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Final Thesis

The advent of E-invoicing: the effects on authomated Business accounting. De'Longhi RPA case study.

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INTRODUCTION:

The principal aim of this thesis work is to analyze and evaluate the radical changes brought by the introduction of the new technologies such as Artificial Intelligence and the robotization of processes (RPA) in business landscape and in the workplace, with the aim of understanding their potentials and possible threats.

The importance of technological innovation is now deep-rooted in the consciousness of many businesses and in a growing number of people, as a matter of facts terms as automation, machine learning, artificial intelligence and robotics are gradually entering the everyday language and influencing the way people act, interact, communicate, how people do their works and even how work is changing due to the above-mentioned digitalization of processes.

The economical background of this thesis work is the advent of electronic invoicing that in 2019 brought in Italy one of the biggest, technology driven, changes.

This argumentation will cover several points starting from Chapter I with a brief introduction to the concept of digital transformation, digitalization and artificial intelligence with a deep focus on the main object of the essay, the RPA from the definition of what it is, how it works where could be applied and finally its pros and cons.

The attention will then switch to the main Italian scenario where the advent of electronic invoicing made it possible for artificial intelligence to come to life thanks also to the so called Robotic Automated Process (RPA).

It is within this context that will be analyzed the De'Longhi RPA case study, starting from the initial investment and then by analyzing the major drivers to assess which processes to focus the attention to. The evaluation was made in order to maximize the benefits the automation could have brought, in terms of volume of repetitive documents, that were only a mere data entry job with no value added for a physical employee but the perfect kind of process to be carried out by the RPA.

The utility for the company is expressed by the possibility of having a new employee software that will take care of selected processes, carrying them out without errors and in much less time: i.e. a gain in quality and costs, also because, according to accredited studies, a software employee costs one third of a full-time employee.

Bots are to be considered as a new team member, the intent not to replace human agents but to support their work in order to make it more efficient and effective.

It is in this optic that employees have to try not to consider automation as a potential threat, as something that is going to "steal" their job, but as a natural consequence of the impact that digital transformation is having on our everyday life.

CHAPTER I: DIGITAL TRANSFORMATION ERA

1.1 Industry 4.0 – From Digitalization to Artificial Intelligence

Digital transformation and Artificial Intelligence are just some of the most important keywords related to Industry 4.0, the fourth industrial revolution in history.

For industrial revolution we mean an organized movement in the economic sphere that brought a disruptive change by which a new social, political or scientific order is established, characterized by an overturning of customs, habits, knowledge, practices and functions.

The term Industry 4.0 refers to a process that aims to digitalyze the manufacturing sector, renewing the value chain by changing the way of operating. Today we can say that Industry 4.0 can be considered as a synonymous for smart manufacturing because of the high level of innovations and digital technologies that it entails.

The cornerstone of Industry 4.0 is cyber-physical systems, physical systems strictly connected with computer systems, that can interact and cooperate with each other. Today, this new concept called the Internet of Things is bringing greater efficiency and intelligence across many industries and business areas, and the concepts of smart manufacturing and smart supply chain are declinations of Industry 4.0.

As consequence of what stated above, the number of robots in European companies will increase more and more, and those will be increasingly intelligent and interactive, with new functionalities and utilities that complement human capabilities and skills.

The introduction of new techniques and strategies has the function of making the production process leaner and more efficient, taking advantage of technological innovations that allow links and relationships to be established between the various objects and systems in a production plant.

It is within the concept of Industry 4.0 that we can also talk about digital transformation and Artificial Intelligence as two of the most powerful drivers of the new disruptive concept of industry.

On the one hand digital transformation can be defined as the process through which companies drive a fundamental change because it involves the use of digital technologies and tools embedded across their businesses, to automate and improve processes, systems, and experiences. The goal of a digital transformation, as outlined in a McKinsey & Co article: « should be to build a competitive advantage by continuously deploying tech at scale to improve customer experience and lower costs ».[1]

There are mainly two concepts related to digital transformation: the digitization and the digitalization. An Accenture's essay on digital transformation defines: « *digitization* as the process of translating analog information and data into digital from, for example, scanning a document and storing it on a computer, whereas *digitalization* as the use of digital technologies to change the business processes and projects, such as for example skilling employees »[2] (Accenture, 2023).

On the other hand, automation has been defined as per Treccani Dictionary as: « The use of a set of means and technical procedures that, by appropriately acting on particular devices to ensure the automatic performance of a given process, the automatic operation of an industrial plant, a public service, etc.; the technique

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[1] McKinsey & Company (2023), *What is digital transformation?* McKinsey Global Publishing.

[2] Accenture (2023), What is Digital Transformation?
https://www.accenture.com/it-it/insights/digital-transformation-index

itself that studies, prepares and coordinates these procedures, and the technical-scientific conception from which it proceeds: the introduction of A.I. in industry.

More specifically, automation is the technical and applicative aspect of cybernetics and systems theory and concerns the use of complex and refined machines and procedures, capable of regulating their own functioning and of controlling the quality of the work produced by means of sensitive organs, in particular with reference to production cycles governed by process computers ». [3] (Treccani, 2020)

Nowadays, there are no fields of our everyday life that have not been influenced or not been touched by automation: we can just think about drones that can deliver groceries and food to our home's door or taxi able to drove someone everywhere thanks to the autopilot or again the use of OCR – Optical Character Recognition in different sector, those are just some examples of automation that people face on a daily basis.

Automation is the creation and application of technologies to the production of goods and services with minimal or even no human intervention through the development of various software to perform tasks that were previously done manually by human workers in order to improve efficiency, speed and reliability.

What is important to underline is that not all processes are appropriate to be automatized. Professor A. Mani Tipathi identifies, as possible criteria for the definition of the requisites needed « a process composed of repetitive steps, highly time-consuming, characterized by low quality output and involving several people and several functions of the corporate organigram. Furthermore, this must be logical, composed of well-defined, rule-based steps, triggered by a decipherable input, the output of which is accessible »[4] (A. Mani Tipathi, 2018).

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[3] Treccani dictionary (2020), Automation definition

[4] A. Mani Tripathi (2018): *Learning Robotic process automation: create software robots and automate   business process with the leading RPS tool,* Packt Publishing.

1.2 Robotic Process Automation

Nowadays automation has reached a stage of maturity such that other complementary technologies have developed: the Robotic Process Automation (RPA) is one of them and is characterized by a widespread adoption in different business contexts thanks to its adaptability.

As stated on an IBM essay regarding the RPA: « The fundamental difference is that RPA is process-based, whereas Artificial Intelligence is data-based. RPA bots can only follow processes defined by an end user, whereas AI bots use machine learning to identify patterns in data, especially unstructured data, and learn over time. In other words, AI is designed to simulate human intelligence, while RPA replicates activities performed by humans. Although the use of both AI and RPA tools minimizes the need for human intervention, as the way they automate processes is different. »[5]

The title Robotic Process Automation (RPA) denotes the automation of processes through the programming of appropriate bots.

The term *Robotic* does not refer to a physical or mechanical robot, but rather to a software-based robot (or bot) that is capable of performing the tasks for which it is programmed for.

The term *Process*, on the other hand, frames the context: what is to be automated are the activities that characterize the workflow of the different company departments.

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[5] Cos'è l'RPA? (Robotic Process Automation), https://www.ibm.com/it-it/topics/rpa

Finally, there is the term *Automation*, entailing the ultimate goal of the software, which is to make the selected activities autonomous. In fact, the RPA application will perfectly emulate the activities that the user carries out on a daily basis, interacting with the graphical user interface of the information system, producing the same results with greater precision, in less time and at lower cost.

To summarize, the Robotic Process Automation (RPA) is configured as a technology based on software applications that emulate human actions by interacting with computer applications, following paths based on pre-determined rules. The execution of business processes, once performed manually by physical operators, often requires reading and typing or simply clicking on existing applications used to perform specific, targeted tasks. RPA robots are able to perform complex calculations and decision-making based on the input data and pre-defined rules programmed at first.

Thanks to RPA it has become much easier for companies to automate static and repetitive tasks in favor of automated or semi-automated processes.

An RPA can easily handle from repetitive and high-volume tasks like the entering of data or the download of multiple documents from the website to more diverse and complex systems working simultaneously on different platforms and web interfaces, offering at the same time consistency in quality, accuracy, productivity, efficiency and significantly lowering the operating costs. By implementing such a solution, human resources initially involved in more simple and alienating tasks can engage in something of greater value-added activities and with more quality impact, leaving the more alienating tasks to Robots software.

A further relevant feature of the RPA is its ability to interact with different applications and interfaces, regardless of the technologies on which they are built. It is able in fact to collaborate with the most popular ERP applications such as, for example: SAP/SAP4Hana, Oracle, Microsoft Dynamics and many more.

The RPA platforms allow the software called robots, or more simply bots, to interact with any application in the exact same way of a human being, thus enabling the automation of work based on pre-defined steps and rule and at the same time guaranteeing an equal quality output over time and iterations.

RPA is widely accepted and implemented in most sectors business realities all over the world. Sectors that can benefit the most from RPA solutions are the following: Business Process Outsourcing (BPO), insurance sector, public service, healthcare companies and last but not least the financial sector, upon which a deep analysis will be made during Chapter II considering as an example the De'Longhi RPA case study.

1.2.1 RPA – Software Infrastructure selection

The RPA market can be defined as an oligopoly situation as it is characterized by a limited number of companies that provide RPA solutions up to now. There are currently three market leaders providing this kind of technology, however it is important to mention that there are also other suppliers that offer RPA solutions but are not as relevant on the market, so we will focus our attention just on the three most relevant, UiPath, Blueprism and Automation Anywhere.

The first player is UiPath, a Romanian software company founded in 2005 and nowadays operating globally.

UiPath provides RPA tools, which it defines as a technology that enables the emulation and integration of human actions into a digital system. In fact, they can interact with other systems to perform various repetitive tasks. The company claims that an RPA robot can bring several benefits to the business, as it can work 24 hours a day and if configured correctly it would not make mistakes, and in the long run, the investment would be justified as it costs less than a human operator (Taulli, 2020).

UiPath has moreover provided the RPA solutions to the big four consultancy companies (EY, PwC, Deloitte and KPMG) with whom it works to offer RPA products to their customers.

Nowadays, the main environments offered by the software are UiPath Studio, UiPath Robot and UiPath Orchestrator.
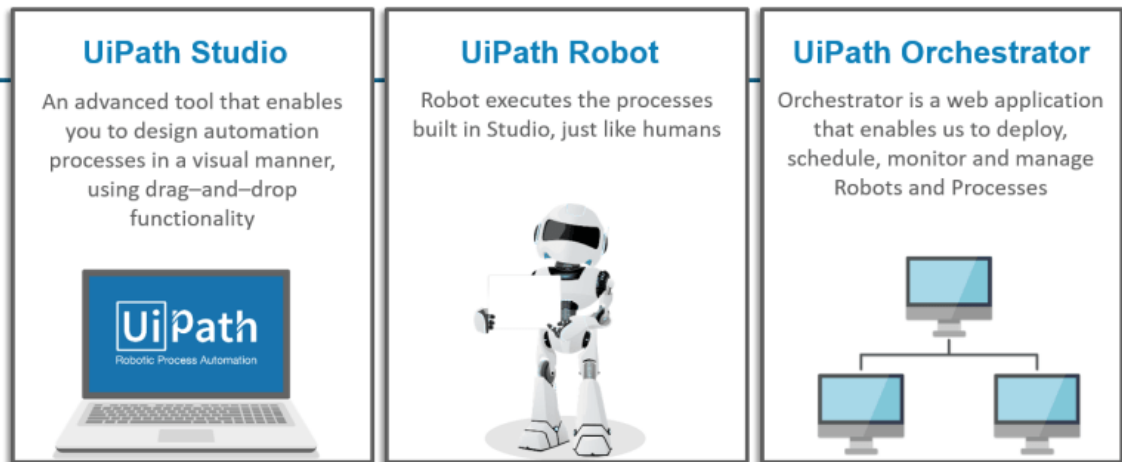
Image 1: Principal components' of UiPath platform.

- **UiPath Studio** is the environment that allows the construction of the workflow to be automated. The platform has a large number of features that make it easy to use and scale, such as the Recording function, which allows to record mouse and keyboard activities and automatically generate a script that will reprocess those movements, or the Data and Screen Scraping, which allow data and images to be automatically taken from the screen and reused.

- **UIPath Robot** is the execution environment of the process represented via Studio.

  This environment can be installed in User or Service mode. The difference is that User mode does not allow the unassisted execution of bots.

- **UiPath Orchestrator** is the intermediary environment between the other two. It helps the user to check the general efficiency and status of the bots.

To conclude, UiPath is clearly recognized as a market leader, for its innovative product vision, its ability to execute and for the scale of its sales. It is the platform that offers the most comprehensive service and is preferred by users for its user experience.

The second major provider of RPA solutions is Automation Anywhere, an American software company founded in 2003 and based in California.

Automation Anywhere provides intelligent automation tools, offering its products around the world. Its RPA partnerships are with Grant Thornton, AllianceBernstein, Ryan and EXL. Its target industries are: financial services, insurance, healthcare, technology, manufacturing and telecommunications.

Finally, another well-known supplier of RPA solutions is Blueprism, which is defined as the pioneer in this field. In fact, it launched its first RPA solutions back in 2001. Barclays, a British international British bank, helped the expansion of BluePrism's products by being one of their first customers; the software they purchased helped them in their debt collection processes and in call center processes (Taulli, 2020). The target sectors in which the company operates are: financial services, telecommunications, insurance, retail, health care and pharmaceuticals, professional services, energy, utilities, public sector and providers of outsourcing. BluePrism's best-known auditing firms are EY and Deloitte (BluePrism, s.d.).

As we will see in more details during Chapter II, EY is the consultancy firm that helped the De'Longhi Group to implement the RPA within the Finance and Accounting department and has adopted UiPath has RPA software provider, because of the best trade-off between offering, strategy and market presence, as shown in the next pictures.
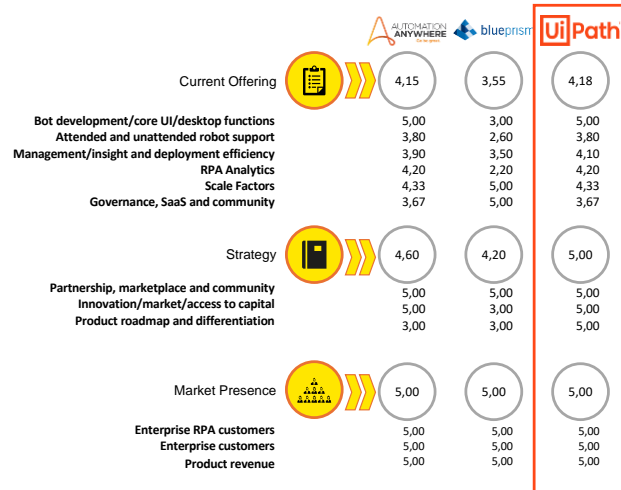
Software Infrastructure Selection

		AUTOMATION ANYWHERE	blueprism	UiPath
Current Offering		4,15	3,55	4,18
Bot development/core UI/desktop functions		5,00	3,00	5,00
Attended and unattended robot support		3,80	2,60	3,80
Management/insight and deployment efficiency		3,90	3,50	4,10
RPA Analytics		4,20	2,20	4,20
Scale Factors		4,33	5,00	4,33
Governance, SaaS and community		3,67	5,00	3,67
Strategy		4,60	4,20	5,00
Partnership, marketplace and community		5,00	5,00	5,00
Innovation/market/access to capital		5,00	3,00	5,00
Product roadmap and differentiation		3,00	3,00	5,00
Market Presence		5,00	5,00	5,00
Enterprise RPA customers		5,00	5,00	5,00
Enterprise customers		5,00	5,00	5,00
Product revenue		5,00	5,00	5,00

Image 2: The Software Infrastructure selection by EY

Image 3 and 4: The Forrester Wave™: Robotic Process Automation, Q4 2019

1.2.1 RPA – Opportunities and threats of Robotic Process Automation

As seen before, regardless of the context of its application there are considerable and diverse benefits that can positively impact implementing an RPA solution within a business.

In the slide shown below we can see how an RPA is able to generate value in the business landscape where it is applied from several points of view.

Image 5: The advantages of using a RPA, by EY

First of all, from a technological point of view:

- It is a non-invasive and easy technology that can be overlapped on existing applications and systems.
- It is able to interact with different applications and web services by leveraging the UI.

From the point of view of an employee/people:

- RPA enable employees to work on task that can give them more value added by using their skills and creativity.
- The bot can execute various processes, even in different departments, if programmed to.

From the point of view of the processes itself:

- RPA enable the customer satisfaction because of the speed and its efficiency.
- The bot can execute the same processes and tasks that are performed by a physical employee, eliminating any execution variations.
- The robot can perform the right result and take the right decision at the very first time.

Another benefit of using bots is the increased reliability of business processes. Bots are designed to execute processes with high reliability, reducing downtime and ensuring accurate results. This translates into a significant reduction in the error rate, with a direct impact on the quality of the product/service offered and a reduction in the costs associated with rejects. In addition, process automation is fundamental to regulatory compliance, as bot solutions strictly adhere to rules and guidelines, minimizing the risk of non-compliance and preserving the organization's reputation and compliance.

The implementation of bots has a significant positive impact on costs, as several studies have shown. According to these studies, by increasing efficiency and potentially working 24/7, a bot has a cost equivalent to about a third of a full-time employee. This figure underlines the real economic advantage of using bots. In

addition, by automating workflows, the organization reduces the need for additional resources, resulting in a significant reduction in costs.

This means that the company can achieve a higher return without having to increase personnel or operating expenses.

DISADVANTAGES OF ROBOTIC PROCESS AUTOMATION

The implementation of Robotic Process Automation (RPA) has undoubtedly brought numerous benefits to the working environment.

However, despite the opportunities and benefits above mentioned, it is important to mention and also analyze the disadvantages and potential risks that this solution might entails.

A critical aspect of adopting RPA might be security related. On the one hand, the use of Robotic Process Automation (RPA) allows processes to be executed according to pre-defined rules, ensuring consistency and compliance. On the other hand, it is crucial to ensure the protection of sensitive data processed by bots.

In this optic, it is necessary to take appropriate security measures, such as encrypting the information in order to ensure that only authorized users can have access to the data.

Data protection is of crucial importance to preserve the privacy and security of information.

One of the disadvantages to consider while implementing an RPA solution is its fragility. The technology is based on the reproduction of the user's interactions with the graphic interface of the device being used. It is important to emphasize that if the appearance or mode of interaction of the interface changes, the bot will have to be partially modified.

It is also important to mention the threat that the implementation of an RPA system may pose to corporate staff as a whole, since part of their work could be carried out by a bot. If staff are not adequately prepared for this transition, they may suffer an external shock caused by this technology, suddenly finding themselves with a new job, tasks, responsibilities and, if not prepared, might even lose their jobs.

In the current context of high unemployment, this technology could be viewed with skepticism, as it could contribute to increasing the number of unemployed in the short term.

1.2.2 The new labor market concept

Despite of the importance of all the benefits described so far, cost reduction is one of the primary benefits of implementing RPA at an enterprise level.

In the business context, has now became quite common to compare the equivalence of a robot to a number of Full Time Equivalent (FTE) human operators, as the hourly capabilities of a robot, 24 hours a day without breaks or holidays, compared to a full-time employee operating for up to eight hours a day, this represents a significant cost reduction.

Cost reduction is influenced by the high speed of a robot's execution. Robots often need to be slowed down to be compatible with the speed and latency of the applications on which they operate. In this sense, higher speed means better response times and an increase in the volume of output processed.

Another advantage of Robotic Process Automation is the greater consistency of the operations performed: a robot never deviates from a predefined set of rules and steps while performing a given task.

The complexity of the operations performed is offset by the simplicity of programming an RPA because as already mentioned, is not required to have high level of programming skills to set up the daily routine of the bot and the maintenance can be done internally within the company's IT department.

The main concerns linked to the introduction of new technologies, such as the Robotic Process Automation, in business landscape is related to the negative impacts these might have on the labor market.

Jobs that comprehend repetitive and manual tasks are more affected by the use of innovative and smart solutions, whereas on the contrary, jobs that requires more creative and/or strategic content for the implementation of social intelligence are less susceptible to automation, even though there is ample room in terms of supporting and assisting decision-making and unstructured processes.

We can conclude by saying that the increased satisfaction given by the implementation of new smarter solutions in a business also affects employees, who have not to consider the implementation of the RPA in their department, as something that is going to steal their job, something that is trying to replace them but as something that able to free them up in order to engage themselves in more value-added activities that require the use of skills such as emotional intelligence, reasoning, and intuition. In this sense, the RPA does not reduce job opportunities, it simply changes the way we were used to look at certain kind of jobs by freeing employees from tedious tasks towards more satisfying horizons.

1.3 The advent of electronic invoicing in Italy

Legal nature of an invoice

An invoice has been defined by Art. 21 of Italian DPR 633/1972 as: « for each taxable transaction, the subject making the supply of the goods or services issues an invoice, including in the form of a note, bill and parcel notice, without prejudice to his liability, ensures that the same is issued, on his behalf, by the customer or by a third party».

We can summarily define it as a mandatory fiscal and administrative document issued by the vendor, holder of a VAT number, in order to prove a certain supply of goods or services and to exercise the right to cash the money at a pre-established due date of the same document.

Electronic invoicing « is a digital system for issuing, transmitting and storing invoices, which makes it possible to do away with paper and the associated costs of printing, postage and storage. FatturaPA is the way to produce electronic invoices: it is a structured data flow in digital format with the same information content as a paper invoice, but in XML language », (Bucap, 2020).

Over the past few years also the concept of invoice itself has changed. Thanks to the digital transformation and its consequent opportunity to dematerialize the administrative accounting cycle of business processes, we have seen it change from a mere paper format, which was an expensive, not environmentally friendly method entailing the risks that the document might have been lost, to a digital format, and finally to the biggest and most relevant change: the advent of the electronic invoicing in Italy starting from 2019.

We can say that the digitization of passive invoices is the first step to simplify administrative processes and the start line of the path of digital transformation.

As stated in the Italian Revenue Agency website: « The Revenue Agency is the authority responsible for the electronic invoicing procedure. All invoices that economic operators resident or established in Italy issue to Italian government departments must be in electronic form and digitally signed. Non-Italian economic operators can issue invoices in paper or electronic form.

All electronic invoices must be sent to the **Exchange System** (SDI – Sistema di Interscambio, in Italian), which provides the address to the receiving government department. The exchange system is managed by the Revenue Agency ».

Electronic invoicing in Italy has led to significant improvements for businesses, especially for what concerns the management of passive invoices. As a matter of facts, the use of e-invoices has reduced the time needed to book the invoices received, simplified their verification procedures, streamlined the payment approval process and accelerated the activation of payment orders: all advantages brought by the standard XML format that e-invoicing has introduced.

Another relevant improvement brought by the electronic invoicing regards it's introduction in order to fight the tax gap and the tax evasion, others that are gradually getting there, and others that are pushing for its widespread adoption as a tool for innovation and process digitalization. In Italy, where B2B/B2C invoicing has been mandatory since 2019, it has been interpreted by the most virtuous companies not as a mere compliance, but rather as an opportunity to digitize active and passive cycle business processes. It has thus become a tool for simplifying and accelerating business relationships, but also for innovation and the creation of an efficient and transparent digital ecosystem.

CHAPTER II: RPA – DE'LONGHI CASE STUDY

As we saw in the previous chapter, in a world where digitalization is increasingly present in our everyday life, electronic invoicing was a fundamental step in the process of modernizing businesses.

Thanks to the dematerialization of the invoice and the steps forward made by researchers on Artificial Intelligence, it is now possible to implement the automation of processes even in a field of businesses where previously was not even imaginable.

Within this context it was possible for De'Longhi to develop the very first robotic automation initiative within the Group, the RPA project.

When we hear people talking about automation, their thoughts immediately go to the physical plants or machinery, and they are likely to associate the automation of processes mostly to the manufacturing world.

The RPA developed for the De'Longhi Group, on the other hand, is very different from all this, primarily because of its field of application: within the Accounting and Finance department.

A Robotic Process Automation (RPA) is a computer software that runs repetitive and rule-based processes. The software has been instructed based on certain specifications, explained in more details during the rest of the chapter, and, of course, that can be adjusted at any time if needed.

The RPA was designed with the partnership of an external consultant (EY) and, as we said before, implemented within the Finance division with the aim of automating the passive recording of the invoices.

First of all it is fundamental to emphasize one more time that this automated solution has been made possible thanks to the digitalization progresses made over the past few years, starting from the digitalization of the invoice itself from a paper document to a PDF document, then also to the electronic invoicing that saw Italy as the very first pioneer in this context and made it possible for Artificial Intelligence to read and process the documents accordingly.

In order to implement the RPA, a deep analysis was made in order to assess and identify the most suitable and robotically processes.
In the slide below are illustrated the fundamental steps followed during the Set-Up phase: from the discovery and identification of the most suitable processes, passing through the assessment of a very detailed analysis of the above-mentioned selected processes and finally to the architecture & development of the RPA solution within the business.
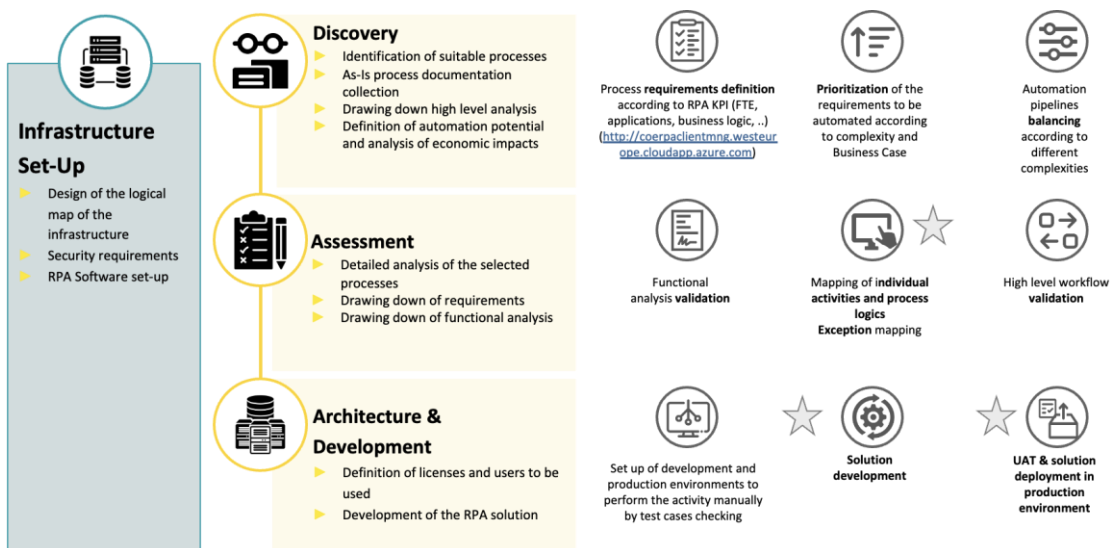
Imagine 6: RPA Set-Up phase map, by EY

- **Discovery:** During the discovery there is the identification of all the suitable processes.

  By answering some specific questions regarding the logic, the applications used and the FTE involved in the process management, a score card is generated. The score card shows the automation potential of the process. Two indicators are provided: one related to the impact that automation of the process would have on the customer business and the second related to the benefit of the RPA implementation. The higher the impact, the higher the ease of the implementation itself.
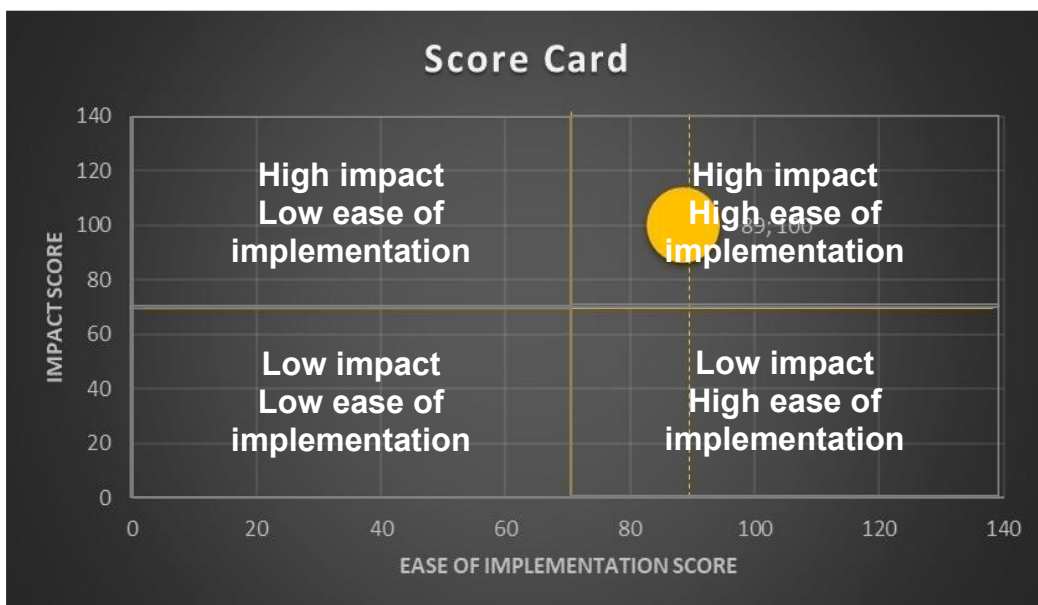
Image 7: RPA Score card, by EY

- **Assessment**: During the assessment phase it is necessary to map click-by-click the processes chosen for automation purposes, mapping the individual activities and process logics and eventual exceptions to be considered.
  Once the detailed assessment phase is closed, the functional analysis document is drawn up. It shows in detail the TO-BE of the process that will be automated, what the robot will do once scheduled in the production environment.

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- **Architecture & Development**: During the final phase there is the definitions of the licenses to be used and the final development of the RPA solution.

During the above-mentioned Set-Up phase, a total of five processes of recording passive documents were identified: three within the field of the Italian Electronic invoices and two among the Analogue invoicing from UE/Extra UE.

The main drivers in order to assess which processes to focus the attention to, were those most burdensome from a volume and management point of view, in order to maximize the benefits that the automation could have brought.

In fact, the aim of the robotization is precisely to automate long and repetitive processes, in order to enhance the value of people within the team and give them the necessary levers so that they can devote their precious skills, thinking and time to activities with greater value added, shifting their daily focus from data entry activities to data management and monitoring activities, whereas robots are very efficient in handling repetitive tasks, and where even a small variation in the process could compromise the result of the processing.

2.1 RPA – Process mapping

First of all, it is important to define what is a process. A process can be defined as a set of activities that might lead to a certain result. The RPA solution is useful to perform the standard activities of a process. In order to implement an RPA system, it is good to map the processes and identify which can be automated and which cannot be.

Planning underpins the implementation of any new technology. In fact, to ensure the success of the project, it is good to define the preconditions in terms of time and budget to be dedicated to the implementation of the solution. Depending on the complexity of a process, the development phase of an RPA bot can vary from a few weeks to several months or even a few years (Huang & Vasarhelyi, 2018). A company needs to have identified and documented all the processes that could be good candidates for automation. To map a process, it is necessary to list in detail all the activities performed by an employee (Lacurenzeanu, Tiron-Tudor, & Bresfelean, 2020).

The mapping of basic processes is done by means of a flow chart.

Mapping processes in the organization is important because it provides an intuitive view of the architecture and the processes within it.

In essence, to map a process, you need to

- Identify the people responsible;

- Identify the steps that make up a process;

- Trace the individual activities carried out within the process.

Below are reported two flow-charts representing the To-Be process and the steps performed by the RPA while processing the registration of an electronic invoice.

In the first flow-chart is shown the TO-BE process of registration of supply-type invoices (DDT) issued by suppliers to De'Longhi in order to be able to record the invoice on the SAP application.

Electronic Invoices with DDT
To-Be Process Flowchart with RPA
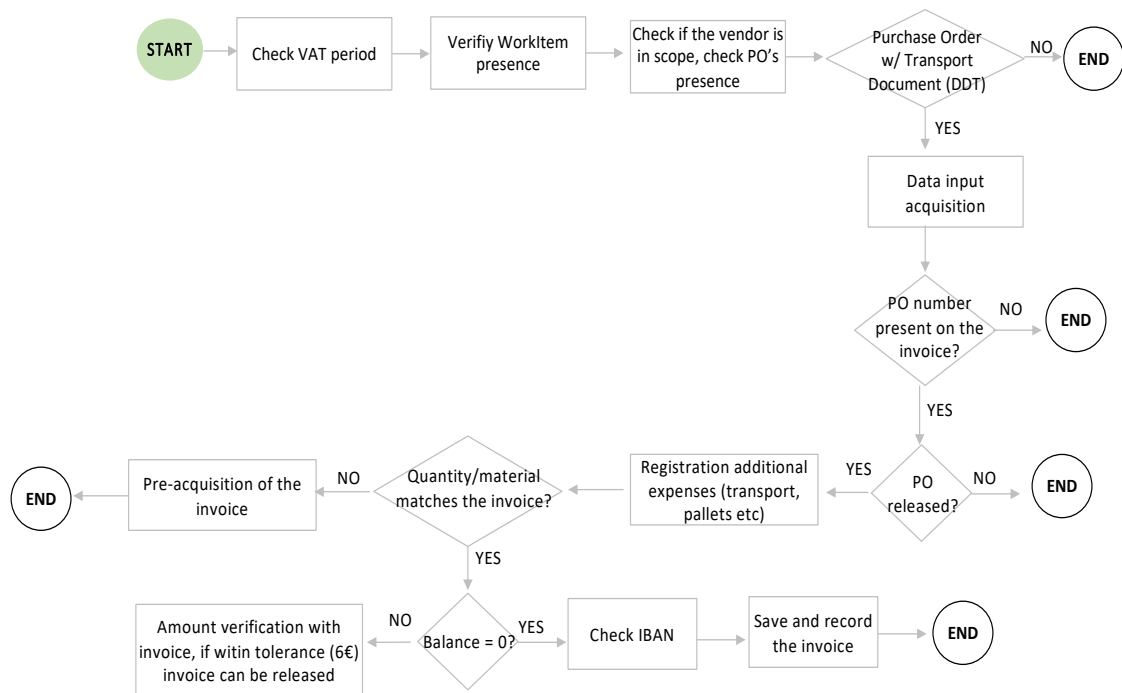
Image 8: Electronic Invoices with DDT, To-Be Process Flowchart with RPA

In the second flow-chart is shown the process that the RPA execute while processing NOLO invoices issued by suppliers to De'Longhi in order to record the invoice on the SAP application.

Specifically, the process is divided into 5 different managements according to the characteristic of the invoice under examination:

1.   Customs duties

2.   Health clearance fees

3.   Treasury/airport charges

4.   Pre-parking nolo invoices

5.   Invoices with minimum data only and which do not fall under the above cases

NOLO Electronic Invoices without DDT
To-Be Process Flowchart with RPA
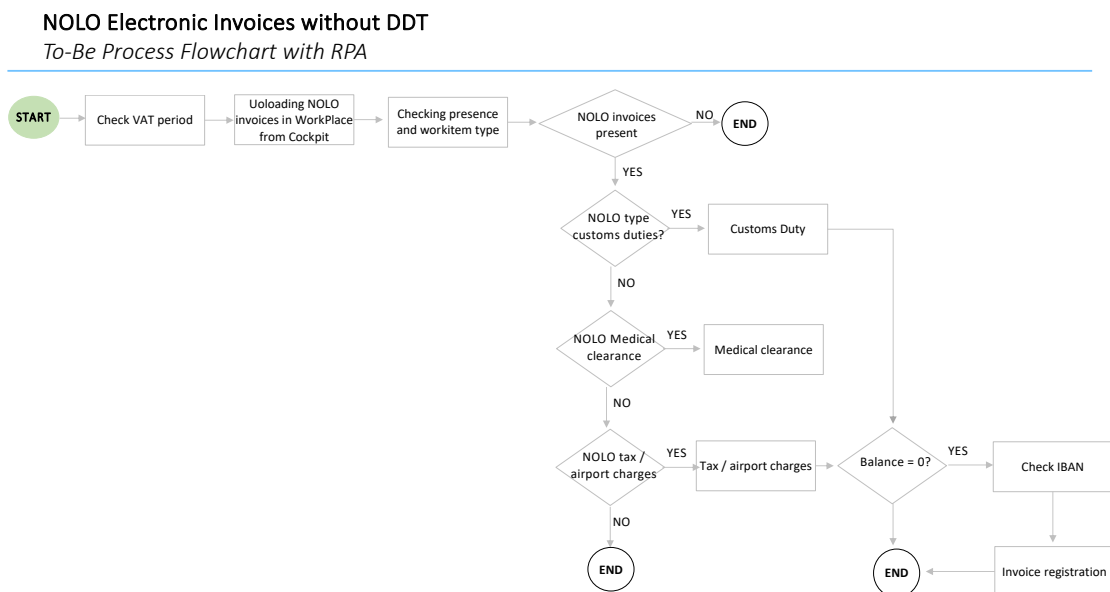
Image 9: NOLO Electronic Invoices, To-Be Process Flowchart with RPA

2.1.1 RPA – Example of invoice registration step by step

In this paragraph will be shown three examples of the step by step performed by the RPA in order to complete the registration of a passive document.

The first example would be the registration of a customs duties invoice, the second example would show the registration process of a medical clearance invoice, and finally the third and last example presented relates to the registration of an invoice with Purchase Order with all the drivers that had been necessary to map for the bot to go ahead and proceed with the registration of the same.

As can easily be guessed by looking at the examples below reported, even a very small change in how the information is displayed on the invoice, the not mapping of some keywords etc. may lead to the unprofitable result of not processing of the document itself.

EXAMPLE 1: Custom duties invoice registration, steps performed by RPA.

In the table below are reported the steps performed by the bot in order to complete, whenever is possible, the registration of a custom duties invoice.

First of all, the bot accesses the .xml file of the invoice and fill in all the document data necessary in order to start ith the registration (such as for example the invoice data, the registration date of the document, the document amount, currency, tax rate etc.). Those steps are performed for any type of registration, custom duties invoice rather than after sales invoices rather than marketing invoices with Purvhase Order.

THE ROBOT ACCESSES THE XML FILE OF THE INCOMING INVOICE TO BE PROCESSED AND COLLECTS THE DATA REQUIRED TO COMPLETE THE PROCESS.

PREVIOUS ACT.	NEXT ACT	DETAILS	SCREENSHOTS / NOTES
		• From the XML invoice, opened in the previous process step, it is necessary to retrieve: 1. Tax identification for VAT purposes 2. Document Date 3. Documet Number 4. Total amount of the invoice 5. Reason 6. Purchase Order Identifier 7. Purchase Order data 8. Description of good/service per line 9. Total amount per line 10. VAT rate (for each line present) 11. Nature of the transaction (for each line present) 12. Total taxable amount/amount 13. Normative reference (for each line present) 14. Payment due date	**Dati del cedente / prestatore** **Dati anagrafici** Identificativo fiscale ai fini IVA: **IT00162110274** Codice fiscale: **00162110274** Denominazione: **ARCHIMEDE GRUDEN SRL (VENE** Regime fiscale: **RF01** (ordinario) **Dati generali del documento** Tipologia documento: **TD01** (fattura) Valuta importi: **EUR** Data documento: **2020-06-05** (05 Giugno 2020) Numero documento: **2020-A-004905** Importo totale documento: **1013.55** Causale: **TIPO DOCUMENTO: FATTURA** Causale: **- ANNOTAZIONI:** Causale: **Ocean Vessel : TITAN Voyage : 0436-018W** Causale: **Port of Loading : YANTIAN ETS : 30/04/2020** Causale: **Port of Discharge : VENICE ETA : 30/05/2020** Causale: **Place of Delivery :** **Dati dell'ordine di acquisto** Identificativo ordine di acquisto: **5500001885** Data ordine di acquisto: **2020-05-21** (21 Maggio 2020) **Dati relativi alle linee di dettaglio della fornitura** *Nr. linea: 1* Descrizione bene/servizio: **NS RIF.: 2020-IMA-1393** Valore unitario: **0.00** Valore totale: **0.00** IVA (%): **0.00** Natura operazione: **N1** (esclusa ex art.15) *Nr. linea: 2* Descrizione bene/servizio: **VS RIF.: 4501073421** Valore unitario: **0.00** Valore totale: **0.00** IVA (%): **0.00** Natura operazione: **N1** (esclusa ex art.15) *Nr. linea: 3* Descrizione bene/servizio: **523 CTNS - KETTLES / BOLLITORI - KGS. 3760,18** Valore unitario: **0.00** Valore totale: **0.00** IVA (%): **0.00** Natura operazione: **N1** (esclusa ex art.15) *Nr. linea: 4* Descrizione bene/servizio: **CSLU2005616** Valore unitario: **0.00** Valore totale: **0.00** IVA (%): **0.00** Natura operazione: **N1** (esclusa ex art.15) *Nr. linea: 5* Descrizione bene/servizio: **DIRITTI DOGANALI LIQUIDATI IN BOLLA DOGANALE IM/A 17477T** **03/06/2020 DOGANA DI VENEZIA BOLLA DOGANALE ALLEGATA** Quantità: **1.00** Valore unitario: **1013.55** Valore totale: **1013.55** IVA (%): **0.00** Natura operazione: **N1** (esclusa ex art.15) **Dati di riepilogo per aliquota IVA e natur** Aliquota IVA (%): **0.00** Natura operazioni: **N1** (escluse ex art.15) Totale imponibile/importo: **1013.55** Totale imposta: **0.00** Esigibilità IVA: **I** (esigibilità immediata) Riferimento normativo: **ESC ART.15** **Dati relativi al pagamento** Condizioni di pagamento: **TP02** (pagamento completo) *Dettaglio pagamento* Modalità: **MP05** (bonifico) Data scadenza pagamento: **2020-06-06** (06 Giugno 202** Importo: **1013.55**

			Note: Rows set to 0, i.e. for which the Total Value field is '0.00', will not be taken into account by RPA.
		• Once the data have been acquired from XML, it is necessary to proceed with specific processing for the different suppliers in RPA scope.	
END Activity			

Once the bot has completed it's primarily data acquisition, let's get deeper into the process acquisition of the custom duties invoices:

Example 1: Customs duties example step by step:

In this first example are shown the steps performed by the bot in order to complete the registration.

First of all the robot search within the service description the presence of the term "customs" and the search ends with a positive result the RPA complete the booking it valorize the costs as per table mapping.

THE ROBOT REGISTERS THE INVOICE OF SUPPLIER XXX IN THE SYSTEM AFTER CHECKING WHETHER CUSTOMS CLEARANCE TOOK PLACE IN ITALY OR ABROAD.			
PREVIOUS ACT.	NEXT ACT	DETAILS	SCREENSHOTS / NOTES
		• Search within the Goods / Service Description field of line 5 of the XML the values of the CUSTOMS field of the Customs	

		AG technical table (Excel) to support the process. • Once the customs has been identified, enter the corresponding value in the field general ledger account (account L10401 is charged for domestic customs clearance, account N22020 for foreign customs clearance)	Nr. linea: 5 Descrizione bene/servizio: DIRITTI DOGANALI LIQUIDATI IN BOLLA DOGANALE DEL 28/05/20 24513.18 - DOGANA DI RIJEKA BOLLA DOGANALE ALLEGATA· Quantità: 1.00 Valore unitario: 3232.12 Valore totale: 3232.12 IVA (%): 0.00 Natura operazione: N1 (esclusa ex art.15)
	E N D	• If no duty is identified, stop processing the item • Validate the End of Processing Notes field with 'Unidentified Customs'.	Nr. linea: 5 Descrizione bene/servizio: DIRITTI DOGANALI LIQUIDATI IN BOLLA DOGANALE DEL 20/05 DOGANA DI VALENCIA BOLLA DOGANALE ALLEGATA Quantità: 1.00 Valore unitario: 5093.94 Valore totale: 5093.94 IVA (%): 0.00 Natura operazione: N1 (esclusa ex art.15)
		Dometisic customs duties (L10401)	
		• Search within the Goods/Service Description field of line 5 for an alphanumeric value consisting of only initial numeric values and a final letter, such is the identifier of the customs bill number. • If not identified, search on line 4 for the container number, acquire that value. If a '/' symbol is present, acquire the previous value.	Nr. linea: 5 Descrizione bene/servizio: DIRITTI DOGANALI LIQUIDATI IN BOLLA DOGANALE IM/A 18443S DE 12/06/2020 DOGANA DI VENEZIA BOLLA DOGANALE ALLEGATA Quantità: 1.00 Valore unitario: 6518.60 Valore totale: 6518.60 IVA (%): 0.00 Natura operazione: N1 (esclusa ex art.15)

- Go to the Co. Ge account tab.
- Validate a record as follows:
  - General Ledger account = "L10401" (CdC authomatically filled in)
  - Currency amount = <total taxable amount acquired by invoice>*
  - Assignment:
    If delivery note number is identified, value the field with:
    "4"&[3 space characters]&[N values "0"]&<Customs Bill Number>.**
    f no delivery note number is identified, fill in the field with the container number
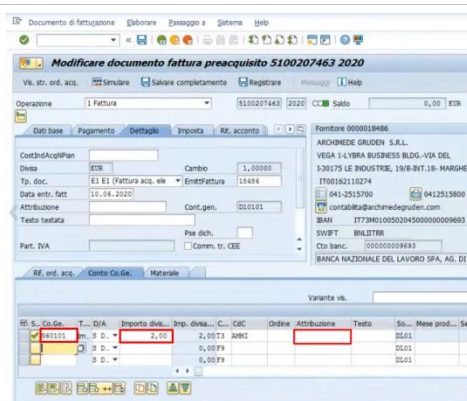
* the taxable total is entered in the Summary Data section by VAT rate and nature in the field Taxable total/amount

** the total number of characters in the Assignment field must be 11, so, after deducting the initial 4 characters given by '4' and 3 spaces, the bubble number must be preceded by as many '0's as there are 7 digits in total:
EX:
N custom = 12345A
  ➔ Assignment = 4   012345A

- Conclude the processing by filling in the registration form:
  - Payment condition = "0150", at sight
  - Doc type = "E1"

		• If balance = 0, proceed to step 4 (check IBAN).	
	E N D	• If Balance <> 0, end processing of the item and value the Notes field of the end processing file with 'Balance <> 0'.	
		• Foreign custom duties (N22020)	
		• Within the field Description Good/ service of line 4 the container number is indicated, acquire this value. If a '/' symbol is present, acquire the previous value.	Nr. linea: 4 Descrizione bene/servizio: TCNU4796490/OOLU9852453/TCNU5579518 Valore unitario: 0.00 Valore totale: 0.00 IVA (%): 0.00 Natura operazione: N1 (esclusa ex art.15) Nr. linea: 5 Descrizione bene/servizio: DIRITTI DOGANALI LIQUIDATI IN BOLLA DOGANALE DEL 20/05 DOGANA DI VALENCIA BOLLA DOGANALE ALLEGATA Quantità: 1.00 Valore unitario: 5093.94 Valore totale: 5093.94 IVA (%): 0.00 Natura operazione: N1 (esclusa ex art.15)
		• Conclude the processing by filling in the registration form: o Payment condition = "0150", at sight o Doc type = "E1"	
		• If balance = 0, proceed to step 4	
	E N D	• If Balance <> 0, end processing of the item and value the Notes field of the end processing file with 'Balance <> 0'.	
END Activity			

Example 2: Medical clearance example step by step:

In this second example are shown the steps performed by the bot in order to complete the registration.

First of all the robot access also in this case the .xml file in order to acquire the data of the related invoice.

Once it has completed this stage, there is the imputation of the costs related to the service (In this case the service offered is the medical clearance).

THE ROBOT ACCESSES THE XML FILE OF THE INCOMING INVOICE TO BE PROCESSED AND COLLECTS THE DATA REQUIRED TO COMPLETE THE PROCESS.			
PREVIOUS ACT.	**NEXT ACT**	**DETTAGLI**	**SCREENSHOTS/NOTE**
		• From the XML invoice, opened in the previous process step, it is necessary to retrieve: 1. Tax identification for VAT purposes 2. Document Date 3. Documet Number 4. Total amount of the invoice 5. Reason 6. Purchase Order Identifier 7. Purchase Order data 8. Description of good/service per line 9. Total amount per line 10. VAT rate (for each line present) 11. Nature of the transaction (for each line present) 12. Total taxable amount/amount	**Dati del cedente / prestatore** **Dati anagrafici** Identificativo fiscale ai fini IVA: **IT00162110274** Codice fiscale: **00162110274** Denominazione: **ARCHIMEDE GRUDEN SRL (VENEZI** Regime fiscale: **RF01** (ordinario) **Dati generali del documento** Tipologia documento: **TD01** (fattura) Valuta importi: **EUR** Data documento: **2020-06-05** (05 Giugno 2020) Numero documento: **2020-A-004905** Importo totale documento: **1013.55** Causale: **TIPO DOCUMENTO: FATTURA** Causale: **- ANNOTAZIONI:** Causale: **Ocean Vessel : TITAN Voyage : 0436-018W** Causale: **Port of Loading : YANTIAN ETS : 30/04/2020** Causale: **Port of Discharge : VENICE ETA : 30/05/2020** Causale: **Place of Delivery :** **Dati dell'ordine di acquisto** Identificativo ordine di acquisto: **5500001885** Data ordine di acquisto: **2020-05-21** (21 Maggio 2020)

		13. Normative reference (for each line present) 14. Payment due date	**Dati relativi alle linee di dettaglio della fornitura** *Nr. linea: 1* Descrizione bene/servizio: NS RIF.: 2020-IMA-1393 Valore unitario: 0.00 Valore totale: 0.00 IVA (%): 0.00 Natura operazione: N1 (esclusa ex art.15) *Nr. linea: 2* Descrizione bene/servizio: VS RIF.: 4501073421 Valore unitario: 0.00 Valore totale: 0.00 IVA (%): 0.00 Natura operazione: N1 (esclusa ex art.15) *Nr. linea: 3* Descrizione bene/servizio: 523 CTNS - KETTLES / BOLLITORI - KGS. 3760,18 Valore unitario: 0.00 Valore totale: 0.00 IVA (%): 0.00 Natura operazione: N1 (esclusa ex art.15) *Nr. linea: 4* Descrizione bene/servizio: CSLU2005616 Valore unitario: 0.00 Valore totale: 0.00 IVA (%): 0.00 Natura operazione: N1 (esclusa ex art.15) *Nr. linea: 5* Descrizione bene/servizio: DIRITTI DOGANALI LIQUIDATI IN BOLLA DOGANALE IM/A 17477T 03/06/2020 DOGANA DI VENEZIA BOLLA DOGANALE ALLEGATA Quantità: 1.00 Valore unitario: 1013.55 Valore totale: 1013.55 IVA (%): 0.00 Natura operazione: N1 (esclusa ex art.15) **Dati di riepilogo per aliquota IVA e natur** Aliquota IVA (%): 0.00 Natura operazioni: N1 (escluse ex art.15) Totale imponibile/importo: 1013.55 Totale imposta: 0.00 Esigibilità IVA: I (esigibilità immediata) Riferimento normativo: ESC ART.15 **Dati relativi al pagamento** Condizioni di pagamento: TP02 (pagamento completo) *Dettaglio pagamento* Modalità: MP05 (bonifico) Data scadenza pagamento: 2020-06-06 (06 Giugno 202 Importo: 1013.55 Note: Rows set to 0, i.e. for which the Total Value field is '0.00', will not be taken into account by RPA.
	(2)	• Proceed with next step	
END Activity			

Then, the bot search for additional charges, such as for example the stamp fees and record them accordingly to the general ledger account previously mapped.

PREVIOUS ACT.	NEXT ACT	DETAILS	SCREENSHOTS / NOTES
THE BOT VERIFIES THE PRESENCE OF LINES ON THE INVOICE RELATING TO STAMPS AND RECORDS THEM IN THE SYSTEM.			
(1)		• Identify the presence of invoice lines relating to additional stamp duties.	The identification of such lines is based on the provision to the RPA solution of technical tables containing the keywords identifying the expenses in question. If the same search for such keywords in the "Description of goods/services" field of an individual line gives a positive result, the amount of the invoice line that gave a positive result will be considered as a contribution to the interest expense. These tables will be as follows: • Keywords "Stamp" If several lines related to the same type of expense are identified on the invoice, the amounts for each line must be summed up together. The total amount will be the amount to be entered in the specific ledger account.

		Charges Stamp	
		• In the case of stamp type expenses, check that the document date falls within the range indicated by the details in the Stamp Duty technical table and that the amount indicated in the invoice line of interest is equal to the amount indicated in the same table (typically €2).	
		If one of these checks fails, enter "Stamp amount different from expected" in the end of processing notes field and do not record the expense.	
		Otherwise (OK outcome of both checks), select tab ledger account.	
		Value the first free record as follows:	
		o Ledger account = "N60101", account used for stamp.	
		o Divisional amount = sum of the total values of the lines of interest	
		o Value the VAT Code with "T3".	
		• Proceed with next steps	
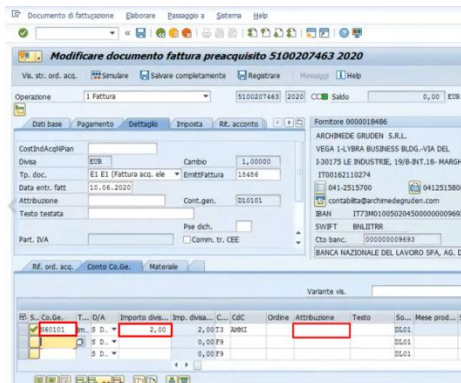
END Activity

3 – Filling out the registration form
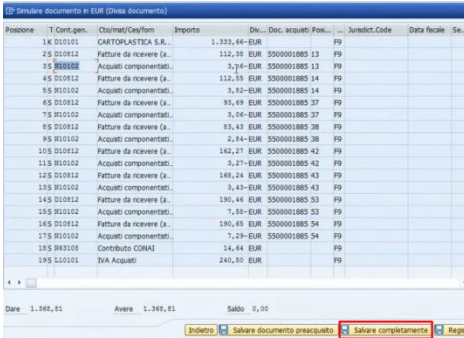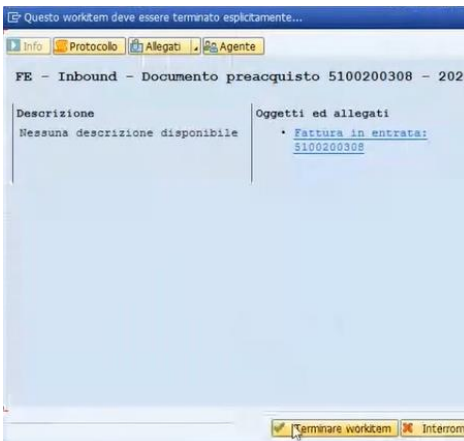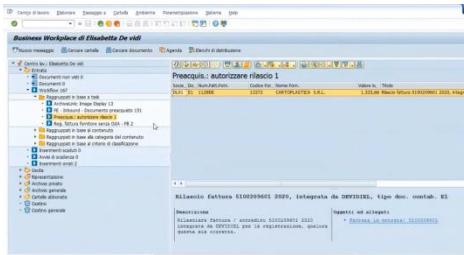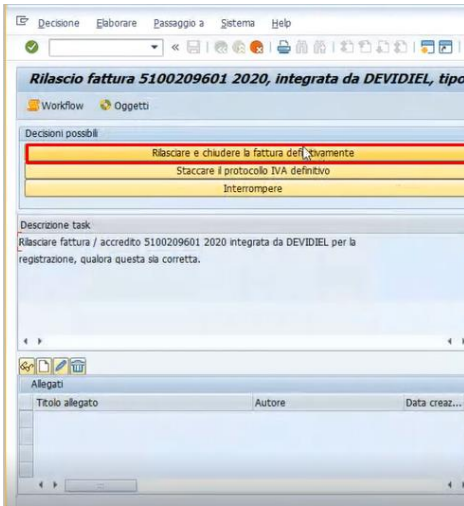
THE ROBOT REGISTERS THE INVOICE FOR MEDICAL CLEARANCE COSTS IN THE SYSTEM.

PREVIOUS ACT.	NEXT ACT	DETAILS	SCREENSHOTS / NOTES
		Accrual Management	
	9	- If the value of the XML document date field is for the year before the current year, it is an accrual. - Go to the general ledger account tab in MIRO and highlight: - Account = "L10520" (account used for accrual's management) - Currency amount = <total taxable amount acquired by invoice>	
		Accrual Management - END	
		- If it is not an accrual, value a record as follows: - Account = "N20103" (CdC filled in authmatically) - Currency amount = <total taxable amount acquired by invoice>	 *The taxable total is indicated in the Summary Data section by VAT rate and nature in the field Taxable total/amount for medical clearance expenses
		Conclude the registration by filling in also:	

		○ Paymnet condition terms= "0199" ○ Doc. type. = "E1"	
		• If balance = 0, proceed to step 4	
	E N D	• If Balance <> 0, end processing of the item and value the Notes field of the end processing file with 'Balance <> 0'.	

END Activity

The final activity in each registration is the bank details verification, in which the bot checks if the IBAN code present on the invoice matches or not the code present in the vendor master data in SAP. If the bot finds out that the two codes are not equal, it does not proceed with the registration but he preaquire and save the registration for user's proper check and verification / contact with the supplier.

THE ROBOT CHECKS WHETHER THE IBAN CODE ON THE INVOICE MATCHES ONE OF THE CODES IN THE SUPPLIER MASTER DATA IN SAP.			
PREV IOUS ACT.	NEX T ACT	DETAILS	SCREENSHOTS / NOTES
1, 2, 3		• In MIRO in the Basic Data tab click on the highlighted button to display the supplier's details	

		Details	Screenshots / Notes
		• Look up the values of the field Val. IBAN field in the Tax ID for VAT purposes field of the XML invoice	
		• If there is no match, value the Notes field of the end-of-processing file with "IBAN check KO: invoice <Identifier XML> vs MIRO <Identifier MIRO>". • Otherwise, "Check IBAN OK".	
	5	• - Proceed with item processing	
END Activity			

If the IBAN present on the invoice equals the data present on the vendor master data in SAP, the bot proceed with the registration of the invoice that can be considered concluded with the SAP release of the relative fiscal booking number.

THE ROBOT SIMULATES THE RECORDING AND REGISTERS THE ITEM, CONCLUDING THE PROCESSING.			
PREVIOUS ACT.	NEXT ACT	DETAILS	SCREENSHOTS / NOTES
9		• Click Simulate	

		• Click Save completely	
		• Click End workitem	
		• Exit the FE Inbound drawer and open the Pre-acquisition drawer • Select the document just processed	
	E N D	• Click Release and completely close invoice	

END Activity

Technical Tables

The above-mentioned technical tables allow transcoding and verification of data needed to complete the process without operator intervention during each machining operation, some examples of those table are reported below:
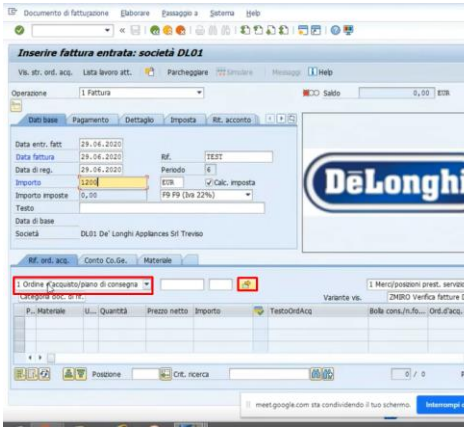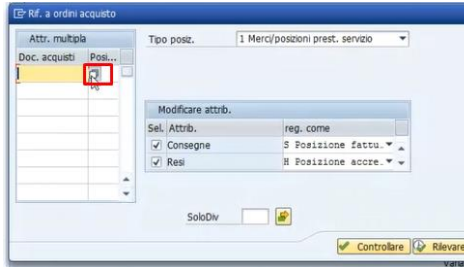
ID	Tabel	Note
1	Keywords Custom Duties	Tabel containing all the keywords o be searched in the XML file of the invoice identifying customs duty expenses. DLG_RPA_Keywords DirittiDoganali.xlsx
2	Keywords Medical Clearence	Tabel containing all the keywords o be searched in the XML file of the invoice identifying medical cleaence expenses. DLG_RPA_Keywords NullaOstaSanitario.x
3	Keywords taxes / airport charges	Tabel containing all the keywords o be searched in the XML file of the invoice identifying taxes / airport charges expenses. DLG_RPA_Keywords SpeseErarialiAerport
4	Keywords Stamp	Tabel containing all the keywords o be searched in the XML file of the invoice identifying stamps expenses. DLG_RPA_Keywords Bollo.xlsx
5	VAT Code	Normative reference coding table to be indicated in MIRO on the basis of the Transaction Nature and Normative Reference values indicated in the invoice XML
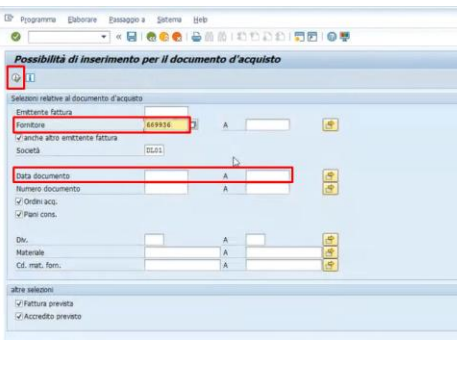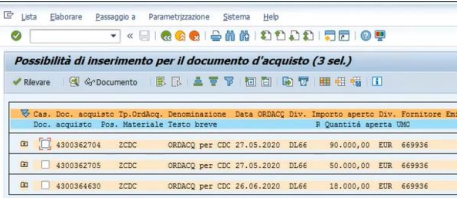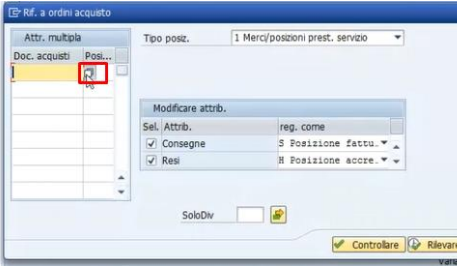
		 DLG_RPA_CodiceIV A_NatOperazione_R
6	VAT Code – Tax rate	Coding table normative reference to be indicated in MIRO on the basis of the VAT rate value indicated in the XML of the invoice DLG_RPA_CodiceIV A_AliquotaIVA.xlsx
7	Law of Reference	Table with the codes of the regulatory references in the multiple choice menu in MIRO in relation to the values of the VAT rate or the type of transaction and the regulatory reference (in the case of VAT rate = 0.00) present in the XML invoice. DLG_RPA_Riferimen ti_Normativi.xlsx

EXAMPLE 3: Electronic Invoicing registration with Purchase Order and DDt

In the table below are reported the steps performed by the bot in order to complete, whenever is possible, the registration invoice with PO and DDT.

First of all, the bot accesses the .xml file of the invoice and fill in all the document data necessary in order to start ith the registration (such as for example the invoice data, the registration date of the document, the document amount, currency, tax rate etc.).

Then the bot search for the presence of an open Purchase Order on SAP for the specific vendor of the invoice.

THE BOT PERFORMS A SEARCH FOR OPEN ODA FOR THE SUPPLIER OF INTEREST WITHIN THE INVOICE.			
PREV IOUS ACT.	NEX T ACT	DETAILS	SCREENSHOTS / NOTES
		• Double-click on the item of interest in Workplace	
		• Select "1 Purchase Order/Delivery Schedule". • Click on the highlighted button	
		• Click on the highlighted button	

		- Enhance the Supplier field with the supplier code found in Workplace - Validate the Document Date fields with the date of 1 January and 31 December of the current year, respectively - Run the transaction	
		- The system shows in the Purchase Doc. field the open POs for the supplier of interest. - Look for these values in the XML invoice layout	
		- If at least one match is found for POs starting with 59, 55, 45, 43, go back to the MIRO and enhance the window seen above with the PO value(s) identified in the invoice - Click Check	
		The system associates the selected orders with the document that is going to be booked	
	4	Proceed with transportation document verification if a PO beginning with 43* has been identified	
	E N D	- Processing of the item should be terminated if there is no correspondence between the SAP invoice and PO, or if POs that do not start with 59, 55, 45, or 43 are identified. - Insert the Notes field of the end-of-processing file with "OdA unidentified".	
END Activity			

THE ROBOT CHECKS WHETHER THE ITEM THAT HAS ODA 43* IS A DDT TYPE			
PREVIOUS ACT.	**NEXT ACT**	**DETAILS**	**SCREENSHOTS / NOTES**
		• Double click on item of interest to open MIRO • Check whether the field delivery note is assigned to at least one line with the relevant PO. • If the field Delivery note is checked, this means that there is a DDT	
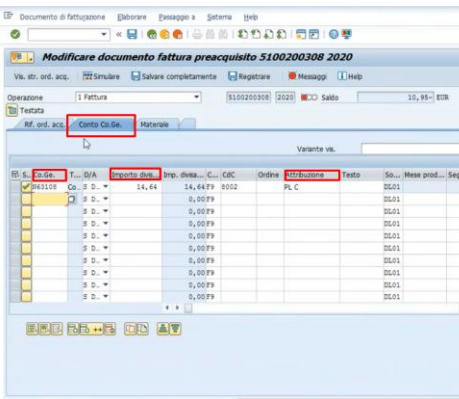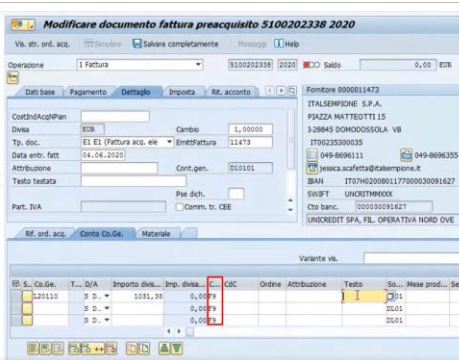
THE ROBOT ACCESSES THE XML FILE OF THE INPUT INVOICE BEING PROCESSED AND ACQUIRES THE DATA REQUIRED TO COMPLETE THE PROCESS.			
PREVIOUS ACT.	**NEXT ACT**	**DETAILS**	**SCREENSHOTS / NOTES**
		• Click on the highlighted button • Click on Attachment List	
		• Select .xml file • Click on confirm • The system would visualize the selected document	
		• From the invoice it is necessary to retrive: 15. Tax identification for VAT purposes 16. Document date 17. Document number 18. Total docuemnt amount 19. PO identifier	

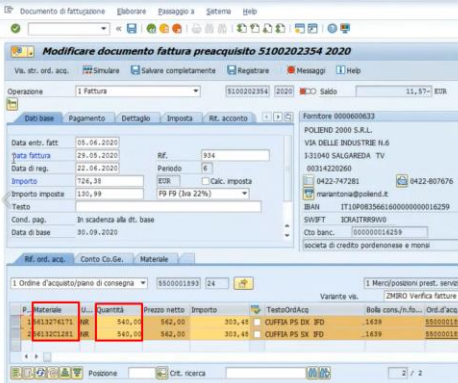|			
		20. PO's date 21. DDT number 22. DDT date 23. Good/service descpription per line 24. Total amount per line 25. VAT rate (per each line of the document) 26. Nature of transaction 27. Normative reference (for each line present) 28. Payment due date	**Dati generali del documento** Tipologia documento: **TD01** (fattura) Valuta importi: **EUR** Data documento: **2020-06-05** (05 Giugno 2020) Numero documento: **2020-A-004905** Importo totale documento: **1013.55** Causale: **TIPO DOCUMENTO: FATTURA** Causale: **- ANNOTAZIONI:** Causale: **Ocean Vessel : TITAN Voyage : 0436-018W** Causale: **Port of Loading : YANTIAN ETS : 30/04/2020** Causale: **Port of Discharge : VENICE ETA : 30/05/2020** Causale: **Place of Delivery :** **Dati dell'ordine di acquisto** Identificativo ordine di acquisto: **5500001885** Data ordine di acquisto: **2020-05-21** (21 Maggio 2020) **Dati del documento di trasporto** Numero DDT: **BC00002850** Data DDT: **2020-05-21** (21 Maggio 2020) **Dati relativi alle linee di dettaglio della fornitura** *Nr. linea: 1* Descrizione bene/servizio: **NS RIF.: 2020-IMA-1393** Valore unitario: **0.00** Valore totale: **0.00** IVA (%): **0.00** Natura operazione: **N1** (esclusa ex art.15) *Nr. linea: 2* Descrizione bene/servizio: **VS RIF.: 4501073421** Valore unitario: **0.00** Valore totale: **0.00** IVA (%): **0.00** Natura operazione: **N1** (esclusa ex art.15) *Nr. linea: 3* Descrizione bene/servizio: **523 CTNS - KETTLES / BOLLITORI - KGS. 3760,18** Valore unitario: **0.00** Valore totale: **0.00** IVA (%): **0.00** Natura operazione: **N1** (esclusa ex art.15) *Nr. linea: 4* Descrizione bene/servizio: **CSLU2005616** Valore unitario: **0.00** Valore totale: **0.00** IVA (%): **0.00** Natura operazione: **N1** (esclusa ex art.15) *Nr. linea: 5* Descrizione bene/servizio: **DIRITTI DOGANALI LIQUIDATI IN BOLLA DOGANALE IM/A 17477T** **03/06/2020 DOGANA DI VENEZIA BOLLA DOGANALE ALLEGATA** Quantità: **1.00** Valore unitario: **1013.55** Valore totale: **1013.55** IVA (%): **0.00** Natura operazione: **N1** (esclusa ex art.15) **Dati di riepilogo per aliquota IVA e natur** Aliquota IVA (%): **0.00** Natura operazioni: **N1** (escluse ex art.15) Totale imponibile/importo: **1013.55** Totale imposta: **0.00** Esigibilità IVA: **I** (esigibilità immediata) Riferimento normativo: **ESC ART.15** **Dati relativi al pagamento** Condizioni di pagamento: **TP02** (pagamento completo) *Dettaglio pagamento* Modalità: **MP05** (bonifico) Data scadenza pagamento: **2020-06-06** (06 Giugno 202) Importo: **1013.55** Note: Rows set to 0, i.e. for which the Total Value field is '0.00', will not be taken into account by RPA.
	6	• Once the data has been acquired from XML, proceed to the next step	
END Activity			

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Then the bot search for the presence any additional expenses to be valorized, such as for example transportation costs, stamp, CONAI, packaging fees etc. as shown in the table below:
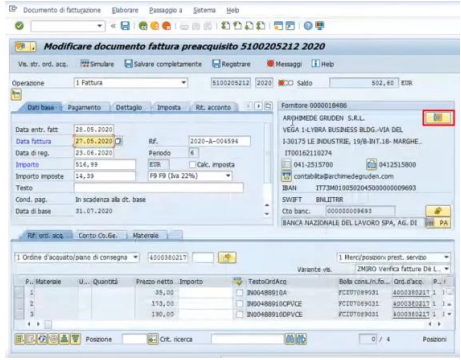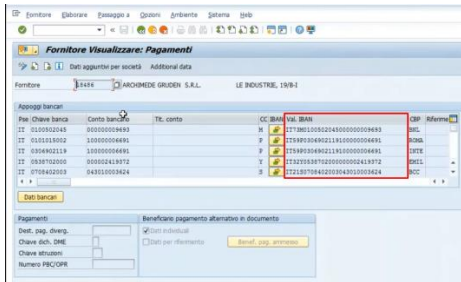
THE RPA VERIFIES THE PRESENCE ON THE INVOICE OF LINES RELATED TO STAMP/ CONAI/ TRANSPORT/ PACKAGING AND PROCEED TO REGISTER THEM IN THE SYSTEM.			
PREVIOUS ACT.	**NEXT ACT**	**DETAISL**	**SCREENSHOTS / NOTES**
		• Identify the presence of invoice lines relating to additional expenses	The identification of such lines is based on the provision to the RPA of technical tables containing the keywords identifying the expenses in question. If the search for such keywords in the "Goods/Service Description" field of an individual line finds a positive result, the amount of the invoice line that yielded a positive result will be considered as contributing to the expense of interest.These tables will be as follows: • Keywords CONAI • Keywords Bollo • Keywords Trasporti • Keywords Imballaggi If several lines relating to the same type of expense are identified in the invoices, the amounts for each line would be added together. The total amount of those will be the amount to be entered in the specific general ledger account

		CONAI expenses
		• If CONAI-type expenses are present, select tab Conto Co. Ge.
		• - Value the first free record as follows
		  ○ Account = "N63108"
		  ○ Amount = sum total values of rows of interest	

		Stamp expenses 1. If there are Stamp Duty type expenses, check that the Document Date falls within the range indicated by the details in the Stamp Duty technical table and that the amount indicated in the invoice line of interest is equal to the amount indicated in the same table.	
	E N D	2. If one of these checks fails, value the Notes field of the end-of-processing file with 'Stamp amount different from expected' and do not record the expenses. End processing of the item	
		3. If the balance is 0,00 procede with the last check (check IBAN)	
		4. Proceed with the next step otherwise	

END Activity
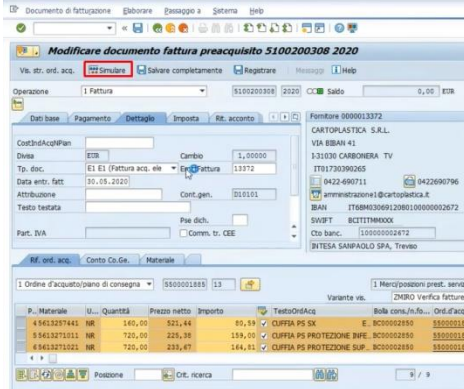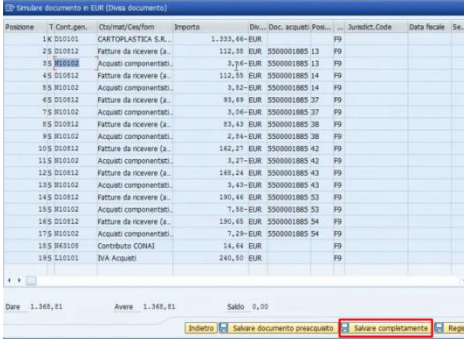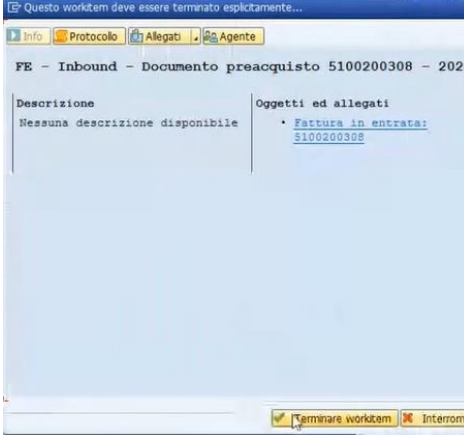
THE ROBOT, IN ORDER TO CHECK WHETHER THE LINES PRESENT IN THE MIRO ARE THE SAME AS THOSE PRESENT IN THE INVOICE, PERFORMS A MATCH BY QUANTITY AND MATERIAL VALUE
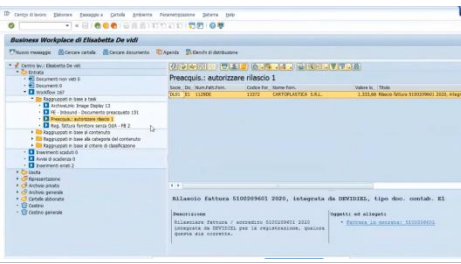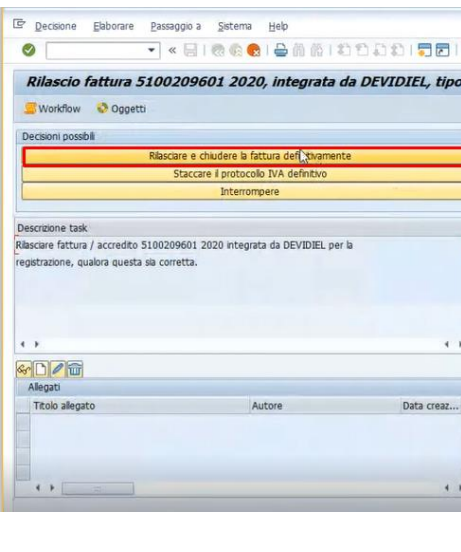
PREVIOUS ACT.	NEXT ACT	DETAILS	SCREENSHOTS / NOTES
		• Compare the values of the Quantity field of the MIRO lines with the corresponding previously acquired value of the invoice lines	
		If no 1:1 match was found for Quantity, search for Material field values given in MIRO on invoice If a match is found, filter the MIRO for those values. Once the bot has associated the MIRO-invoice rows and checked that the balance is non-zero, it verifies that the amount values of the rows matches.	
	END	Terminate processing of the item if no matches were found for Quantity and Material according to the described logic Validate the Notes field of the end of processing file with "OdA lines to be invoiced not identified".	

END Activity

The final activity in each registration is the bank details verification, in which the bot checks if the IBAN code present on the invoice matches or not the code present in the vendor master data in SAP. If the bot finds out that the two codes are not equal, it does not proceed with the registration but he preaquire and save the registration for user's proper check and verification / contact with the supplier.

| **THE ROBOT CHECKS WHETHER THE IBAN CODE ON THE INVOICE MATCHES ONE OF THE CODES IN THE SUPPLIER MASTER DATA IN SAP.** |
PREVIOUS ACT.	NEXT ACT	DETAILS	SCREENSHOTS / NOTES
1, 2, 3		• In MIRO in the Basic Data tab click on the highlighted button to display the supplier's details	
		• Look up the values of the field Val. IBAN field in the Tax ID for VAT purposes field of the XML invoice	
		• If there is no match, value the Notes field of the end-of-processing file with "IBAN check KO: invoice <Identifier XML> vs MIRO <Identifier MIRO>". • Otherwise, "Check IBAN OK".	
	5	• - Proceed with item processing	
END Activity

If the IBAN present on the invoice equals the data present on the vendor master data in SAP, the bot proceed with the registration of the invoice that can be considered concluded with the SAP release of the relative fiscal booking number.

THE ROBOT SIMULATES THE RECORDING AND REGISTERS THE ITEM, CONCLUDING THE PROCESSING.			
PREVIOUS ACT.	NEXT ACT	DETAILS	SCREENSHOTS / NOTES
9		• Click Simulate	
		• Click Save completely	
		• Click End workitem	

		• Exit the FE Inbound drawer and open the Pre-acquisition drawer • Select the document just processed	
	E *N* *D*	• Click Release and completely close invoice	

END Activity

2.1.2 RPA – Statistics

As we had the chance to see in the previous chapters, the mapping of the RPA solution had been very detailed in order to avoid as much as possible the possibility for the bot to fail the success of a passive document registration.

What is important to underline, once again, is that the bot is made to perform repetitive and already mapped tasks, which means that even a small variation in the process' mapping may lead to run-out of the registration, for example a word that has not been mapped on the keywords table or a new customs not previously mapped, are all exceptions that might arise and is important to map so that they are not discarded in the future.

In the graphs below are reported two statistics for the month of July 2021, 1 month after the go live of the RPA solution. The first graph shows the report on the electronic invoicing with Purchase Order, the second graph represents the statistics for the NOLO processes (logistics passive documents).
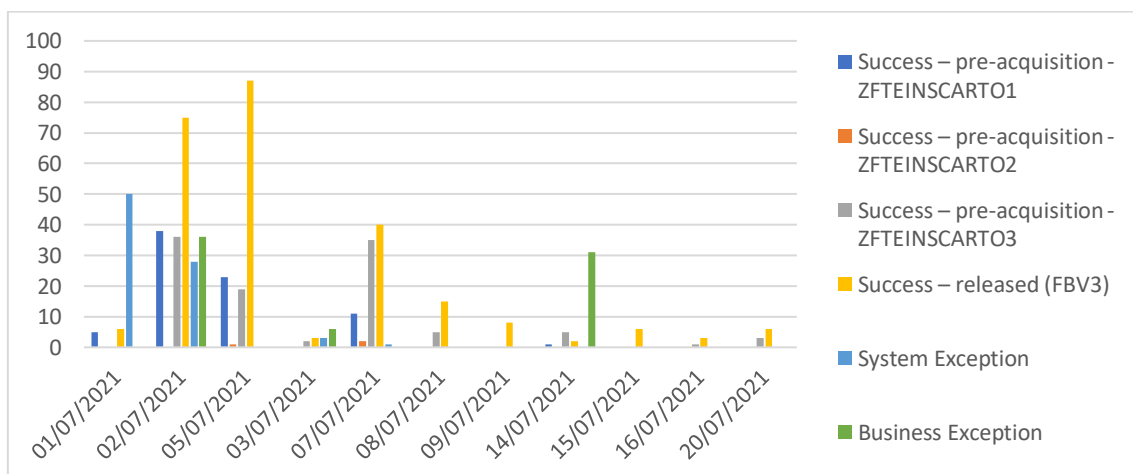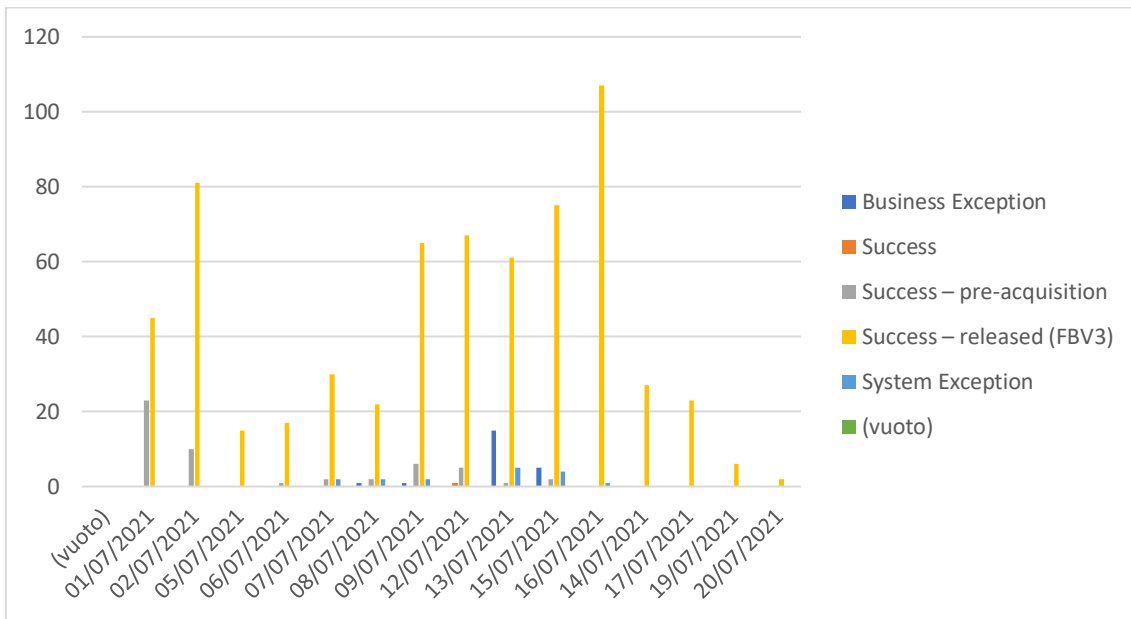
Two years later, on July 2023, the statistics shows relevant changes in terms of profitability and efficiency of the RPA solution within the Finance and Accounting Department.

Tipe of registration	Success – pre-acquisition	Success – released (FBV3)	System Exception	Total	Successful (%)
NOLO_E	314	1238	1	1553	100%
DDT_E	166	465	0	631	100%
DDT_A	23	59	2	84	98%
DGN_A	0	0	0	0	0%
Total	**503**	**1762**	**3**	**2268**	100%

2.2 RPA Investment - Costs and Savings

The implementation of such a solution, the RPA, within a business is not an easy choice. It is an important investment, both from an economic point of view, but also because of the effort spent to make this project come to life.

During an economic evaluation of the investment, the two major cost drivers that have to be considered are: The consulting services (in this case from EY that helped the Group to implement the RPA in the Finance department) and of course the Maintenance costs needed to make the solutions persists over time.

In the table below are shown an estimate of the costs incurred by the Group:

The total consulting services fee was equal to 180.000,00€ in order to implement the whole process from scratch and having the support of the consulting firm among all the pre and post implementation of the services.

Another variable to be considered are of course the maintenance costs that are the costs incurred by the organization in order to keep the assets, in this case the RPA, run properly over time. The total maintenance costs is equal to 60.000,00€ and it is comprehensive of the yearly amortization of the hardware, the annual licences of the bots and an estimation of annual maintenance done by the internal IT department.

COSTS STRUCTURE

Consulting Services	Maintenance Costs
€180.000 Invoices Posting €60.000 Treasury Back Office €50.000 Master Data €20.000 Tax Compliance €50.000	**€60.000** Amm. Hardware x year €10.000 Annual Licences BOT €30.000 Annual maintenance €20.000

Image10: RPA cost structure

Therefore, in order to evaluate the impact of such an investment within the core of a business, it is important to calculate which is the return on the investment (ROI). The classic definition of the return on investment (ROI) of the Robotic Process Automation, is the net profit divided by the costs incurred. ROI is an important tool used to measure the impact of the RPA solution with datas. In the case of RPA, profit can be calculated by subtracting the total costs incurred to implement the RPA (consulting services costs + maintenance costs) from the total costs of employing people to perform the same tasks.

As shown in the table below, despite from the very first year where is shown a negative impact on the ROI due to the important initial investment that makes the Total Costs greater than the Total Saving, from year two on the total cost would lower the impact on the return of investment and have a positive impact on the investment itself, generating a savings that is able to overcome the costs. It is

expected that on year 3 the Progressive Impact on the ROI would be positive and equal to 261.750,00 €.

	Year 1	Year 2	Year 3
Consulting Services	€180.000	-	-
Maintenace Costs	€60.000	€60.000	€60.000
Total Costs	**€240.000**	**€60.000**	**€60.000**
Saving people	€175.000	€175.000	€175.000
Data quality/ Sinergy	€32.250	€32.250	€32.250
Total Savings	**€207.250**	**€207.250**	**€207.250**
Annual Impact	(€32.750)	€147.250	€147.250
Progressive Impact	**(€32.750)**	**€114.500**	**€261.750**
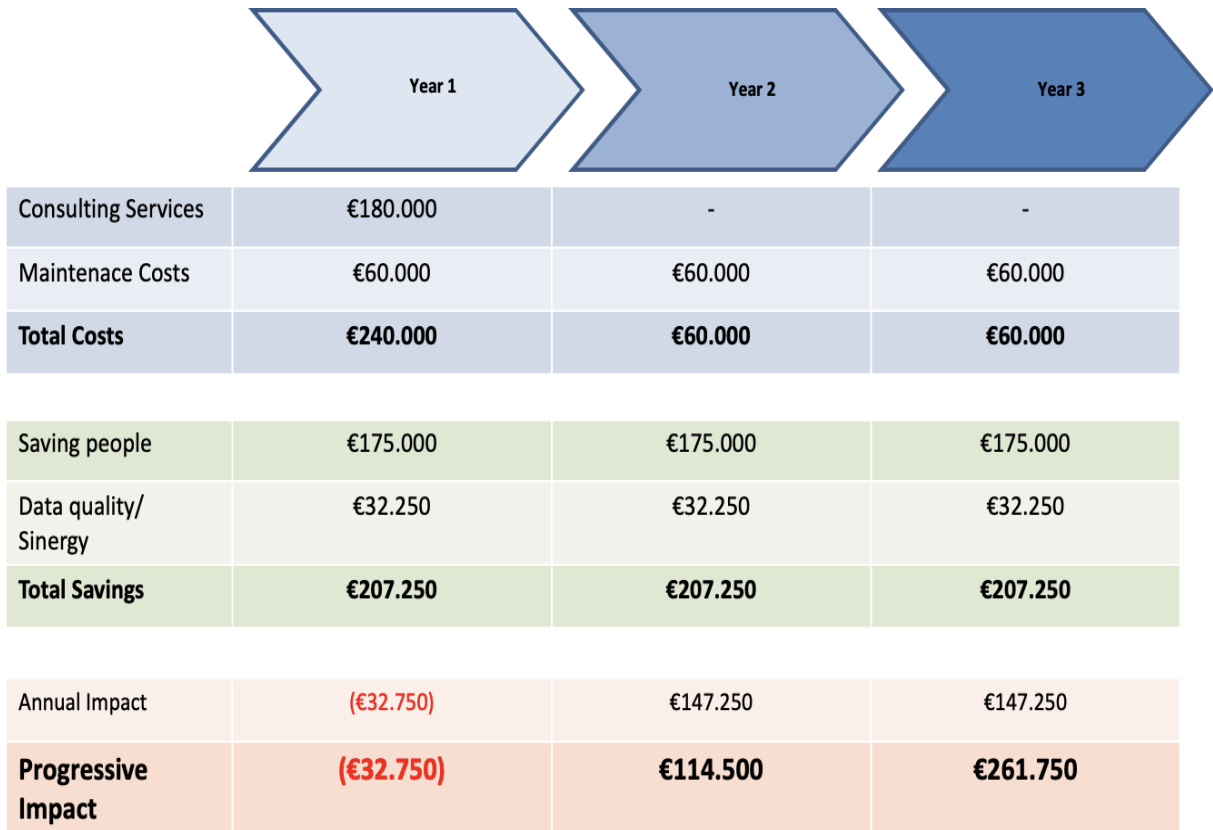
Image11: RPA Return on Investment

Since as we already seen, the RPA projects involve many moving parts and nuances, we need to go beyond a simple equation in order to understand the real return on investment that it carries out.

Below are indeed reported some of the major savings that a business can face while adopting a new RPA solution:

Labor cost savings	Time savings	Reduction in human errors and related costs	Speed of RPA implementation
Statistically, an RPA solution works at ⅓ of the cost of the companies' offshore resources and 1/10 of its onshore resources.	Using RPA bots can significantly reduce processing times, in some cases from weeks to seconds.	Implementing RPA can help weed out operational errors and reduce costs related to fixing them.	The average time it takes to automate a process using RPA is from several days to a couple of weeks.

CHAPTER III: E-INVOICING, EUROPEAN SCENARIO

3.1. – E-invoicing, centralized and decentralized clearence models

The term Electronic Invoicing (EI) refers to the process by which an invoice document is issued, sent, kept and stored entirely in a digital way.

This process, precisely defined by the legislator (both Italian and European), is based on three main principles:

1.   Dematerialization, as it excludes the paper format.

2.   Integration, as it provides for the existence of computerized generation, issuing and storage models with the aim of protecting the counterparties (customer, supplier and verifier).

3.   Collaboration, as customer and supplier have to agree on "how" the invoice will be generated and then issued.

The international E-Invoicing scenario is constantly evolving in terms of processes, technical specifications, regulations and compliance.
The lack of a global or European standard to rely on creates a situation of extreme fragmentation at a global level, as each country has its own technical rules and laws that need to be adapted, creating a very difficult and complicated tax-compliance environment for companies that operate also abroad especially while dealing with the way they manage invoices.

As stated in Aleksandra Bal essay on EU E-invoicing : « Many of the most confusing changes revolve around an emerging standard called "*invoice clearance*," which requires businesses to issue invoices in a machine-readable format and have them validated by tax administrators or outsourced providers, before sending them on to customers ».

An invoice clearance model involves three parties: the buyer, the seller and the tax authority which has to validate, to clear more precisely, the electronic invoice before this last one is issued to the recipient, in order to provide to the competent tax authority, the visibility of the hole economic activity.
In this way would also be overcome the delay, between transaction and reporting, encountered by the tax authority to detect any suspicious transaction.
Nowadays, in-fact in many countries the traditional periodic tax reporting transfers the data to the tax administration monthly, if not even quarterly basis. The invoice clarence model can also be used as a very important tool in order to detect, combat and reduce the tax fraud.

We can distinguish between two major types of invoices clearence models: a centralized clearence model and a decentralized clearence model.

1. The centralized clearence model can be defined as a form of real-time reporting where e-invoices are cleared and validated through a central platform deployed by the Tax Administration.
   Taxpayers are required to submit their invoices, in a standardized format, to the competent Tax Authority for 'clearance'.

   Italy was the very first country that in 2019 introduced a centralized clearence model with the launch of the so-called Sistema di Interscambio (SdI).

As shown in the image below with the SDI all taxpayers are obliged to send their electronic invoices, in a standardized format called FatturaPA to the Tax Authority (1); The Tax Authority is in charge of the approval the invoice (2) in order to then forward it to the buyer (3). Once the buyer has received the e-invoice has to send a confirmation of receipt back to the Tax Authority (4).
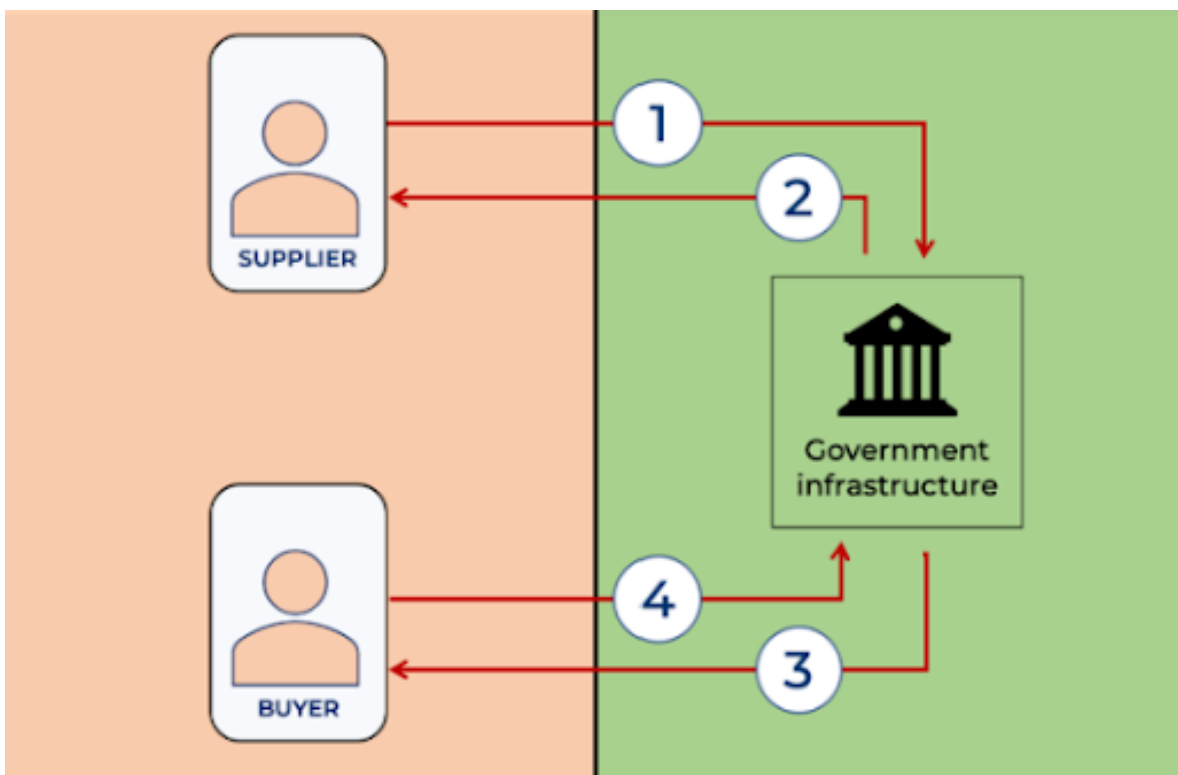

Image12: Centralised clearence, Peppol (2021)

2. On the other hand, on a decentralized clearence model the competent Tax Authority outsources the clearence process to a third-party service provider who needs to validate the invoice data and send it back to the relative tax authorities. This clearence model is quite popular among Latin Amrican

countries such as Mexico and Guatemala. No countries in the Europen Union has instituted this model yet, but France is expected to be the very first to apply this approach with their *Plateforme de Dématérialisation Partenaire (PDP)*.
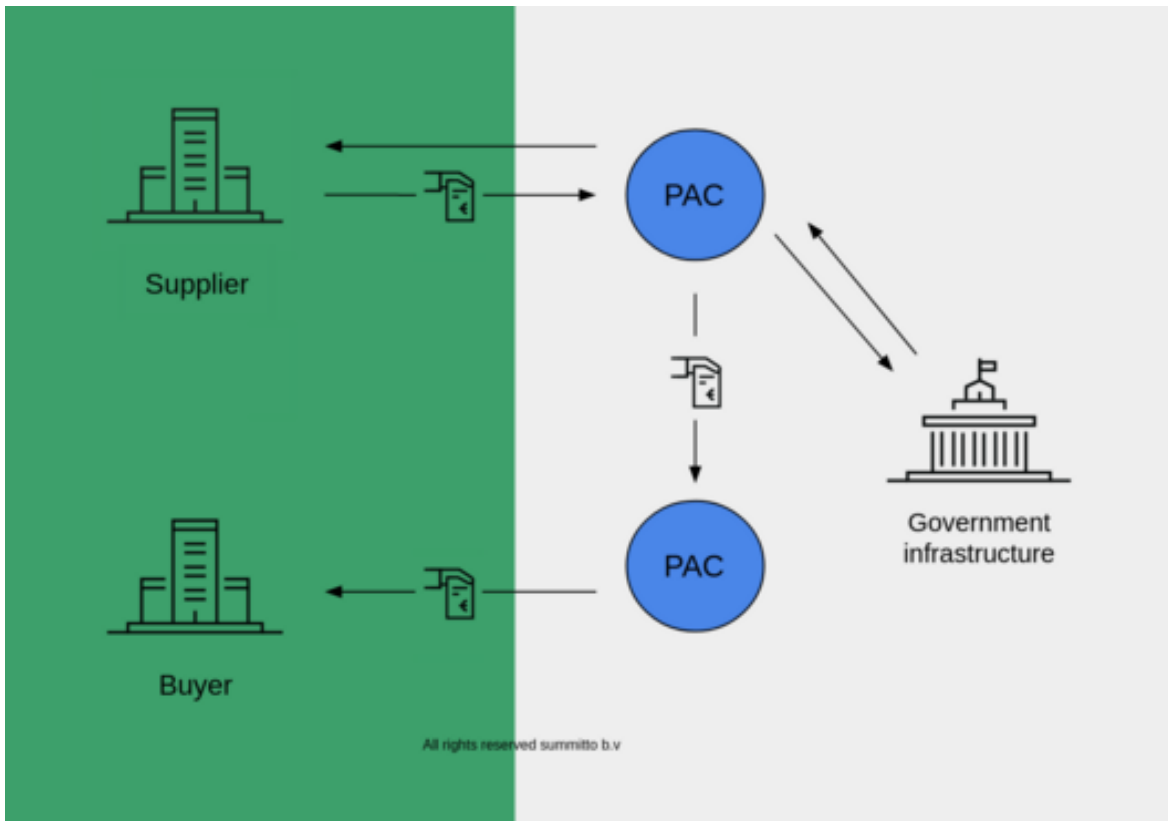
Image 13: Decentralised clearence, Summitto (2022)

There are several pros and cons of adopting a decentralized clearence model for invoicing. Benefits include the fact that in this way the system would be less vulnerable towards failures of a central platform, moreover can increase the stability for businesses and reduce their implementation costs by allowing businesses to maintain their invoice flow.
On the downside is that the process might be more vulnerable to corruption if it is delegated to a third party.

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3.2 -cNext steps on European E-invoicing. European Roadmap on following countries to adopt electronic invoicing.

Nowadays, we are facing a very dynamic time for E-invoicing legislation in Europe, with many changes taking place.

The implementation of mandatory B2B schemes has been announced in several countries. For example, compliance is expected to begin in Poland from January 2024, and in France in mid-2024. In Spain, the relevant decree is still pending for approval, but the necessary infrastructure is already in place to ensure compliance. Belgium and Germany have both declared their intention to introduce the B2B obligation. In Germany, the use of e-billing has been agreed upon by the government.

When companies need to e-invoice abroad, they face two practical problems. First of all, they need to communicate the information according to the technical and tax specifications of each country.

The second issue is purely technical. Not all companies are flawless from an IT perspective. For instance, not all companies have a central ERP to govern their systems, resulting in a significant fragmentation of applications that creates enormous management difficulties. Creating customized infrastructures at the level of individual countries and individual ERPs becomes complex for the development and maintenance of systems. From a technical perspective, there are challenges with anomalous file archiving. It is necessary to ensure archiving according to the specifications of each individual country.

All of the above-mentioned challenges are further complicated by the lack of harmonization of the electronic invoicing tools, because each country has its own format, rules, processes, and activities, which have significant impacts on business systems.

For that reason, in February 2022, the European Parliament has called on the European Commission to establish an harmonized common standards for E-invoicing across the European Union, and the 'race to comply' by member states and businesses has already begun.

Upcoming B2B E-Invoicing mandates in Europe

Green = confirmed, Red = draft/proposal/rumor
Update: September 25, 2023

Jul 1, 2024	Jan 1, 2025	Jan 1, 2026	March or Oct 2026	Jul 20, 05	Date unknown
Poland	**Spain**	**Germany**	**France**	**ViDA (EU)**	**: Bulgaria, Finland, Hungary, Lithuania, Luxembourg, Slovakia, Slovenia, Sweden**
EU Approved, law enacted, format available, tax technical regulations issued, Q&A issued	No EU approval yet, enacted in law, draft Royal decree available	EU approved	France: EU approved, law enacted. Implementation postponed , new date not yet known	Dreaft under dicussion in European Council	
Romania	**Lavia, Croatia, Greece**	**Belgium**			
EU approved, no law for the extended mandate, no tax technical requirements issued (E-Reporting as of Jan 1, 2024)	No EU approval yet - no further details known	No EU approval yet, draft law			

Image 14: Upcoming B2B E-invoicing European scenario

The table above represents a roadmap of the next steps that the European scenario will face on his journey to implement the electronic invoicing in the B2B sector.

Although the B2G (Business to Government) obligation is almost fully implemented, no country has yet introduced constraints on invoicing between private individuals, i.e. B2B (Business to Business) and B2C (Business to Consumers).

The most relevant upcoming dates to watch out for B2B Electronic invoicing are:

- In France, the B2B obligation will be gradually introduced starting from June 2024. This will be done through a 3-stage plan that should be completed by 2026, involving first large companies and gradually all companies.

- In Spain, a law is currently being passed that will introduce the B2B e-billing obligation through two gradual phases. However, within the next couple of years, the use of e-invoicing will be unavoidable.

- In Poland, the local KSEF platform has been in use since January 2022, allowing for the electronic handling of B2B invoices. Although currently optional, its use is expected to become mandatory from July 2024.

- Romania: starting from July 2022 a partial B2B obligation comes into force, linked to the sale of several goods considered to be at higher risk of tax fraud. From January 2024 the e-invoice has been extended to the whole sector.

The adoption of e-invoices often involves implementing additional measures such as Continuous Transaction Control (CTC) to manage tax obligations digitally and improve traceability.

SAF-T is a commonly used protocol in multiple countries for communicating tax data to authorities. This protocol enables communication of the required data to the authority in accordance with the legislation of each state. The structured path

has various profiles depending on the country of reference. Although it is the same communication protocol, there may be differences in layout, periodicity (annual, six-monthly, monthly, or only at the request of the reference authority), and type of data to be submitted.

Several European countries have adopted this protocol, including:

Portugal,

Austria,

Luxembourg,

Norway,

Romania,

and Poland (where it is known as JPK).

Other states have instead decided to adopt similar solutions, but based on national technologies and platforms, for example:

- Spain has adopted a solution called SII
- Germany communicates balance sheet data via the E-Bilanz protocol.
- Greece through the myDATA platform.

We can therefore conclude by saying that electronic invoicing has become a popular tool all other the world in order to improve public finance monitoring and t process efficiency.

CONCLUSIONS

This thesis work has examined the major impacts that digital transformation and Artificial Intelligence (AI) have brought in most sectors and how markets are nowadays undergoing and learning to cope with them.
Digitization is helping organizations to reduce costs, improve operational efficiency, understand market trends and enhance the customer experience.

Digitalization and Artificial Intelligence would play even more a key role during the next few years in order to cope with the constantly increasing rate of denatality and declining population growth, because the use of Artificial Intelligence would help counteract the effects of demographic decline and help companies become more labour efficient

The demographic crisis is still underestimated, despite the fact that population decline and ageing might lead to a loss of 1/3 of GDP as early as 2050.
So far, the measures taken by companies and the Italian government in order to boost the birth rate, have proved to be insufficient to tackle the demographic crisis.
It is in this optic that the contribution that artificial intelligence can make to the Italian economy, which is threatened by a demographic winter, becomes interesting.
As we had the chance to see also during this thesis work, when it comes to artificial intelligence, the greatest fear that population have is that the AI would replace them in total at work and leave them at home unemployed. With data in hand, in Italy this potential disadvantage could become a great opportunity: by filling the labour gap created by the demographic crisis, artificial intelligence could keep the Italian economy afloat and, according to some estimates, even improve it.

As stated in an Adnkronos article about Artificial Intelligence, this on the contrary could bring several advantages such as:

- *An increased work efficiency*: Artificial Intelligence can help businesses, professionals and workers to improve operational efficiency and gain a competitive advantage. The AI can automate production processes, reduce human error and improve the quality of products and services.

- *Production process automation*: it can play a key role in automating project management workflows.
  AI can be used for various purposes such as predictive maintenance, detection of poor-quality products, factory automation, product design automation, robotic intelligence, as well as in logistics and planning for more accurate delivery time prediction, business trend forecasting and even security.

- *Waste reduction*: by improving efficiency in various sectors such as manufacturing, healthcare and transport, AI can reduce costs and waste in production processes, which also benefits the environment.

Pwc estimates states that Artificial Intelligence can increase the global GDP by 26% by the end of 2030. An estimate for Italy comes from Accenture, according to which the greater diffusion of AI could generate a GDP increase of around 2.9% by 2035. However, it must be recognized that it is currently very difficult to make precise estimates of the future impact of this technology.

What we can say for sure, to conclude, is that Artificial Intelligence and new technologies in general, if properly harnessed, could become the beating engine of the global economy and overcome the problem of an aging population.

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Last but not least, I would like to acknowledge all my colleagues and Giovanni and Rossella for giving me the chance to cope with such a great project, the RPA, and for always have believed in me and in my potential.

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