improvement may be different depending on the objectives, where the most common are reducing costs, errors and reducing executions times. The BPM is defined by Nathadiel Palmer (Palmer, 2014) as a "mixture of modeling, automation, execution, control, measurement and optimization of business activity flows in sustenance certain goals..."

With BPM, the path to improving processes through automation becomes clear. Automation involves a set of tools, processes, and insights that environments use to self-modify and adjust, and some enterprises have started using intelligent automation to drive a new, more productive relationship between people and machines. One automation process that is widely used nowadays besides Artificial Intelligence is RPA – Robotic Process Automation. While the technology was developing for some time before, the emergence of the term "Robotic Process Automation" can be dated to early 2000. (UiPath, 2016)

1.2. STUDY OBJECTIVES

Considering the problem identified before, the emphasis of this project will be the modulation and analysis of the financial processes of NOVA IMS. Therefore, the goal is to modulate the existing processes, analyze, and identify which processes can be improved and in which way. Subsequently, these improvements can result in reduced execution times, costs and resources.

To achieve this main goal some successive objectives are:

- | Understand the importance of BPM and Automation inside a company/organization.
- | Identify the main processes in the financial environment of NOVA IMS
- | Process modeling in BPMN nomenclature
- | Investigate the possible implementation of new automated processes, as well as, improvement of old ones.

1.3. METHODOLOGY

This project will follow the listed phases:

1. **Acquiring Knowledge:** This phase corresponds to the literature review. Before gathering the processes or starting to work with real data, a study about the themes needs to be made. In this stage will be presented the topics and concepts about BPM, automation, finance, etc.
2. **Process and Information collection:** After gathering crucial information about the thesis theme it is time to start collecting the real data. The financial processes and faculty related information is acquired by meeting with a representative person of NOVA IMS financial services. Several interviews will be conducted with the faculty's financial services representative, in which the processes of this department are discussed. In the first sessions the processes will be discussed from a general point of view and in each iteration, together with information gathered from other literature, additional and more specific information will be incorporated until we have a process identical to reality.
3. **Process Modelling:** After the phase of gathering information on the daily activities of financial services, it arrives in time to translate this information into a model in BPMN 2.0 language. This model, made up of several processes will be the main pillar of this project, since it is from it that it will be possible to analyze and identify improvements to existing processes.
4. **Propose of Improvements:** After analyzing the AS-IS is time to propose possible improvements. The knowledge about automation and BPM advantages is the main theme in this stage.

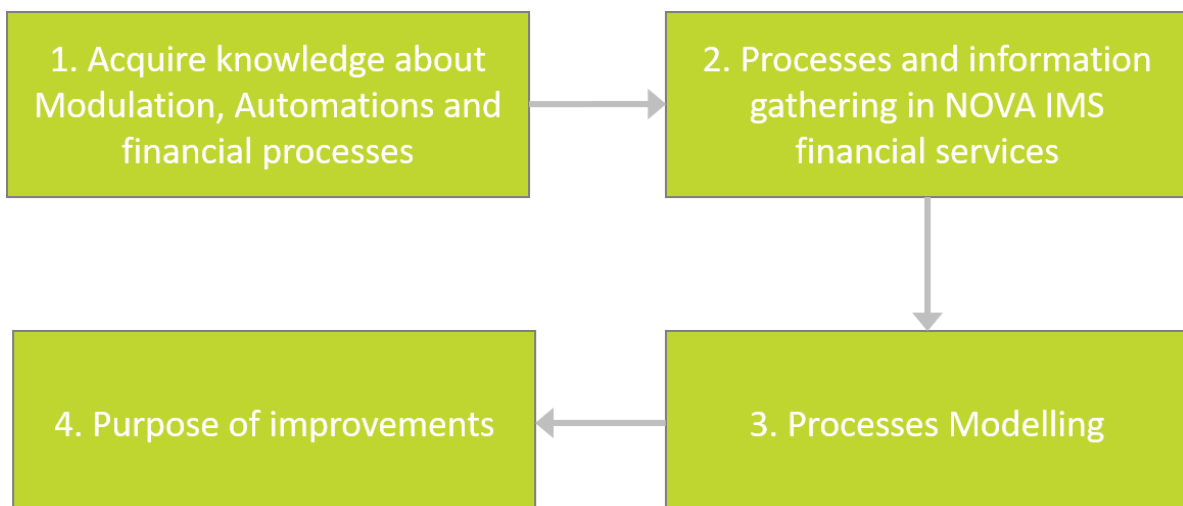


Figure 1 – Methodology outline

1.4. NOVA INFORMATION MANAGEMENT SCHOOL

NOVA IMS was founded in 1989 in response to many graduates who specialized in Information Management and the growing need for the use of new information technologies.

Its main strategy is based on six components:

- | Excellence in teaching and learning;
- | Excellence in research;
- | Promoting partnerships;
- | Improving the quality of students at the entry-level;
- | Increase the motivation and professional quality of the staff;
- | Transparency and efficiency in management;

NOVA IMS faculty also has high participation in research. The research center (MAGIC) has obtained high levels of quality in the evaluations carried out by international experts, and the NOVA IMS Ph.D. program is highly regarded. It also has a remarkable scientific production with the publishing of articles in the best journal of the specialty.

NOVA IMS has many accreditations as A3ES (Agency for Assessment and Accreditation of Higher Education) and ABET that guarantee its place in the top rankings of information management schools

1.5. NOVA IMS – ORGANIZATION CHART

The NOVA IMS Organizational Structure is arranged as presented below:

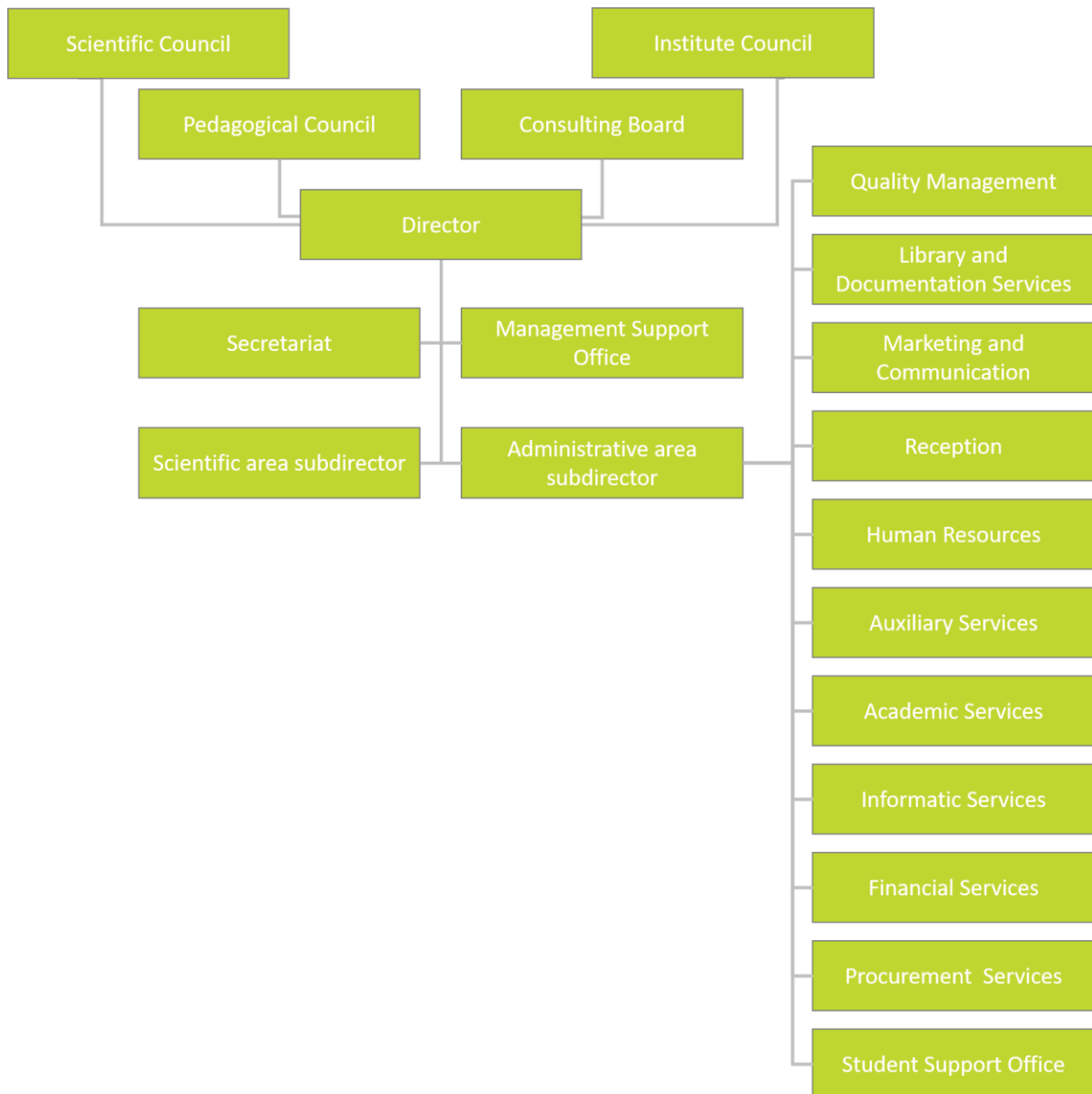


Figure 2 - NOVA IMS Organization Chart

Based on (Nova Information Management School, 2017)

As shown in figure 2, NOVA IMS organization structure is centered on the director, having above him all the councils and below all the services responsible for keeping the faculty running.

We can also analyze that NOVA IMS is divided into two different areas: scientific and administrative; The scientific area is responsible for the investigation in NOVA IMS and administrative area, as the name says, is responsible for all the administrative process. All the services and administration offices of NOVA IMS report to the administrative sub-director or directly to the director.

1.6. FINANCIAL SERVICES

NOVA IMS' Financial services have the responsibility to ensure the financial and asset management. (NOVA IMS, s.d.)

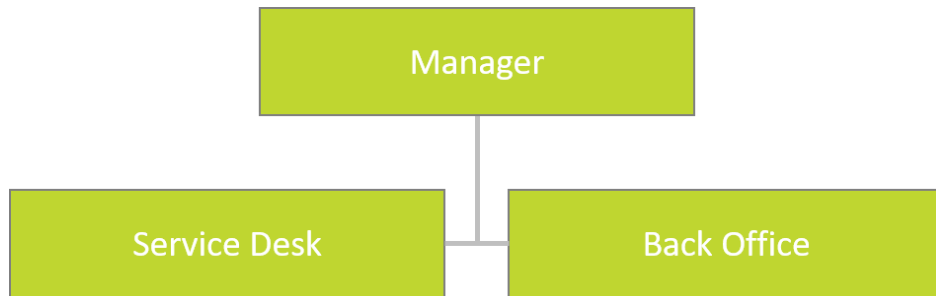


Figure 3 - NOVA IMS Financial Services Chart

As presented in figure 3, financial services are composed by a manager, that is the person to who has been allocated the responsibility of managing the department; A service desk, responsible for receiving the students (mainly for face-to-face payments); And a back office, that does the daily basis tasks related to the finance of the faculty, for example, the subcontractors payments.

2. LITERATURE REVIEW

This chapter will present essential concepts and information for the development of the project work. The main topics refer to the business process management, business process life cycle and business process modeling notations.

2.1. BUSINESS PROCESS MANAGEMENT

2.1.1. Concepts

Before understanding what BPM is, we need to understand its basic concepts, such as process.

As Marlon Dumas et al say, processes exist everywhere as they are the base unit of every company and can be defined as “Chains of events activities and decisions that ultimately add value to the organization” (Dumas, La Rosa, Mendling, & Reijers, 2012)

When we get a company that acquires value by delivering a good or service and uses a chain of activities, events, actors, and objects in order to do it, the term business process is created, another base terminology for understanding BPM.

Knowing the basic terms, Dumas et al defines BPM as “art and science” of managing the work in a company to ensure the meeting of goals and present the possibilities of improvement such as reducing costs and times and acquire a competitive advantage. Another definition is given by ABMP (2013) is that BPM is a managerial discipline that treats business processes as assets and so, the objectives can be achieved by the definition, design, control, transformation, and improvement of the business processes. The main idea in BPM is to optimize the business processes by eliminating or change activities that do not add value and improve process fluency.

2.1.2. BPM Life Cycle

There are several BPM lifecycles models for example for (ABPMP, 2013) the BPM life cycle has six phases all of them in a continuous cycle. These phases are Planning, Analysis, Design, implementation, monitoring and control, and refining. The life cycle proposed by (Dumas, La Rosa, Mendling, & Reijers, 2012) (see fig.1) also have six phases but has more information, bringing more value for this work. The cycle and phases are described and presented bellow.

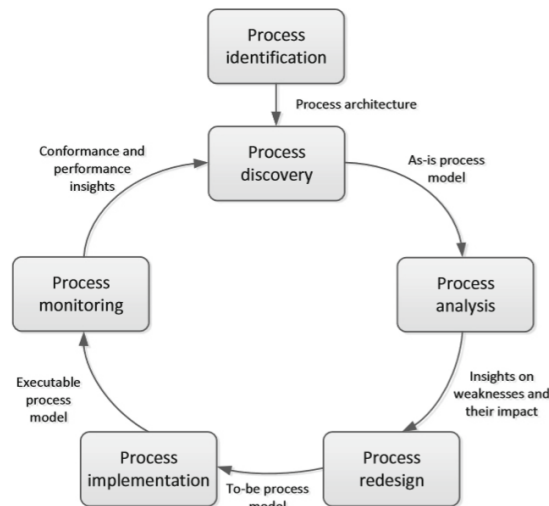


Figure 4 - BPM Life Cycle

Source: (Dumas, La Rosa, Mendling, & Reijers, 2012)

To acquire a better solution out of the BPM process, the alignment between the BPM initiatives and the strategic goals need to be guaranteed.

Process identification

In the first phase of the life cycle, the business problem is identified, as well as, other important processes. The result of this phase is anew or updated process architecture, which provides a global understating of the organization processes and relations. Typically, process identification is done in parallel with performance measure identification.

Process discovery

Also called “as-is process modeling”, this phase is characterized by the documentation of the current state of the relevant processes. The result is one or more as-is process models.

Process analysis

In this phase, issues from the as-is processes are identified, documented and, if possible, quantified using performance measures. The output is a collection of issues prioritized based on the potential impact and effort needed to resolve them.

Process redesign

Also denominated process improvement, this step consists in identify the changes that can be done to address the issues and achieve the desired performance goals. This phase and the previous one (process analysis) are done together since after the new changes are defined, they need to be analyzed again. The outcome of this phase is a to-be process model containing the changes that need to be implemented.

Process Implementation

In this phase, the changes required to move from the as-is to the to-be process model are performed. It covers two aspects which are organizational management and process automation. The former one refers to activities that when implemented will change the way of work of all participants of the process. The second one consists of the support of the to-be process by IT systems (developed also in this phase).

Process monitoring

Once the redesign process is running new important data is collected and all the performance tests are made. Errors that don't fit the desired objectives are identified and corrected. This results in the repetition of the BPM process life cycle.

2.1.3. Process modeling

Business process models are important at various phases of the BPM life cycle. There are many reasons to model a process, such as a simple understanding of the process by the people involved in that process. (Dumas, La Rosa, Mendling, & Reijers, 2012)

Business process modeling is a set of activities involved in the creation of business process representations. The main purpose is a complete and easy to understand representation of the processes. (ABPMP, 2013) The models can have different levels of details, from an abstract vision to a detailed one. In terms of content, a process model has different icons and lines that represent activities, events and other elements of the process as well as the connections between those elements.

Many notations can be used to represent a business process as we can see in figure 2.

Notation	Description
Flowcharts	Simple but limited set of symbols
Event-driven Process Chain	Events become the triggers for a process step
Integrated Definition Language 3	It provides a mechanism for collection and documenting processes
Activity Diagrams	Technical notations oriented to the description of information systems requirements
Business Process Model and Notation	Great for representing a model for different targets

Table 1 - Business Processes Notations

2.1.4. Business Process Model and Notation

As defined before the BPM is the combination of techniques that allows the understanding, analysis, and improvement of services and an effective and efficient delivery of business objectives.

To express the business process modeling different types of notations can be used but for this work project, the BPMN (version 2.0) was selected since it provides a graphical notation for representing processes in diagrams that are easy to understand by all the business users but at the same time presenting all the information needed for the technical users. (Object Management Group)

The development of BPMN has roots in other notations including UML diagrams, IDEF, UML EDOC Business Process, Activity-Decision Flow Diagrams, ..., which makes it easier for people to transact from /the previous notations to this new one. (Recker, Indulska, Rosemaan, & Green, 2005). For example, Stheephen White (White, 2004) compared the BPMN specification to UML activity diagrams and concludes from his investigation that BPMN is more intuitive than UML.

BPMN is a standard created by the group Business process Management Initiative and was published as a standard by the Object Management Group (OMG) in 2011 having as the latest version the BPMN 2.0. According to (ABPMP, 2013), BPMN it's a notation that can present a process model that can be interpreted by different target audience since it has the versatility to modulate different situations of a process, easy to understand even with the vast set of symbols and other figures.

BPMN modeling presents four sets of different elements:

- | Flow Objects
- | Connecting objects
- | Artifacts
- | Swimlanes

All these elements are listed and described in table 2.

Category	Element	Description	Notation
Flow Objects	Event	Something that happens during the process and normally has a trigger or impact on the result. The can be Start, intermediate or end events.	
	Activity	A rounded-corner rectangle that is the generic work that an organization perform	
	Gateway	A diamond shape that is used to control the divergence and convergent of the process flow. Its mostly used when decisions need to be taken.	
Connecting Objects	Sequence flow	A solid line that is used to show the sequence order of the process	
	Message flow	A dashed line used to show the flow of messages between two different participants in the process	
	Association	A dotted line used to associate data, text and other artifacts with flow objects.	
Swimlanes	Pool	Represents a participant and acts as a container for the activities of that participant	
	Lane	A sub-partition within the Pool that extends his length either horizontally or vertically	

Category	Element	Description	Notation
Artifacts	Data Object	Elements produced or necessary for the activity	
	Group	A rounded-corner dashed line rectangle that can be used for documentation or analysis purposes	
	Annotation	Provides additional information for the reader of a BPMN Diagram	

Table 2 - BPMN Elements Notation

Source: Based on (White, 2004)

2.1.5. Modeling tools

To accomplish the study carried out during the literature review and thus realize the current state of the financial processes of Nova IMS School, a model of the processes in BPMN will be built. Therefore, the first step to be taken is the selection of a tool that enables an efficient and effective way to build this model and at the same time allow a simplified analysis of it.

Since there are different tools on the market, it was necessary to search, analyze and evaluate a set of tools to choose the one that best fits our study process.

The following analysis and comparison is based on a study conducted by Gartner, a research and advisory company, with the objective of provide leaders across the enterprise with the crucial business insights, advice and tools they need to achieve their mission and build their future organization. (Gartner, 2019)



Figure 5 - Magic Quadrant for Intelligent Business Process Management Suites

Source: Magic Quadrant for Intelligent Business Process Management Suites (Gartner, 2019)

Popular selected tools for this project are Appian BPM Suit, IBM Business Automation Workflow; Oracle BPM Studio; Bizagi Process Modeler and K2.

2.1.5.1. Appian BPM Suit:

Appian BPM Suit, from Appian, allows the creation of processes, drawing inspiration from the various BPMN tools and combining them with low code (drag and drop) functions. It consists in a highly capable suit of tools that includes process modelling, Ui design and decision design. This solution even allows users to optimize their communication with partners, that means its easy use. “The Appian platform allows enterprises to dynamically alter processes for ongoing process improvement and supports intelligent business processes that support business transformation”. (Gartner, 2019)

2.1.5.2. IBM Business Automation Workflow:

IBM Business Automation Workflow, from IBM, “is software that combines business process management and case management capabilities into a single integrated workflow solution”. (Oracle, 2020) One of the big advantages of this tool is the enhanced decision making by using built-in visibility, that allows the identification of the best practices to resolve and improve every case. It also has a cloud version that support the same capabilities as the standard options and is hosted and managed by IBM in its IMB Cloud data centers.

2.1.5.3. Oracle BPM Studio:

Oracle BPM Studio is a component of the Oracle BPM Suite, created by Oracle. It supports BPMN 2.0 and BPEL allowing the creation of process-based applications and model business processes. Since it provides a web-based application for creating business processes, editing Oracle Business Rules, and task customization using predefined components, it can be used by analysts and developers. (Oracle, 2018).

2.1.5.4. Bizagi Process Modeler:

The Bizagi Process Modeler is an application that allows the creation of workflows and process models using the BPMN 2.0 notation. It joins the IT with the business because of the great user-friendly and simple interface and the use of drag and drop properties. (Bizagi, 2018)

This application approaches the market in different way, using its focus on easy usability and free usage business model as a major point of interest for the consumers.

According to Gartner and Bizagi users, this application has highest average customer satisfaction scores because of its well-rounded usability and experience.

2.1.5.5. K2:

“K2 provides end-to-end capabilities that enable you to build your most complex business applications with little-to-no code.” (K2, 2020)

The main capabilities of K2 solution is the drag and drop workflow design, collaboration between developers and business teams using feature-rich forms and, because of its relationship with Microsoft, allows the integration with much of Microsoft services such as Office 365 and Power BI.

After the analysis of different tools and more specifically those mentioned above, in the following table we can see the summary of the greatest advantages of each one, based on Gartner's analysts' studies. As a result of this table we can get a holistic view of all the tools.

Tools	Advantages
Appian BPM Suit	Platform with a strong performance across all criteria; High user satisfaction with the overall platform experience.
IBM Business Automation Workflow	Consistent web-based design; Part of a collection of tools that can all be integrated for a unified experience.
Oracle BPM Studio	Strong analytical capabilities; Dynamic orchestration of business processes; Can also be used with the OIC (Oracle Integration Cloud, for a browser-based experience.
Bizagi Process Modeler	Freemium software; Easy to use; Popular between its market niche; Free access to comprehensive self-training courses.
K2	Easy collaboration between business and professional developers using Smartforms; Microsoft partnership allowing integrations with Microsoft products like Office 365 and Power BI;

Table 3 - Modeling tools Advantages

2.1.6. Process transformation

The goal is to find the best way the process does its work, it can mean simple things as new equipment or more complex things as new business approaches. It can be hard to implement and create discomfort for the traditional mindset members, but it all can be attenuated with preventive measures, for example, a gradual transformation (ABPMP, 2013)

According to ABPMP, there are several ways to apply systematic transformation and improve the processes. The most used and that improve the process continuously are Lean, Six Sigma and TQM; But we also can use the processes redesign; processes reengineering, and others. Next, according to ABPMP, the methodologies that improve processes (Lean, Six Sigma and TQM) will be analyzed more deeply since they preceded and inspired BPM.

Lean

Originated from the Production Toyota System, the main objective of Lean is to obtain the right things, for the right place, in the right time and right quantity, to minimize the waste and be open to changes (ABPMP, 2013). It identifies seven wastes in the value chain: overproduction, inventory, waiting-time, transportation, processing, motion, and scrap.

The key principles of this way of thinking are:

- | Perfect quality the first time – chase for the zero defects;
- | Waste minimization by eliminating activities that don't generate value;
- | Maximization of the resource's usage;
- | Continues improvement;
- | Pull processing: products and services are requested by clients
- | Flexibility
- | Building and maintaining a long-term relationship sharing suppliers through collaborative sharing of risks, costs as well as information sharing arrangements.

Six Sigma

Six Sigma is a process improvement approach developed by Motorola, in the mid-1980s, where the efforts are orientated to achieve perfection in operations (Neubauer, 2009). It relays on facts and statistic data to eliminate any defects in any process since its manufacturing to traditional and from product to service (ABPMP, 2013). A defect is defined as anything outside of customer specifications. Achieving a Six Sigma level of quality means limiting defective performance to 3.4 per million opportunities (Montes & Molina, 2006). This approach is not necessarily applied alone and sometimes it blends with the Lean leading to the approach known as Lean Six Sigma.

TQM

Total Quality Management is a set of practices to ensure that an organization can satisfy or even exceed client requirements. It is considered a precursor of Six Sigma and relies on the statistical analysis of the data to identify defects and improvement opportunities. (ABPMP, 2013) This approach is primarily found in manufacturing domains. (Dumas, La Rosa, Mendling, & Reijers, 2012)

2.2. ROBOTIC PROCESS AUTOMATION

Process automation is one of the possible results after a business process has been analyzed and identified. “RPA does not replace BPM, but rather complements it.” (Willcocks, Lacity, & Craig, 2015)

RPA is a developing technology, but, as we just briefly discussed, it still relies on the technologies of artificial intelligence, screen scraping, and workflow automation and elevates these technologies to a new level, advancing their capabilities in a significantly improved way. Deloitte suggests that “Robotic Process Automation (RPA) is the application of technology allowing employees in a company to configure computer software or a ‘robot’ to reason, collect and extract knowledge, recognize patterns, learn and adapt to new situations or environments.”

Although the term “Robotic process automation” suggests physical robots doing office tasks normally did by humans it is a software-based solution. IRPAI (Institute for Robotic Process Automation and Artificial Intelligence) defines RPA as a technology that allows the employees of a company to configure a software (robot) to utilize existing applications from processing and manipulating data, as well as, communicate with other digital systems. All of this is done without any human interaction.

RPA tools can range from solutions that operate simple and individual computers to ones that operate in the enterprise server and have wide contact with the information of a company. They can be applied to different domains, for example, banking, finance, insurance, healthcare, and legal services. RPA tools are created to imitate the same manual paths taken by a human, by using a combination of user interface interaction. (Gartner, 2018)

Gather, consider the main advantages of this tool the costs and time-consuming reduction, increase accuracy, compliance improvement and time-consuming reduction.

Using BPM, we can identify the best business processes to automate that, according to Accenture, are rule-based and not dependent on human judgment, initiated by a digital trigger, with a high volume of executions and stable.

From Ernest & Young experience, there are five key aspects vital to the successful RPA implementation:

- | **Process Prioritisation:** Processes critical to business and their interaction should be clearly understood.
- | **Business and IT Accountability:** Business process owners must feel accountable for the involvement of their people in the RPA development and implementation. They also should be respectful and follow IT governance protocols.
- | **Design and Execution:** Move quickly to prove that RPA concepts are viable for the automation project.
- | **Stakeholders engagement:** The value of RPA must be effectively communicated to all the persons involved in the project but also to the chief officers.
- | **Benefits realization:** continuous improvement mechanisms should be provided. Regular updates are essential to maintain the confidence of all stakeholders

An area where the RPA is important for this work is Financial Services. EY (Ernst & Young Accountants LLP, 2016) refers that RPA is quickly evolving in finance functions since this is in constant pressure and the major challenges are to shrink costs and support decreasing margins. Capgemini also adds that organizations that are innovating using RPA can drive 25-50% cost savings, reducing the latency and getting higher levels of productivity.

Some RPA solutions most used nowadays in the financial area are listed and analyzed below:

- | **Capgemini RPA Solution:** With an approach that helps financial institutions to define an RPA roadmap, select appropriate tools, create a pilot, set an operating model, perform governance, set up the right team and test the solution before launch. They give financial institutions and insurance companies a way to improve their processes.
- | **BluePrism Digital Workforce** (financial services): “Automates many of the processes that hold financial organizations back. With world-class security, comprehensive audit trails and non-repudiation, Blue Prism is designed to meet the strict security and compliance needs of the financial services industry.” (Blueprism, s.d.)
- | **UiPath enterprise RPA platform:** “UiPath provides process efficiency and lowers costs while ensuring regulatory compliance and deeper analytical insight. Implementation with UiPath is faster and competitively less expensive than IT automation projects”. (UiPath) For example, the robots can check incomes, expenses and other data from several databases and present it for the analyst in real-time.

3. PROJECT DEVELOPMENT

This stage will consist of the process's design and analysis. The first segment of the stage consists of the analysis of the information gathered and the model's assembly, while the second one, based on the first, is focused on understand the results and propose improvements.

In order to collect the processes related to the financial services, it was necessary to meet with Dra Silvia Alves, the responsible person of NOVA IMS financial services. There were several meetings where the daily basis work was discussing and the main connections necessary to make this work happen were presented. After understanding all the processes were Dr. Silvia was involved, the design of the processes was made. At every iteration with her, the process models were presented to make the necessary adjustments.

During the meetings it was possible to gather 5 (five) big processes that will be described later in the document:

ID	Process
1	Goods and services acquisitions
2	Invoices processing
3	School fees payment
4	Bank reconciliation
5	Salaries processing

Table 4 - Financial Processes

3.1. ENTITIES

With the aim of processes design, all the entities, on it, involved, were defined. The actors, that are every person or group that perform tasks, the systems, as the name indicates, represent the systems used to perform the tasks or storage information and the documents, meaning papers or their digital copies that the actors used to communicate between them.

In the diagrams, actors correspond to lanes and the system and documents to artifacts.

3.1.1. Actors

Name	Description	Appearance in processes
Financial Services	Department responsible for the financial management of NOVA IMS	1 2 3 4 5
Patrimonial Department	Responsible to ensure the assurance of a service or good is rightly made.	4 5
Other Area or Department	Any area or department of NOVA IMS that request for a service or good	5
Authorizer	It can be the Director or Administrator of NOVA IMS and is the person that authorizes the sales.	4 5
Provider	The entity that provides a service or good.	5
Student	Student of NOVA IMS	3
Employees	Employees of NOVA IMS	1

Table 5 - Process Actors

3.1.2. Systems

Name	Description	Process where it appears
CXA SIGES	System containing all the financial information about students	3
Sistema Integrado de Gestão	Central systems containing all the financial information	5

Table 6 - Process Systems

3.1.3. Documents

Name	Description	Process where it appears
Purchase Order (PO)	Formal request to a vendor for the supply of goods or services.	4 5
Expense approval request (PAD – Portuguese abbreviation)	Formal request for expense approval.	5

Table 7 - Process Documents

3.2. TOOLS

After analyzing the tools presented previously (3.5.1 Modeling tools), the tool selected for the process modeling was Bizagi.

Bizagi modeler is not the most complete tool especially compared with the Oracle solution but its main benefits and the prior knowledge about the tool, acquired during the academic years, led it to be the tool of choice.

The main benefits that Bizagi Modeler includes, that become the choice factors are:

- | Be Simplistic, with the drag and drop functionality;
- | Capacity to export in different types of files
- | Based on BPMN notation
- | Free software

After the definition of the notation and tool for modeling the processes, the final need is the process itself.

3.3. PROCESS MODELS

As said before the information necessary to build these models was collected in interviews with Dra Silvia Alves, responsible for the financial services in NOVA IMS. Nevertheless, the research about general financial processes had a great impact on understanding the information shared.

3.3.1. Macro process

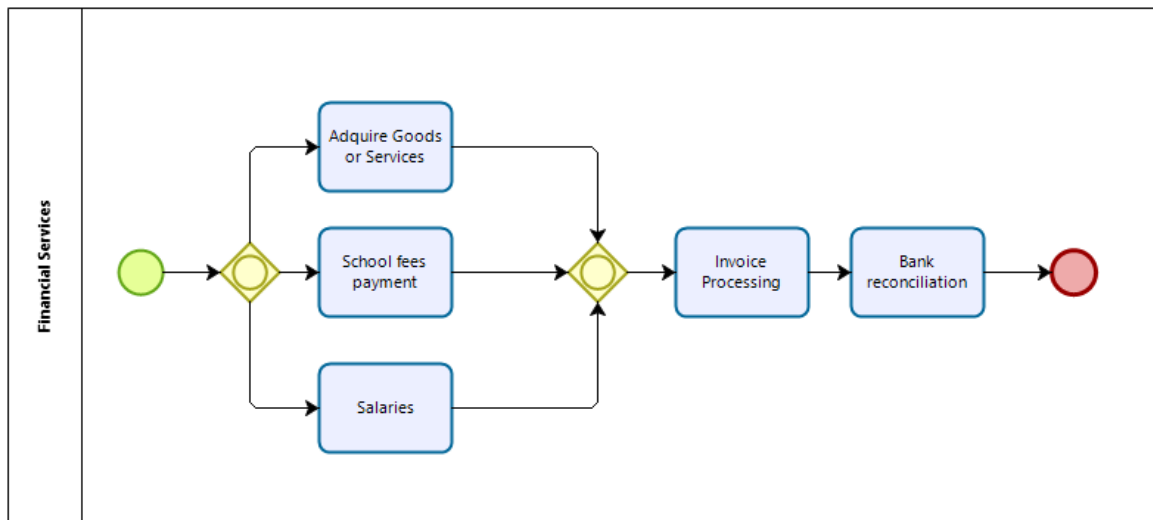


Figure 6 – Macroprocess

The macro process presented us with the connections between all the processes on the financial services responsibility scope.

3.3.2. Processes

3.3.2.1. Goods and services acquisition process

This is the process where every step since the purchase needs to the payment. In this process, there are many actors, documents and system that makes it more complex than the others. The main objective of this process is to acquire a service or good from a supplier. (See the process in the next page, figure 6)

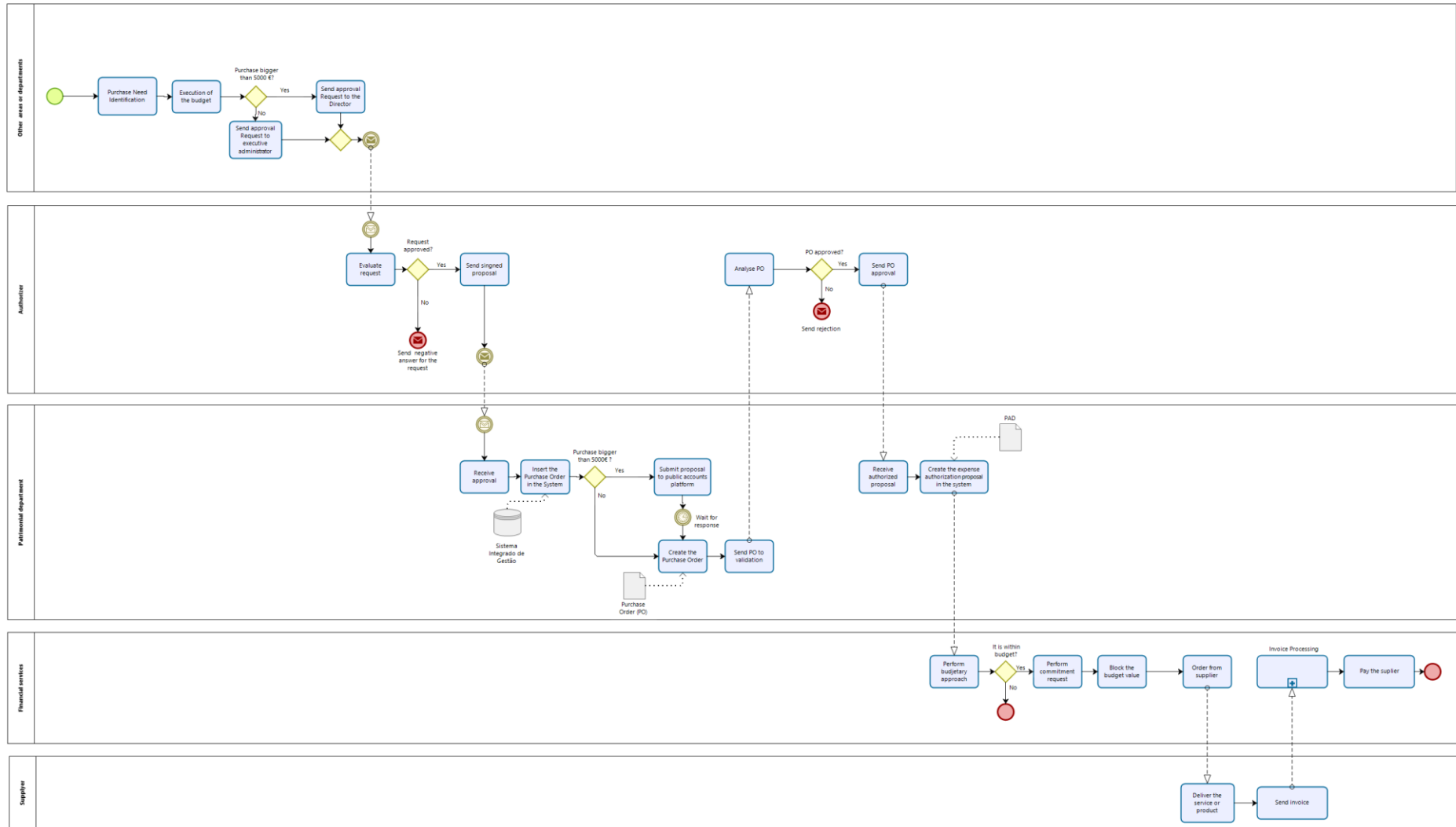


Figure 7 - Goods and services acquisition process

3.3.2.2. School fee payments

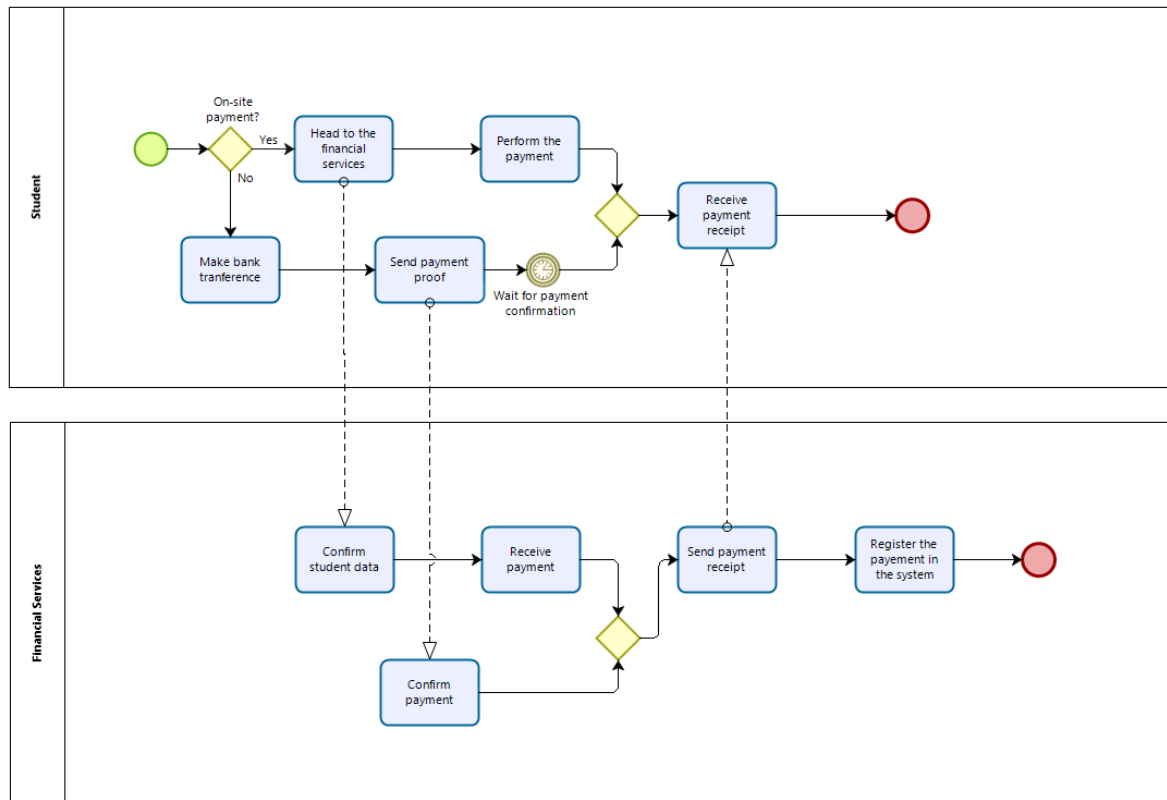


Figure 8 - School fee payments process

This process corresponds to the payment of school fees, usually, by the students. The main difference inside this process is the possibility of on-site or transaction payments. Describing the process, a student can go in person to the financial services pay the school fees, or he can make it way, for example by bank transference. Once the payment is done, the financial services will confirm the payment and send back the receipt. At the final of this process, the payment is registered in the system so the academic services can rightly regulate the student's debt.

3.3.2.3. Salaries processing process

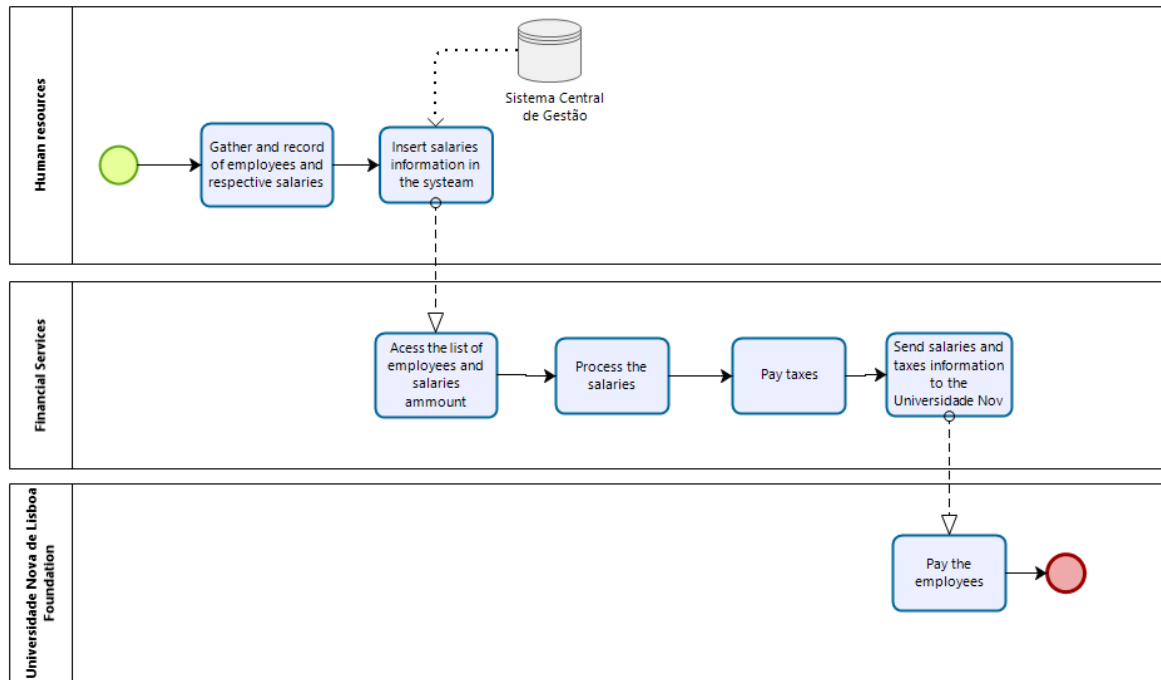


Figure 9 - Salaries Process

As presented in the figure above, this process relates to the NOVA IMS employee's salary payment.

It starts with the human resources having all the information regarding each employee's salary, which then is inputted on the Sistema Central de Gestão, so it can be accessed by the financial services. Then, they process the salaries and related taxes and send the final information to the Universidade Nova de Lisboa foundation that will pay the employees.

3.3.2.4. Invoice processing process

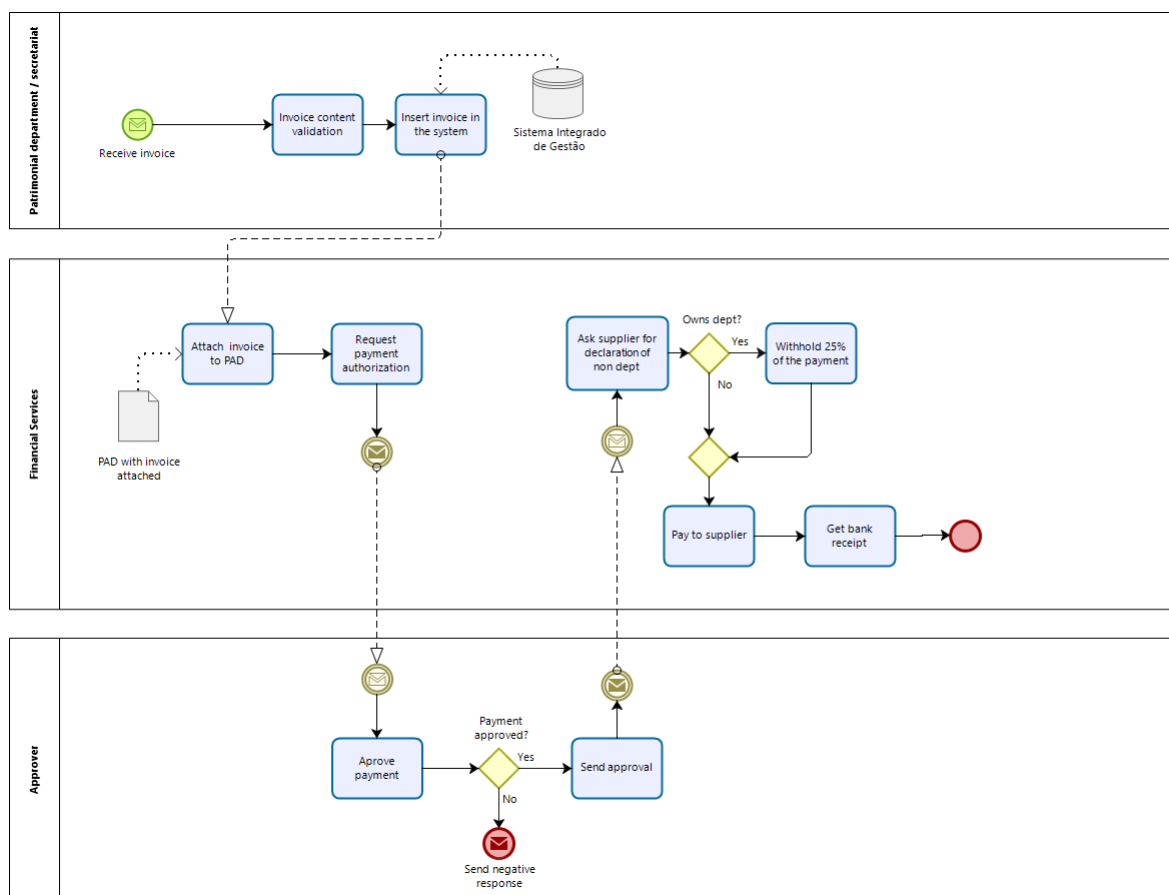


Figure 10 - Invoice processing process

This subprocess is transverse to many processes since it is necessary every time a transaction is made. In this case, it appears on the Goods and services acquisition process. The main objective is to process the invoices and be sure that the payment happened. The process starts with the invoice validation which guarantees that is the correct one to be inserted in the system. After that, it is attached to the PAD and sent to be approved one more time before the payment to the supplier.

3.3.2.5. Bank reconciliation process

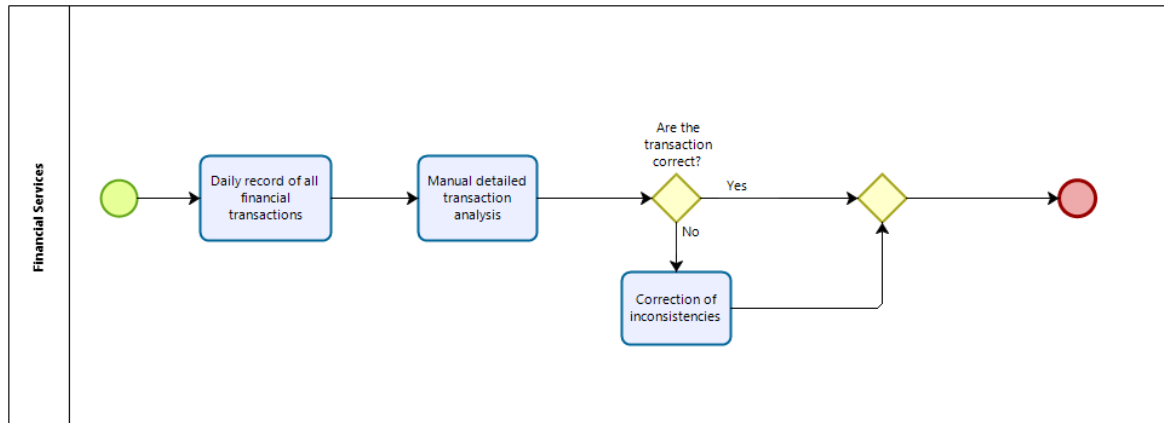


Figure 11 - Bank reconciliation process

The process presented in figure 6 has the main objective of guarantee that every transaction has been properly made and that the final bank balance is correct. Firstly, a record of every financial transaction made during a day is prepared. As the next step, there is a manual and detailed analysis to see if every transaction and value is correct. When inconsistencies are found they are investigated and if possible, the proper corrections are made.

3.4. PROPOSAL FOR IMPROVEMENTS

After reviewing and analyzing the processes presented and, to reflect that analysis in improvements, the next section of this project work will explain which are the main deficiencies and propose possible solutions. The focus would be automatizing the process with RPA solutions, reducing time, money and improve employee's satisfaction and productivity.

Another point of analysis will be the Sistema Central de Gestão. The NOVA IMS financial services and other departments already have this centered system where they can, in a fast way, share information. However, it is not currently being used at its fullest potential.

General improvements to the processes:

One concern raised by Dr. Silvia was the reduced level of personnel responsible to keep the financial services working. The current team can give the response to the daily basis tasks but there are some events during the year that overload that team with work. Examples of these events are the students' fee payment time or worker vacations. The hire of at least one more person can be seen initially seen as an expense but in a long-time scenario, it would increase the quality of the results, the production level and of course the happiness and wellbeing of the employees.

Another lack, that in this case, correlates the system and the people, starts with the fact that the system is a SaaS (Software-as-a-service) and so, after implementation, it has multiple releases regarding people's needs. These types of solutions as many advantages but it is also needed to take into consideration some disadvantages, for instance, the management of the user knowledge. On NOVA IMS every time there is a new update, not all the users are notified and there is no training related to the updates which reduce workers' knowledge about the tool and increase the time and resources spent to do each task.

The best improvement to do regarding this point is to have short workshops every time a new release comes out. With this upgrade, not only the people will have more capacity for daily basis tasks but they have a moment to be heard that results in a better work environment and also the gathering of feedback related to the system in use.

Process number and name	Critical analysis	Proposal for improvements
Process 1 – Services and goods acquisition	a) Currently, at NOVA IMS the creation of the PO is done manually. An employee enters the systems, search for the right order and creates the PO. This task by itself is simple but when the number of PO increases it becomes more confusing and a systematic task that can lead to errors. b) As seen in the process model every time an area of NOVA IMS wants to make a new purchase, it needs to send an email to the authorizer and just after the authorization, the purchase is sent to the patrimonial area to be inserted into the system. These actions can lead to errors and the most common are the failure in sending the email, loss of the email in the middle of the number of emails received during the day or also send the email to the wrong person.	a) Automatic PO creation: With RPA the entire process from creating a purchase request to raising a purchase order is done automatically. The software, that would be integrated with the current system would automatically follow a workflow seeking approval from the approver and processing the request to raise a PO. After that, and if needed, the financial services employee can just consult or print it for documentation records. The benefits of this suggestion are reducing the time by eliminating a simple but time-consuming task. b) System utilization at fully potential: This segment of the process could be avoided and improved if every area has its account profile in the system and, when a new purchase wants to be made, it is immediately registered in the system. The authorizer (director or administrator) could also have profiles to authorize the order directly in the system. Instead of using the email for communication, that has a high risk of not being received or read, all the communications would be done in the system that also does the follow-up process. These improvements would highly reduce time and allow the centralization of information in one place, granting a quick and organized access to it. Additionally, it would allow the other participants in the process to understand better who did the request and in which scope.

Process number and name	Critical analysis	Proposal for improvements
Process 4 – Invoice processing	a) The registration of the invoice in the system and consequently attach to the PO is also done manually. This is a simple but time-consuming task that could easily be done automatically	a) Automatic invoice registration: Exploiting robotic automation processes, any invoice received by paper or email would be automatically scanned, processed with an OCR technology, registered in the system, and attached to the PO. All the actions automatically made would be saved in logs for future audits and possible errors solution. Optical Character Recognition, or OCR, “is a technology that enables you to convert different types of documents, such as scanned paper documents, PDF files into editable data”. (ABBYY, 2019) This solution will reduce the times and decrease the probability of errors.
Process 5 – Bank reconciliation	a) In NOVA IMS bank reconciliation is a synonym of a tick-and-tie method. All the transactions are analyzed and match manually, a process that takes a lot of time and resources.	a) Automatic back reconciliation: With the utilization of RPA solution, all the processes could be automated. For example, (Quidjest, 2019) says that you can automatically import bank statement information and through matching criteria defined by the user, cash movements are easily reconciled with bank movements through an automatic suggestion. This process would decrease drastically the time spent on this task and avoid the most common source of errors – the human.

4. CONCLUSIONS

Knowing that technology is increasingly present in our days, we must be able to use it to improve our daily tasks. The organizations are mainly the ones that use the technology, applying it in their departments, to develop and evolve their activities, thus aiming to obtain all the benefits it provides. An example of using this technology is the BPM methodology. The Business Process Management methodology has been actively implemented in public and educational organizations resulting in a noticeable improvement in the services that they provide, as demonstrated in the various documents used and referenced in this document. Because it is a simple language it is understandable to everyone involved in the process from analysts to programmers, and thus leads to a positive synergy for development. This study also proved to be an essential tool for understanding the processes analyzed and so creating value for them.

With the creation of process diagrams, we were able to immediately infer some fewer effective practices and the improvements needed to reconstruct them. Bizagi Modeler software has proved to be an excellent working tool. With the main benefits of being simple, easy to understand and offering different export possibilities, it becomes a great ally in process modeling.

It was very interesting to apply this knowledge to the specific case of Nova Information Management School's financial services. Even though it is an information management school some of its daily processes were still carried out manually and with the need to use different systems and resources to ensure their fluidity. It was realized that processes such as bank reconciliation or e-mail exchanges for approval of a purchase order could use automation to become faster, less expensive, and free up to college employees who can focus on most important tasks.

With this project only intended to modulate the financial processes and analyze possible improvements future work could address these improvements, seek their practical implementation, and implement them thus offering NOVA IMS a tool of internal evolution.

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ANNEXES

A. Documents

1. Purchase authorization email example

Page 1

Virginia Judice

From: Pedro Bernardino
Sent: terça-feira, 23 de julho de 2019 15:01
To: Biblioteca NOVA IMS; sfinanceiros
Subject: RE: Pedido de aquisição de bibliografia - Prof. - 1º semestre - Gestão e armazenamento de dados_orçamento nº240

Autorizo.

Com os meus cumprimentos, *Best regards*

Pedro Garcia Bernardino
Administrador Executivo | Executive Administrator



De: Biblioteca NOVA IMS <bsd@novaims.unl.pt>
Enviada: 23 de julho de 2019 14:53
Para: Pedro Bernardino <pbernardino@novaims.unl.pt>
Cc: Biblioteca NOVA IMS <bsd@novaims.unl.pt>
Assunto: FW: Pedido de aquisição de bibliografia - Prof. - 1º semestre - Gestão e armazenamento de dados_orçamento nº240

Boa tarde Dr. Pedro Bernardino,

Venho por este meio solicitar a aquisição do(s) livro(s) abaixo indicado(s), para o(a) Professor(a) através do centro de custos MGI, no valor de 90,19€ (c/IVA) ao fornecedor Marka.

Compras a cabimentar:

Referência	Editora	Pedido por	Centro custos	Semestre	Nº Exemp print
Lemahieu, W., vanden Broucke, S., & Baesens, B. (2018). Principles of Database Management: The Practical Guide to Storing, Managing and Analyzing Big and Small Data. Cambridge University Press. 9781107186125; 9781316952986	Cambridge	Mijail Naranjo	MGI	1º2019_2020	1

Eric Vanier, Birju Shah, Tejaswi Malepati (2019). Advanced MySQL 8: Discover the full potential of MySQL and ensure high performance of your database. Packt Publishing. ISBN-13: 978-1788634445	Packt Publishing	Mijail Naranjo	MGI	1*2019_2020	1
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Consulta de Preços:

Referência	Editora	Pedido por	Centro custos	Semestre	Nº Exemp ebook
Lemahieu, W., vanden Broucke, S., & Baesens, B. (2018). Principles of Database Management: The Practical Guide to Storing, Managing and Analyzing Big and Small Data. Cambridge University Press. 9781107186125; 9781316952986	Cambridge	Mijail Naranjo	MGI	1*2019_2020	
Lemahieu, W., vanden Broucke, S., & Baesens, B. (2018). Principles of Database Management: The Practical Guide to Storing, Managing and Analyzing Big and Small Data. Cambridge University Press. 9781107186125; 9781316952986	Cambridge	Mijail Naranjo	MGI	1*2019_2020	
Lemahieu, W., vanden Broucke, S., & Baesens, B. (2018). Principles of Database Management: The Practical Guide to Storing, Managing and Analyzing Big and Small Data. Cambridge University Press. 9781107186125; 9781316952986	Cambridge	Mijail Naranjo	MGI	1*2019_2020	
Lemahieu, W., vanden Broucke, S., & Baesens, B. (2018). Principles of Database Management: The Practical Guide to Storing, Managing and Analyzing Big and Small Data. Cambridge University Press. 9781107186125; 9781316952986	Cambridge	Mijail Naranjo	MGI	1*2019_2020	0
Eric Vanier, Birju Shah, Tejaswi Malepati (2019). Advanced MySQL 8: Discover the full potential of MySQL and ensure high performance of your database. Packt Publishing. ISBN-13: 978-1788634445	Packt Publishing	Mijail Naranjo	MGI	1*2019_2020	
Eric Vanier, Birju Shah, Tejaswi Malepati (2019). Advanced MySQL 8: Discover the full potential of MySQL and ensure high performance of your database. Packt Publishing. ISBN-13: 978-1788634445	Packt Publishing	Mijail Naranjo	MGI	1*2019_2020	
Eric Vanier, Birju Shah, Tejaswi Malepati (2019). Advanced MySQL 8: Discover the full potential of MySQL and ensure high performance of your database. Packt Publishing. ISBN-13: 978-1788634445	Packt Publishing	Mijail Naranjo	MGI	1*2019_2020	
Eric Vanier, Birju Shah, Tejaswi Malepati (2019). Advanced MySQL 8: Discover the full potential of MySQL and ensure high performance of your database. Packt Publishing. ISBN-13: 978-1788634445	Packt Publishing	Mijail Naranjo	MGI	1*2019_2020	0

Com os meus cumprimentos [Best regards]

Isabel Gomes Pinto
Bibliotecária | Librarian
ig@novams.unl.pt
WhatsApp: +351

2. Purchase order example



Identificação da proposta de aquisição	
N.º	30
Data	12/03/2018
Proponente	BSD
Centro de custo	Percentagem
201005 - Biblioteca e Serviços de	100,0%

Responsável	Chefia de Núcleo ou Departamento	O Diretor da UO ou Serviço
@isegi.unl.pt Em: 12/03/2018 @isegi.unl.pt Em: 13/03/2018		

Designação/assunto
Livros para a unidade curricular "Base de Dados II", indicado pelo sr. prof.

Justificação da necessidade
Livros para a unidade curricular "Base de Dados II", indicado pelo sr. prof.

Linha	Designação	Quantidade	Valores sem IVA		Valor com IVA
			Unitário	Total	
1	Ramez Elmasri & Shamkant B. Navathe (2017). Fundamentals of Database Systems, Global Edition, 7 ed. Pearson. ISBN-10: 1292097612 • ISBN-13: 9781292097619	2,00	51,06 €	102,11 €	108,24 €
Soma				102,11 €	108,24 €

Júri do procedimento (apenas se se pretender convidar a apresentar proposta mais do que uma entidade)

Observações
Fornecedores recomendados: Amazon.Es Prazo de entrega requerido: Preço-base (sem IVA): 0,00€ Outras indicações:

3. Expense approval request (PAD) example

Page 1



Ano económico de 2019

Proposta de autorização de despesa n.º 537 de 12/08/2019

Parecer(es)	Despacho
-------------	----------

Processo de aquisição	Proposta de aquisição
Processo n.º: 539 Abertura: 12/08/2019	Data: 12/08/2019 Proponente: BSD - Biblioteca e Serviços de Documentação

Justificação da necessidade

Aquisição de bibliografias ao fornecedor Amazon - Espanha

Entendendo-se necessário proceder à aquisição de Aquisição de bibliografias ao fornecedor Amazon - Espanha, submete-se à consideração superior a presente proposta de adjudicação e autorização de despesa.

Entidade adjudicatária

Propõe-se que a presente aquisição seja adjudicada à seguinte entidade:

Adjudicatário	NIF	Data	Total
Amazon EU S.a.r.L	PT 980339898		1 €

Proposta de aquisição

Linhas	Designação	Quantidade	Unidade	Preço unitário	IVA (%)	Valor s/ IVA
1	Aquisição de bibliografias ao fornecedor Amazon - Espanha	1,00		€	6,0	€
Valor sem IVA:						€
IVA (6,0%) :						€
Valor total:						€

Procedimento de aquisição

Ajuste Direto Simplificado, n.º 1 do Artigo 126.º (bens e serviços) - Ajuste Direto Simplificado (Bens ou Serviços < 5 000 €)

Prazo de execução:

Centros de custo

9999 - Geral

Informação de cabimento e compromisso / Distribuição de encargos

A despesa de tem cabimento na verba do(s) orçamento(s):

NOVA IMS - 2019

Actividade	Rubrica	N.º cabimento	F. financiam.	Detação	Saldo	Encargo	Saldo final
IMS193	020118	1094	522	1 €	1 €	€	

A mesma despesa fica comprometida na verba do(s) orçamento(s):				
NOVA IMS - 2019				
Actividade	Rubrica	N.º cabimento	N.º compromet./PAD	Valor compromet.
IMS193	020118	1094	1086/537	€

O proponente

/ /

4. Commitment document example



IMS0 * NIPC 501559094
NOVA Information Management School
Campus de Campolide * 1070-312 * LISBOA

Compromisso n.º 1086

Data: 13/08/2019

Valor: 0 €

Fornecedor: Amazon EU S.a.r.L

Descrição: Aquisição de bibliografias ao fornecedor Amazon - Espanha

Linha de compromisso: **1**

Orçamento: NOVA IMS - NOVA IMS

Capítulo	Divisão	Subdivisão
03	89	00

Rubrica: 020118

Atividade: IMS193

F. financiamento: 522 - 00 €

Class. funcional: 2014

Class. europeia:

N.º requisição	536	12/08/2019
Proposta	539	12/08/2019
Cabimento	1094	13/08/2019

Valor inicial: 00 €	Valor corrigido: 0,00 €	Valor cabimentado: 00 €	N. cred. abatidas: 0,00 €	Reposiç. abatidas: 0,00 €	Valor: 0,00 €
----------------------------	--------------------------------	--------------------------------	----------------------------------	----------------------------------	----------------------

Alteração a compromisso

Tipo de alteração	Data	Valor

Centro de custo	Valor
201005 - Biblioteca e Serviços de Documentação	00 €

Parecer:

Em:

Ass.:

Despacho:

Autorizo ☐

Não autorizo ☐

Em:

Ass.:

5. Budgetary approach document example



Information
Management
School

Universidade Nova de Lisboa

IMS0 * NIPC 501559094

NOVA Information Management School

Campus de Campolide * 1070-312 * LISBOA

Cabimento n.º 1094

Data: 13/08/2019

Valor: 0 €

Fornecedor: Amazon EU S.a.r.L

Descrição: Aquisição de bibliografias ao fornecedor Amazon - Espanha

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Orçamento: NOVA IMS - NOVA IMS

Capítulo	Divisão	Subdivisão
03	89	00

Rubrica: 020118
Atividade: IMS193

Programa: 010

Medida: 018

Class. funcional: 2014

Rubrica projeto:

F. financiamento: 522

Processo: 539

Quadro-resumo para a rubrica **020118** e atividade **IMS193** e fonte de financiamento **522**

Valor inicial: 0,00 €	Valor corrigido: 00 €	Valor cabimentado: 0,00 €	N. cred. abatidas: 0,00 €	Reposiç. abatidas: 0,00 €	Valor: 00
Dotação inicial: 0,00 €	Dotação ajustada: 0,00 €	Total cabimentado: 0,00 €	Dotação disponível: 0,00 €		

Alteração a cabimento

Tipo de alteração	Data	Valor

Centro de custo	Valor
201005-Biblioteca e Serviços de Documentação	0 €

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Ass.:

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