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# FEASIBILITY EVALUATION OF AN RPA IMPLEMENTATION IN SIEMENS HEALTHINEERS INTERNAL CONTROLS

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**Abstract**

The present Working Project aims at studying the topic of Robot Process Automation (RPA) in a specific organizational context of a medical technology company. For this purpose, a time feasibility test was designed to help support the decision, as a first stage, of implementing the aforementioned technology in internal controls. In the end, the test was successfully applied for two internal controls that performed monthly, by the HUB for internal audit purposes. Although the fully operationalization of the RPA itself proved not to be possible during the project's timespan, it is expected to occur in the approaching future.

**Keywords:** RPA, Internal Controls, Internal Audit, Medical Technology Companies.

## 1. Introduction

Today's companies face a business environment of uncertainty and risk, resulting from markets' globalization, rigorous regulation, technological advancements and enterprise scandals (Kapoor and Brozzetti, 2012). Senior management is required to supervise and control activities, so that the achievement of corporate objectives is realized. As a matter of fact, the establishment of the Sarbanes Oxley-Act has emphasised even more the need for supervision, internal controls and corporate governance (Sarens and De Beelde, 2006). Therefore, companies are demanding increasing assurance over risks, operations and control.

Robot Process Automation (RPA) appeared as a technological advancement that, when applied to the corporate world, help enterprises with this current quandary. This recent technique consists in the development of a system that would perform extremely repetitive tasks instead of a human, which, in the end, will result, in both, an efficiency gain and, also, would help decrease the existence of human errors.

Therefore, the following research, which is a Directed Research Internship, aims at exploring the first stage to a fully implementation of the RPA by designing a time feasibility test and, afterwards, apply it for two internal controls of Siemens Healthineers, a German multinational medical technology company. In such manner, the researcher actively participates in the investigation, which follows a qualitative approach.

The report is composed of five sections, being this introduction the first. Section 2 reviews the empirical literature regarding the key concepts related to RPA. In Section 3, the methodology and research question are discussed. Section 4 discusses the design and implementation of the feasibility test and provides recommendations for the company. Finally, Section 5 compiles the main contributions and limitations of this research.

## 2. Literature Review

### 2.1. Internal Audit

As it is well established, public traded companies must be subject to external audit in order to guarantee that the financial statements are presented accordingly to the accepted accounting principles. However, as history demonstrates, having only an external audit cannot be enough to prevent error/fraud (Petraşcu and Tieanu, 2014). Moreover, fraud, nowadays, is considered to be one of the most important risks to what enterprises are exposed to and "*having a close connection to market, credit, judicial or reputational risks*" (Munteanu et al., 2010, p. 33). For that reason, such companies would benefit from having an Internal Auditing Function (hereby IAF) as the contributions provided by internal auditors could be helpful in identifying and reducing corporate risk (Raiborn et al., 2017). With this in mind, in 2013, the NASDAQ Stock Market LLC proposed to the Securities and Exchange Commission (SEC) to require listed companies to establish and maintain an internal audit function (SEC, 2013a), in order to reduce accounting scandals and schemes.

Internal audit is defined, by the Institute of Internal Auditors (hereafter IIA), as *"an independent, objective assurance and consulting activity designed to add value and improve an organization's operations. It helps an organization accomplish its objectives by bringing a systematic, disciplined approach to evaluate and improve the effectiveness of risk management, control, and governance processes (…)"* (IIA, 2010, p. 2). Furthermore, Rossiter (2011) explained that the focus of external auditors is very different from the focus of internal auditing. Whilst, external auditors, as mentioned above, are mainly focused in assuring the financial statements are in accordance with the accounting principles, the internal auditors' tasks goes beyond this to risk management, control and governance processes of the entire organization. Moreover, if, by any chance, external auditors perform activities that should be done by internal

auditors, which was the Enron´s case, the corporate governance process can collapse, or even the company itself (Wilson et al., 2014). Also, this function may be provided by a department within the company, that specializes in this area, called "in-house", or may be outsourced to another company. Despite the pros and cons of both options, the organization believes that, regardless of who provides the service, the strategic objectives of the corporation are best dealt with if the IAF activities are completed by staff that have sufficient knowledge and access to the necessary resources in conformity with the International Standards for the Professional Practice of Internal Auditing as promulgated by the IIA (2009, 2012).

A prior study, conducted by Eighme and Cashell (2002), consider the role developed by internal auditing in detecting and constraining earnings management may be a great aid in complementing the work developed by external auditors. Additionally, according to prior literature, if a corporation has a high-quality IAF, capable of resisting any kind of external pressures, is more likely to increase its financial reporting quality; this is so as the corporation would be able to detect and deter any opportunistic or biased judgements made by management more efficiently (Prawitt et al. 2009).

### 2.2. History of Internal Controls

Throughout the years the economy has been presented with some of the worse accounting scandals and schemes that ever existed. Cases, like Enron and WorldCom are some examples of such incidents that resulted in severe internal control deficiencies. However, this is just recent evidence of the internal control's existence. In order to capture the true essence of the subject, one should go back in time to ancient civilizations. At that time, it could already be found some primitive examples of internal controls, such as the records of grain in public warehouses (Hain, 1966, p. 699) or records of Greek merchants trading throughout the eastern Mediterranean and the Middle East (ibid, p. 701).

As shown above, in the most simplistic legal systems, where the power was concentrated in some sort of central authority figure, such as the Monarch, internal controls were relatively simple and were mainly related to inventory recording and theft protection. However, as society has become more and more complex and the assets are owned not by a single person, but by corporations instead, and are possessed by a wide variety of agents, the purpose of internal controls have increased. Nowadays, besides the initial purpose, internal controls provide a certain level of assurance that the financial statements are reliable, boosts a use of the assets that is more efficient and finally helps to monitor the faithfulness by management and employees to corporate policies (Wilson et al., 2014). The first two of these purposes are categorised as "accounting" internal controls and the last two as "administrative" internal controls (ibid). Accordingly, the difference between accounting controls and administrative controls is that the first ones were defined as those related mainly with guaranteeing the trustworthiness of the financial records and the protection of assets, such as systems of authorization and approval or physical controls over assets, and the latter were defined as those that, mainly, have to do with compliance to management policies and operational efficiency, such as statistical analysis or quality controls (Wilson et al., 2014; AICPA, 1958).

Despite the existence of internal controls since the ancient times, it was not until 1949 that they were firstly professionally defined by the Committee on Accounting Procedure. The concept was described as *"Internal Controls comprise the plan of organization and all of the coordinate methods and measures adopted within a business to safeguards its assets, check the accuracy prescribed managerial policies"* (American Institute of Certified Public Accountants [AICPA], 1949, p. 6). Throughout the following forty to fifty years, the definition would suffer some significant changes, before the version of 1992, which is the current one. The most significant change occurred in 1977, where rules were defined for the first time, regarding financial reporting and internal controls, that would apply for all public held companies. In the current

version, internal controls are defined as *"a process, effected by an entity's board of directors, management, and other personnel, designed to provide reasonable assurance regarding the achievement of objectives of the following categories: effectiveness and efficiency of operations, reliability of financial reporting and compliance with applicable laws and regulations"* (Committee of Sponsoring Organizations of the Treadway Commission [COSO], 1992, p. 94). With this in mind, controls were to be considered effective if *"managers and directors understand the extent to which the corporation's objectives are being achieved, the corporation is preparing and publishing reliable public financial statement, and, the corporation is complying with applicable laws and regulations"* (COSO, 1992, pp. 1-2). Through history, enhancements regarding internal controls quality and efficiency have consistently resulted from economic scandals and crises generated by gambling in corporate stock based on financial statements that, in retrospection, proved to be untruthful or misleading. Thence, in order to restore investors' confidence in the market and the financial statements provided by the companies, different financial reforms were taken. The most important of which, came after the Arthur Anderson scandal of obstruction to justice and lead to the creation of the Sarbanes-Oxley Act (SOX, 2002, §§ 1-1107).

### 2.2.1. Internal Controls over Financial Reporting

As previously mentioned, the internal audit function may bring significant benefits to an organization. The aforementioned Arthur Anderson scandal led to the increase of Federal legislation, affecting both auditing and internal controls, which resulted in the creation of the Sarbanes-Oxley Act (SOX, 2002, §§ 1-1107). Section 302 and 404 (a) and (b) of the Sarbanes-Oxley Act (SOX) are specifically dealing with these Internal Controls over Financial Reporting (hereafter ICFR) requirements (US Congress, 2002). The act intended to increase the independence of auditors by requiring them to look for signs of management misconduct. Sarbanes-Oxley has also increased the duties performed by public accountants at a time when

increased record keeping was required for all duties (Wilson et al., 2014) Furthermore, it requires that each annual report to include an "Internal Control Report" in which management states the accountability for launching and preserving an adequate system of internal controls and contains an assessment of the effectiveness of them. Moreover, it requires that corporate executives take personal responsibility for financial statements (SOX, 2002, §302). After the passage of SOX, the IAF became even more important, because it could assist management assess reporting risks, design controls and monitor the effectiveness of internal controls. In addition, external auditors can benefit from the act given that they could take the most of this IAF internal knowledge when performing the financial statement audit (Abbott et al., 2007; Del Vecchio and Clinton, 2003; Rittenberg and Covaleski, 2001; Rittenberg et al., 1999). However, despite the increased legislation, there continues to be some accounting and audit deficiencies "*where auditors just simply are not doing adequate audit work in very important audit areas*" (Whitehouse, 2012). In the next section, the researcher is going to present the concept of Robot Process Automation (RPA). Moreover, this robotized system is capable to reduce the deficiencies that are currently found both in audits, either internal or external, and internal controls.

### 2.3. Robot Process Automation (RPA)

In an attempt to achieve compliance with regulatory requisites such as Sarbanes-Oxley-Act, many organizations have already made significant strides in closely overseeing their financial processes. These include, identifying risks that are related to the accuracy of financial reporting, documenting the internal controls (both business process and IT) necessary to mitigate these risks, and operating these controls as required to ensure compliance (Moffitt et al., 2018) For that reason, the implementation of what is called a Robot Process Automation is of the utmost importance for enterprises. Since the term has a revolutionary ring to it, often leads people to imagine physical robots roaming around office space performing tasks just like humans would

(Willcocks and Lacity, 2016; Lacity et al., 2015). In reality, this is not true. The Institute of Electrical and Electronics Engineers Standards Association defines RPA as *"A preconfigured software instance that uses business rules and predefined activity choreography to complete the autonomous execution of a combination of processes, activities, transactions, and tasks in one or more unrelated software systems to deliver a result or service with human exception management"* (IEEE Std 2755-2017, 2017). However, since it is a process that is relatively innovative, when considering its applicability to internal audit and internal controls, enterprises should look for "easy wins" (ibid). Moreover, both professional auditing and business process literature suggest that RPA can result in economies of scale and improved processes as long as the steps that should be done by the software are manual and repetitive, that is, processes that are very standardized and well defined. A more in-depth analysis is carried out in the next sections regarding the implementation of the software.

### 2.3.1. Implementation of RPA in Internal Controls

The literature concerning RPA implementation in internal controls is very limited; this is due to the fact that companies are still learning from this recent technology. Nevertheless, McClimans (2016) has concluded that RPA software returns more value-creating work back to both external and internal auditors, by replacing extremely repetitive tasks and replacing them with ones that require high order thinking (Lacity et al. 2015; Seasongood 2016). Moreover, these modifications must be not only thought in terms of the replacement of the workforce activities (Frey and Osborne, 2013), but also in the perspective of the technological process reframing (Issa et al., 2016). Other benefits may include more reliability, perfect audit trails and improved security, for example.

As mentioned above, the RPA is only capable of functioning in processes that are very well established and homogeneous. In terms of design, a RPA is considered very easy and

"lightweight" IT (Lacity and Willcocks, 2015; Fersht and Slaby, 2012), because the program does not write directly into a data base, but instead, only uses the exhibition layer of a software, that is, access, only, the user-interface-level, just like a real person. Additionally, there are more characteristics that make the processes keen to be performed by RPA, such as tasks that are mature, done in high volume and repeatedly which makes them less desirable to perform by hand (Willcocks and Lacity, 2016). After this initial process identification and selection, additional stages should be taken into consideration in order to implement the RPA. Since the software is supposed to relieve the employee of performing the same task incessantly, it is also required to perform a collaborative work with the IT department, so that they can assess the RPA implementation from a technical perspective based on the nature of the activities that are necessary to perform to achieve the internal control and, after gaining a thorough understanding of the processes, comment if they are feasible or not to suffer automation (Moffit et al., 2018). Moreover, a very important factor to successfully implement the RPA is the standardization of the way the control is performed. This is of the upmost importance as the processes should have a structured format, so that the program is able to perform as intended. One possible way to standardize the way controls are performed is, for example, through the existence of a template (ibid). After the completion of these stages, the software is ready to have a pilot implementation and to be tested, in terms of its effectiveness and applicability.

Concluding, one of the main reasons to implement a RPA in internal controls would be to try to prevent the collaborators of executing extremely repetitive tasks and, by doing so, refocus the human effort into tasks that require creativity, complex decision making, and emotional insight (Moffitt et al., 2018). Additionally, RPA software vendors will improve their software with artificial intelligence capable of much more complex tasks, such as the ability to contextual learning and advanced cognitive capabilities, which mean that, many human-like tasks will, in the future, be performed by RPA (The Institute for RPA, 2015).

# 3. Methodology

## 3.1. Objectives of Internship and the Research Question

This dissertation aims to contribute to accounting knowledge by studying accounting from a practice perspective. Multinational's that operate in the healthcare area, given its competitive nature all across the world, are usually exposed to enormous risks and threats, either strategic, financial, non-compliance or even IT systems risks (BDO, 2015). Therefore, the implementation of a fully automatable RPA system that would perform the internal controls and help increase their effectiveness is not only reasonable, but also fundamental. Despite the importance of the topic, there are scarce empirical studies that investigate of how RPA systems can help performing internal controls in organizations. Such lack of knowledge motivated the researcher to find an answer to the following research question: 'Which internal controls are feasible to be automatized using RPA?'

Towards finding a practical solution for the stated question, the researcher engaged in an internship at Siemens Healthineers´s Accounting HUB in the area of Risk and Internal Control in the period between 18th June and 17th December 2018.

The internship had a threefold objective that, together, allowed the researcher to address the key research question mentioned above. The first objective was to help standardizing the way the controls were performed so that future analysis regarding the RPA could be made; the second consisted of finding out what controls could be performed by a RPA instead of a human, based on an analysis of the nature of the previously standardized steps necessary to achieve the internal control; the final objective related to the creation of a model that allowed to make an analysis of the time that could be saved by using RPA and its application for two internal controls. However, because of the internship's limit of time, it was not possible to implement the RPA or to undertake an analysis of future possible improvements of the implemented RPA.

### 3.2. Research Method

This investigation followed a qualitative research method, rather than a quantitative one, given that the evidence gathered, and analysis methods are flexible and not structured (cf. Mason, 2018; Yin, 2015). This approach was chosen as the most appropriate since the investigation occurred in a detailed and complex environment.

Additionally, the research had an interventionist approach, given that, the researcher was working for the company under investigation, directly developing a practical solution for the research question of this report and analysing the results in view of the relevant literature, despite not having complete control over the project and not having implemented the RPA. (cf. Jönsson and Lukka, 2006). Therefore, the role of the researcher is considered active participation, since, according with Ryan et al. (2002, p. 152), *"(...) the researcher is directly involved in the organization – possibly introducing a new system or procedure. As such, the researcher is an active participant in the process being researched"*.

### 3.3. Plan and Steps followed

In pursuing an answer to the research question previously mentioned, a plan was created and practical steps defined (see Appendix A for the chronological plan of the research). The proposed plan for this project comprised seven phases (see Appendix B), which were interactive rather than sequential since some of them were not concluded when the next was initiated. The first two phases were prior to the standardization of and development of the new process; the following four phases were related with the standardization and analysis of the feasibility of a possible implementation of the RPA system in internal controls; and the last one was subsequent to both the standardization and analysis of the internal controls viability of the usage of a RPA system.

The plan commenced with the examination of internal documents and external literature relevant to the development of a RPA system. Additionally, the researcher analysed the previous efforts performed by the other business areas of the company towards the implementation of the system. The next step of the plan was the definition of the project's objectives, including the analysis of the effectiveness of the internal controls already performed. These objectives and the proposed plan of action were, afterwards, validated by the director of the Accounting HUB that encompasses the Risk and Internal Control division.

The subsequent step was the design of measures that would enable the implementation of the RPA system. These measures are comprised in the process of standardization of performing internal controls. This process includes, among other factors, the harmonization of the way of performing the internal controls, by the designing of templates and detailed execution manuals for each internal control, in order to guarantee that they are always performed in the same way, allowing for a possible system robotization.

Following the proposed plan, the next stage was to identify the controls that, based on the nature of activities and its repetitiveness, were able to be performed by a robotic process. To do so, several meetings were held with the division coordinator in order to see what controls were eligible to the implementation of a RPA. To perform this assessment, a combination of observation and practical approach were chosen. With the help of the coordinator, and due to the nature of the activities that were necessary to be performed in order to achieve the internal control itself, the researcher was able to reduce the number of controls that were eligible to be performed by a RPA, on a preliminary analysis.

After performing this first reduction, there was the feasibility analysis stage. This comprised the required information gathering, which was obtained by holding several meetings with the Headquarters Robotics team in order to see the specific criteria so that the control was eligible

to the implementation of a RPA. Also, some information from a previous RPA that was implemented in a different business area in Germany was used in order to breakdown the feasibility analysis even further, so that the final conclusion of this work project could be more reliable. To perform this evaluation, several methods were used, such as a checklist, in which several parameters had to be met so that the control could be performed by a RPA and also a model, developed by the researcher, to analyse the expected timesaving from using the RPA. The aforementioned checklist did not change when performing the evaluation between the different controls.

Finally, the sixth and posterior stages referred to the result of this feasibility evaluation, that being the conclusion if the internal control that was tested and evaluated was capable of being automated with a RPA.

### 3.4. Sources of evidence

In order to collect evidence for the investigation, the researcher used several sources such as documentary analysis, meetings, unstructured inquiries and participant observation. This allowed the researcher to assure that data was triangulated (cf. Ryan et al., 2002; Yin, 2015). Regarding documentary evidence, both external documents (e.g. IIA Standards and Guidance) and internal archives (e.g. company's norms and auditing reports) were explored (for a full list of consulted documents, refer to Appendix C).

The unstructured inquiries occurred, in general, throughout the project with the department's collaborators and coordinators whenever doubts existed. These allowed for a deeper understanding of several topics along with the clarification of the internship´s objectives since they were based on a dialogue where facts could be explained and not only described (Mason, 2002). This data was not available in a documentary manner meaning that it is only attainable either by observation or questioning. Observing would be an interminable process, which is

why this method was preferred. None of the inquiries was tape-recorded given the organizational context where they occurred; as an alternative, extensive note-taking was used (cf. Yin, 2015).

Last but not least, participant observation was adopted through daily observation of activities and attendance in meetings. This source of evidence is appropriate when the researcher is deeply involved in the studied context, such as in internship situations, because practical data can be collected.

### 3.5. Description of company and department

As it was previously mentioned, this internship took place at Siemens Healthineers. Siemens Healthineers was founded in 1847 and today it is one of the world's largest healthcare companies employing 50,000 people (Siemens Healthineers, 2018). In the fiscal year 2018, the revenue turnover was 13,300 million euros and the net profit for the same period amounted to 1.284 million euros (Siemens Healthineers, 2018). The company is a publicly-listed company on the Frankfurt Stock Exchange, since February 2018. Its principal shareholder is Siemens AG which holds 75% of the shares outstanding (Siemens Healthineers, 2018)

Siemens Healthineers's businesses portfolio is divided in four business areas: in Diagnostic Imaging; Ultrasound; Advanced Therapies and Diagnostics (see Appendix D for an illustration of the group structure). All of the business areas are focused in the healthcare business sector, operating in either the "in vitro" or in the "in vivo" division. The "in vitro" division only captures the business areas of Diagnostics. This specific area breaks downs even more to three business lines: Point of Care, Laboratory Diagnostics and Molecular Diagnostics. The "in vivo" division captures the other three business areas. Similar to what happens in the area of diagnostics, each of the previous three areas suffers a further breakdown in multiple business lines. All of the business areas have a portfolio of products that are completely independent

from each other. Also, each of the business areas has its independent research and development departments and support functions.

The researcher developed his work in the Risk and Internal Control Team within the Europe 1 HUB department (hereafter HUB). HUB is the department in which it is centralized the accounting, closing, governance and reporting services, that is, the support functions. Therefore, the HUB reports directly to the accounting Headquarters of Siemens Healthineers located in Germany. Despite being located in Portugal, the HUB is responsible for providing support functions services to seventeen countries both in the "in vivo" and in the "in vitro" divisions, such as France, Spain and Italy, for example.

The mission of the HUB is to guarantee the quality in the closing process and in the reporting of the financial figures of Siemens Healthineers. The department is composed of five divisions – Accounting, Controlling, Risk and Internal Controls (hereafter, RIC), VAT, Projects - each of them with a specific scope. The research was integrated in the RIC team, working directly with the HUB head (Refer to Appendix E, for an illustration of the Department).

## 4. Feasibility Analysis

### 4.1. Prerequisites for RPA Implementation in Siemens Healthineers

As I previously mentioned, despite being of great help and extremely useful for the companies, the implementation of a RPA is not suitable for all processes that exist within the companies. In order to implement it, the processes must follow a specific set of prerequisites that differ from company to company and that will determine in the first instance if the RPA implementation is reasonable. In the following paragraph, the researcher will describe, in detail, what is the specific criteria used by Siemens Healthineers in order to see if it is possible for a RPA implementation. These criteria consist in eight parameters that complement each other and that support make a more trustworthy decision regarding a possible implementation of the

software (refer to Figure 1). As previously mentioned, the first four factors are related to the process characteristics. More precisely, with no specific order, guarantee that the controls that are being performed are highly manual; to see how many times the control is executed within a month and within a year, that is, its repetitiveness; guaranteeing the control is rule based, which means, assuring that the process of performing the controls is harmonized. Furthermore, related to the previous criteria, it is extremely important, for a successful implementation of RPA, to ensure that the performance of the controls has very low exception rates (in nominal terms, the optimal is between two and three), and, the programmer, when preparing the RPA, must be aware of the exceptions, so that, the program can run properly, even with the existence of those exceptions. Also, it is essential to take the authorizations that the RPA is allowed to have in consideration, since it needs access to the required programs, in order it can perform the necessary tasks just like a human. Additionally, besides the existence of these four extremely important parameters, there are other equally relevant parameters to take into account when implementing a RPA, such as defining the format in which the information is available , that is, either in a digital format or exits physically (e.g. on paper). In the specific case of Siemens Healthineers, this is not an issue due to the fact that all the required information to perform the internal controls is available in digital format. Moreover, it is necessary to consider if there are peaks in the process volume (namely, during month closing), so that there are no malfunctions in the RPA due to this increase in process volume.

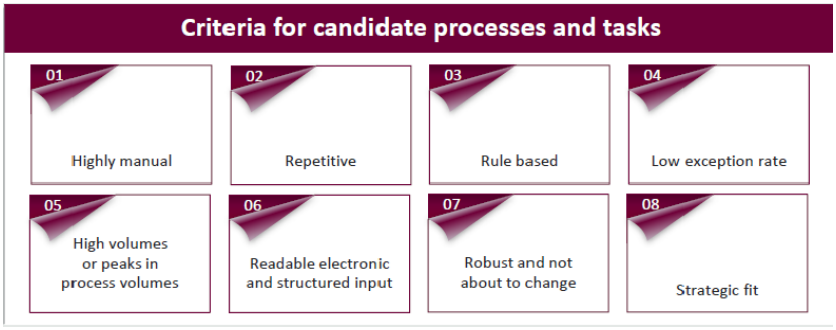



**Figure 1 RPA Criteria**

***Source:*** *Internal Document*

Moreover, as it is possible to see from the figure above, it is necessary to guarantee that the process is matured, meaning, it is robust and is not constantly shifting. Lastly, one of the most important factors to take into attention, when analysing a possible process robotization, is the strategic fit, which means answering the following question: "What are the benefits, in terms of time and cost efficiency, for the company to implement the RPA?" In the subsequent sections, the researcher will enter in more detail in this last criterion.

### 4.2. Description of the Process to Perform the Internal Controls

During the internship, the researcher got in touch with a total of twenty-three different internal controls. Nevertheless, as said before, not all the controls were suitable for RPA implementation due to several reasons, namely, the excessive number of exceptions or even the fact the control was not mature enough. For that reason, by taking in consideration the parameters that were explained in the previous section and with the support of the HUB coordinator, from the list of twenty-three controls, the researcher selected two in order to check if a future implementation of a RPA is possible (please refer to appendix G). This was made considering the characteristics of the required steps to achieve the control and the amount of monthly evidence collected throughout the internship as well as through the empirical observation on how to properly perform the internal controls. In the following two paragraphs, it is described the process to perform the selected internal controls.

The first control that was selected was the one that assures and covers the risk that the data that comes from SAP accounting systems is equal to the data presented in the reporting system of the company (hereafter CLM), through which the consolidation is made, in the company´s Headquarters, of all the accounting data from every country and entity, so that it can be presented to the financial market and to the shareholders. Within the enterprise, any control can be identified by its number that also functions as the control "fingerprint". In this specific case,

the control number is '3.2.9-9'. Moreover, in order to verify that internal control can be considered as "effective", each HUB accountant needs to guarantee, on a monthly basis, that there are no differences between the accounting system used by him/her and the CLM, in each specific ARE[1] (see figure 2 to see the expected final result). The researcher uses one of the accounting systems, that is, K24, as an example[2]. Additionally, in order to see a detailed description on the way to appropriately perform the control, under all accounting systems used by the HUB, please refer to appendix N[3].

| | Column Labels | | |
|---|---|---|---|
| | CLM | K24 | Grand total |
| Grand Total | -17.035.881,65 | 17.035.881,65 | 0,00 |

**Figure 2 Final result of the control 3.2.9-9**

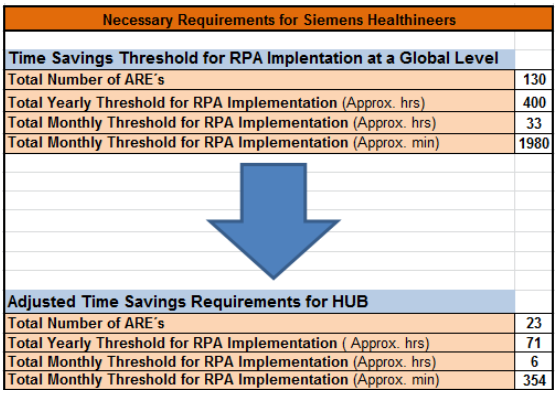
***Source**: Internal Document*

The second control chosen by the researcher was the one that assures that all monthly fixed assets depreciations are posted correctly in accordance with the specified rates defined by the Siemens Healthineers Headquarters in the Siemens Financial Reporting Guidelines (hereafter, FRG´s), for each asset class. As in the previous case, in the company, the control´s identification number is: '3.2.5.2-5'. In order to consider this control as "achieved", the HUB accountant needs to ensure, that the monthly amount of depreciation, calculated automatically according to the previously mentioned rates defined in the FRG´s is, in fact, the difference between accumulated depreciations of fixed assets between the current period (T) and the previous period (T-1). In case there are any differences in the amounts, the HUB accountant needs to analyse the reason of the difference. In contrast to what occurs in the previous control, the way this control is performed is transversal to all accounting systems. Moreover, in order to see a detailed explanation on how to properly perform the control please refers to appendix O[4].

[1] *Individual Companies, both "In-Vivo" and "In-Vitro"*
[2] *for confidentiality reasons, additional information regarding the control must not be shown, such as the real name of the programs used or the country to which these values are associated*
[3] *This table was constructed based on documents that were created in order to help the harmonization of the processes (ex: manuals, templates, etc.) and, also, by observing several HUB accountants performing the control.*
[4] *For confidentiality reasons, additional information regarding the control must not be shown.*

**Feasibility Test**

As previously referred in section 3.1 of the empirical study, one of the most relevant factors to determine whether the implementation of an RPA should proceed or not, is the strategic fit within the company. However, the evaluation of this criterion can assume a wide variety of approaches. Since that in Siemens Healthineers this is a pilot project, the company Headquarters defined that the evaluation of the strategic fit would, for now, be made only by analysing the time that would be saved, in the scenario that the RPA is fully implemented, thence not focusing in the cost analysis. Additionally, the Headquarters delineated that the threshold for considering a RPA would be that the automation was able to save, at least, four hundred (400) hours per year for the entire organization, which comprises one hundred and thirty (130) ARE´s, that is, individual companies, both "in vivo" and "in vitro", throughout the entire world. However, the researcher needed to adjust, firstly, the previously mentioned annual requirement established for the entire enterprise, for the specific dimension of the HUB, that only has twenty-three (23) ARE´s (please refer to figure 3). Additionally, in the following paragraphs is provided more detail in the feasibility analysis done for the two controls that were described in the previous section.



| Necessary Requirements for Siemens Healthineers | |
|---|---|
| **Time Savings Threshold for RPA Implentation at a Global Level** | |
| Total Number of ARE´s | 130 |
| Total Yearly Threshold for RPA Implementation (Approx. hrs) | 400 |
| Total Monthly Threshold for RPA Implementation (Approx. hrs) | 33 |
| Total Monthly Threshold for RPA Implementation (Approx. min) | 1980 |
| **Adjusted Time Savings Requirements for HUB** | |
| Total Number of ARE´s | 23 |
| Total Yearly Threshold for RPA Implementation ( Approx. hrs) | 71 |
| Total Monthly Threshold for RPA Implementation (Approx. hrs) | 6 |
| Total Monthly Threshold for RPA Implementation (Approx. min) | 354 |

**Figure 3 Time Saving Requirements**

***Source**: Excel - Model Developed*

Firstly, regarding the control '3.2.9-9', in order to perform a proper feasibility analysis of a possible implementation o f a RPA, it is necessary to perform an analysis of the total time that

is spent, each month, performing the internal control. Moreover, since that there are multiple ARE´s within the HUB, the researcher, in order to get a decent time estimate of how much time it is required to perform the control, did individual inquiries to the HUB accountants, which are the ones responsible for carrying out the execution of the control each month, for each ARE. As it was expected, the time required to execute it varied through the ARE´s. On average, the time necessary to perform the activities that are required in order that one control can be considered as "achieved", was 21.74 minutes both per month and per ARE (please refer to Appendix K to see a detailed description of the time necessary per ARE and refer to Appendix L for a detailed description per accounting system.) Additionally, and taking the previous estimate in consideration, the researcher developed a model that allowed further analysis for the possible implementation of the RPA (please refer to appendix H). With this model, it was possible to analyse not only the time currently required to perform the control at the HUB level, but also, to extrapolate to a possible implementation at a global level, considering *ceteris paribus*[5]. Moreover, it also created a scenario where the RPA is fully implemented, hence allowing analysing the possible time savings for meeting the threshold defined by Siemens Healthineers, both in the HUB level and in a global level (please refer to appendix H). Focusing on the HUB, and assuming that the above mentioned estimate is established to all ARE´s as the time required performing the control, the researcher is able to conclude that the time that is necessary to properly perform the control is, approximately, 8.3 hours per month which constitutes 91.7 hours per year[6]. (Please refer to figure 4).

[5] *The same exact conditions that are observable within the HUB.*
[6] *For this specific control, the Headquarters defined that, the control only needs to be performed in eleven months.*

| HUB level | |
|---|---|
| Total number of ARE´s | 23 |
| | |
| Per Month: | |
| Estimate of the required monthly time to perform the control (min. per ARE) | 21,74 |
| Total required time to perform the control (approx. min.) | 500,0 |
| Total monthly required time to perform the control (approx. hrs) | 8,3 |
| | |
| Per Year: | |
| Estimate of the required monthly time to perform the control (min. per ARE) | 239,1 |
| Total required time to perform the control (approx. min.) | 5500,0 |
| Total required time to perform the control (approx. hrs) | 91,7 |

**Figure 4 Time required for the control**

***Source**: Excel - Model Developed*

Despite being extremely helpful to gain awareness of the time that is spent executing the control, these data, on its own, does not allow any kind of decision regarding a possible implementation of an RPA. For that reason, as it was aforementioned, a scenario was created, in which the robot was fully implemented. In this scenario, it is necessary to determine an estimate of the efficiency gain in order to draw a helpful conclusion regarding the employment of the RPA. In order to guarantee that the RPA implementation is beneficial for Siemens Healthineers, an efficiency gain of, at least, 77% is required. Following this, the researcher took three factors in consideration to be able to make a justified estimate. With this in mind, the researcher considered the characteristics of the activities required to perform the control, which are mainly IT centred, around 92% (please refer to appendix N), the evidence of time savings obtained in a previous RPA implementation in a different business area within the company, above 80%, and the existence of some unusual exceptions. Therefore, and considering the previous aspects, the researcher, in accordance with his company supervisor, believes that an efficiency gain of 80% would be the accurate estimate. Furthermore, assuming this estimate as the true value for the efficiency gained after the implementation, it can be determined that is expected that the HUB is able to save, approximately, 73.3 hours per year (see figure 5), which is above the required 71 hours (see figure 3). If a global implementation was to be considered (130 ARE´s) after the pilot implementation in the HUB, considering also *ceteris paribus*, the company could be able to save 414.5 hours of human work, yearly, which is also above the defined threshold (see appendix H for the detailed feasibility analysis performed). Concluding,

the control passed the feasibility test, which means the pioneer pilot implementation of the RPA applied to internal control can now initiate (see appendix J for a draft of the flowchart describing the activities performed by the RPA[7]).

| HUB level | |
|---|---|
| Total number of ARE´s | 23 |
| | |
| **Per Month:** | |
| Estimate of the required monthly time to perform the control (min. per ARE) | 4,3 |
| Total required time to perform the control (approx. min.) | 100,0 |
| Total monthly required time to perform the control (approx. hrs) | 1,7 |
| | |
| **Per Year:** | |
| Estimate of the required monthly time to perform the control (min. per ARE) | 47,8 |
| Total required time to perform the control (approx. min.) | 1100,0 |
| Total required time to perform the control (approx. hrs) | 18,3 |

| HUB Time Savings Analysis | |
|---|---|
| **Per Year:** | |
| Time saved per ARE (min.) | 191,3 |
| Total time saved (min.) | 4400,0 |
| Total time saved (hrs) | 73,3 |

**Figure 5 Estimate of time savings**

***Source**: Excel - Model Developed*

Additionally, the model previously mentioned was also used to perform the feasibility test for the control '3.2.5.2-5'. As it was done in the previous case, and focusing the attention on the HUB, the researcher did individual inquires to all the HUB accountants in order to see the average required time to perform the control monthly, per ARE. The final result of this inquiry was, on average, four minutes per ARE, each month. Based on this information, it was subsequently calculated that, per year, the HUB spends a total of 18.4 hours performing the control. However, the threshold for considering an RPA implementation defines that the automation should save, at least, 71 hours of human work pear year. For that reason, since the actual time required to perform the control is extremely small, the expected timesaving from a RPA implementation is residual. Accordingly, employing the RPA would mean that the allocation of resources within the company was not being efficient (please refer to appendix I). In conclusion, this specific control did not pass the time feasibility test despite the fact that, as said before, based on the characteristics of the activities required to perform it (please refer to

[7] *for confidentiality reasons, the researcher cannot disclose the true names of the programs and RPA software used.*

appendix G), the control was an excellent candidate for robotization (please refer to appendix O for a more in- depth analysis of the characteristics of the activities).

### 4.3. Recommendations

The RPA implementation should now be evaluated in terms of costs. In order to do so, a programmer should, firstly, perform the control in order to estimate the amount of time that is necessary to program the RPA and to develop a pilot version ready for tests. Only after this, it is possible to perform a proper and detailed analysis of the costs.

Moreover, an annual revision of the RPA is suggested, since the major changes occur in the beginning of the fiscal year and it's necessary to assure that the RPA is working properly from the beginning. Additionally, throughout the year it is advisable that the HUB accountants' guarantee that the program is operating correctly, so that major errors can be prevented.

For that reason, all the responsibilities of the RPA should be allocated within the teams of the HUB. Each team should select one collaborator to be responsible for gathering all the issues regarding the RPA and acting according to the urgency of the errors.

Additionally, it is suggested that top managers and boards are involved in the development of the RPA system; specifically, they should support this project and inform employees about the concept of RPA and its importance to the company (cf. Decaux and Sarens, 2015). This will promote and facilitate the implementation of the RPA system across the organization, which can lead to significant gains in efficiency.

## 5. Conclusion

Through the review of the empirical literature, in Section 2, one concluded that research concerning Robot Process Automation was very scarce. Therefore, this Working Project contributes to fulfil this gap in literature through the development of a methodology that guides companies on how to start the process of implementing RPA´s.

The project's main result was the development of a model that supports Siemens Healthineers, in a first instance, in the decision of possible implementation of a RPA. As a result, one can see, from the evidence shown above, that only taking into account the expected timesaving from the usage of a RPA, is beneficial for the company to use this technology when performing internal controls. Moreover, this robotised system would help the company prevent severe deficiencies. The main benefit of this new framework is the number of hours of human work that can be saved by preventing the human from doing extremely repetitive tasks every month which, in the future, will translate to significant reductions in costs. Nevertheless, a limitation of this project was the timeframe of the internship which has impeded the implementation of the RPA.

Regarding future investigation, it is recommended the creation of a guide explaining how to use and review the RPA system. As a matter of fact, the researcher will be responsible to produce this guide as well as organizing a workshop for the collaborators of the HUB department.

Finally, as this report explores a recent field of study, further research is expected. For instance, it would be relevant to study the impact and consequence of RPA's implementation in companies in which RPA's are already fully implemented.

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A Work Project, presented as part of the requirements for the Award of a Master Degree in Finance from the NOVA – School of Business and Economics.

# SUPPLEMENTARY APPENDICES

of the Work Project

FEASIBILITY EVALUATION OF AN RPA IMPLEMENTATION IN SIEMENS HEALTHINEERS INTERNAL CONTROLS

JOÃO MIGUEL SOUSA SANTOS (29988)

A Project carried out on the Master in Finance Program, under the supervision of:

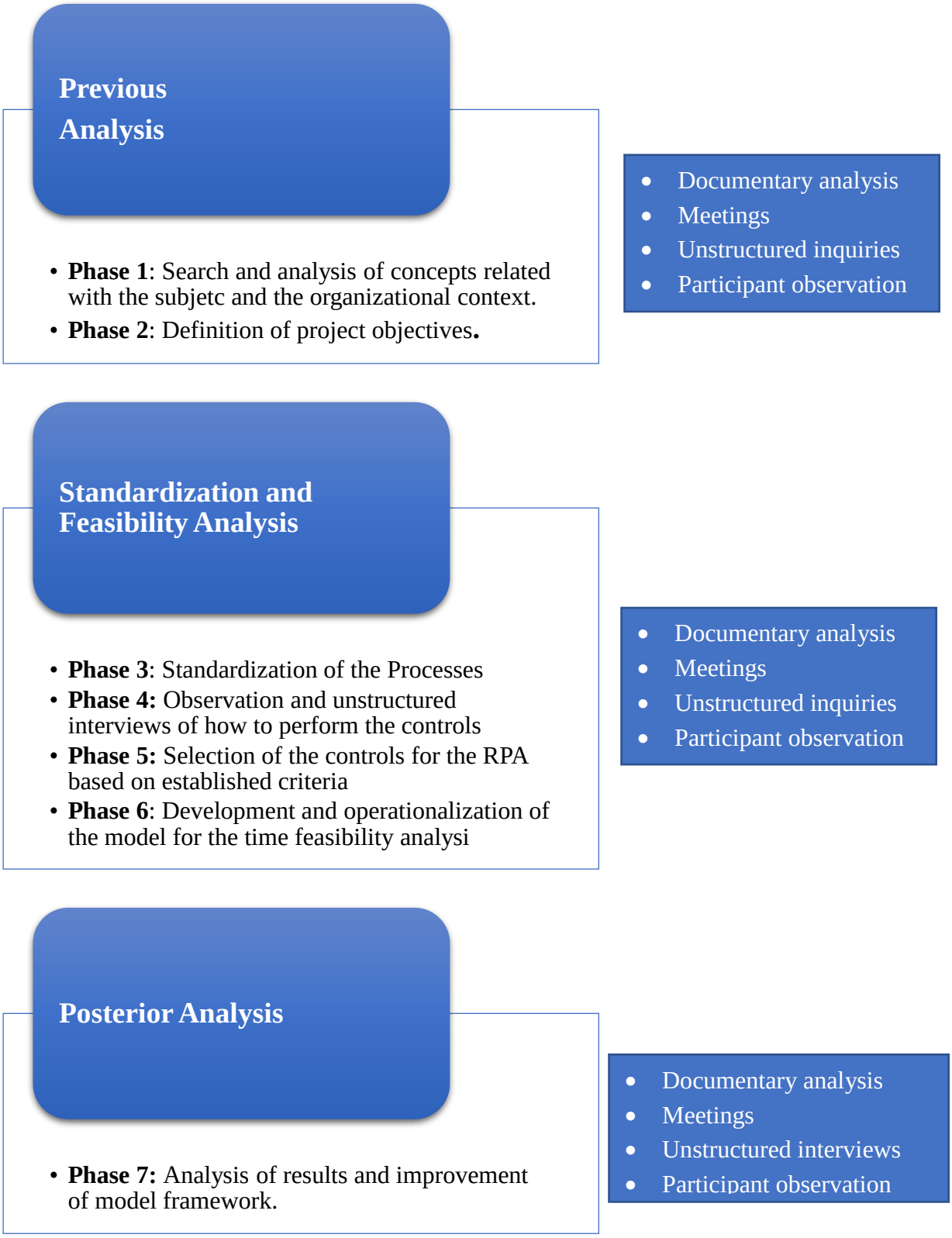
Associate Professor Maria João Major

JANUARY, 2019

## Appendix A– Chronological Plan of the Internship

| Tasks | Month | June | | July | | | | August | | | | September | | | | October | | | | November | | | | December | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Week | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 3 | 4 |
| **Phase 1**: Search and analysis of concepts related with the subject and the organizational context. | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Phase 2**: Definition of project objectives | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Phase 3:** Standardization of the Processes | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Phase 4**: Observation and unstructured inquiries of how to perform the controls | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Phase 5**: Selection of the controls for the RPA based on established criteria | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Phase 6:** Development and operationalization of the model for the time feasibility analysis | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Phase 7:** Analysis of results and improvement of model framework | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Literature Analysis and Working Project** | | | | | | | | | | | | | | | | | | | | | | | | | |

**Appendix B – Schematic illustration of the Methodology and Sources of Evidence**



## Appendix C – List of consulted documents

| Title | Author | Publisher | Type | Topic |
|---|---|---|---|---|
| Audit Committee Characteristics and Restatements | Lawrence J. Abbott, Susan Parker, Gary F. Peters | Auditing: A Journal of Practice and Theory | External Document | Internal Controls |
| Perceptions of factors affecting audit quality in the post- SOX UK regulatory environment | Viviam Beattie; Stella Fearnley; Tony Hines | Accounting and Business Research | External Paper | Internal and External Audit |
| The Transformation of Internal Auditing | Gaurav Kapoor; Michael Brozzetti | The CPA Journal | External Paper | Internal Audit |
| Internal Auditing | Henry B. Fernald | Accounting Review | External Paper | Internal Audit |
| Internal Audit: A comfort provider to the audit committee | Gerrit Sarens; Ignace De Beelde; Patricia Everaert | The British Accounting Review | External Paper | Relationship between Internal Audit and Audit Committee |
| Audit committee quality, auditor independence, and internal control weaknesses | Yan Zhang; Jian Zhou; Nan Zhou | Journal if Accounting and Public Policy | External Paper | Relationship between audit committee quality, auditor independence, and internal control |
| A Post-Sox Examination of Factors associated with the size of internal audit functions | Urton L. Anderson; Margaret H. Christ, Karla M. Johnstone; Larry E. Rittenberg | Accounting Horizons | External Paper | Internal Audit size SOX |
| The Relationship between Internal Audit and Senior Management: A Qualitative Analysis of Expectations and Perceptions | Gerrit Sarens; Ignace De Beelde | International Journal of Auditing | External Paper | Relationship between internal auditing and top managers |

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|---|---|---|---|---|
| International Standards for the professional Practice of Internal Auditing | The Institute of Internal Auditors | | External Document | Internal Audit |
| Assurance & Auditing Services: Concepts for a Changing Environment | Christine Jubb; Larry E. Rittenberg; Karla M. Johnstone; Audrey Gramling | Cengage Learning | External Book | Internal and External Audit |
| The Essential Handbook of Internal Auditing | K H Spencer Pickett | John Wiley & Sons, Ltd | External Book | Internal Audit |
| What do we know about audit quality? | Jere R. Francis | The British Accounting Review | External Paper | Audit quality of publicly listed companies |
| Internal Auditors' Roles in Overcoming the Financial Reporting Crisis | Jan E. Eighme, and Jim D. Cashell | Internal Auditing | External Paper | Internal Audit |
| Accounting Control in the Zenon Papyri. | Hans Hain | Accounting Review | External Paper | Internal Controls |
| 2009 Annual Report – IIA Global | Institute of Internal Auditors | | External Document | Internal Audit |
| Internal Auditng: Assurance, Insight, and Objectivity | Institute of Internal Auditors | | External Document | Internal Audit |
| 2012 Annual Report: Elevate – IIA Global | Institute of Internal Auditors | | External Document | Internal Audit |
| Implementing Combined Assurance: Insights from Multiple Case Studies | Loic Decaux, and Gerrit Sarens | Managerial Auditing Journal | External Paper | Combined Assurance |
| 2015 BDO Retail Risk Factor | BDO | | External Document | Risk analysis |
| Robotic Automation Emerges As A Threat To Traditional Low-Cost Outsourcing | Phil Fersht, and James R. Slaby | HfS Research | External Paper | Robot Process Automation |
| Research Ideas for Artificial Intelligence in Auditing: The Formalization of Audit and Workforce Supplementation | Hussein Issa**,** Ting Sun, and Miklos A. Vasarhelyi | Journal of Emerging Technologies in Accounting | External Paper | Robot Process Automation |
| Nine Keys to World-class Business Process Outsourcing | Mary C. Lacity, and Leslie P. Willcocks. | Bloomsburry Publishing | External Book | Robot Process Automation |

| | | | | |
|---|---|---|---|---|
| Co-sourcing and Other Alternatives in Acquiring Auditing Services | Stephen C. Del Vecchio, and B. Douglas Clinton | Internal Auditing | External Paper | Internal Audit |
| Qualitative Researching | Jennifer Mason | Sage Publications | External Book | Robot Process Automation |
| Elements of a Coordinated System and Its Importance to Management and the Independent Public Accountant | American Institute of Certified Public Accountants (AICPA) | American Institute of Accountants | External Paper | Internal Controls |
| The Outsourcing Dilemma: What's best for internal auditing? | Larry Rittenberg, Moore, and Mark A. Covaleski | Internal Auditor | External Paper | Internal Audit |
| Risk and Internal Control Manual | Siemens Healthineers | | Internal Document | Siemens Healthineers |
| Welcoming our Robotic Security Underlings | Fred McClimans | | External Document | Robot Process Automation |
| The Role of Internal Audit in Fraud Prevention and Detection | Daniela Petraşcu, and Alexandra Tieanu | Procedia Economics and Finance | External Paper | Internal Audit |
| Qualitative Research from Start to Finish | Robert Yin | Guilford Press. | External Book | Robot Process Automation |
| Sarbanes-Oxley Act of 2002 | US Congress | Government Printing Office | External Paper | Internal Controls |
| The Future of Employment: How Susceptible are Jobs to Computerization? | Carl B. Frey, and Michael A. Osborne | Technological Forecasting & Social Change | External Paper | Robot Process Automation |
| Internal Audit Function Quality and Earnings Management | Douglas F. Prawitt, Jason L. Smith, and David A. Wood | Accounting Review | External Paper | Internal Audit |
| How Internal Audit Adds Value to the Governance Process | Carmen Rossiter | | External Document | Internal Audit |
| History of Internal Controls | Tim Wilson, Steve Wells, Harold Little, and Mark Ross | Academy of Business Journal | External Paper | Internal Controls |

| | | | | |
|---|---|---|---|---|
| The Internal Audit Function: A Prerequisite for Good Governance. | Raiborn, Cecily, Janet B. Butler, Kasey Martin and Mina Pizzini | The Journal of Corporate Accounting & Finance | External Paper | Internal Audit |
| Scope of the Independent Auditor´s Review of Internal Control | American Institute of Certified Public Accountants (AICPA), and Committee on Auditing Procedure | Statement on Auditing Procedure | External Paper | Internal Controls |
| Not Just for the Assembly Line: A Case for Robotics in Accounting and Finance | Shawn Seasongood | | External Document | Robot Process Automation |
| Robotic Process Automation for Auditing | Kevin C. Moffitt, Andrea M. Rozario, and Miklos A. Vasarhelyi | Journal of Emerging Technologies in Accounting | External Paper | Robot Process Automation |
| IEEE Guide for Terms and Concepts in Intelligent Process Automation | IEEE Corporate Advisory Group | IEEE | External Book | Robot Process Automation |
| There and Back Again: Doing Interventionist Research in Management Accounting Author links open overlay panel | Sten Jönsson, and Kari Lukka | Handbooks of Management Accounting Research | External Paper | Interventionist Research |
| Robotic Process Automation at Telefónica O2 | Lacity, Mary C., Leslie P. Willcocks, and Andrew Craig. | The Outsourcing Unit Working Research Paper Series | External Paper | Robot Process Automation |
| Internal Control- Integrated Framework | Committee of Sponsoring Organizations of the Treadway Commission (COSO) | COSO | External Paper | Internal Controls |
| Earnings Release and Financial Results Q4 FY2018 | Siemens Healthineers | | Internal Document | Siemens Healthineers |
| Internalization vs. Externalization of the Internal Audit Function: An Examination of Professional and Organizational Imperatives | Rittenberg, Larry, and Mark A. Covaleski | Accounting, Organizations and Society | External Paper | Internal Audir Function |

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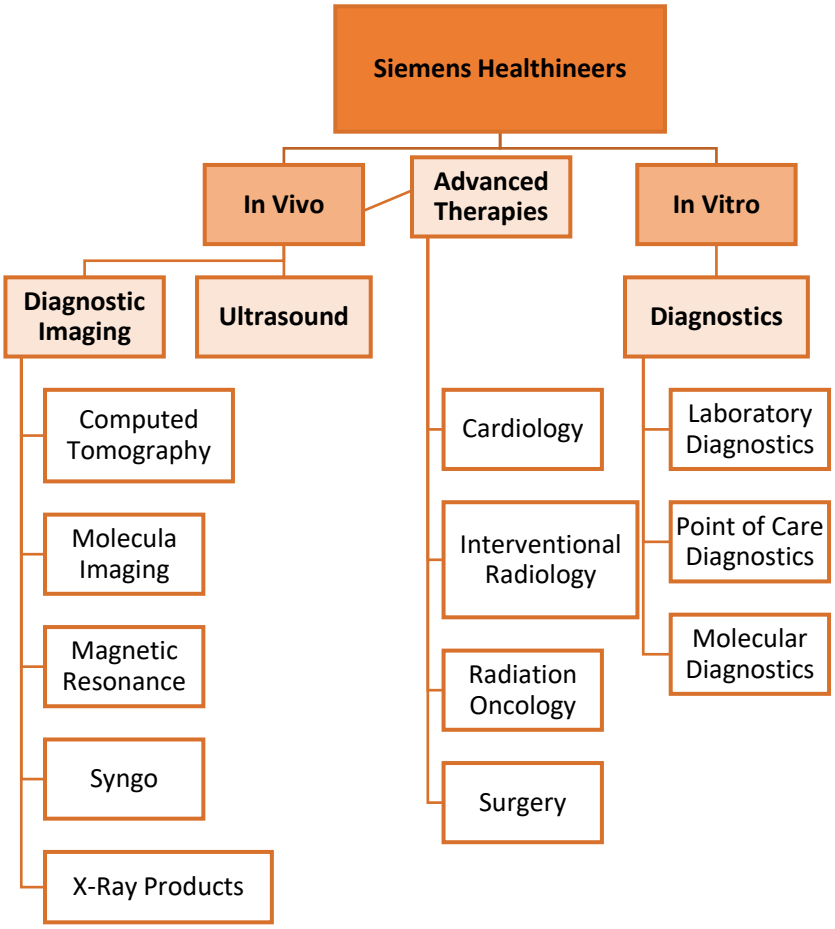
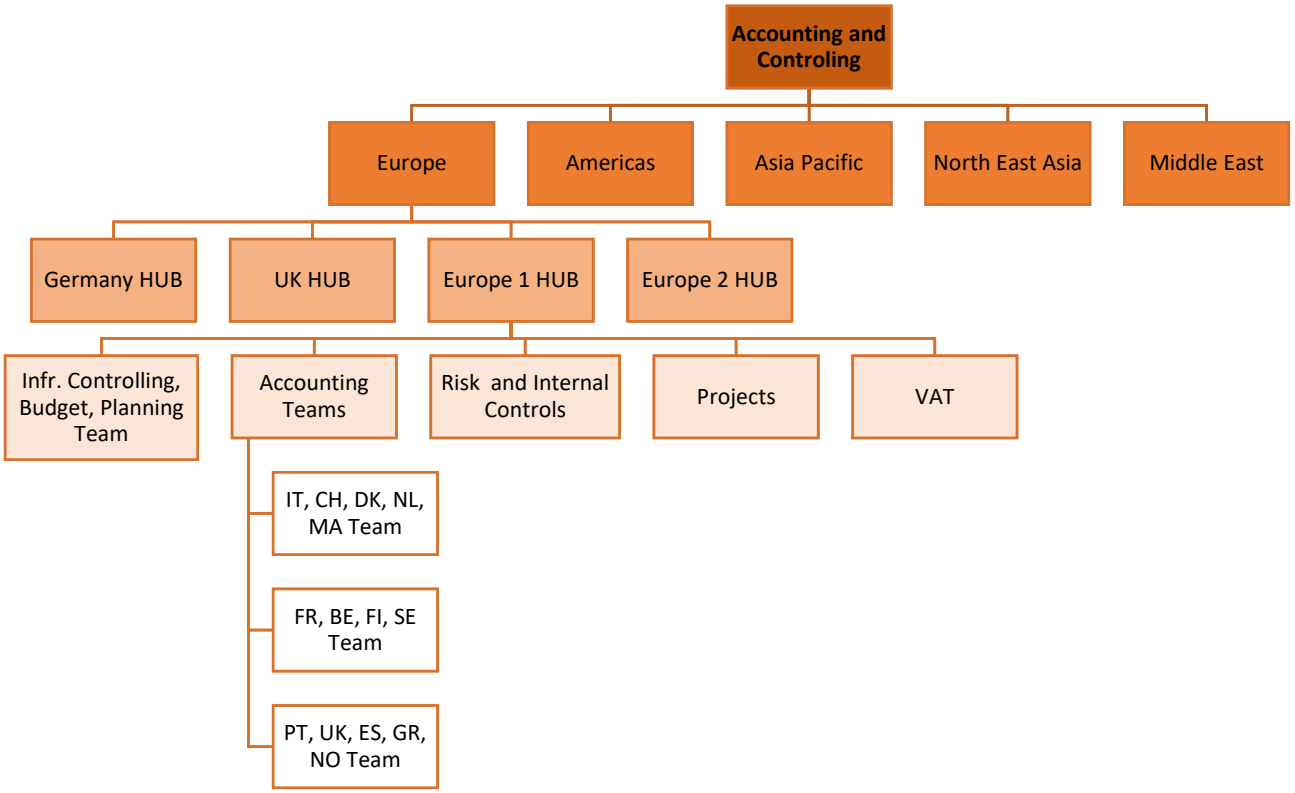
|---|---|---|---|---|
| Auditul intern la întreprinderi şi instituţii publice: Concepte, metodologie, reglementări, studii de caz [Internal Audit in Public Companies and Institutions: Conceps, Methodology, Regulations, Case Studies] | Victor Munteanu, Stefan Zuca and Marilena Zuca | Wolters Kluwer | External Book | Internal Audit in Public Companies |
| Franzel: PCAOB Looking at Audit Committee Role. | Tammy Whitehouse | | External Document | Internal Audit |
| Notice of Filing of Proposed Rule Change to Require that Listed Companies Have an Internal Audit Function | Securities and Exchange Commission (SEC) | | External Document | Internal Audit Function |
| Introduction to Robotic Process Automation: A Primer | Institute for RPA | The Institute for RPA. | External Book | Robot Process Automation |
| Service Automation – Robots and the Future of Work | Leslie P. Willcocks, and Mary C. Lacity | Steve Brookes Publishing | External Book | Robot Process Automation |
| Research methods and methodology in Finance and Accounting | Bob Ryan, Robert W. Scapens, and Michael Theobold | Thomson | External Book | Research Methodology |

## Appendix D – Structure of Siemens Healthineers




**Adapted from**: Siemens Healthineers, 2018

## Appendix E – Accounting and Controlling Organization Chart




**Source**: Adapted from internal documents.

## Appendix F - Brief Description of Europe 1 HUB Divisions

### Infr. Controlling, Budget, Planning Team

The main responsibilities of this division can be agglomerated in two main areas: Functions and Planning. The first one incorporates: center of competence for all functions related topics, support country management, cost center controlling and business administration activities, prepare and deliver functions reporting package, support functions' heads in budget and forecast, preparation and monitoring of functions services contracts and charges, and provide ad hoc reports for special needs. The second includes: supporting zones business controllers in budget and forecast activities, ensure support on planning systems and tools, perform consistency checks and data validation before reporting submission and, lastly, provide regular reports on zones and business level.

### Accounting Teams

This area incorporates the center of competence for all accounting topics. We ensure the integrity, quality and compliance of Siemens Healthineers financial statements. As such, the division performs operational IFRS G/L accounting, fixed asset accounting, month end closing and reporting and balance sheet reviews. Moreover, the division supports external audit and finance-related internal audit activities. Additionally, ensure the implementation of changes to the Financial Reporting Guidelines and any other corporate regulations related to Accounting.

### Risk and Internal Control

This area is focused in designing, evaluating and implementing internal controls (ICFR) to mitigate financial risks and identify potential inaccuracies in our financial statements. Identify and report on internal control weaknesses and undertake deficiency remediation efforts where required.

**Projects**

Projects area must ensure that the integration of any company that is acquired/merged or carved out, in accounting terms, is made smoothly and in compliance with the International Financial Reporting Standards.

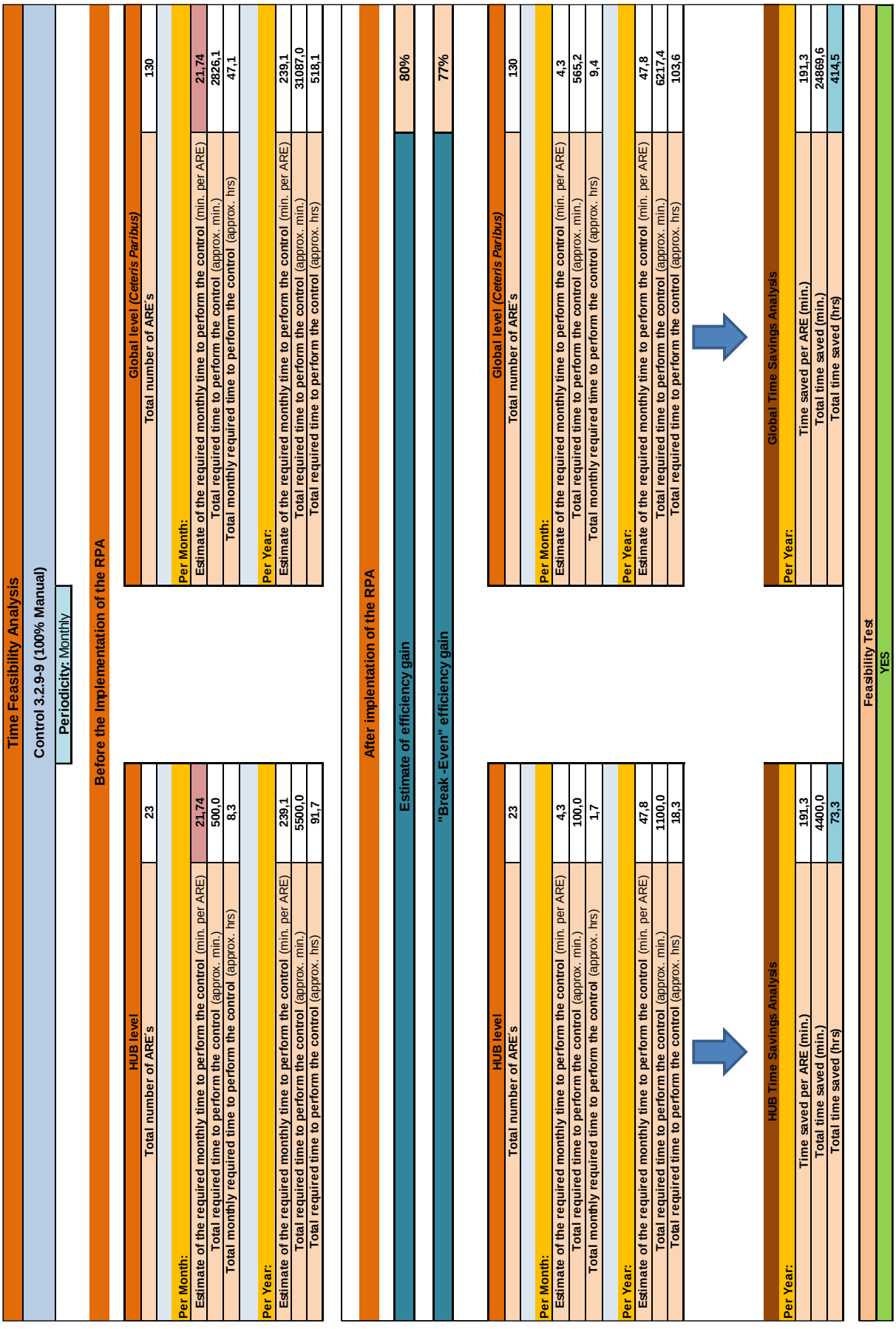
**VAT**

VAT division is responsible for ensuring the correct registration of the received receipts, for the preparation of the declarations to present to the government authorities of the different countries and for giving support regarding other taxes.

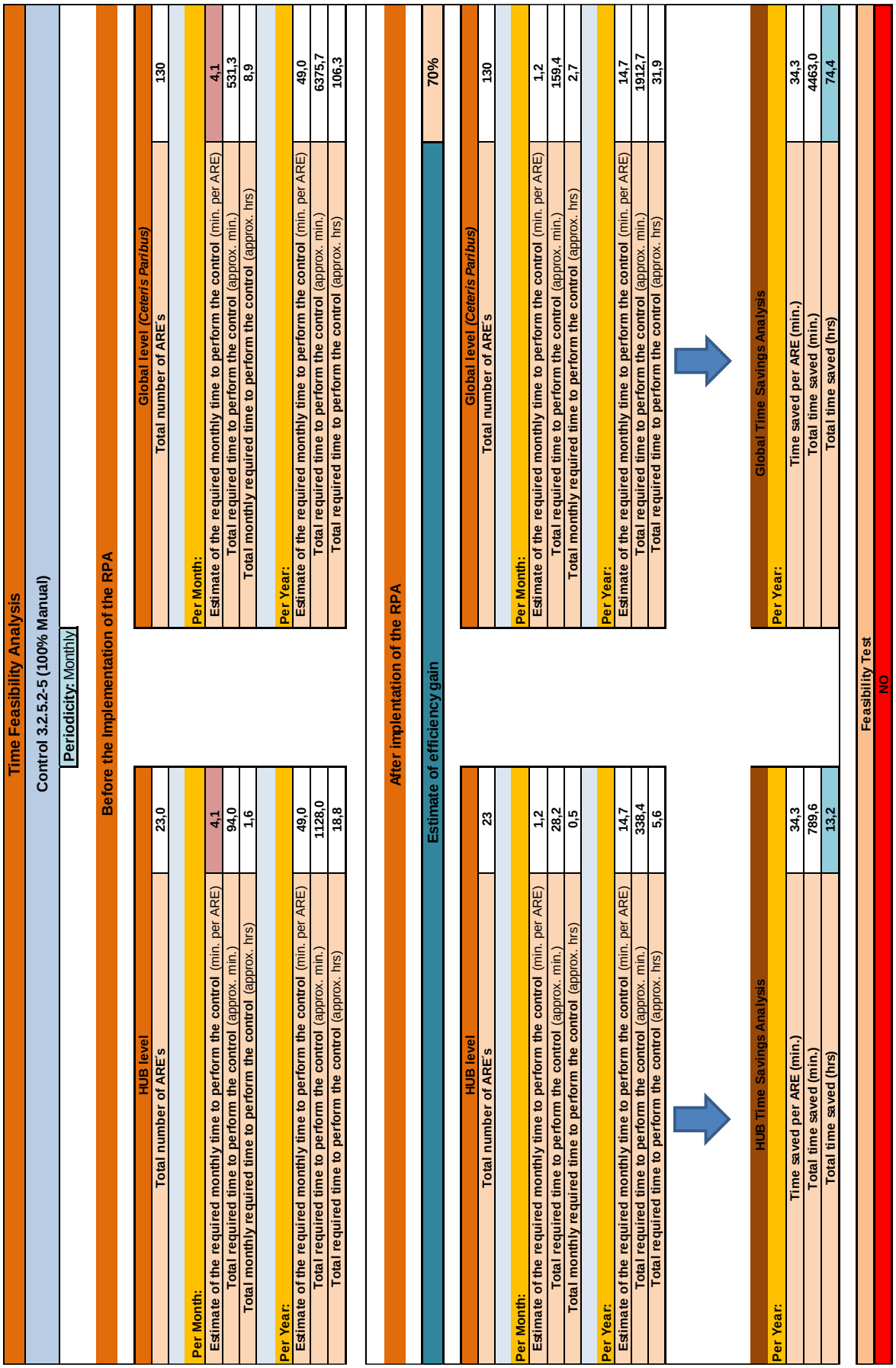
## Appendix G – Analysis of the Twenty Three Controls in each Required Aspect

| | Required Criteria | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Control Number** | **Highly Manual** | **Repetitive** | **Rule Based** | **Low Exception rate** | **High volumes or peaks in process volumes** | **Electronic Input** | **Robust and not about to change** | **PROBABILITY OF RPA IMPLEMENTATION** |
| **2.3.1.3-4** | YES | NO | YES | NO | YES | YES | NO | **57,1%** |
| **2.4.5.4-7** | YES | NO | YES | YES | NO | YES | YES | **71,4%** |
| **3.2.1.3-11** | YES | YES | YES | NO | YES | YES | NO | **71,4%** |
| **3.2.2.2-19** | YES | NO | YES | NO | YES | YES | NO | **57,1%** |
| **3.2.5.2-1-1** | YES | NO | YES | NO | YES | YES | NO | **57,1%** |
| **3.2.5.2-1-2** | YES | NO | YES | NO | YES | YES | YES | **71,4%** |
| **3.2.5.2-1-3** | YES | NO | YES | NO | YES | YES | YES | **71,4%** |
| **3.2.5.2-5** | YES | YES | YES | YES | NO | YES | YES | **85,7%** |
| **3.2.5.3-1** | YES | NO | YES | NO | NO | YES | YES | **57,1%** |
| **3.2.5.4-1** | YES | NO | YES | NO | NO | YES | YES | **57,1%** |
| **3.2.7.4-1-1** | YES | YES | YES | YES | NO | YES | NO | **71,4%** |
| **3.2.7.4-1-2** | YES | YES | YES | YES | NO | YES | NO | **71,4%** |
| **3.2.7.4-2** | YES | NO | YES | NO | YES | YES | YES | **71,4%** |
| **3.2.7-2** | YES | NO | NO | NO | YES | YES | YES | **57,1%** |
| **3.2.7-7** | YES | NO | YES | YES | NO | YES | YES | **71,4%** |
| **3.2.7-8** | YES | NO | YES | NO | NO | YES | YES | **57,1%** |
| **3.2.9.1-1** | YES | NO | YES | NO | NO | YES | YES | **57,1%** |
| **3.2.9.1-2** | YES | YES | YES | NO | YES | YES | NO | **71,4%** |
| **3.2.9-8** | YES | YES | YES | NO | NO | YES | NO | **57,1%** |
| **3.2.9-9** | YES | YES | YES | YES | NO | YES | YES | **85,7%** |
| **3.2.9-10** | YES | NO | YES | YES | NO | YES | YES | **71,4%** |
| **3.3.3.2-1** | YES | YES | YES | NO | NO | YES | NO | **57,1%** |
| **3.4.3-1** | YES | NO | YES | NO | YES | YES | YES | **71,4%** |

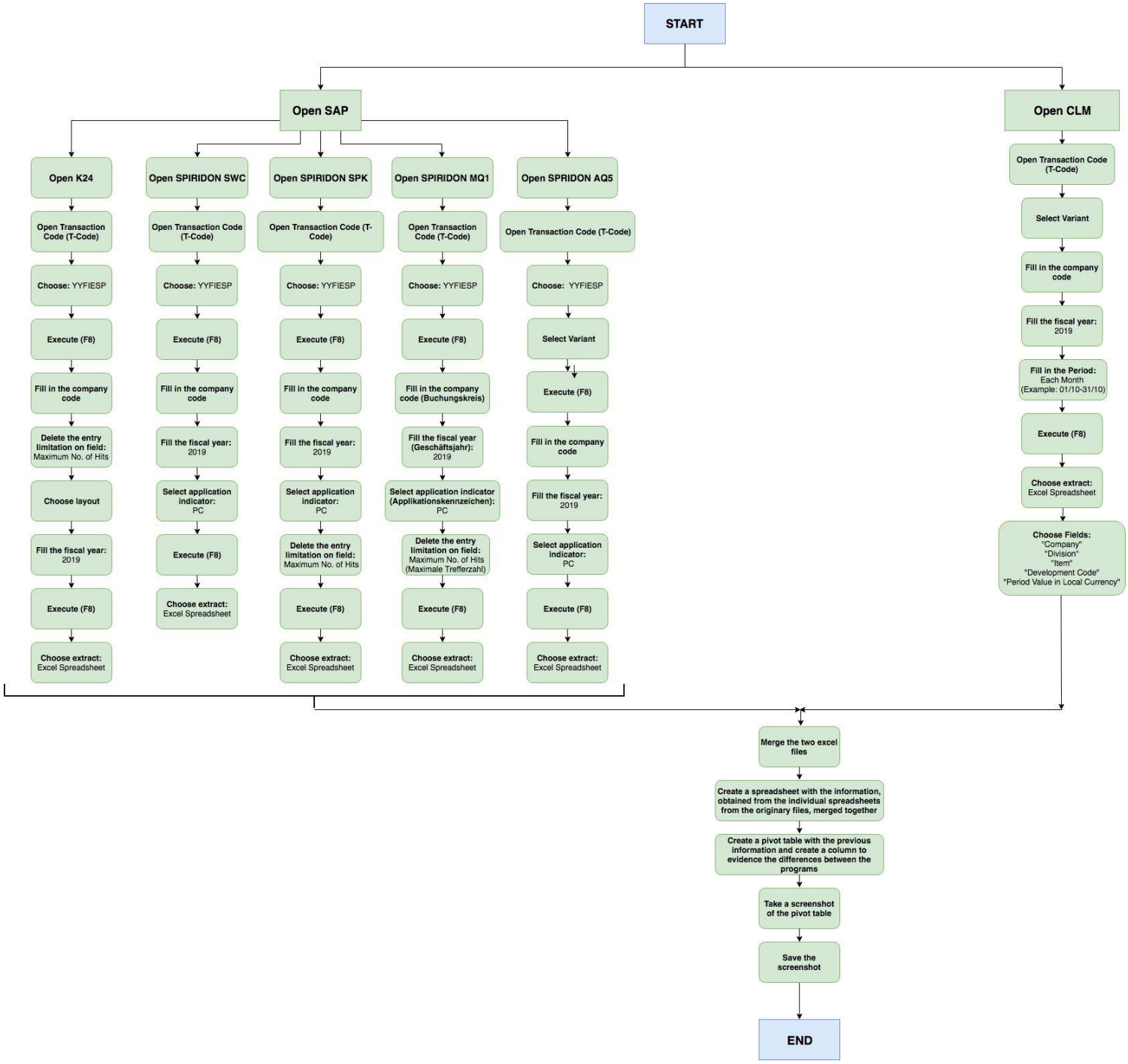
## Appendix H – Complete Feasibility Test of Control 3.2.9-9



## Appendix I – Complete Feasibility Test of Control 3.2.5.2-5



# Appendix J – Brief Explanation of How the RPA is going to Operate in Control 3.2.9-9



## Appendix K – Detailed Time Expense Breakdown per ARE[8]

- **Control 3.2.9-9**

| ARE | Duration of the control (min.) | SAP System |
|---|---|---|
| 1 | 30 | SPIRIDON SWC |
| 2 | 15 | SPIRIDON SWC |
| 3 | 20 | SPIRIDON SWC |
| 4 | 30 | SPIRIDON SWC |
| 5 | 20 | SPIRIDON SWC |
| 6 | 20 | SPIRIDON SWC |
| 7 | 15 | K24 |
| 8 | 15 | SPIRIDON SPK |
| 9 | 25 | SPIRIDON MQ1 |
| 10 | 30 | K24 |
| 11 | 15 | K24 |
| 12 | 25 | K24 |
| 13 | 20 | SPIRIDON SWC |
| 14 | 25 | K24 |
| 15 | 30 | K24 |
| 16 | 30 | K24 |
| 17 | 30 | K24 |
| 18 | 20 | K24 |
| 19 | 20 | K24 |
| 20 | 15 | SPIRIDON AQ5 |
| 21 | 15 | K24 |
| 22 | 20 | K24 |
| 23 | 15 | K24 |
| Average Time | 21,74 | |

- **Control 3.2.5.2-5**

| ARE | Duration of the control (min.) | SAP System |
|---|---|---|
| 1 | 5 | SPIRIDON SWC |
| 2 | 5 | SPIRIDON SWC |
| 3 | 3 | SPIRIDON SWC |
| 4 | 6 | SPIRIDON SWC |
| 5 | 4 | SPIRIDON SWC |
| 6 | 4 | SPIRIDON SWC |
| 7 | 3 | K24 |
| 8 | 3 | SPIRIDON SPK |
| 9 | 5 | SPIRIDON MQ1 |
| 10 | 6 | K24 |
| 11 | 3 | K24 |
| 12 | 5 | K24 |
| 13 | 3 | SPIRIDON SWC |
| 14 | 4 | K24 |
| 15 | 5 | K24 |
| 16 | 6 | K24 |
| 17 | 3 | K24 |
| 18 | 3 | K24 |
| 19 | 4 | K24 |
| 20 | 4 | SPIRIDON AQ5 |
| 21 | 3 | K24 |
| 22 | 4 | K24 |
| 23 | 3 | K24 |
| Average Time | 4,09 | |

[8] *for confidentiality reasons, the researcher cannot disclose the true names of the ARE´s that exist in the HUB*

## Appendix L - Detailed Time Expense Breakdown per SAP System

- **Control 3.2.9-9**

| SAP System | Required time (min.) | Required time (hrs) |
|---|---|---|
| **Per Month:** | | |
| K24 | 290 | 4,83 |
| SPIRIDON SWC | 155 | 2,58 |
| SPIRIDON SPK | 15 | 0,25 |
| SPIRIDON MQ1 | 25 | 0,42 |
| SPIRIDON AQ5 | 15 | 0,25 |
| Total | 500 | 8,33 |
| **Per Year** | | |
| K24 | 3190 | 58 |
| SPIRIDON SWC | 1705 | 31 |
| SPIRIDON SPK | 165 | 3 |
| SPIRIDON MQ1 | 275 | 5 |
| SPIRIDON AQ5 | 165 | 3 |
| Total | 5500 | 91,67 |

- **Control 3.2.5.2-5**

| SAP System | Required time (min.) | Required time (hrs) |
|---|---|---|
| **Per Month:** | | |
| K24 | 52 | 0,87 |
| SPIRIDON SWC | 30 | 0,50 |
| SPIRIDON SPK | 3 | 0,05 |
| SPIRIDON MQ1 | 5 | 0,08 |
| SPIRIDON AQ5 | 4 | 0,07 |
| Total | 94 | 1,57 |
| **Per Year** | | |
| K24 | 624 | 10,4 |
| SPIRIDON SWC | 360 | 6 |
| SPIRIDON SPK | 36 | 0,6 |
| SPIRIDON MQ1 | 60 | 1 |
| SPIRIDON AQ5 | 48 | 0,8 |
| Total | 1128 | 18,80 |

## Appendix M – Overview of an RPA Implementation Process


**Source**: Internal Documents.

# Appendix N – Detailed description to perform the control 3.2.9-9 per Accounting System

| | K24 |
|---|---|
| | **First Stage** |
| | **1º** Go and open K24<br>**2º** Open T-code: YYFIESP<br>**3º** Choose the Table Parameter<br>**4º** Execute (F8)<br>**5º** Fill in the company code Parameter<br>**6º** Tick: Delete the entry limitation on field Maximum No. of Hits<br>**7º** Choose Layout<br>**8º** Fill the fiscal year Parameter<br>**9º** Execute (F8)<br>**10º** Choose export: Excel Spreadsheet |
| | **Second Stage** |
| | **1º** Go and open CLM<br>**2º** Open T-code<br>**3º** Select Variant<br>**4º** Fill in the company code Parameter<br>**5º** Fill the fiscal year Parameter<br>**6º** Fill in the Period Parameter<br>**7º** Execute (F8)<br>**8º** Choose extract Excel Spreadsheet<br>**9º** Choose the following fields: “Company”; “Division”; “Item”; “Development Code”; “Period Value in Local Currency” |
| | **Third Stage** |
| | **1º** Merge the two excel files<br>**2º** Merge the two sheets<br>**3º** Create a column where it show the differences between the two programs<br>**4º** Take a screenshot of the pivot<br>**5º** Save the screenshot |
| | **Forth Stage** |
| | **1º** Put the screenshots in the control template<br>**2º** Conclude depending of the evidences shown |
| **IT Based Activities to Achieve the Control** | **92,31%** |
| **Estimated Efficiency Gain with the RPA** | **80,00%** |

| | SWC |
|---|---|
| | **First Stage** |
| | **1º** Go and open SWC<br>**2º** Open T-code: YYFIESP<br>**3º** Choose the Table Parameter<br>**4º** Execute (F8)<br>**5º** Fill in the company code Parameter<br>**6º** Fill the fiscal year Parameter<br>**7º** Select application indicator: PC<br>**8º** Execute (F8)<br>**9º** Choose export: Excel Spreadsheet |
| | **Second Stage** |
| | **1º** Go and open CLM<br>**2º** Open T-code<br>**3º** Select Variant<br>**4º** Fill in the company code Parameter<br>**5º** Fill the fiscal year Parameter<br>**6º** Fill in the Period Parameter<br>**7º** Execute (F8)<br>**8º** Choose extract Excel Spreadsheet<br>**9º** Choose the following fields: “Company”; “Division”; “Item”; “Development Code”; “Period Value in Local Currency” |
| | **Third Stage** |
| | **1º** Merge the two excel files<br>**2º** Merge the two sheets<br>**3º** Create a column where it show the differences between the two programs<br>**4º** Take a screenshot of the pivot<br>**5º** Save the screenshot |
| | **Forth Stage** |
| | **1º** Put the screenshots in the control template<br>**2º** Conclude depending of the evidences shown |
| **IT Based Activities to Achieve the Control** | **92,00%** |
| **Estimated Efficiency Gain with the RPA** | **80,00%** |

| MQ1 | |
|---|---|
| **First Stage** | |
| **1º** Go and open MQ5<br>**2º** Open T-code:YYFIESP<br>**3º** Choose Table Parameter<br>**4º** Execute (F8)<br>**5º** Fill in the company code Parameter (Buchungskreis)<br>**6º** Fill the fiscal year Parameter (Geschäftsjahr)<br>**7º** Select application indicator Parameter (Applikationskennzeichen): PC<br>**8º** Tick: Delete the entry limitation on field Maximum No. of Hits (Maximale Trefferzahl)<br>**9º** Execute (F8)<br>**10º** Choose export: Excel Spreadsheet | |
| **Second Stage** | |
| **1º** Go and open CLM<br>**2º** Open T-code<br>**3º** Select Variant<br>**4º** Fill in the company code Parameter<br>**5º** Fill the fiscal year Parameter<br>**6º** Fill in the Period Parameter<br>**7º** Execute (F8)<br>**8º** Choose extract Excel Spreadsheet<br>**9º** Choose the following fields: “Company”; “Division”; “Item”; “Development Code”; “Period Value in Local Currency” | |
| **Third Stage** | |
| **1º** Merge the two excel files<br>**2º** Merge the two sheets<br>**3º** Create a column where it show the differences between the two programs<br>**4º** Take a screenshot of the pivot<br>**5º** Save the screenshot | |
| **Forth Stage** | |
| **1º** Put the screenshots in the control template<br>**2º** Conclude depending of the evidences shown | |
| **IT Based Activities to Achieve the Control** | **92,31%** |
| **Estimated Efficiency Gain with the RPA** | **80,00%** |

| SPK | |
|---|---|
| **First Stage** | |
| **1º** Go and open SPK<br>**2º** Open T-code: YYFIESP<br>**3º** Choose the Table Parameter<br>**4º** Execute (F8)<br>**5º** Fill in the company code Parameter<br>**6º** Fill the fiscal year Parameter<br>**7º** Select application indicator: PC<br>**8º** Tick: Delete the entry limitation on field Maximum No. of Hits<br>**9º** Execute (F8)<br>**10º** Choose export: Excel Spreadsheet | |
| **Second Stage** | |
| **1º** Go and open CLM<br>**2º** Open T-code<br>**3º** Select Variant<br>**4º** Fill in the company code Parameter<br>**5º** Fill the fiscal year Parameter<br>**6º** Fill in the Period Parameter<br>**7º** Execute (F8)<br>**8º** Choose extract Excel Spreadsheet<br>**9º** Choose the following fields: “Company”; “Division”; “Item”; “Development Code”; “Period Value in Local Currency” | |
| **Third Stage** | |
| **1º** Merge the two excel files<br>**2º** Merge the two sheets<br>**3º** Create a column where it show the differences between the two programs<br>**4º** Take a screenshot of the pivot<br>**5º** Save the screenshot | |
| **Forth Stage** | |
| **1º** Put the screenshots in the control template<br>**2º** Conclude depending of the evidences shown | |
| **IT Based Activities to Achieve the Control** | **92,31%** |
| **Estimated Efficiency Gain with the RPA** | **80,00%** |

| | |
|---|---|
| | **AQ5** |
| | **First Stage** |
| | **1º** Go and open AQ5<br>**2º** Open T-code: YYFIESP<br>**3º** Choose the Table Parameter<br>**4º** Select Variant<br>**5º** Execute (F8)<br>**6º** Fill in the company code Parameter<br>**7º** Fill the fiscal year Parameter<br>**8º** Select application indicator: PC<br>**9º** Execute (F8)<br>**10º** Choose export: Excel Spreadsheet |
| | **Second Stage** |
| | **1º** Go and open CLM<br>**2º** Open T-code<br>**3º** Select Variant<br>**4º** Fill in the company code Parameter<br>**5º** Fill the fiscal year Parameter<br>**6º** Fill in the Period Parameter<br>**7º** Execute (F8)<br>**8º** Choose extract Excel Spreadsheet<br>**9º** Choose the following fields: “Company”; “Division”; “Item”; “Development Code”; “Period Value in Local Currency” |
| | **Third Stage** |
| | **1º** Merge the two excel files<br>**2º** Merge the two sheets<br>**3º** Create a column where it show the differences between the two programs<br>**4º** Take a screenshot of the pivot<br>**5º** Save the screenshot |
| | **Forth Stage** |
| | **1º** Put the screenshots in the control template<br>**2º** Conclude depending of the evidences shown |
| **IT Based Activities to Achieve the Control** | **92,31%** |
| **Estimated Efficiency Gain with the RPA** | **80,00%** |

# Appendix O – Detailed description to perform the control 3.2.5.2-5 for all Accounting Systems

| | Any Accounting System |
|---|---|
| | **First Stage** |
| | **1.** Go and open any accounting system<br>**2.** Open t.code: AFBP<br>**3.** Fill the company code<br>**4.** Fill the fiscal year<br>**5.** Fill the posting period<br>**6.** Execute: F8<br>**7.** Make a total (∑) on the column "amount to be posted"<br>**8.** Make a subtotal by:<br>a. Depreciation area<br>b. Asset class<br>c. Show list of asset clasees for IFRS depreciation area<br>**9.** Save a screenshot of the report ensuring the date by emailing it to the user Workflow |
| | **Second Stage** |
| | **1.** Open t.code F.01.<br>**2.** Choose the company code and chart of accounts (if applicable in your system).<br>**3.** On the tab "Further Selections" choose:<br>a. Applicable financial statement version<br>b. The reporting year and period (period in scope)<br>c. Comparison year and period (previous period).<br>**4.** Filter by *09* accounts (asset depreciations).<br>**5.** Check, for each asset class, that the amounts posted in the period on the 09* accounts (see column "Abs. diff.") match the amount reported in the AFBP report.<br>**6.** Save a screenshot of the *09* accounts report by emailing it to the user Workflow<br>**7.** All differences must be investigated and justified. |
| | **Third Stage** |
| | **1.** Open 2KEE t.code<br>**2.** Fill in Company code and controlling area in scope<br>**3.** Fill in Posting Period for the period in scope only and current fiscal year<br>**4.** Fill in Account with the account range in scope of this control: 09*<br>**5.** Execute the report (F8).<br>**6.** Make a subtotal (∑∑) by:<br>a. Transaction type (TTy)<br>b. Account number.<br>**7.** As all current depreciations are booked with Transaction Type 09, you should have a match between the amounts shown on 2KEE t.code and AFBP report.<br>**8.** Save a screenshot of 2KEE report and give an explanation on the differences in your conclusion by emailing it to the user Workflow |
| | **Forth Stage (Manual Part)** |
| | **1.** Put the screenshots in the control template<br>**2.** Conclude depending of the evidences shown |
| **IT Based Activities to Achieve the Control** | **85,29%** |
| **Estimated Efficiency Gain with the RPA** | **70,00%** |

## Appendix P – Example of a Templated Created

| | | | |
|---|---|---|---|
| **CR Number** | **3.2.9-9** | [Signature/Digital Signature] | |
| **ARE:** | | | |
| **System** | | | |
| **Key Control Performer** | | | |
| **Date** | | **Period/Fiscal Year** | |
| **Control Requirement Description:** | **that all SC-reporting data delivered to CLM (data synchrony) match with the data of the accounting system on division level (Segment Consolidation Unit). In case the requirements for data synchrony cannot be fulfilled, measures must be taken.** | | |
| **Key Control Design:** | **What:** All data reported to CLM must be verifiable on basis of the accounting records on ERP system.<br>**How:** On a monthly basis, the data reconciliation between ERP and CLM system are performed with Year To Date (YTD) values and results of the analyses documented and archived locally, including all necessary information for consolidation purposes.<br>Reasons for the mismatch need to be analyzed and if possible corrected in the current period.<br>Refer to SHS AC Hub Lisbon's PCMB Execution Guidance.<br>**Who:** Hub accountant<br>**How often:** Monthly<br>**When: A**fter Month end Closing | | |
| **Accounts** | | | |
| **Conclusion** | | | |

Documentation Required:
- Evidence of the reconciliation (comparison of reports of both systems)
- List of mismatch and respective corrective action

**Source**: Adapted from Internal Documents.