MESG

MESTRADO EM ENGENHARIA DE SERVIÇOS E GESTÃO

Process Modelling to Support ERP Procurement: A Case Study

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Master Dissertation

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To my Best Friend,
that I will never forget.

Abstract

The main purpose of this dissertation was to create, execute and evaluate in a real scenario, a process modelling based methodology to support ERP procurement activities.

Although companies make huge investments in both money and people for ERP implementation programs, the actual process of procurement and selection of these solutions is, commonly, executed in a somewhat unstructured and subjective way. Therefore, it is intended for this work to create an adequate methodology for a business process modelling that stands as a cornerstone in the overall procurement framework.

This modelling project was held in an industrial area company where the first part focused on identifying and representing the current activity of the company, with the definition of the AS-IS models. A careful approach was designed to guarantee the maximum possible accuracy and the validation of the customer on the models proposed. In the second phase of the project, improvements identified throughout the first phase were analysed for the TO-BE models creation that represent the future vision of the company. At the same time, a process portfolio was created to support reading and understanding of the process models.

The main conclusions of the present dissertation were that business process modelling has proved to be of extreme importance when selecting and assessing different solutions to be implemented in a company. Business process modelling provides the company with an important documentation to support requirements and guide the implementation and adaptation of the new solution for the company. The methodology created here allows to support a company in the selection of any type of IT solution.

Resumo

O principal objetivo da presente dissertação foi criar, executar e avaliar, em cenário real, uma metodologia de modelação de processos que apoiasse as empresas nas atividades de seleção de um novo ERP.

Embora as empresas façam grandes investimentos monetários e de pessoal em projetos de implementação de soluções *ERP*, o processo de procura e seleção deste tipo de soluções é feito, normalmente, de forma subjetiva e pouco estruturada. Neste sentido, pretendemos com este trabalho criar uma metodologia para modelação de processos que se adeque e suporte as empresas nos processos gerais de procura e seleção de novas soluções no mercado.

Este projeto foi desenvolvido numa empresa do setor industrial e a primeira parte focou-se na identificação e representação do cenário de atividade atual da empresa com a definição dos processos *AS-IS*. Uma forma de trabalho foi cuidadosamente pensada, por forma a garantir o máximo de precisão possível e a validação do cliente sobre os modelos propostos. Numa segunda fase do projeto, as melhorias identificadas, durante a primeira fase, foram analisadas para a criação dos modelos *TO-BE* que representam a visão futura da empresa. Ao mesmo tempo, foi criado um portfólio de processos para apoiar a leitura e compreensão dos modelos de processos apresentados.

As principais conclusões da presente dissertação foram que a modelação de processos tem uma grande importância no apoio a atividades de seleção e avaliação de diferentes soluções a serem implementadas numa empresa. A modelação de processos de negócio proporciona à empresa uma importante documentação para suportar os requisitos e guiar a implementação e adaptação do novo sistema na empresa. A metodologia criada neste projeto permite apoiar uma empresa na seleção de qualquer tipo de soluções de TI.

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1 Introduction

1.1 Scope and general objectives of the dissertation

This dissertation was developed for the Master in Service Engineering and Management (MESG) in InovRetail, an innovation company fully invested to Research & Development of new technology-based solutions for the retail industry. Within InovRetail organization there is a consultancy department focused in providing the best support on business analysis activities.

The project of this dissertation was held at the consultancy area of InovRetail with the objective of modelling a company business processes, in the context of a broader project of ERP Procurement. The main goal was to document and understand the company´s business processes, documenting it to achieve the level of detail necessary to support the definition and implementation of the new ERP solution. The project took place at Cork Supply Portugal and its main results are going to be presented from now on.

1.2 Cork Supply Portugal

Cork Supply was founded in 1981 by Jochen Michalski in the winery region of North California. The company has multiplied its employees along the past years and it has expanded its activity throughout the world. The company is present in the main wine production areas around the world, having service operations to the customer throughout Europe, North America, South Africa and Australia.

Cork Supply Portugal (CSP) was created in 1995 and it is the centre of Cork Supply production and R&D. CSP currently has more than 150 employees spread over three industrial units:

- CSP1 in São Paio de Oleiros, where the company headquarters are located. This unit is responsible for the stoppers manufacturing and for guarantying the quality control of its products.
- CSP2 in Rio Meão is the unit responsible for finishing stoppers. In this unit the stoppers are customized accordingly to each customer specification.
- CSP3 in Montijo is the unit responsible for cork purchasing and preparation.

1.3 Cork Supply Portugal ERP Procurement Project

Cork Supply Portugal included in its strategic plan for 2014 the revaluation of the ERP that supports the operation of the company. To achieve the desired results and to guarantee the highest quality on the evaluation of new solutions, the company launched in March 2014 a structured process of analysis and selection of ERP solutions that better fits the company's different business units.

CSP decided to outsource the management and coordination activities for the selection of the ERP solution. This guarantees a dedicated team with quality time for the project, a focused approach and independency in the project deliverables. InovRetail was contacted

to respond to this request because of its team experience managing and coordinating projects of this nature and complexity.

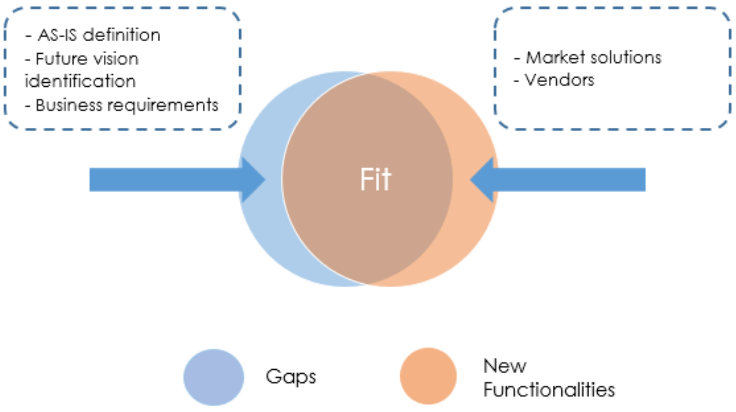


Figure 1. Overall project goal

The goal of the overall project is to identify CSP's vision for the business (current and future requirements), and to seek, evaluate and select ERP solutions that best suit the needs and the vision of the different departments and corporate areas of the company.

The first phase of the procurement project includes the creation of the tender specifications together with the modelling of the business processes. This will support the selection of suppliers in the market with the definition of the *Request for Information*. After this phase, there will be sessions with suppliers for solution presentation and evaluation. The definition of the *Request for Proposals* based on this evaluation will allow the creation of a short list of suppliers that will be present in the final phase of negotiation. In the end, InovRetail will propose to CSP the solution that best fits the company´s requirements.

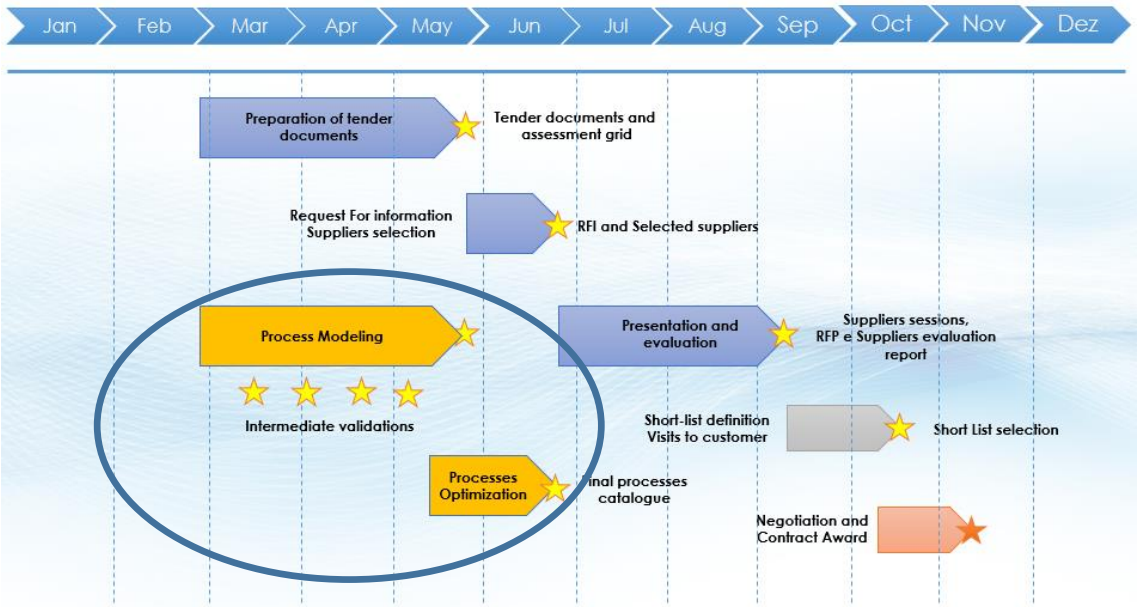


Figure 2. Overall project plan

InovRetail approach for the procurement of ERP solutions includes the identification and modelling of the business processes of CSP to the selection and assessment of the different ERP solutions in the market, as it will support the requirements identified throughout the project. Furthermore, it will guide the ERP providers when defining and implementing the new solution.

This dissertation focuses on the phase of modelling the business processes that will support the activities of ERP procurement. As highlighted in figure 2, the activities of process modelling are a part of the overall ERP procurement project and so, from now on, they are going to be referred as a project of process modelling to support ERP procurement.

1.4 Process Modelling to Support ERP Procurement

The process of procurement and selection of enterprise resource planning (ERP) solutions is typically made in a somewhat unstructured and subjective way, without quantitative tools that support customers in this process. However, the procurement phase has a high strategic importance as it will guarantee the best fit between the company requirements and the adopted solution. Moreover, the selection of a new ERP is an opportunity for organizations to redefine themselves, particularly to optimize their processes.

The identification and modelling of the business processes during the procurement phase is extremely important to guarantee the quality of the overall ERP implementation project. The main goal is to provide CSP with a strong baseline document to support the different phases of the project.

Therefore the key objective of the process modelling project is to provide CSP with tools for:

- better understanding the current processes;
- a single and integrated view of the processes of the company;
- a clear and objective tool for defining requirements;
- and a framework for fit analysis and benchmarking.

In order to document the CSP business processes, it is necessary to understand how the company works and what the company´s vision is for the future. Therefore, the modelling process is going to have two important phases: the definition of the AS-IS and the design of the TO-BE.

The first step is to define and describe the current situation of the company with the AS-IS models that will allow us to have a clear picture and understanding on the company's activity and on how the business processes are being performed to guarantee the success of the company. Along with the identification and modelling of the AS-IS models, possible improvements are going to be identified for the design of the TO-BE models. The goal is to identify the gaps in the different CSP processes and to provide the company with the definition of the TO-BE models that correspond to their vision and future objectives.

In the end, the main deliverable of the process modelling to support the ERP procurement project is going to be a portfolio detailing the AS-IS and TO-BE models. This portfolio is going to have a detailed presentation over each process model and an assessment over the improvements identified for designing the TO-BE.

1.5 Dissertation Synopsis

A new approach that includes the modelling of business processes as a fundamental tool for supporting the activities of ERP procurement has been object of study in this dissertation work. The rest of the dissertation is organized as follows: section 2 presents the state of the art of the related work; section 3 presents the step by step problem description and inherent methodology proposition; section 4 the whole development concerning the AS-IS study and process modelling; section 5 describes the improvements identified together with the TO-BE models proposition and a process portfolio; and finally section 6 presents some general conclusions and suggests future developments.

2 State of the Art – Literature Review

The project of this dissertation focuses on business process modelling to support the procurement of ERP solutions. One important and different step of our approach is modelling the processes of a company to support the assessment of the different ERP offered in the market.

Therefore, the concept of *ERP* and *ERP Procurement* are going to be introduced in this section, with a particular focus on the concepts of *Business Process* and *Business Process Modelling*.

2.1 Enterprise Resource Planning

The ERP was introduced in 1990, by Gartner Group, as the combination of four modules (Financials, Human Resources, Order Management and Manufacturing), that were meant to be integrated and to work together seamlessly. However, as vendors started adding functionality, confusion has arisen in market, and there was no agreement on which modules made part of an ERP (Gartner, 2011).

Given this confusion, the definition of ERP has been broadened to include almost any type of large integrated software package. ERP should not be defined in terms of modules, but as a strategy in which operational transactions are linked to financial transactions. ERP is no longer a set of functionalities, but a kind of suit in which a vendor may place various pieces of functionality. An ERP should also be suited to a specific organization, providing a unified enterprise view of the business that encompasses all functions and departments, as well as, an enterprise database where all business transactions are managed. This unified view will lead to an increasing cooperation and coordination between departments of a company (Leon, 2008).

The Gartner Group defines ERP as a "technology strategy that integrates a set of business functions, such as finance, HR, and purchasing, with operational aspects, such as manufacturing or distribution, through tight linkages from operational business transactions to final records" (Gartner, 2011).

2.2 ERP Procurement

ERP systems are complex and, by their very nature, will impose its own logic on a company's strategy, organization and culture. The technology is tightly integrated and requires a commitment from all business unities. Affecting every department, ERP often change the way a company does business. Implementing a new ERP can be time consuming and it usually represents high cost for companies (Gupta, 2000).

A great number of US firms experience some degree of failure in implementing advanced manufacturing technology. Since an ERP System cannot be completely standard and it must be implemented according to company's specifications and requirements, the greatest enterprise system implementation failures seem to occur when the new technology's capabilities and needs are mismatched with the organization's existing business processes and procedures (Umble et al. 2003).

Despite most ERP solutions have similarities, they also have substantial differences. It is extremely important for companies nowadays to define a sustained strategy when selecting a new ERP. As it represents high costs and can take years to implement, it is extremely important to guarantee that it will match company's needs in the future (Umble et al. 2003).

Therefore, in order to guarantee the new ERP will underscore their unique competitive strengths, while helping to overcome competitive weaknesses, companies are adopting new strategies to procure ERP solutions, being consultancy services more and more important in this market (Gupta, 2000).

2.3 Business Processes

According to Davenport (1993), a Business Process is a structured and measured, managed and controlled set of interrelated and interacting activities that uses resources to transform inputs into specified outputs (goods or services) for a particular customer or market (Bititci and Muir, 1997).

Sharp & McDermott (2009) define Business Process as a collection of interrelated activities, initiated in response to a triggering event, which achieves a specific, discrete result for the customer and other stakeholders of the process (Sharp and McDermott, 2009).

There are several definitions for business process in the literature. Despite there is not a single definition standing out to be the most broadly spread, it is possible to find some components that can be seen in a majority of the definitions (Sharp and McDermott, 2009):

- a Business Process must have an Input and Output;
- it has a purpose or value for the customer. It exists to meet needs of customers, stakeholders or other interested parties;
- it is a set of interrelated activities;
- it achieves a specific or discrete result;
- it is initiated in response to a triggering event.

2.4 Business Process Management

There is not a single definition for Business Process Management. In fact, BPM is currently being used in the market by different people with different meanings. Vendors, consultants, managers and analysts use BPM in different ways, being extremely difficult to assess the different point of view (Lee and Dale, 1996).

John Jeston and Johan Nelis consider in their approach that BPM does not equate to a technology tool or initiative for business processes. Technology has a fundamental role in business processes improvements but there are several business processes that can be improved without the use of it. In fact, Business Process Management Systems and process modelling tools can have great importance when improving business process, but it is mandatory to understand where and when to use them. BPM is about the management of business processes which will be present for a long time and they must be understood as "a management discipline focused on using business processes as a significant contributor to achieving organisation's objectives through the improvement, ongoing performance management and governance of essential business processes" (Jeston and Nelis, 2014).

It is important for leadership and management to understand that there is no finish line for the improvement of business processes. It must be understood as an end-to-end organizational view that must be maintained over time. To be successful, BPM also requires a great deal of common sense throughout the organization (Aalst et al. 2003).

2.4.1 BPM Lifecycle

Business Process Management is viewed nowadays as a discipline for continuous business process improvement. More than automating the process, the goal is to capture the process in a structured way to monitor and optimize it. BPM Lifecycle introduces a culture of continual process improvement and it is repeated continuously for the life of the process (Hepp et al. 2007)

Although there is no uniform view of the phases of BPM Lifecycle in the literature, the BPM lifecycle is commonly divided into six main categories: *strategy development; definition and modelling; implementation; execution; monitoring and controlling; optimization and improvement* (Houy, 2010).

In the BPM life cycle presented in Figure 3, the following concepts are considered as an aggregation of the presented life cycle:

- strategy development regarding the management of business processes;
- definition and modelling of relevant processes;
- implementation of processes in an organization;
- execution of implemented processes;
- monitoring and controlling of the process execution;
- optimization and improvement of processes.

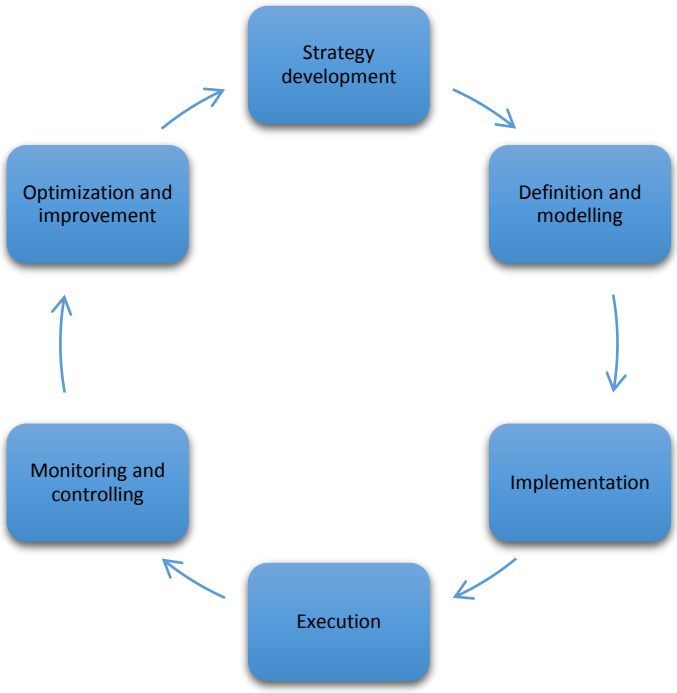


Figure 3. Business Process Management Lifecycle (Houy et al. 2010)

BPM Lifecycle is an easy tool for continuously manage business process improvements. As the focus of this project is to create a methodology for ERP procurement with the design of business processes, we will focus on the definition and modelling category of the BPM Lifecycle (Hepp et al. 2007).

2.5 Business Process Modelling

Process modelling is widely used within organizations as a method to increase awareness and knowledge of business processes, and to deconstruct organizational complexity (Bandara et al. 2005). It is an approach for describing how businesses conduct their operations and typically includes graphical depictions of at least the activities, events/states, and control flow logic that constitute a business process. Additionally, process models may also include information regarding the involved data, organizational/IT resources, and potentially other artefacts such as external stakeholders and performance metrics (Scheer, 2000).

Significant attention has been paid to the role conceptual models and conceptual modelling play in process of Information Systems development. Traditional forms of conceptual modelling state that building a representation of selected phenomena in a problem domain for the purpose of understanding and communication among stakeholders (Siau, 2004), accounted only for the organization's data and, if at all, that portion of its processes that interacted with the data. Nowadays, with the increased use of Information Systems, the deployment has been extended beyond transactions processing and into communication and coordination. This extension is known as a process-aware perspective on information systems (Dumas et al. 2005), and it is this perspective that gave rise to the conceptual modelling of business processes, known as process modelling (Havey, 2005).

Companies often use Business Process Modelling to get competitive advantages among competitors. In fact, if done well, there are several motivations for companies to model their processes, such as (Havey, 2005):

- *Formalize existing process and spot needed improvements*. Process modelling give companies the opportunity to rethink and formalize their understanding of current processes. Usually, people running the business spot potential improvements that must be taken into consideration. These improvements can lead to a removal or automation of some processes, or to the reengineering of a part or the whole of the flow.
- *Facilitate automated, efficient process flow.* Modelling allows to identify and understand the activities of a certain process. Identifying the flow of this activities allows a company to reduce the time between them to achieve a better performance. Plus, process modelling support process parallelism, so that independent processes can be performed at the same time in isolation with their results merged latter in the flow.
- *Increase productivity and decrease headcount.* The possibility to get work done faster with fewer people. With process modelling it is possible to identify opportunities to make work more effective, increasing customer satisfaction while reducing cost with personal.
- *Allow people to solve the hard problem.* Although the idea of process modelling is often about removing or decreasing human participation in a process, one of its major benefits is the possibility of using people to fix problems. Process modelling does not necessarily eliminate people, but has them to manually fix and correct problems that may occur in more complex automated processes.

- *Simplify regulations and compliance issues.* Business Process Modelling helps businesses build auditable processes that help organizations comply with various regulatory requirements.
- *Process over People*. Process modelling creates a standardized way to do work that can be perceived by anyone. Companies are not dependent on their workers anymore as the way of doing things is registered and can be easily transmitted.

2.5.1 BPM Techniques

There are several approaches and techniques to create business process models. Modelling techniques differ from each other in the way they represent this information. Giaglis, 2001, state that for representing this information, modelling techniques should take into consideration the following perspectives:

- *The functional perspective* that represents the activities of a process that are being performed.
- The *behavioural perspective* representing when the activities of a process are performed and how they are performed.
- *The organizational perspective* that represents who perform the activities and where, as well as the physical communication mechanisms used to transfer entities, and the physical media and locations used to store entities.
- *The information perspective* represents the information entities that are produced or manipulated by a process and their interrelationship.

Business Processes can be modeled through a large number of methods and techniques. Depending on the BPM Methodology, a preferred diagrammatical method may be used. Some classic business process modelling techniques, such as *flowcharting* and *IDEF*, are briefly described in the following paragraphs.

Flowcharting

One of the first modelling techniques introduces was *flowcharting*. Jones, 1986, describes flowcharting as the technique to depict the physical media on which data are entered, produced, and stored in order to highlight key processing and decision points. Initially, *flowcharting* was created to represent computer program login. Although, due to its generic nature, it has been used in many other application areas, such as business process modelling. The use of these technique has evolved due to its familiarity and easiness (Aguilar-Savén, 2004). Some of flowcharting advantages and disadvantages are presented in table 1.

Table 1. Flowcharting Advantages and Disadvantages

Advantages	Disadvantages
- Ability to represent overall structure of a process; - Easy to use and understand.	- Only provide basic facilities in representing processes; - Alterations and modifications.

Example of a *flowchart*:

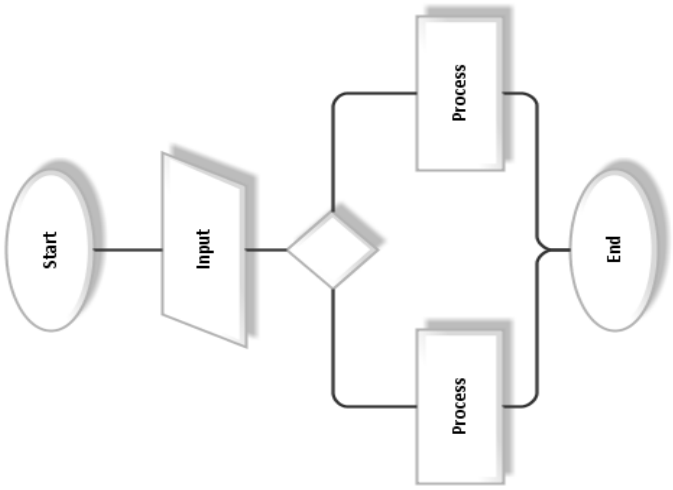


Figure 4. Example of a *flowchart* diagram (adapted from Aris Community, 2014)

IDEF

IDEF is known as a family of modelling techniques especially created to represents and model process and data structures in an integrated way. Developed as a set of notational formalisms, The *IDEF* suite consists of a number of independent techniques. The most relevant techniques, regarding process modelling, are *IDEF0* and *IDEF3*. Although these techniques were developed with the same purpose of modelling business processes, they do it in different ways. *IDEF0* is mostly targeted towards the functional modelling perspective, while *IDEF3* describes processes as ordered sequences of events and activities. *IDEF3* appears as an evolution of *IDEF0*, overcoming some limitations of the first technique (Giaglis, 2001). Some of *IDEF3* advantages and disadvantages are presented in table 2.

Table 2. *IDEF3* Advantages and Disadvantages

Advantages	Disadvantages
- Ability to behavioural and informational modelling; - Ability to describe the flow of activities within a process; - Ability to represent the different states of entities through the process; - Easy to learn.	- Difficult to maintain (many software support tools does not support the IDEF numbering notation); - Abstraction away from timing, sequencing and decision logic; - Difficult to understand for the people outside the domain.

Example of an *IDEF3* diagram:

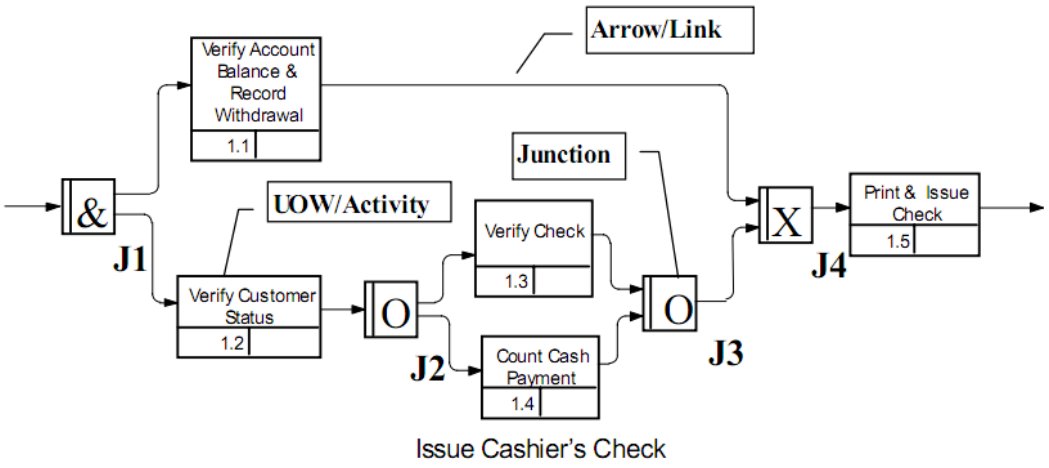


Figure 5. Example of an *IDEF3* diagram (adaptd from BPwin Methods Guide, 1997)

Some examples of more recent modelling techniques, such as *swimlanes*, *SIPOC* and *BPMN*, that are going to be used in this dissertation work, are briefly described in the following paragraphs.

Swimlane diagrams

Swimlane diagrams are process workflow models that provide richer information on who does what. These diagrams are divided lengthwise into *swimlanes* that correspond to each actor or participant in the process. A box represents a step in the process, and is placed in the *swimlane* of the responsible actor. The boxes are connected by arrows that represent the sequence or flow of the steps. These diagrams are used to represent process workflow from a simplified overview down to very detailed steps (Damelio, 2011). Some of *swimlane* diagrams advantages and disadvantages are presented in table 3.

Table 3. *Swimlane* Advantages and Disadvantages

Advantages	Disadvantages
- Easy to read and self-explanatory; - Show individual actors and emphasise their responsibility and interactions with other actors along the process; - Realistic depiction of the workflow; - Highly visual with an obvious sequence.	- Limitations in representing processes at a high-level; - Requires training to proper use.

Example of a *swimlane* diagram:

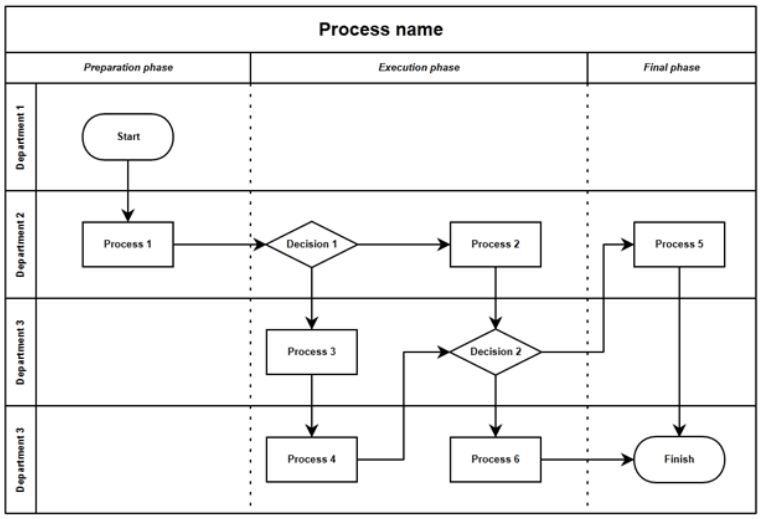


Figure 6. Example of a *swimlane* diagram (adapted from Aphalina, 2014)

The project of this dissertation intends to represent and understand business process at a high-level and so, *swimlane* diagrams will not be the modelling technique to represent it.

SIPOC

SIPOC is a process modelling tool used to represent processes at a high-level, and it is usually used by a team to identify all relevant elements of a process improvement project. It is a visual tool for documenting business processes from beginning to end. These diagrams present a high-level descriptions of processes and do not contain too much detail. The main goal of the *SIPOC* is to ensure the team members understand the boundaries with a clear start of the process and end of the process that meets the scope defined in the contract (Hamza, 2008). Some of *SIPOC* advantages and disadvantages are:

Table 4. *SIPOC* Advantages and Disadvantages

Advantages	Disadvantages
- Providing management with a big-picture view; - Identify process boundaries; - Clear representation of the participants of the process; - Identify the inputs and outputs of the process.	- Limitations in representing processes at a low-level.

SIPOC diagrams simplify the variables of a process into five segments, as it is represented in figure 7.

Process_Name	
Supllier	*Who gives the input of the processes or activity. Every input should have a supplier and it can be a person, system or department.*
Input	*Things that trigger the process. An input is what will be used in the process to produce the output. It will often be tangible.*
Process	*Where the activities or sub-processes that make up the process are represented. This are the activities that are carried out to transform the inputs into outputs. They will form the basis of the process map.*
Output	*Tangible things that the process produces. Every output should have a customer.*
Customer	*Who receives the output and consumes it.*

Figure 7. Example of a *SIPOC* diagram

BPMN

BPMN is a rigorous and powerful notation that standardizes the drawing of process workflow models. *BPMN* was created as an effort to provide a notation that is readily understandable by all business users, creating a standardized bridge for the gap between the business process design and process implementation. Used to represent business processes, *BPMN* notation is capable of representing many different levels of detail and different sorts of diagrams for different purposes. *BPMN* notation offers a wide range of symbols to design processes. However, it is important to understand the use of those symbols when modelling processes. In fact, *BPMN* is best suited for drawing specification level or technical workflow models in preparation for configuring an automated workflow facility or business process management system. Therefore, it can be really confusing to use all of *BPMN* symbols to model business processes. It is important to understand the difference between technical modelling and business modelling when selecting the symbols to use (White, 2008). Some of *BPMN* advantages and disadvantages are presented in table 5.

Table 5. *BPMN* Advantages and Disadvantages

Advantages	Disadvantages
- Standard, with very well defined syntax and a defined semantics; - Ability to communicate outside the development group; - Describe precisely how a processes is implemented and run.	- Necessity to understand the context of implementation.

The *BPMN* symbols that best suit process modelling are:

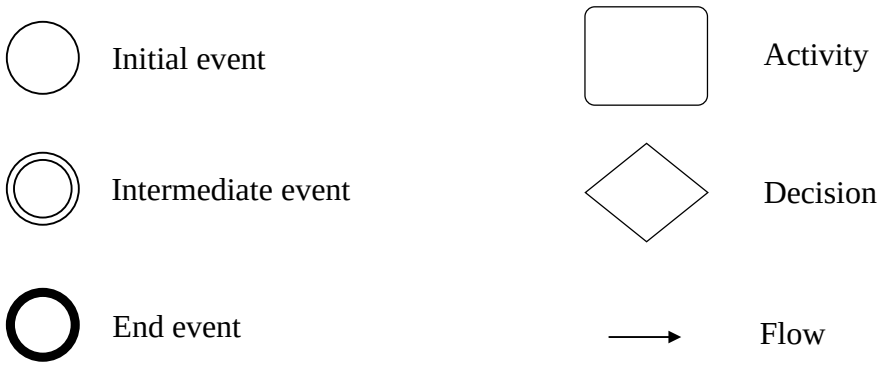


Figure 8 – Examples of *BPMN* symbols

2.6 Conclusion and Guidelines for the Project

ERP systems affect the entire structure of a company and the way it operates. Plus, they are expensive, as well as take a lot of time and resources to implement. Although several approaches have been proposed throughout the years to guarantee the better selection possible of ERP solutions, there is not a standard way to do it, and companies have great difficulty to guarantee the best fit between the ERP solution and their requirements.

In order to create a structured way for the procurement phase of ERP solutions, providing companies with the necessary material for supporting their decision making, we consider, in this project, Process Modelling as a fundamental tool for supporting the procurement phase. In fact, modelling the processes of a company at a high level can help to support the identified requirements and to assess the impact of the different ERP solutions in the company. At the same time the company gets a documental support of all its business processes.

There are several techniques for process modelling that have been proposed in the literature. As the project aims to describe processes at a high-level, with a clear definition on who performs the process activities and which are its main inputs and outputs, the *SIPOC* technique seems to be the one that better suits the project requirements. In fact, we do not want to get into too much detail when describing business processes. Instead, we are getting a clear overview of each process, identifying its boundaries to understand how the new solution fits the process and in which way it will add value to the company.

As it was presented earlier in this section, it can be really interesting to add *BPMN* notation when describing a process inside the *SIPOC*. This will allow a better understanding on how the process activities are connected and the different sequence of activities that it can take. Our goal was to be as accurate as possible when drawing the business processes, as well as to design them in a clear and easy way to understand.

3 Case Description and Adopted Methodology

This section presents the methodology followed in this project to document the processes of CSP. This methodology corresponds to a set of approaches to get the maximum accuracy when modelling processes to create a framework easy to understand that represents the activity of the company. The methodology is divided in two main parts corresponding to the two main goals of the project: defining the AS-IS representing the current activity of the company and designing the TO-BE with the identification of gaps and possible improvements for the future.

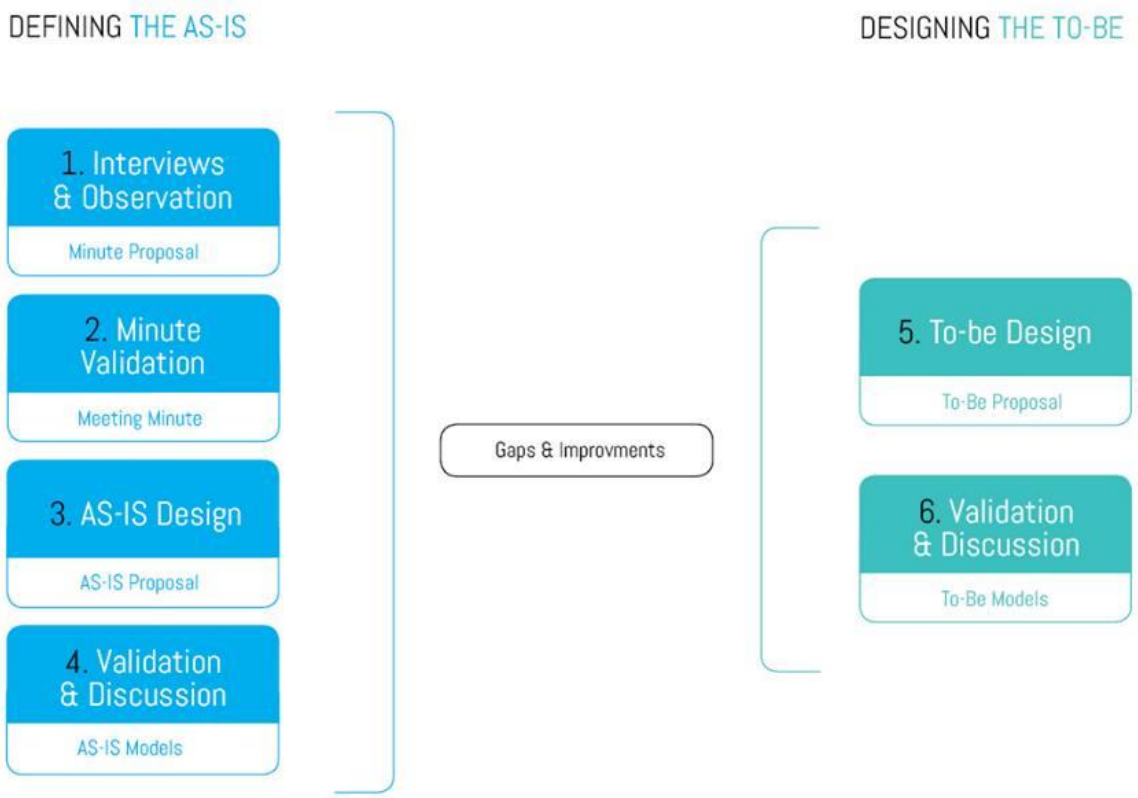


Figure 9. InovRetail Methodology for Process Modelling

3.1 Defining the AS-IS

The first part of the project was to understand and to get a clear picture on how the company works with the definition of the AS-IS. In order to collect the maximum information about the business processes, this first phase was divided into four main steps:

Table 6. Step 1 - Interviews & Observaton

Step 1	Interviews & Observation
Goal	Identification of current business processes in each business area of the company.
Input	Meeting plan.
Output	Minute proposal.

Table 7. Step 2 - Minute validation

Step 2	Minutes validation
Goal	Validations of the minutes by the different business areas.
Input	Minute proposal.
Output	Meeting minute.

Table 8. Step 3 - AS-IS design

Step 3	AS-IS design
Goal	First model of the business processes.
Input	Meeting minute.
Output	AS-IS proposal.

Table 9. Step 4 - Validation & Discussion

Step 4	Validation & Discussion
Goal	Validation of the AS-IS models with the business areas and identification of improvement opportunities.
Input	AS-IS proposal.
Output	AS-IS models.

3.2 Designing the TO-BE

The following phase of the project was to identify possible improvements and to understand the company vision for the future. In order to design the TO-BE models, two main phases are needed:

Table 10. Step 5 - TO-BE design

Step 5	TO-BE design
Goal	Assessment on the impact in the company of each improvement identified in the definition of the AS-IS.
Input	AS-IS models.
Output	TO-BE proposal.

Table 11. Step 6 - Validation & Discussion

Step 6	Validation & Discussion
Goal	Validation of the TO-BE models with the business areas and identification of improvement opportunities.
Input	TO-BE proposal.
Output	TO-BE models.

3.3 Techniques and support material

For the documentation of the business processes, a new approach has been taken in this project. A hybrid procedure, mixing the SIPOC and BPMN techniques was developed, in order to achieve the desired results for the customer. The process modelling was made based on the *SIPOC* with the integration of the *BPMN* to describe the process area. Further explanation on this techniques can be found in the State of the Art.

At the same time, throughout the whole project, a process portfolio to support the reading of the business processes has been created. This portfolio has the information about each activity of the business processes in order to create a common understanding on how they are performed. A support paper was also created to explain and expose the impact of each improvement of the TO-BE models in the company activity.

4 Process Modelling AS-IS

4.1 Interviewing, First Draft & Validation

The first phase of the modelling process was an interview session with the different business departments of CSP. The main goal was to understand how the different department responsible understood their business processes, in order to identify their main activities. As the company organizational map has ten different main business areas, an interview plan with ten sessions was proposed. After the first phase of interviews, the first draft of the business processes was designed for future validation. Additional interviews were held whenever it was necessary. The session plan presented to the company and held throughout the first phase of this project was is presented in table 6.

Table 12. Interview Sessions

Date	*Responsible*	*Area*
10/03	Paulo Cardoso	Commercial.
13/03	Filomena Mota	DSL, Shipping and BARTOPS.
17/03	Francisco Almeida	Cork and Wood Purchasing, Cork Wood Preparation and Shipping.
20/03	Raquel Couto	Customer Service, Production, Quality Control, Logistics & Stocks.
24/03	Paulo Couto	Cork Purchasing.
27/03	António Costa	Quality Control Department.
31/03	André Rocha	Purchasing and Finance.
03/04	Isabel Alegro	Company Overview, Strategy, Vision and Main Goals.
07/04	Mário Outeiro	Industrial Department.
10/04	André Rocha	Human Resources.

After the first session with each department a meeting minute was produced with as much information as possible for validation. This minute validation was of great importance to confirm data and start modelling the business processes. After gathering all the possible information from the different responsible of each department, we started drawing the first draft of the business process.

With our methodology we have created a strong and structured way to support the characterisation of the company business processes. With all the data confirmed and the feedback on each business process, we can guarantee that the modelling process was as accurate as possible and that represents in the best way the company activity and the relation between each department. Having this into consideration, we have developed the processes catalogue in which we included the *Business Process Map* along with the *Business Process Model*.

4.2 CSP AS-IS Business Process Modelling

In order to create an easy and structured model to present the business processes, it was necessary to distinguish between different levels of detail that will be presented further in this section. The different levels of detail are linked between each other and together create the representation of the activity and different business areas of the company. It is important to distinguish from the business process map and the business process models, as they represent the company in different perspectives:

- ***Business Process Map:*** representation of the different business areas of the company and definition of the core and support processes. This is a functional representation of the company activity to create an overview on the company different business areas.

- ***Business Process Model:*** representation of the different business processes levels of the company. This is an organizational representation of the company activity, detailing the processes boundaries and interconnections and it is divided into three different level presented in figure 10.

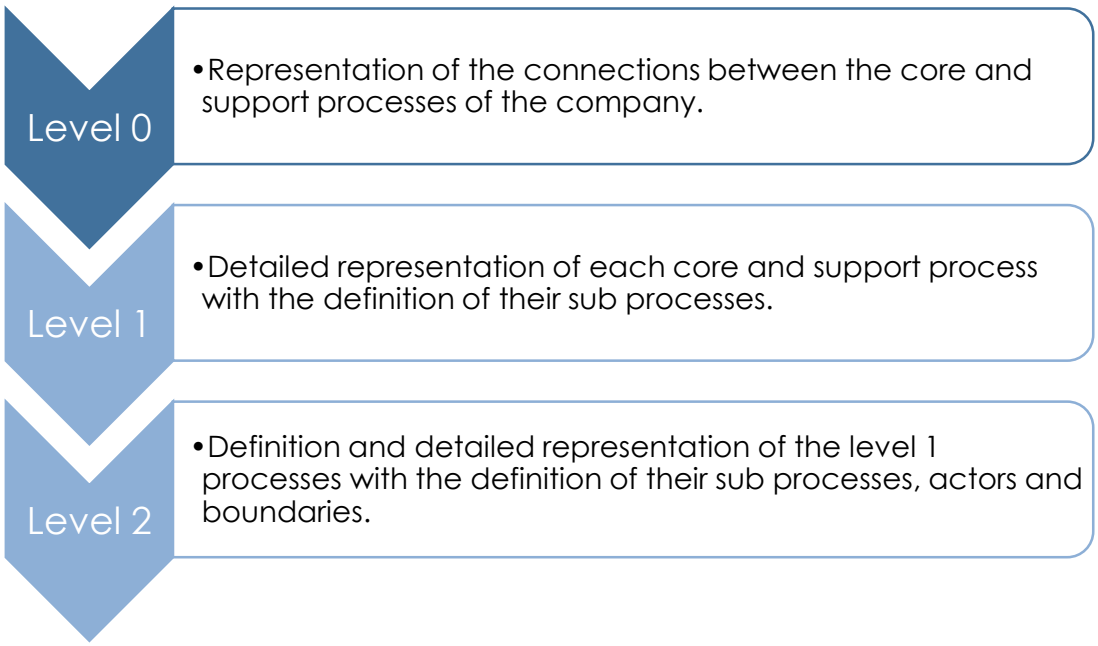


Figure 10 - Business Process Model levels of detail

The structure presented allows us to get the level of detail necessary to support the overall project and to meet, in the best way, our customers' requirements. Every process is going to be defined and exposed leading to a clear representation of the activity of CSP throughout its different departments.

4.2.1 Business Process Map

The main goal of creating the *Business Process Map* was to represent an overview of the main business areas and their assigned groups of processes. With this representation it is possible to understand which processes should be analysed in detail in order to reach our project defined goals of representing the company activity and the relation between its core processes in a structured way, as it is presented in figure 11.

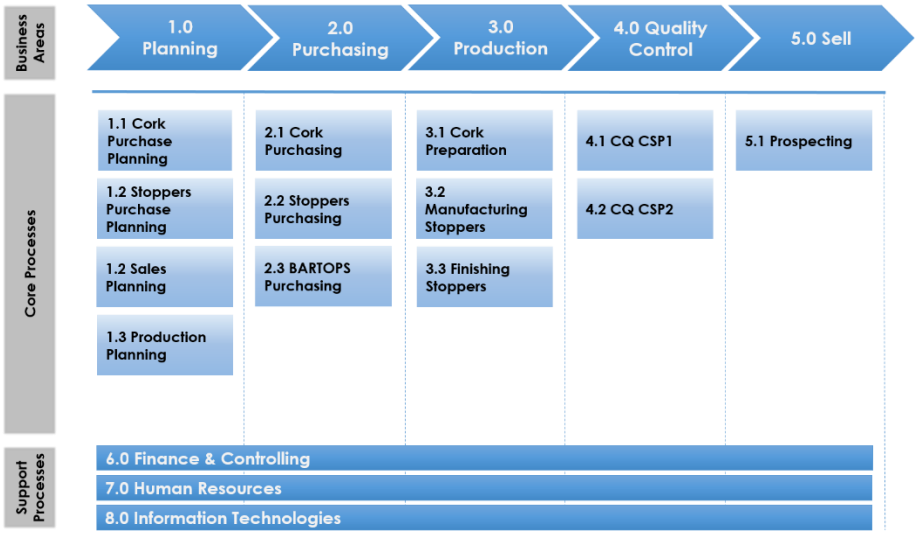


Figure 11. CSP Business Process Map

We have divided the company into five main business areas: *Planning*, *Purchasing*, *Production*, *Quality Control* and *Sell*. In each of those main business areas we identified the core processes that should be taken into consideration further in the project to study in more detail. In fact, each of these core processes will represent a set of sub-processes that will represent the level one of our business process modelling.

There are different kinds of planning such as *Cork Purchase Planning*, *Stoppers Purchase Planning*, *Sales Planning* and *Production Planning*. We will describe the main processes of each one, as we understand they will support and fundament the rest of the company's business processes.

CSP has three kinds of purchase processes in its purchasing area. *Cork Purchasing*, *Stoppers Purchas*ing and *BARTOPS Purchasing* are different purchasing processes fundamental for the company to satisfy its necessities and response to customers.

At the production level, it is important to highlight the processes of *Cork Preparation*, *Manufacturing Stoppers* and *Finishing Stoppers* as they are the core activity of the company and they are fundamental to its competitiveness in the market.

The two different processes for quality control correspond to different phases of the company activity. *QC CSP1* is directly related to the phase of preparation and manufacturing, while the *QC CSP2* is related to the phase of finishing stoppers.

In the sales area we can find the *Prospecting* processes through which the company identifies customers' needs and orders.

The support processes of *Human Resources*, *Finance & Controlling* and *IT* are transversal to all organization and should be taken in attention as the complement the remaining processes.

4.2.2 Business Process Model AS-IS

The business process model was created to represent the different levels of detail of the company business processes. The main goal is to represent the connections between processes and the responsible for each one. A clearer presentation over some processes presented from now on can be consulted in the appendix section.

4.2.2.1 Level 0

First of all, to understand how these processes connect between each other, it is necessary to represent the level 0 of the process modelling. At this level we will represent the links between the different business processes in order to have a clear overview on how they are connected along the activity of the company. It is important to understand that CSP is divided into 3 main production centres that will be distinguished at this level.

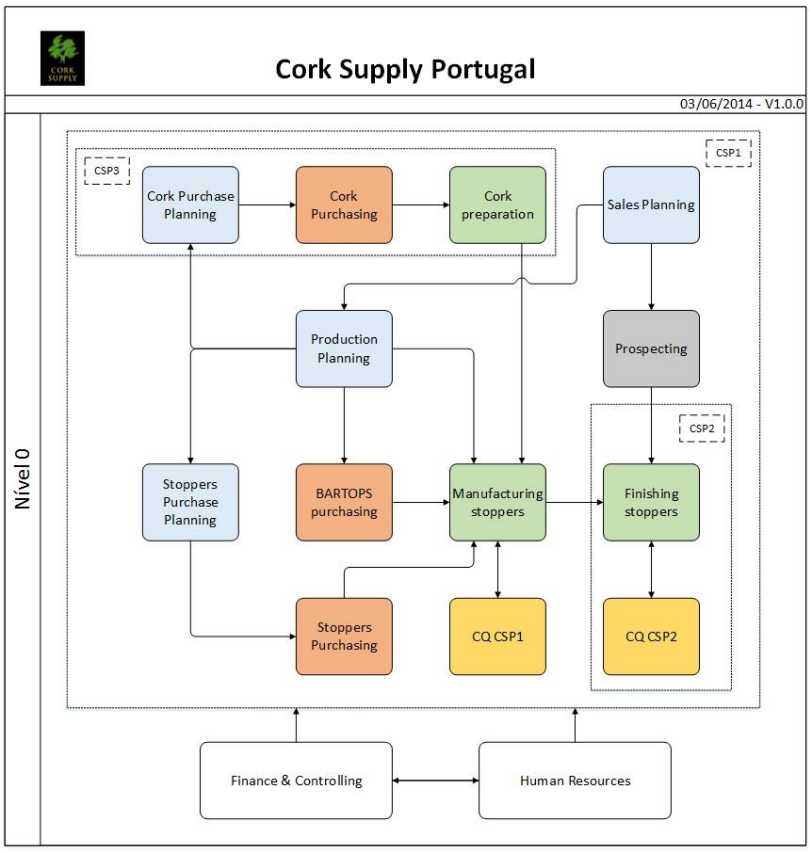


Figure 12. CSP Level 0

CSP3 is the CSP production centre responsible for the cork purchasing and preparation. Here are also performed the activities for cork purchasing planning to satisfy CSP necessities.

CSP1 is where the CSP headquarters are located. The core process of *Manufacturing Stoppers* is in the centre of CSP1 activity. The sales planning, production, stoppers and bartops purchasing, quality control and shipment activities are also held here by the company top management.

CSP2 is the CSP centre responsible for finishing stoppers. Here is where the company responds to each customer order and customizes its products.

4.2.3 Level 1

At this level we will present CSP core business processes in more detail. The goal is to represent the processes that will be necessary for the success of the core processes. The key relations between those processes will also be represented whenever necessary. It is fundamental to have a clear representation of the level 1 when process modelling as it will represent the connection between the processes that will be described further at the level 2. After representing their organization at the level 0 we want to create a clear picture of each one and a clear representation and explanation on how the different business areas perform.

4.2.3.1 Planning

Figure 13. CSP Level 1 Planning Processes

The first big business area of CSP is responsible for the planning activities. There are 4 kinds of planning that will have extreme importance to support the entire activity of the company. Although each Planning process has only one sub process, we can easily understand that there are different types of planning for different activities, and so, we have organized the different kinds of planning as separated level 1 processes.

4.2.3.2 Purchasing

The Purchasing area has great impact in the company activity. In fact, the different kinds of purchasing processes that are going to be presented, are in the begging of the entire production activity of the company and must be taken in attention to respond to the customers' needs and specifications. CSP has activities for cork, stoppers and bartops purchasing that are going to be explained in this section.

Cork purchasing

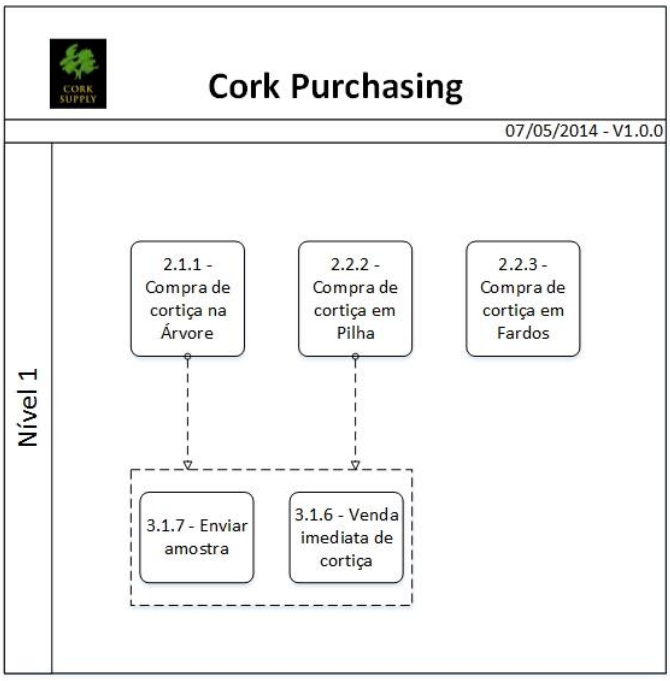


Figure 14. CSP Level 1 Cork Purchasing

The process of *Cork Purchasing* is held in CSP3 and it is CSP process for buying natural cork to respond to the company's necessities. There are three different kinds of cork purchasing that happen in different phases of the year, and so, there is no connection between these processes. Although these buying processes are going to be described in more detail at the level 2 of the process models, it is important to understand how they are organized and which processes are supporting them. In parallel to the main processes of cork purchasing, there are the processes of sending samples, to guarantee the quality of the cork bought, and immediate sale of cork, as the cork bought is, sometimes, out of condition for producing stoppers.

Stoppers purchasing

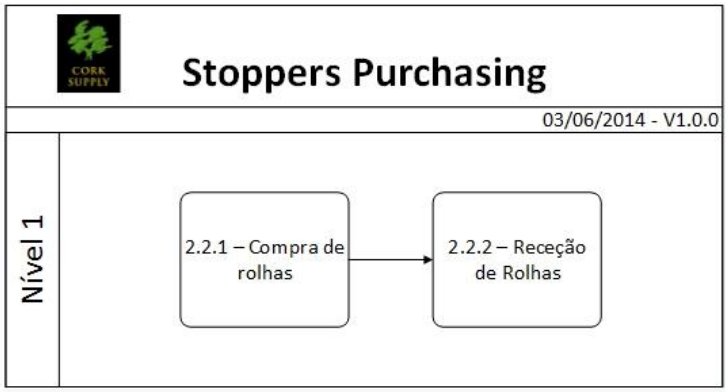


Figure 15. CSP Level 1 Stoppers Purchasing

The process of *Stoppers Purchasing* is the main purchasing process of CSP as it corresponds to 70% of its sales. In fact, this purchase exists to respond to customer's requirements, as the purchased stoppers are going to be transformed in CSP and sold as a semi-finished or finished product. This purchasing process only ends when the stoppers are received in CSP and its quality is approved by the quality control department in CSP1.

BARTOPS purchasing

Figure 16. CSP Level 1 BARTOPS Purchasing

The *BARTOPS Purchasing* process in CSP is the simplest of the three processes presented here. In this kind of purchase are bought the capsules that, together with the stoppers, will form the bartops. There is no planning and these kind of purchase happens as a response to customers' requests and necessities.

4.2.3.3 Production

The Production area is one of the main areas of the company activity. Here we can find the level one processes for *Cork Preparation*, *Manufacturing Stoppers* and *Finishing Stoppers*. Each of these processes is going to have great importance in the company a success and response to the customers, and so, they are going to be described in more detail in this section.

Cork Preparation

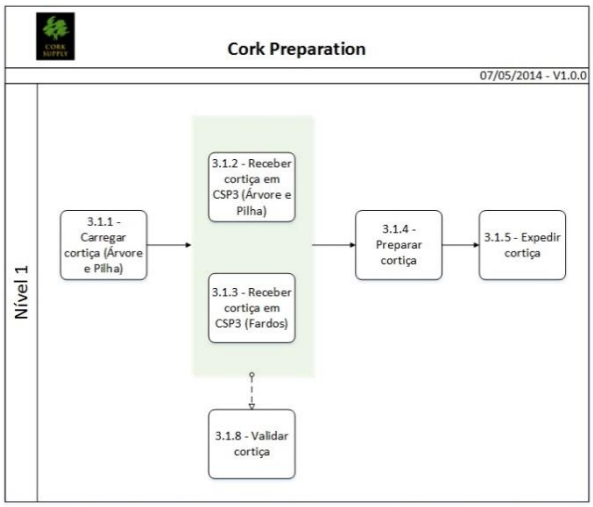


Figure 17. CSP Level 1 Cork Preparation

Cork Preparation is the process performed in CSP3 that guarantees the cork quality to be used in the manufacturing phase in CSP1. As it has been explained in the previous section there are three kinds of cork purchasing in which, the shipment of two of them is done in this phase of the overall process.

The main processes here are the cork preparation and shipment to CSP1. Accordingly to the different kinds of cork purchasing, there are also processes for cork transportation and for receiving the cork in CSP3. The reception of cork leads to the sub process of cork validation by the supplier.

Manufacturing Stoppers

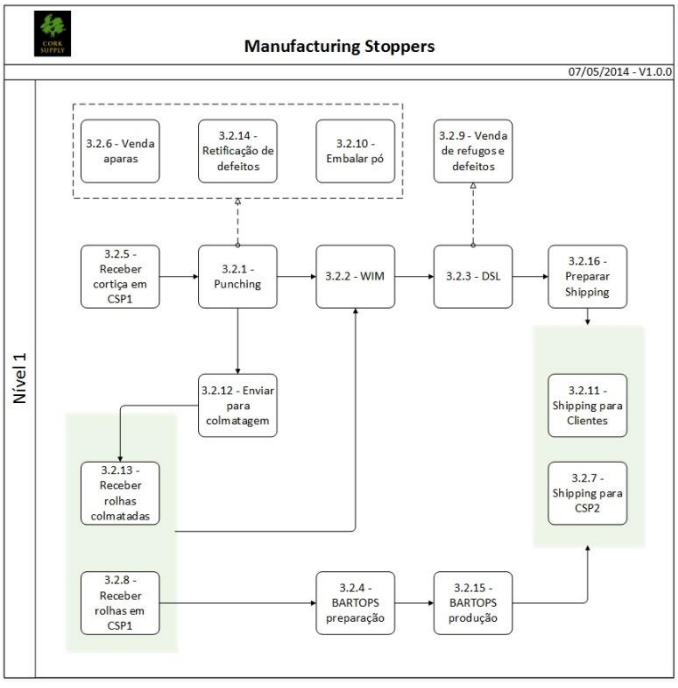


Figure 18. CSP Level 1 Manufacturing Stoppers

Manufacturing Stoppers is the central activity of CSP and it is performed in CSP1. Here, the cork that is received from CSP3, is directly sent to the punching process where it is transformed in stoppers.

The main processes here are the *Punching* for transforming the cork into stoppers, the *WIM* for cleaning the stoppers, the *DSL* to define the different quality patterns and the processes for *BARTOPS Preparation* and *BARTOPS Production*. Along with these processes, there are the processes for receiving, filling and shipping stoppers. It is also important to refer the processes for scrap selling, defects rectification and powder packing.

Finishing Stoppers

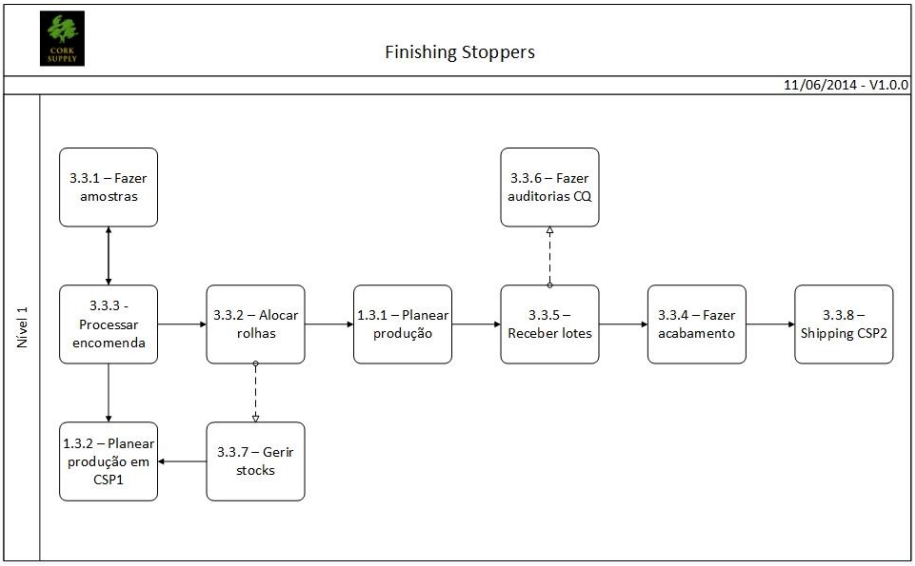


Figure 19. CSP Level 1 Finishing Stoppers

The CSP2 unit is responsible for the activities of finishing stoppers and customization of customers' requests. It is also in CSP2 that is based the customer service of CSP for customers' order processing.

The main processes here are the *Order Processing*, to process orders received from the customers or from the commercial department, the *Making Samples* as every order must have a sample associated, *Stoppers Allocation* to define the stoppers that will be used in the production phase and the sub process for *Finishing Stoppers* to customize customers' orders. Together with these processes there are the processes for receiving batches, planning the production and shipping. It is also important to refer the quality control activities along the all process as they will represent an essential role for the customer satisfaction.

4.2.3.4 Quality Control

One of the biggest challenges in CSP activity is to guarantee the quality of its products. Therefore, the quality control area is going to have great importance throughout the entire activity of the company. As there must be a careful control in the different phases of CSP

activity, there is a quality control centre for the activities of purchasing and manufacturing in CSP1 and a quality control centre for the activities of finishing stoppers in CSP2. Both of these centres are independent and are going to be described here.

QC CSP1

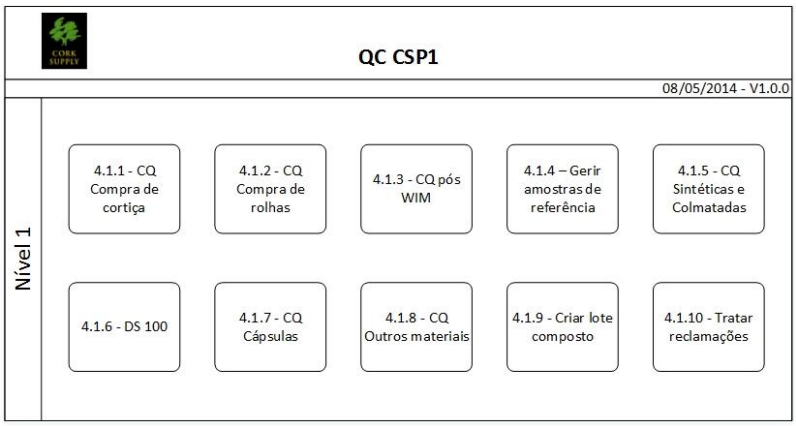


Figure 20. CSP Level 1 QC CSP1

The quality control department in CSP1 is responsible for guaranteeing the quality patterns in the entire activity of the unit to guarantee the satisfaction of the customers.

There are different processes of quality control for the purchasing and manufacturing activities, in order to guarantee the best quality of the products received and produced in CSP1. It is also important to refer the patented service that CSP offers to its customers for guaranteeing the quality of each individual stopper called *DS100.* Together with these processes, the QC CSP1 is responsible for creating compound batches, managing samples and processing customers complains.

QC CSP2

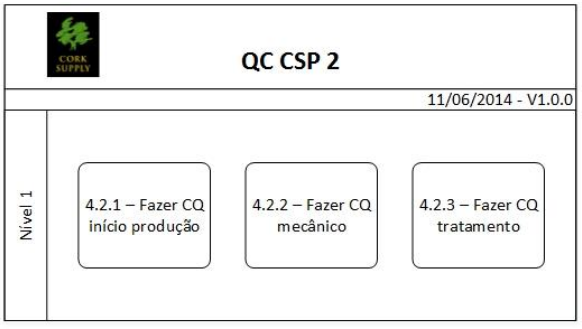


Figure 21. CSP Level 1 QC CSP2

The quality control department in CSP2 is responsible for guaranteeing the quality patterns in the finishing process of the stoppers, in order to guarantee that every order delivered matches the customers' quality expectations.

There are three kinds of quality control here. The first control is performed when the batches arrive to the business unit and it is mandatory to allow the beginning of the production. Then, after the treatment phase, a quality control is necessary to guarantee the success of the treatment phase so that the stoppers can continue to the nest phases of the production line. Finally, a mechanical quality control performed for guaranteeing the quality of the final product that is going to be delivered to the customers.

4.2.3.5 Sell

Prospecting

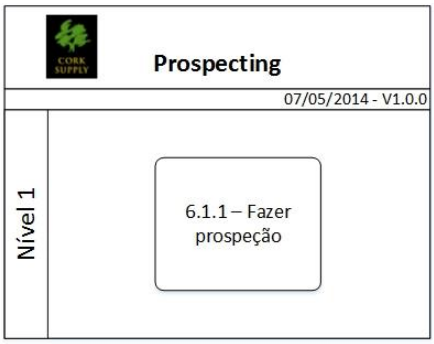


Figure 22. CSP Level 1 Prospecting

The *Prospecting* process is the main activity of the commercial department of CSP. Here the customers of the company are identified and the selling force tries to get the orders necessary to satisfy the company's goals. As this is a very important activity to gather customer information and to identify new selling opportunities, this process must be taken in attention and should be standardized.

4.2.3.6 Finance and Controlling

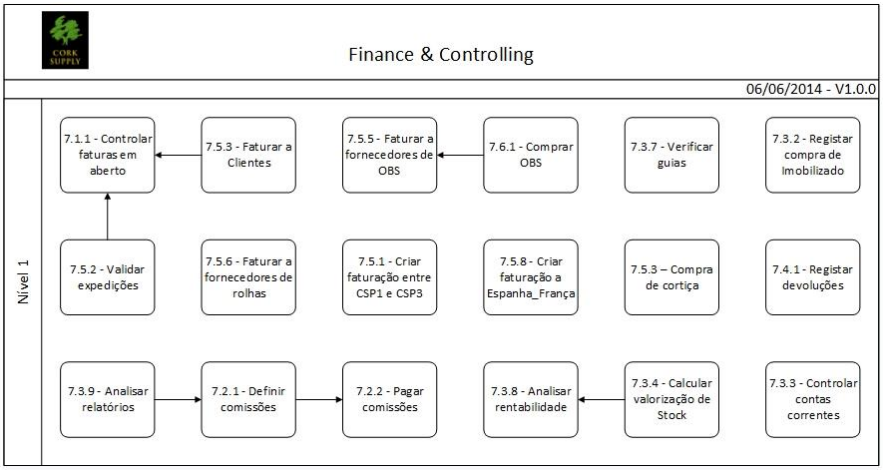


Figure 23. CSP Level 1 Finance & Controlling

The *Finance & Controlling* processes are transversal to the entire organization and will have an important role in the company performance and success. All these activities are performed in CSP1 by the finance team. The different processes correspond to different areas of activity and to different business areas of the company. The main activities

covered here are the activities of billing, purchasing, returns, management control and commissions.

4.2.3.7 Human Resource

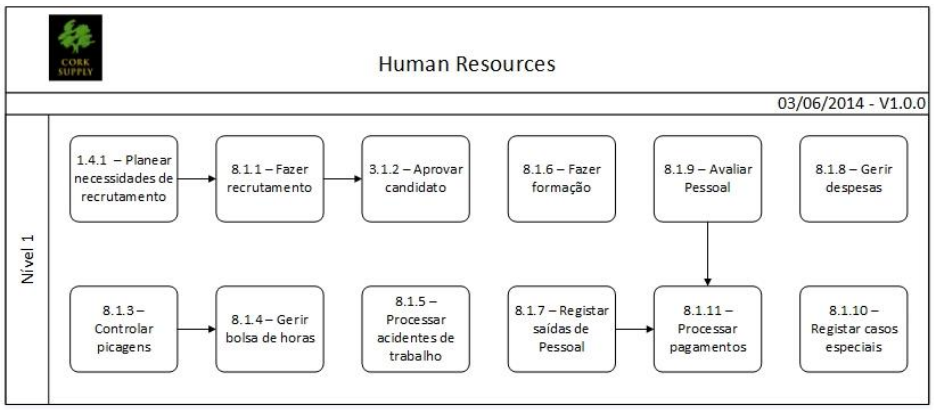


Figure 24. CSP Level 1 Human Resources

The processes that support the activities of HR are transversal and affect the entire organization of the company. With more than 150 employees, the human resources department in CSP1 has increasing importance. Activities for planning and processing the recruitment of new employees are responsibility of the HR department. There is not a standard process for training but there must be a process to manage and register training activities whenever they are performed. All the management of working hours, employees' expenses and special cases that may occur are done here, together with the activities of evaluating personnel work and register of leaving situations. Every payment processing to company works is of the HR responsibility

4.2.4 Level 2

At the level 2 of our business process models we will present in detail the processes presented at the level 1. Here we are going to model the processes at a low level that can give us the information on who participates in the process, which are the process boundaries and what are the expected results and the inputs to get them. This is the level of detail we must guarantee to support the overall project. To get a clear representation that match our project goals, we are going to use here our own methodology mixing the SIPOC technique with the BPMN. In this section, are going to be some exaples of the level 2 processes with the *Process Characterisation*, *Evaluation Matrix*, *Process Model* and *Detailed Process Description.*

4.2.4.1 Order Processing

Process Characterisation

This process is part of the level 1 *Finishing Stoppers* process presented earlier. This is the process, performed by the customer service, for processing the customers' orders received directly by the customer o by the commercial department.

Table 13. Order Processing Process Characterisation

Process Name	Order Processing
ID	3.3.3
Goal	Receive and register customer orders. Provide customers order information and receive confirmation. Issue production order.
Scope	The process applies to every order received in CSP by individual customers.
Input	The process begins with a customer order.
Output	The process ends with a production order.
Actors	Customer Service in CSP2, Commercials, Client, Production CSP1.
Main Activities	Receive order; Associate sample; Verify stock; Create delivery document; Send production order.

Process Model

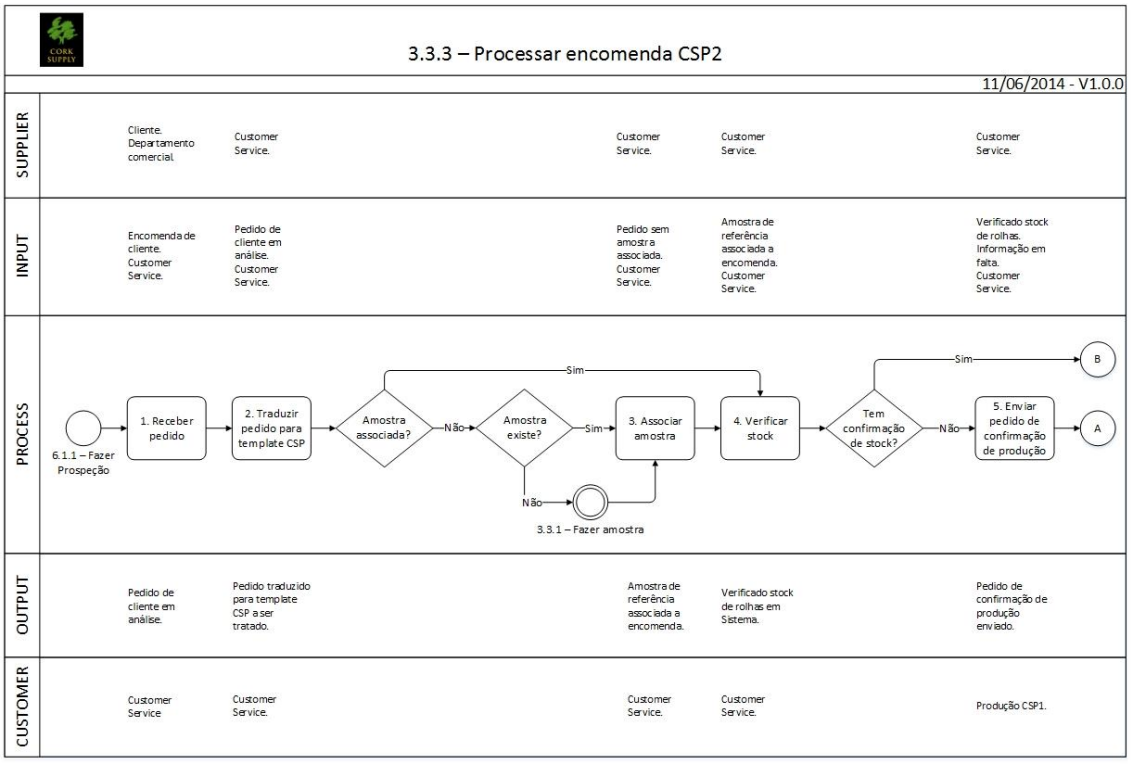


Figure 25. CSP Level 2 Order Processing Part 1

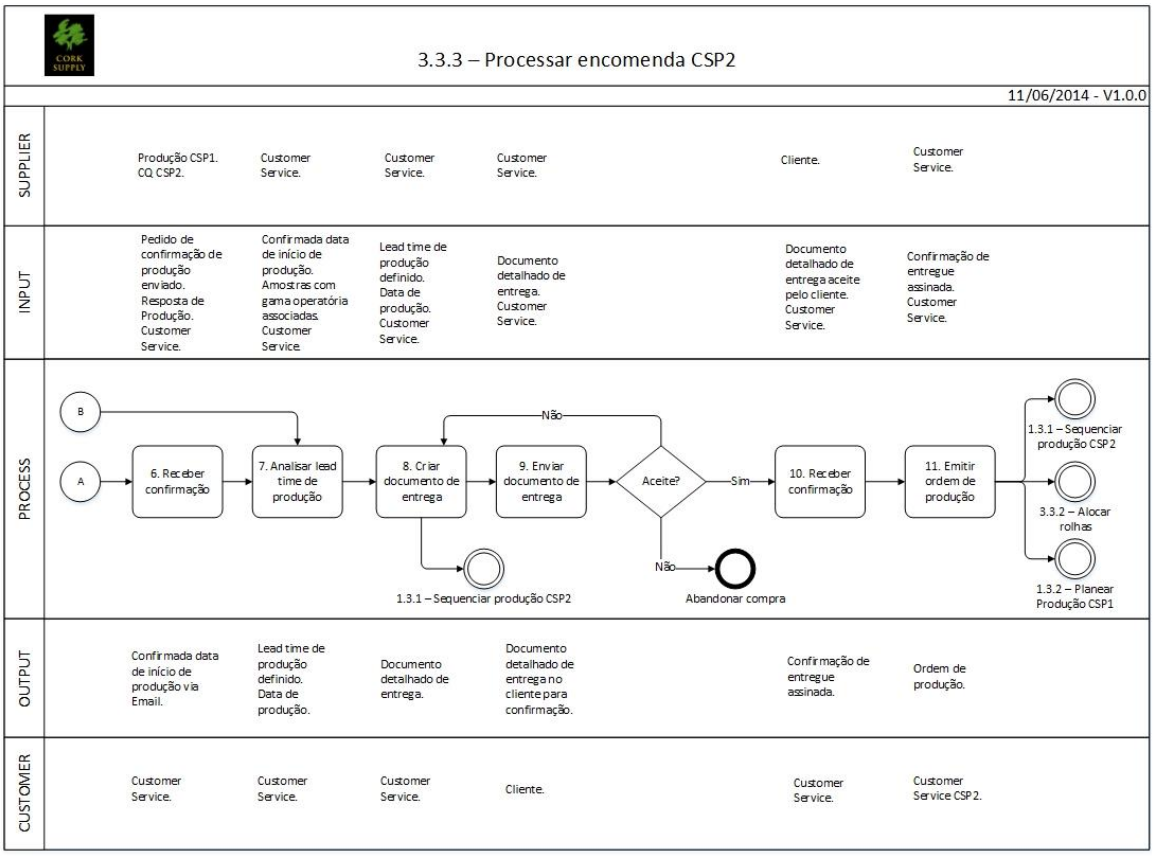


Figure 26. CSP Level 2 Order Processing Part 2

Detailed Process Description

The *Order Processing* process applies to every order placed to CSP. The customer request can be directly made to the customer service in CSP2 or it can be communicated by the commercial department through the prospecting activities. When a customer order arrives to the customer service in CSP2, it is immediately transferred to a CSP template with detail information about the order and the client itself. As every order must have a sample associated to it, the customer service must verify if the sample that match the order already exists in the CSP sample catalogue. If there is no sample associated to it, the customer service communicates with the quality control department for making a sample with the desired characteristics. When the sample is ready and defined, it is associated to the customer order. Then, the customer service verifies if there is available stock in CSP to respond to the customer order. The stock information can automatically be verified by the customer service in some cases, however, if they don't have access to stock information, they must send a production confirmation request to CSP1 in order to analyse the production lead time to the customer order. Once the production lead time is calculated, it is created a detailed delivery document with all the information about the customer order that must be accepted by the customer. Only when the delivery document is accepted and signed by the customers, the order is confirmed and the production order is issued.

4.2.4.2 Cork Purchasing in the Tree

There are three kinds of *Cork Purchasing* processes in CSP3. We have selected the process of *Cork Purchasing in the Tree* to present here, as it is similar to the other ones and it will have future improvements that are going to be presents in the next section of this dissertation work.

Process Characterisation

Table 14. Cork Purchasing in the Tree Process Characterisation

Process Name	Cork Purchasing in the Tree
ID	2.1.1
Goal	To buy, from March to May, the amount of cork necessary to cover necessities.
Scope	Cork necessities identified. Every cork purchase from March to May.
Input	Cork requirement to cover necessities.
Output	Cork purchasing contract.
Actors	Operation department, Buyers, Suppliers.
Main Activities	Visit supplier; Take samples; Negotiate cork; Sign contract.

Process Model

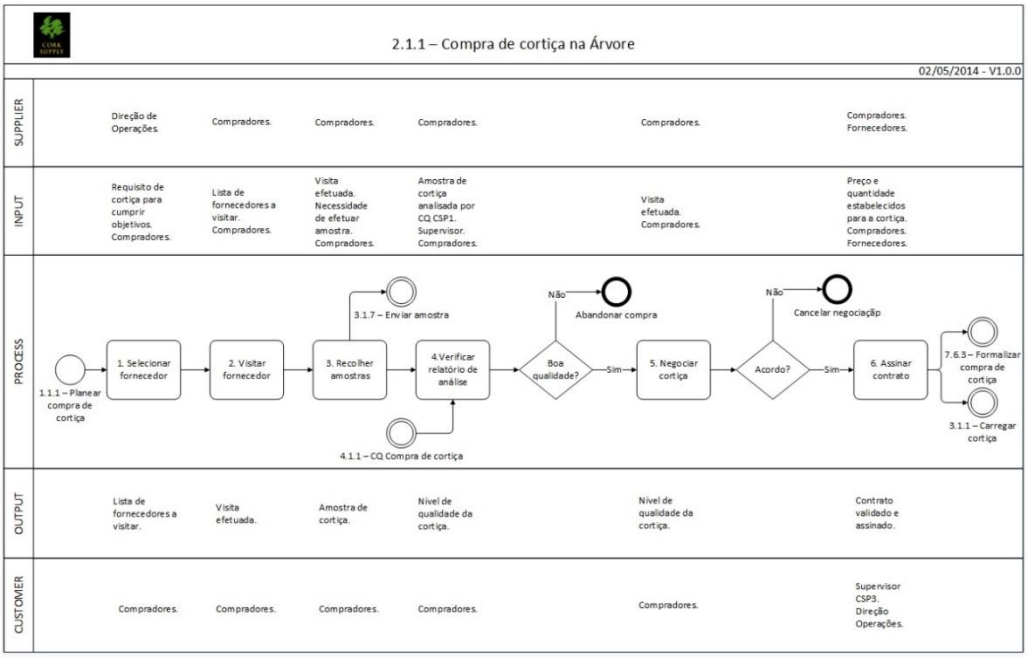


Figure 27. CSP Level 2 Cork Purchasing in the Tree

Detailed Process Description

The *Cork Purchasing in the Tree* process is the cork purchasing process that takes place from March to May when the cork is steal in the tree. There must be a careful evaluation of the quality of the fields as the final quality of the cork must be predicted for a significant level of trees. The process starts with the selection of suppliers to visit to match the desired requirement of purchased cork. After the selection phase, it is made a visit to the customer to take samples from the trees. The samples are sent to the quality control in CSP1 for a careful evaluation of the cork quality. Then, accordingly to the analysis report, the purchasing decision is made and the cork is negotiated. The purchasing contract is made and signed by the both parts. Note that the cork will only be carried to CSP3 when it is extracted three months later.

4.2.4.3 WIM

The *WIM* processes is part of the level 1 *Manufacturing Stoppers* Process. The *WIM* is responsible for guaranteeing that every stopper follows the cleaning standards to match customers' expectations. Here, is located the CSP patented cleaning service *Innocork*, that has extreme importance in customers satisfaction.

Process Characterisation

Table 15. WIM Process Characterisation

Process Name	WIM
ID	2.3.2
Goal	To clean every stoppers that are used in CSP production lines. Guarantee that every stop follow the cleaning standards. Any kind of contamination must be eliminated here.
Scope	Every stoppers used in CSP.
Input	The process starts with when the corks are received in CSP1 or when the finish the process of Punching.
Output	The process ends when every Stopper follows the cleaning patterns.
Actors	Industrial department, Purchasing department, Supervisor, Operator, Team leader.
Main Activities	Clean batches; Process in *Innocork*; Make stoppers coating; Store batches.

Process Model

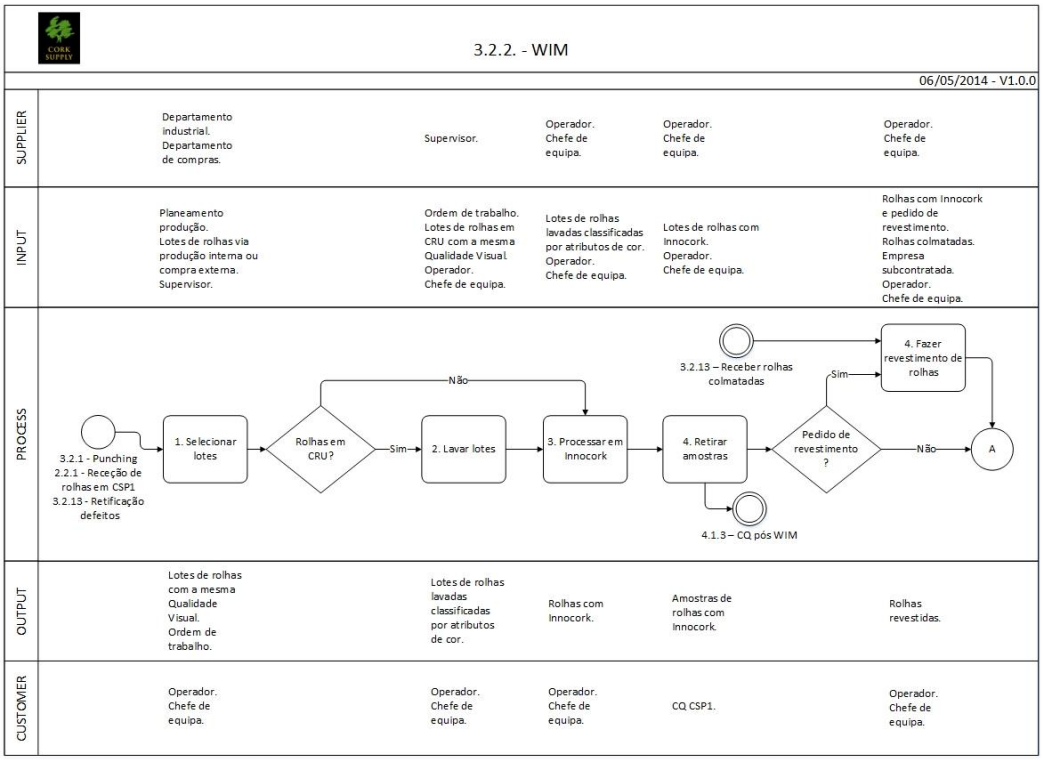


Figure 28. CSP Level 2 WIM Part 1

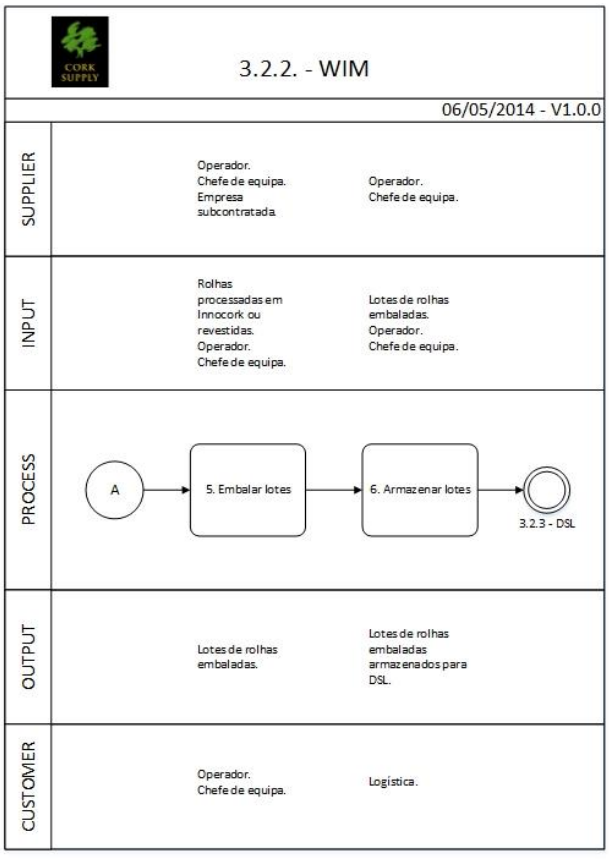


Figure 29. CSP Level 2 WIM Part 2

Detailed Process Description

The WIM process applies to all the stoppers that are used along the company production lines. This process is crucial to guarantee the quality of the CSP products and it applies to every purchased or punching produced stopper. The batches stored in the beginning of the *WIM* are careful selected, as the stoppers must have the same characteristics to be processed here. Then, the stoppers that are in *CRU* state, i.e. which have not been present to any cleaning process yet, must be cleaned and classified by colour attributes. The classified stoppers are then processes in *Innocork*. This is the main activity of the *WIM* process, as it is a CSP patented service for guaranteeing the best quality in stoppers cleaning patterns. Samples are taken from the different batches and sent to the quality control in CSP for further analysis. The customer orders are also verified and, when necessary, the stoppers are sent to be filled. In the end, the batches are packed and stored to be used in the *DSL* process.

4.2.4.4 DSL

Process Characterisation

The *DSL* processes is part of the level 1 *Manufacturing Stoppers* process. The *DSL* is responsible for selecting the different kinds of stoppers according to quality patterns and to eliminate defects.

Table 16. DSL Process Characterisation

Process Name	DSL
ID	2.3.3
Goal	Stoppers validation and qualification by quality levels that meet the needs of customers. Eliminate defects, ensure quality levels and valuate batches.
Scope	Every stopper that is approved in the WIM.
Input	The process starts when the supervisor receives the production planning with the customers' orders.
Output	The process ends when stoppers are packaged in batches of the same quality level.
Actors	Client, Customer Service CSP2, Supervisor, Team member, Programmer.
Main Activities	Analyse samples; Pre-analyse batches; Process samples in electronic system; Programme electronic control; Manual selection; Electronic control.

Process Model

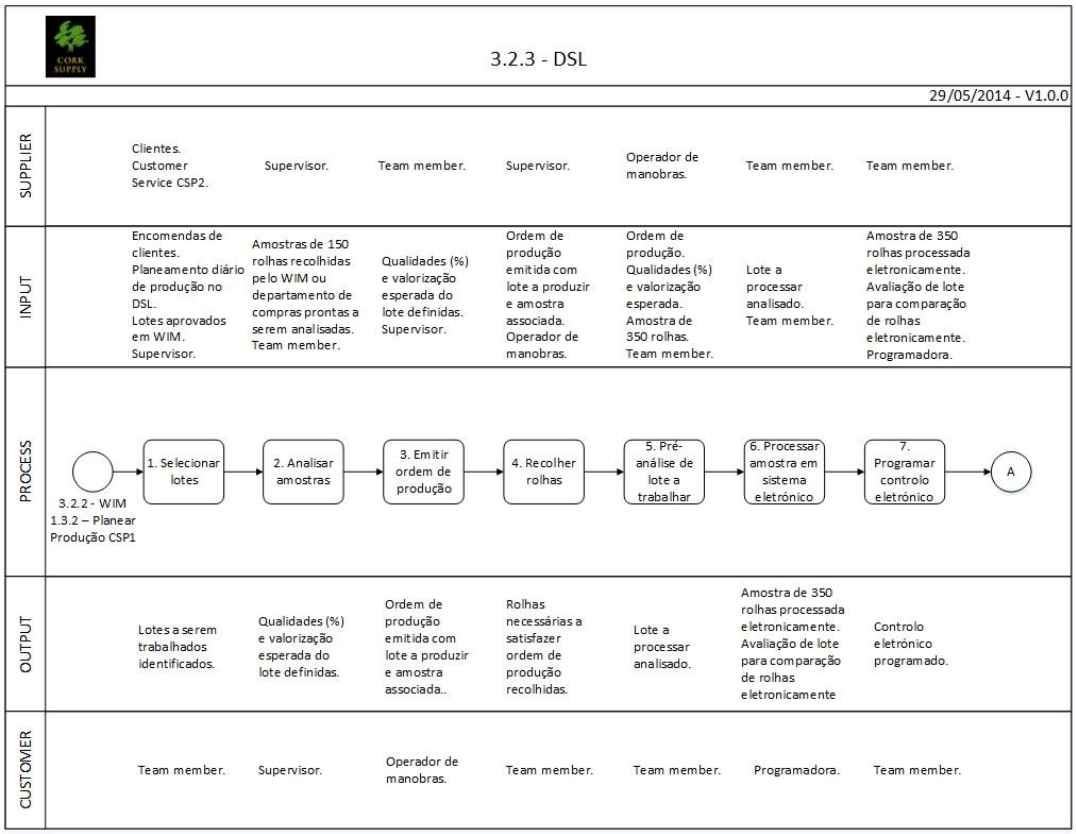


Figure 30. CSP Level 2 DSL Part 1

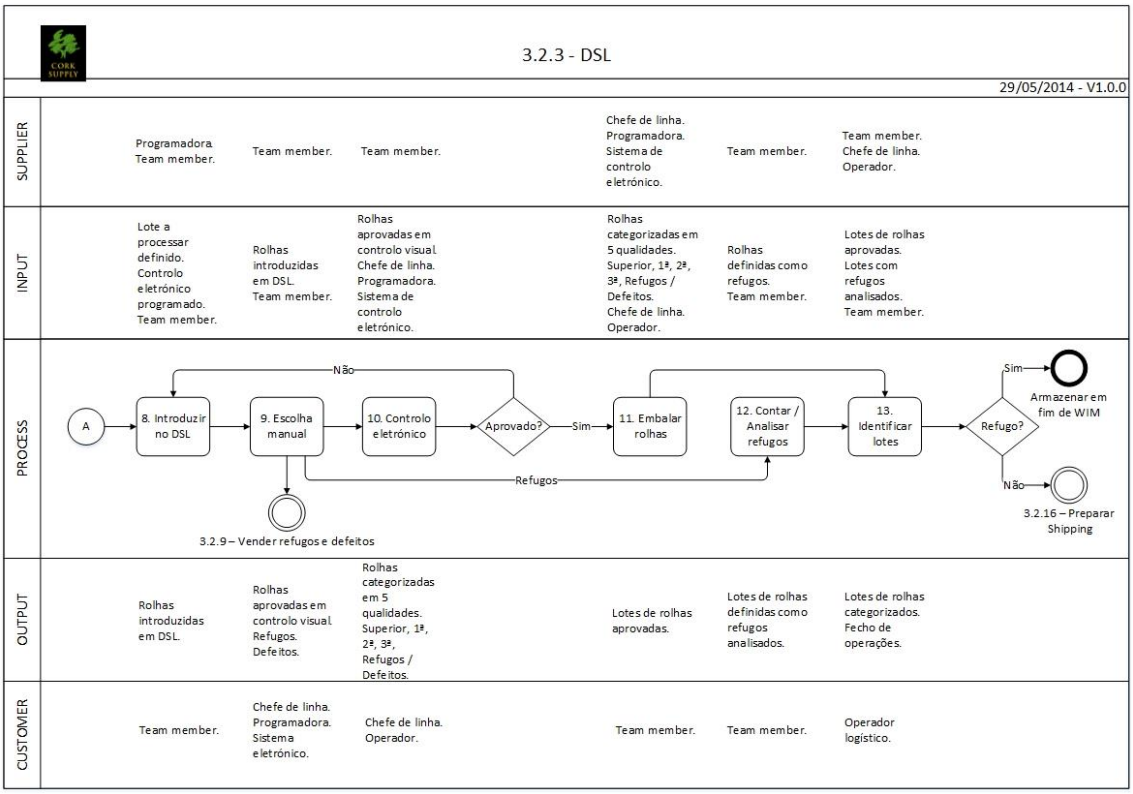


Figure 31 - CSP Level 2 DSL Part 2

Detailed Process Description

The *DSL* process applies to every order placed to CSP as it is here that the stoppers are classified by quality *categories* in order to guarantee the satisfaction of the customers' orders. A selection of the batches produced in the *WIM* and approved by the quality control is made to define the batches that are going to be processed. The supervisor analysis a sample of each batch and issues the production order with the expected percentage of categories and valorisation for the *DSL*. Accordingly to the production order, the stoppers needed to satisfy it are collected from the different batches and a pre-analysis is made for a first definition of qualities. Then, a sample is collected and processed in the electronic control for understanding the expected percentage of stoppers of the different quality levels and programming the electronic control for the evaluation of every stopper. The DSL is a double sorting line process, and so, it has two different types of quality control and selection. When the stoppers are introduces in the *DSL*, they are exposed to a manual control for defects elimination. The stoppers that go through the manual control, are then electronically processed, while the ones that are rejected are immediately sold if they are defects or counted and analysed if scraps. In the electronic control, the stoppers that have been approved earlier in the manual control are analysed and the ones approved are packed by quality levels while the others that are rejected are reintroduced in the *DSL*. After the phases of packaging and scraps analysis, the different batches of stoppers are identified and stored. Here the batches of stoppers defined as scraps are stored for being reprocessed in the *WIM* and the batches that are defined has approved are stored for shipping preparation.

5 Process Modelling TO-BE

The second phase of the modelling process was to understand and idealize the future of the processes of CSP and to give the company a documental and organized analysis ovr each improvement identified. This second phase was created along the process of designing the AS-IS and intends to create a support document to present the TO-BE processes with the analysis on their expected impact on the company performance and efficiency.

A robust methodology, presented earlier in this document, was created to guarantee the maximum accuracy while defining and designing the To-BE models. In this section we will present the final result that is going to be presented to the customer.

5.1 CSP TO-BE Business Process Modelling

Along the whole project there have been several inputs that contributed to the definition of CSP TO-BE processes. In fact, these has been a really important phase that was taken with careful attention as it will guide the implementation of the new ERP in the company. Gathering information along the validation meetings together with an important contribution of InovRetail team, the TO-BE processes were defined, analysed and finally modelled.

A very important step on this modelling phase was to provide the company with the necessary information on the new processes as they processes changes proposed can have great impact on the company activity. In fact, most of the improvement are not implemented I the company due to time and system or restriction. As it is expected for the company to implement most of the improvement identified, we have created an evaluation matrix to study the difficulty of implementation and the expected return of each improvement. After a careful evaluation we have created and designed the final models, highlighting the improvements on each one. A clearer presentation over each process presented from now on can be consulted in the appendix section.

5.1.1 Evaluation Matrix

To characterize each improvement and create a certain level of prioritization between each other, it is necessary to evaluate the different improvements at the same level with common criteria. Therefore, we have created our own evaluation matrix based on the difficulty of implementation and expected return. This methodology is going to be applied to each improvement, in order to create a prioritisation between them and advise the company on how to perform facing each one.

Figure 32. InovRetail TO-BE Evaluation Matrix

This matrix will characterize each improvement with the same evaluation criteria and provide the company with the information on how to act towards each one through the definition of four different quarters

Do It: Improvements that represent low difficulty of implementation and a high expected return for the company. The company should immediately implement the improvement in order to get a higher performance in the short-term.

Evaluate: Improvements that represent high difficulty of implementation and a high expected return for the company. Despite the improvement can get high returns for the company, it can be too difficult to implement. The company should take this improvement in attention and carefully evaluate its implementation.

Analyse: Improvements that represent low difficulty of implementation and a low expected return for the company. This kind of improvement does not represent a significant return for the company but it can be easily implemented. Therefore, the company should analyse its implementation to decide whether it should be, or not, implemented.

Remember: Improvements that represent low difficulty of implementation and a low expected return for the company. This improvement is not got at the short-term for the company as the return doesn't match the difficulty to implement it. However, companies should remember these kind of improvement for future opportunities.

5.1.2 TO-BE Characterisation and Models

Several improvements have been identified and discussed in the different business areas of CSP. We have proceeded to characterize, evaluate and model each one in order to create our detailed TO-BE support document. The table 11 presents the different improvements that were made in the company with their improvement ID, affected business area and core process.

Table 17. TO-BE Improvements Identified

ID	Business Area	Core Process	Improvement
TB_001	Purchasing	Cork Purchasing	System integration in the activities of cork purchasing
TB_002	Production	Manufacturing Stoppers	Introduce Kanban between WIM and DSL
TB_003	Production	Finishing Stoppers	Automated information for CSP1 production planning
TB_004	Production	Finishing Stoppers	System integration when processing orders
TB_005	Production	Finishing Stoppers	Picking in the production line
TB_006	Production	Finishing Stoppers	Issuing transportation Guides
TB_007	Quality Control	QC CSP1	System integration when registering results of QC CSP1
TB_008	Quality Control	QC CSP1	System integration when planning QC activities
TB_009	Quality Control	QC CSP1	Production takes samples
TB_010	Quality Control	QC CSP1	Automated creation of compound batches
TB_011	Quality Control	QC CSP1	QC BARTOPS
TB_012	Quality Control	QC CSP2	System integration when registering results of QC CSP2
TB_013	Sell	Prospecting	System integration in prospecting activities
TB_014	Support	Finance & Controlling	Automated reports
TB_015	Support	Finance & Controlling	Automated batches valuation
TB_016	Support	Finance & Controlling	Registration of transportation Guides in the System
TB_017	Support	Finance & Controlling	Integration of CSE and CEF in the System
TB_018	Support	Finance & Controlling	Automated stock management in the System
TB_019	Support	Finance & Controlling	Transaction registrations between CSP3 and CSP1
TB_020	Support	Human Resources	Integration in the system of pitting program

As there have been several improvements identified and modelled, four examples that represent different kinds of process improvements and match with the processes presented earlier in this dissertation work have been selected: *Process Order*, *Cork Purchasing in the Tree*, *WIM* and *DSL*.

5.1.2.1 System integration when processing orders

TO-BE Characterisation

Table 18. TO-BE - System integration when processing orders Characterisation

Improvement	System integration when processing orders
ID	TB_004
Type	Process / System
Goal	To integrate the system in the activities of order processing, in order to get real time information about samples, stocks and production lead times.
Processes involved	Order Processing
Difficulty	Medium / Low
Return	High

Evaluation Matrix

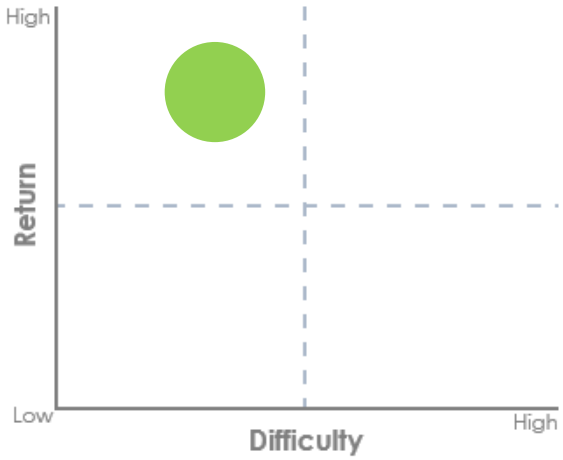


Figure 33. TB_004 Evaluation Matrix

This improvement has been classified as a *Do It* improvement in our evaluation matrix has we understand it can have great return to the company and it is easy to implement. The *Order Processing* process is, at the moment, too complex and represent a bottleneck in the company activity. Integrating the system along this process will represent an increase in the company efficiency and response to the customers. Despite it may seem

difficult to integrate the system at this level, it must be taken in attention that this is a transition phase for the company and that a new system is going to be implemented, and so, if considered since the beginning, it can be easily implemented.

TO-BE Process Model

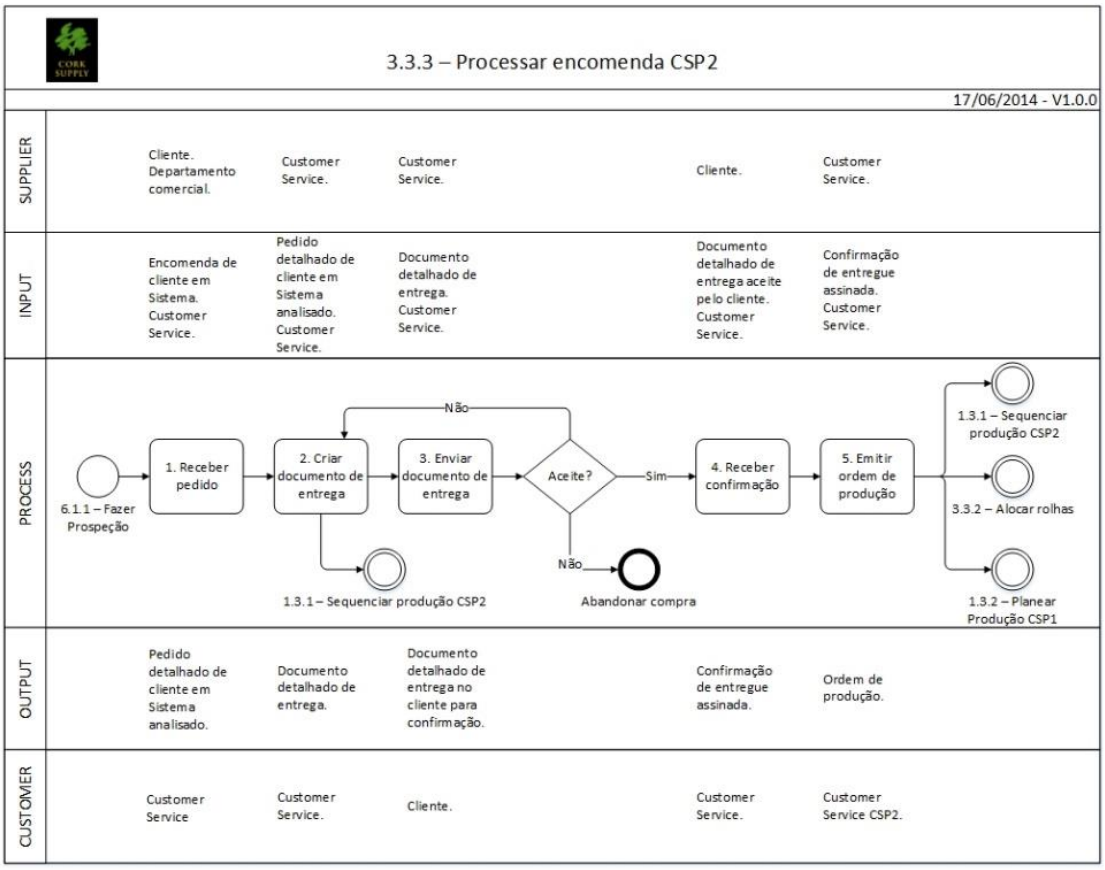


Figure 34. CSP Order Processing TO-BE Model

TO-BE Detailed Description

With the integration of the system, the process of order processing has been significantly reduced. All the activities of sample analysis, stock validation and production lead time calculation are now performed automatically by the system. This way, the customer service receives the order and creates automatically in the system the detailed delivery document that must be validated by the customer. This improvement has been selected to be presented here as it represents a significant replacement of part of the process by the new system implementation.

5.1.2.2 System integration in the activities of cork purchasing

TO-BE Characterisation

Table 19. TO-BE System integration in the activities of cork purchasing Characterisation

Improvement	System integration in the activities of cork purchasing
ID	TB_001
Type	Process / System
Goal	To integrate the system in the activities of cork purchasing to keep valid information about suppliers.
Processes involved	Cork Purchasing in the Tree; Cork Purchasing in Pile.
Difficulty	Low
Return	High

Evaluation Matrix

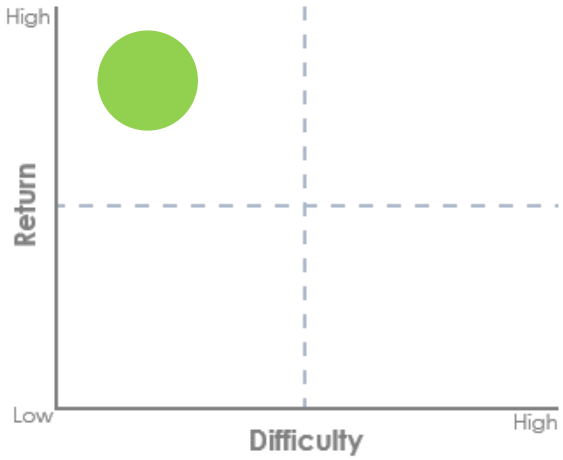


Figure 35. TB_001 Evaluation Matrix

This improvement has been classified as a *Do It* improvement in our evaluation matrix has we understand it can have great return to the company and it is easy to implement. The *Cork Purchasing* process is made in a somewhat unstructured way, and so, the CSP cork buyers are not keeping information about the suppliers. As in this kind of market the lifecycle for the cork to be developed in the three and ready to be sold is of nine years, it is really easy to loose and forget the characteristics of the different suppliers. By integrating the system at this level, with a careful registration of the different suppliers, CSP would increase the efficiency of the purchasing activities and guarantee that the best quality suppliers are visited in the future.

TO-BE Process Model

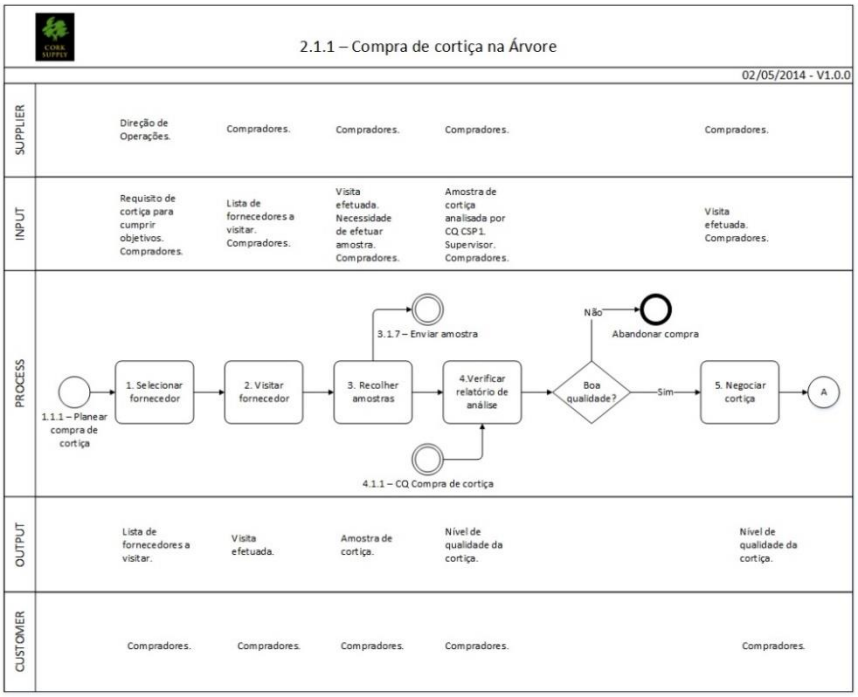


Figure 36. Cork Purchasing in the Tree TO-BE Model Part 1

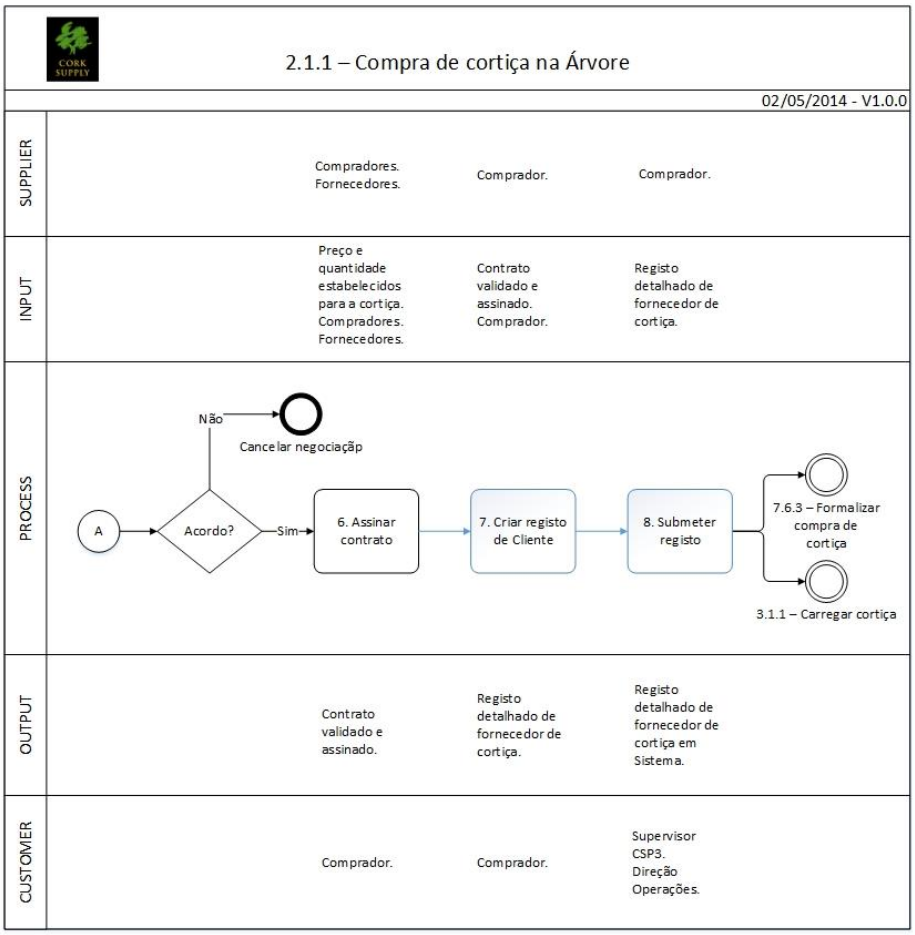


Figure 37. Cork Purchasing in the Tree TO-BE Model Part 2

TO-BE Detailed Description

This improvement has great importance for the company as it allows the record of customer information that can represent great impact in the future cork purchasing activities. The purchasing process will be increased and buyers must be trained to use the new system. In this sense it must be user friendly and really easy to learn. This improvement is being presented here as it represents the kind of system integration that, despite the increasing of the process activities, should be easily implemented and understood be workers.

5.1.2.3 Introduce Kanban between WIM and DSL

TO-BE Characterisation

Table 20. TO-BE Introduce Kanban between WIM and DSL

Improvement	Introduce Kanban between WIM and DSL
ID	TB_002
Type	Process
Goal	To create a Kanban between the process of WIM and DSL in order to increase the efficiency of production planning activities and response to customers.
Processes involved	WIM; DSL.
Difficulty	Low
Return	High

Evaluation Matrix

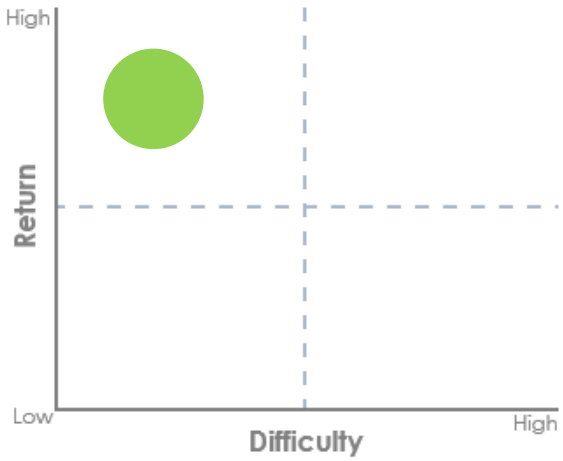


Figure 38. TB_002 Improvement Matrix

This improvement has been classified as a *Do It* improvement in our evaluation matrix has we understand it can have great return to the company and it is easy to implement. CSP is having an increasing presence in the market and is having an increasing number of orders. By creating a Kanban between the activities of *WIM* and *DSL*, the company would guarantee an increasing efficiency to respond to production necessities on time, increasing the customers' satisfaction. This improvement is being already implemented and it should represent high returns for the company in the short term.

TO-BE Process Models

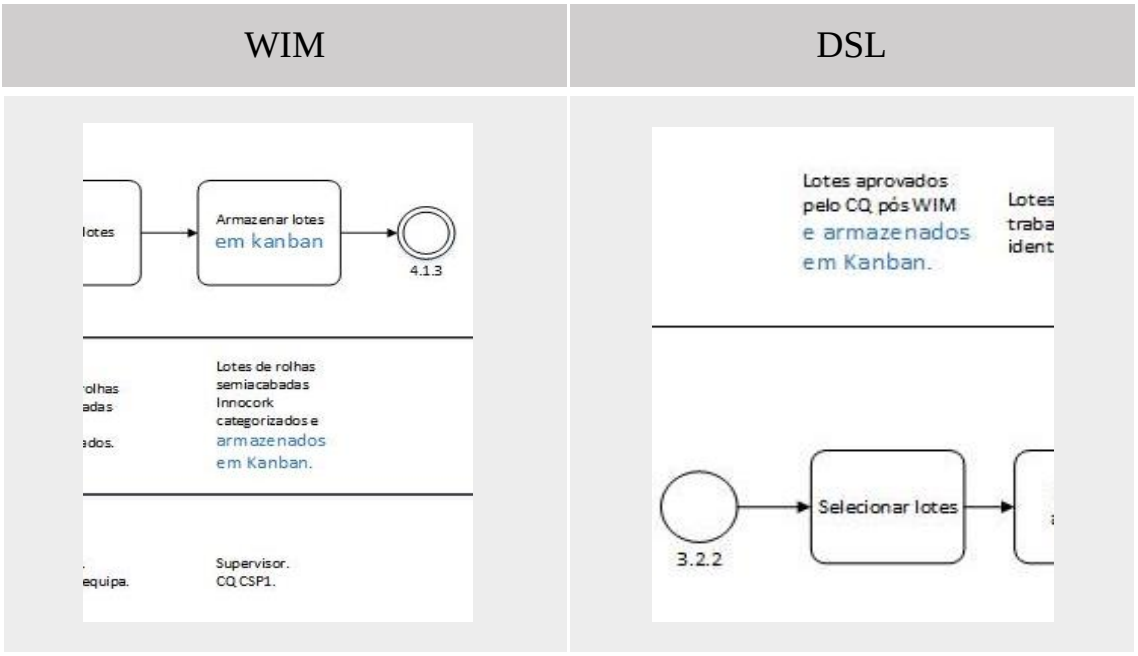


Figure 39. WIM and DSL TO-BE Models changes

TO-BE Detailed Description

This improvement will have great impact in the way how the company works. It is a process improvement and it will represent changes in the company way of storing the batches. It is really interesting to present it here as it demonstrates a kind of improvement that, while not affecting the process activities, will have great impact in the inputs and outputs of the *WIM* and *DSL* processes.

5.1.2.4 QC BARTOPS

Table 21. TO-BE QC BARTOPS

Improvement	QC BARTOPS
ID	TB_011
Type	Process
Goal	To create a process to guarantee the quality of the BARTOPS produced in CSP1
Processes involved	N/A
Difficulty	Low
Return	High

Evaluation Matrix

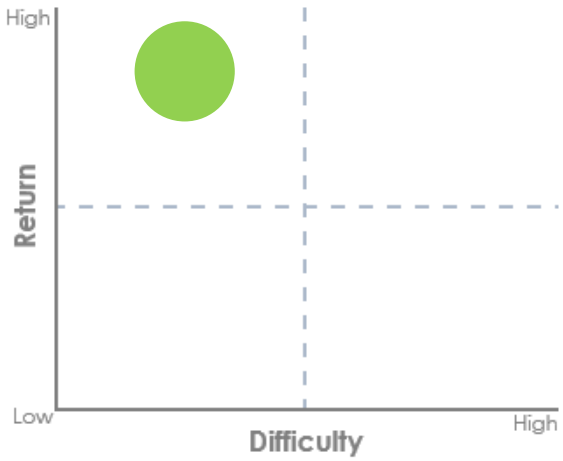


Figure 40. TB_011 Improvement Matrix

This improvement has been classified as a "Do It" improvement in our evaluation matrix has we understand it can have great return to the company and it is easy to implement. By implementing a quality control in the end of the bartops production, CSP would increase its quality guarantees and customers satisfaction. As the company has already the mechanisms ready for this quality service, this improvement should be implemented in the near future.

TO-BE Process Model

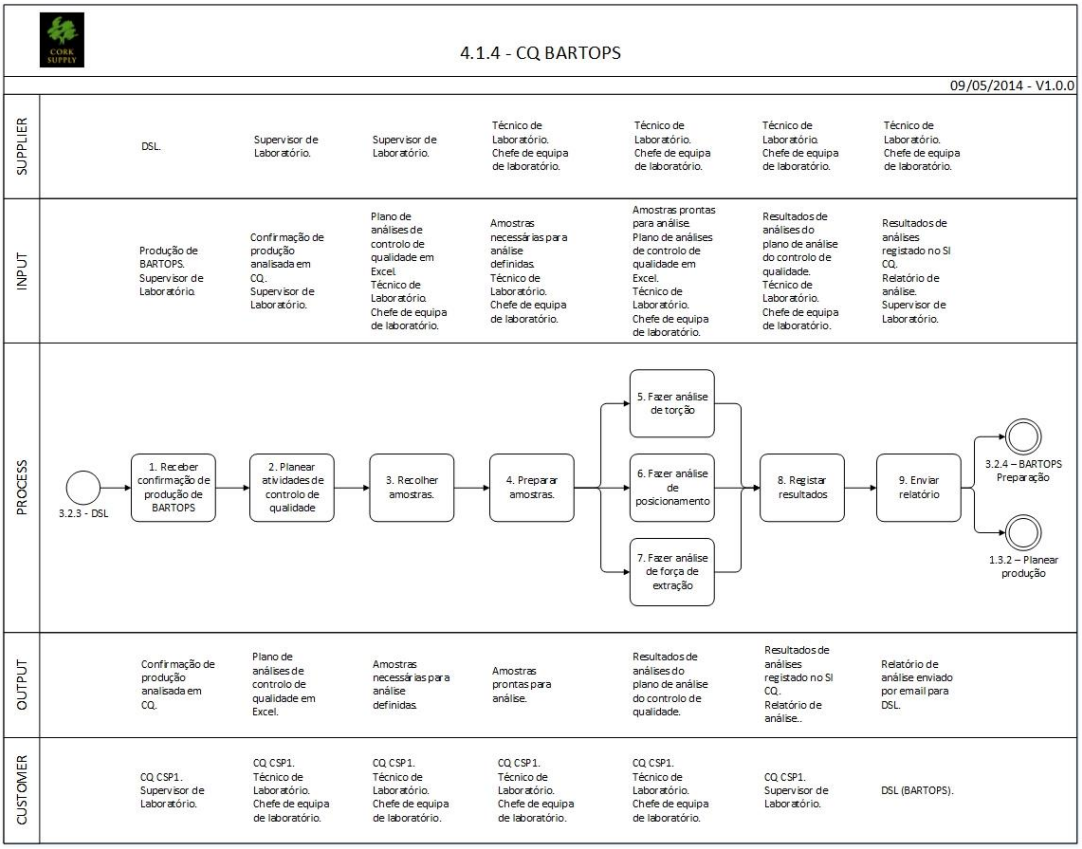


Figure 41. QC BARTOPS TO-BE Model

TO-BE Detailed Description

Besides the improvements identified in the existing business processes, there were also idealized and designed new processes to be implemented in the company activity in order to increase its efficiency and service quality. One example of this kind of improvement is the *QC BARTOPS* process. This is a new process that should be implemented in the short term in the company as it will support the company mission of guaranteeing the best quality of every product that is sold to the customers.

The process starts when the quality control receives the bartops production confirmation and integrates it in its activity plan. Then, bartops samples should be took and prepared for careful analysis of torsion, positioning and extraction force. The analyses results are then registered and sent to the *DSL* where the bartops are produced.

6 Processes Portfolio

To support the company understanding and reading of the business processes, we have created a process portfolio to complement our CSP process modelling developed along the project presented earlier. Firstly, in order to increase reading and comprehension over the processes, we have connected the different levels of the process model. The goal was to increase the understanding between the levels creating an easy and user friendly way to navigate throughout the CSP business processes as it is presented in figure

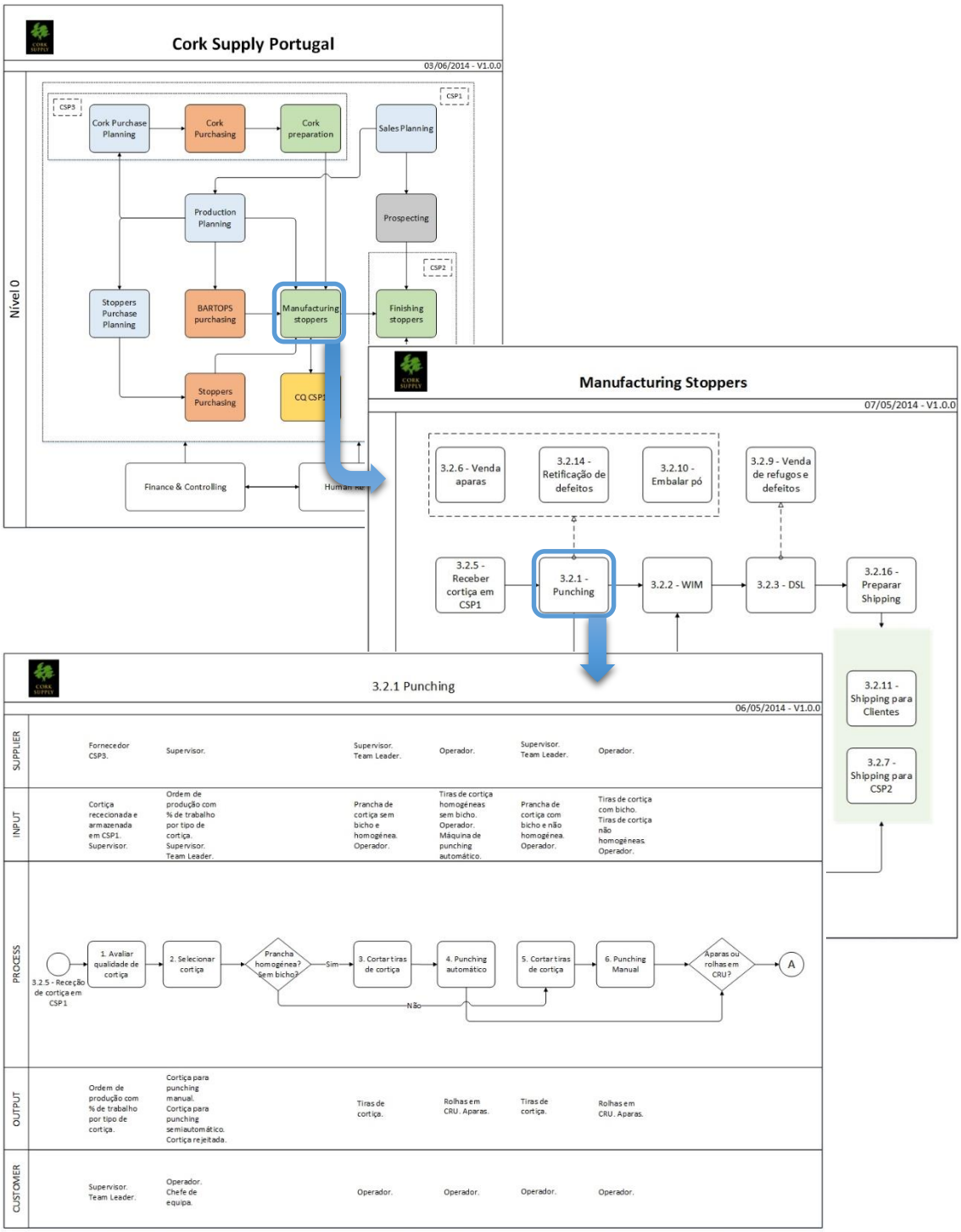


Figure 42. Business Process Level interconnections

As different levels of our business process models are connected, the users can easily navigate between them by clicking in the process they want to see at a different level. In the example above its possible to understand that, by clicking in the *Manufacturing Stoppers* process at the level 0, the level 1 of the same process automatically appears to be consulted. Then, at the level 1, every sub process has a connection to its level 2 model. For instance, by clicking in the sub process *Punching*, automatically appears its representation in the *SIPOC* model that represents the level 2 of our process modelling.

Then, the goal was to create a connection to an Excel support document that details every activity of our level 2 business models. As it is represented in figure 40, by clicking in any activity at this level, the user is able to consult a detailed activity explanation.

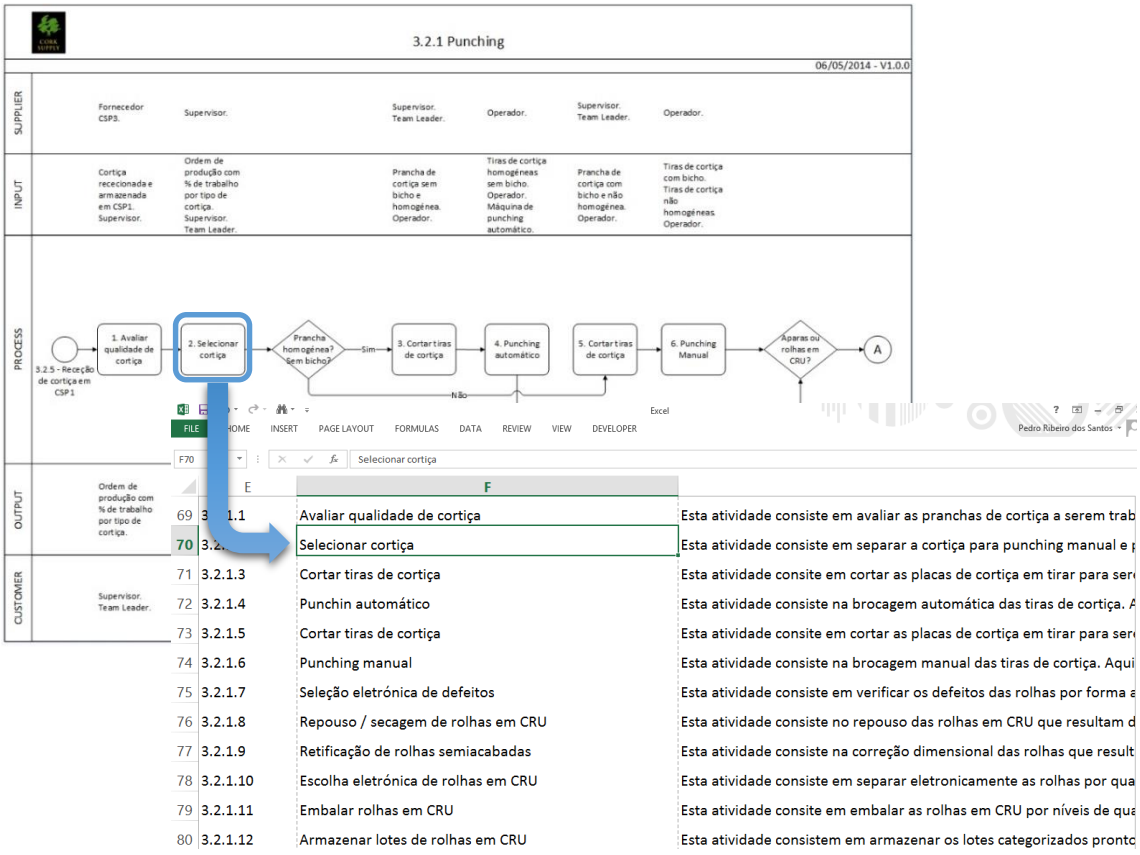


Figure 43. Activities detailed explanation in Excel

InovRetail approach as defined the level 2 of detail as the best one for the activities of supporting ERP Procurement. However, in order to guarantee the understanding over each activity for both business force and ERP providers, we have created a support document in Excel that is connected to our Visio diagrams. It is extremely easy and user friendly and it has proved to support and guide anyone that wants to have a closer look over the company activity.

The process portfolio created throughout this project and presented in figure 40 and figure 41, allows to represent our different process levels together, matching our main goal of creating a methodology that provides our customers with the most accurate information about its processes and business activities.

7 Conclusion

The ERP procurement activities are in constant improvement in the market, and companies try to create strategies to guarantee the success of their ERP selection. In this dissertation work, we have proved business process modelling to be one interesting tool to support procurement activities. By supporting the requirements of a company with the modelling of its business processes, it is possible to guarantee the understanding of the ERP providers on the company activity and guide them throughout the implementation process.

The project of this dissertation aimed to understand and materialize the business processes of a complex organization in a short period of time. A clear and structured representation was created, through different interactions with the customer. The project started with the identification of the AS-IS models to understand the current activity of the company. Then, the improvements identified during the first phase were analysed and the TO-BE models were created. In the end, a process portfolio to support the understanding over the processes identified, was created and delivered. The approach followed in this project has proved to support the expectations and goals of the customer under the overall procurement project.

With this project we gathered the amount of information necessary to satisfy our customer expectations, providing them with the following deliverables: a single and integrated view of the company processes with the definition of the AS-IS models; a clear and objective tool for defining requirements with the improvements identified to create the TO-BE models; and a framework for fit analysis and benchmarking, with the development of a detailed process portfolio.

Our key goal of this project was to guarantee the satisfaction of the company requirements when selecting the new ERP. We have created the basis to support the selection and implementation activities of the overall procurement project, guaranteeing the maximum possible accuracy and return for the company.

The methodology created intended to be diversified and applicable to different kinds of modelling processes, and so it should be used in different contexts to guarantee its effectiveness and increase the understanding over some improvement opportunities. In the future it would be interesting to consider the schedule of the interview session on a functional and not organisational view. It is also important to have a better planning of each interview, with the creation of a session guideline, and apply this methodology in a project that requires a bigger level of detail, in order to adapt it and increase its diversity.

Finally, the phase of process modelling has been concluded and its outputs are already supporting the next phases of the procurement project. In fact, the system requirements identified are already being supported by the process models created here. In the future, some ERP providers are going to be selected for a final evaluation over the solution that best fits the company objectives. The outputs of this project proved to be of extreme importance as they are already supporting a strategic decision that will have great impact in the future of the company.

References

Aalst, Wil, Hofstede, Arthur and Weske, Mathias (2003), "Business Process Management, A Survey", BPM 2003, LNCS 2678, pp. 1-12, 2003, Springer-Verlag Berlin Heidelberg 2003.

Aguilar-Savén, Ruth (2004), "Business process modelling: Review and framework", Int. J. Production Economics 90 (2004), pp. 129–149.

Bandara, Wasana, Gable, Guy G and Rosemann, Michael (2005), "Factors and measures of business process modelling: model building through a multiple case study", European Journal Information Systems, pp.347-360.

Bititci, Umit S. and Muir, Daniel (1997), "Business process definition: a bottom-up approach", International Journal of Operations &Production Management, Vol. 17 No. 4, 1997, pp. 365-374.

Damelio, Robert (2011), "The Basis of Process Mapping", Second Edition, CRC Press, Taylor & Francis Group, New York.

Davenport, T.H. (1993), "Process Innovation", Harvard Business School Press, Boston, MA.

Dumas, Marlon, Aalst, Wil, Hofstede, Arthur (2005) "Process-Aware Information Systems: Bridging People and Software Through Process Technology", John Wiley & Sons, September 2005.

Giaglis, George (2001), "A Taxonomy of Business Process Modeling and Information Systems Modeling Techniques", The International Journal of Flexible Manufacturing Systems, 13 (2001), pp. 209–228.

Gupta, Atul (2000), "Enterprise resource planning: the emerging organizational value systems", Industrial Management & Data Systems, 100 (2000), pp.114-118.

Hamza, Salah (2008), "Design process improvement through the DMAIC Six Sigma approach: a case study from the Middle East", Int. J. Six Sigma and Competitive Advantage, Vol. 4, No. 1, 2008.

Havey, Michael (2005), "Essential Business Process Modelling", O'Reilly Media, Inc., 2005, ISBN: 0596555156, 9780596555153.

Hepp, M., Hinkelmann, K., Karagiannis, D., Klein, R., Stojanovic, N. (2007), "Semantic Business Process and Product Lifecycle Management", Proceedings of the Workshop SBPM 2007, Innsbruck, April 7, 2007, CEUR Workshop Proceedings, ISSN 1613-0073.

Houy, Constantin, Fettke, Peter and Loos, Peter (2010), "Empirical research in business process management – analysis of an emerging field of research", Business Process Management Journal Vol. 16 No. 4, 2010 pp. 619-661.

Jeston, John, Nelis, Johan (2014), "Business Process Management", Third Edition, Routledge, New York, ISBN: 113617298X, 9781136172984.

Jones, J. L., (1986), "Structured Programming Logic: A Flowcharting Approach", Prentice-Hall, Englewood Cliffs, NJ.

Lee, R.G., Dale, B.G. (1996), "Business process management: a review and evaluation", Business Process Management Journal, Vol. 4 No. 3, 1998, pp. 214-225.

Leon, Alexis (2008), "Enterprise Resource Planning", Tata McGraw-Hill Education, 2008, ISBN: 0070656800, 9780070656802.

Umble, Elisabeth, Haft, Ronald and Umble, M. (2003), "Enterprise resource planning: Implementation procedures and critical success factors", European Journal of Operational Research 146 (2003), pp. 241–257.

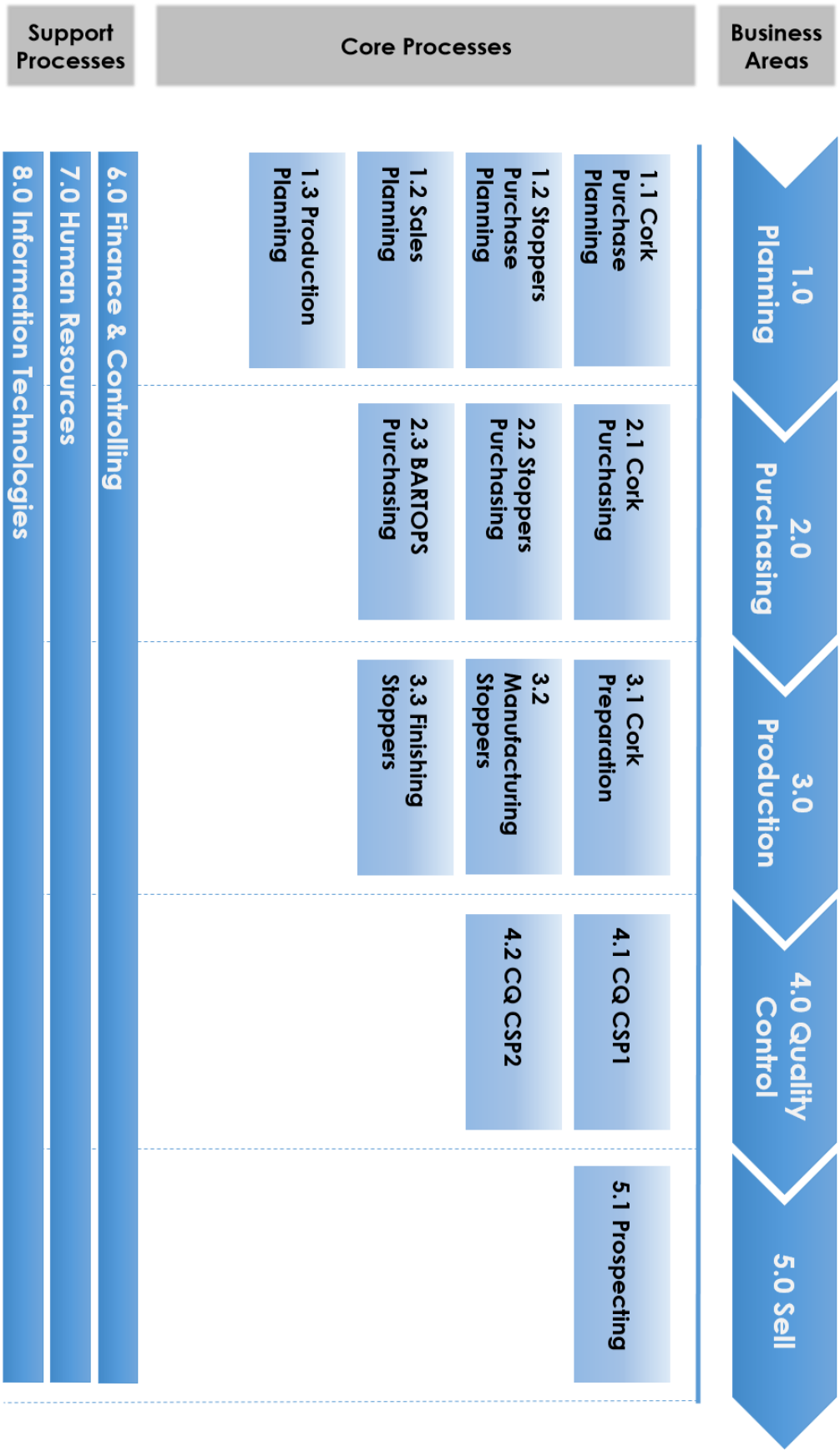
Scheer, August Wilhelm (2010), "ARIS — Business Process Modeling", Springer, 2000, ISBN: 3540658351, 9783540658351.

Sharp, Alec, McDermott, Patrick (2009), "Workflow Modeling: tools for process improvement and application development", Second Edition, Artech House, Inc., Norwood, ISBN-13: 978-59693-192-3

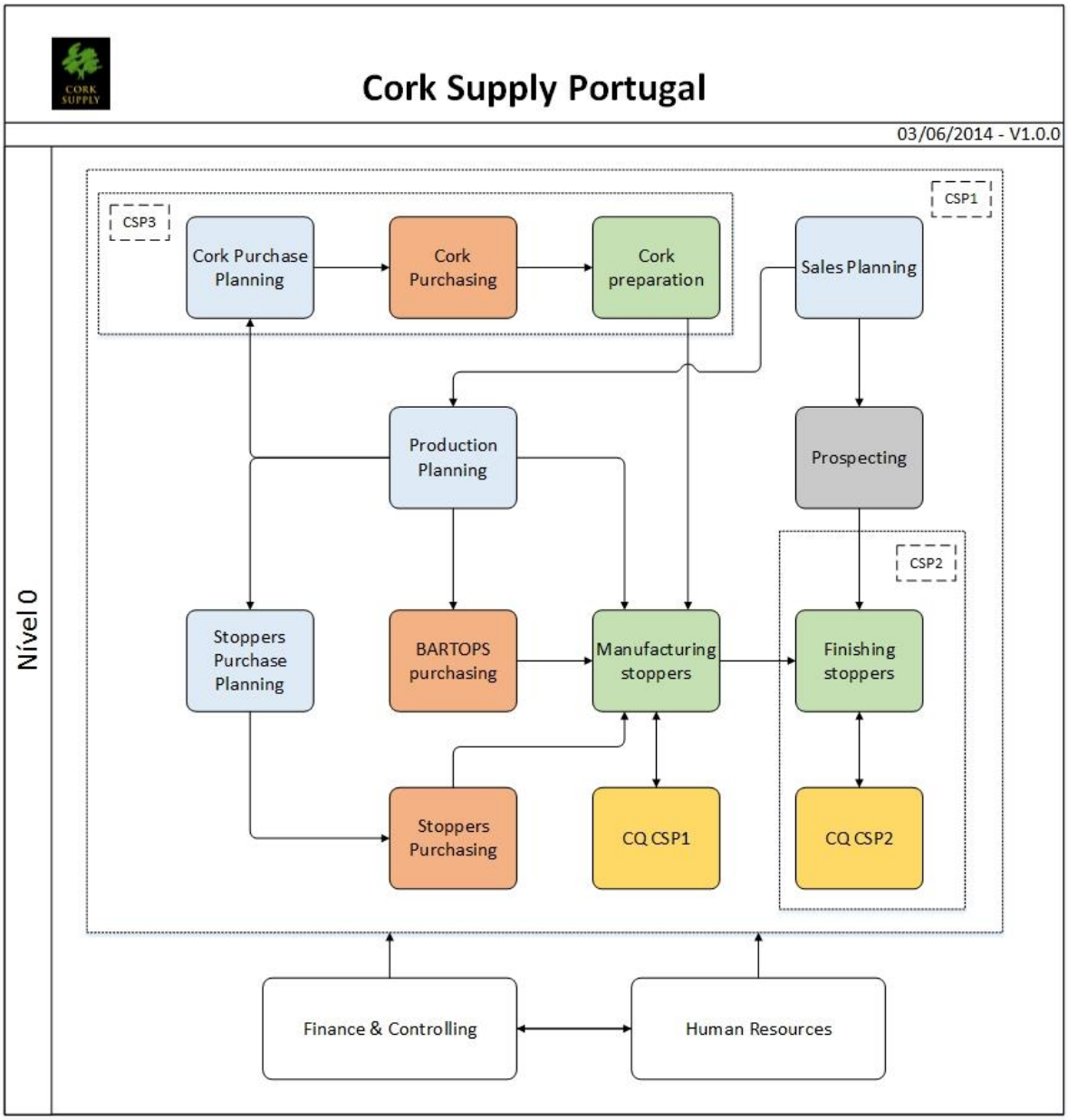
Siau, K. (2004), "Informational and Computational Equivalence in Comparing Information Modeling Methods", Journal of Database Management, pp. 73-86.

White, Stephen (2008), "BPMN Modeling and Reference Guide: Understanding and Using BPMN", Future Strategies Inc., 2008, ISBN: 0977752720, 9780977752720.

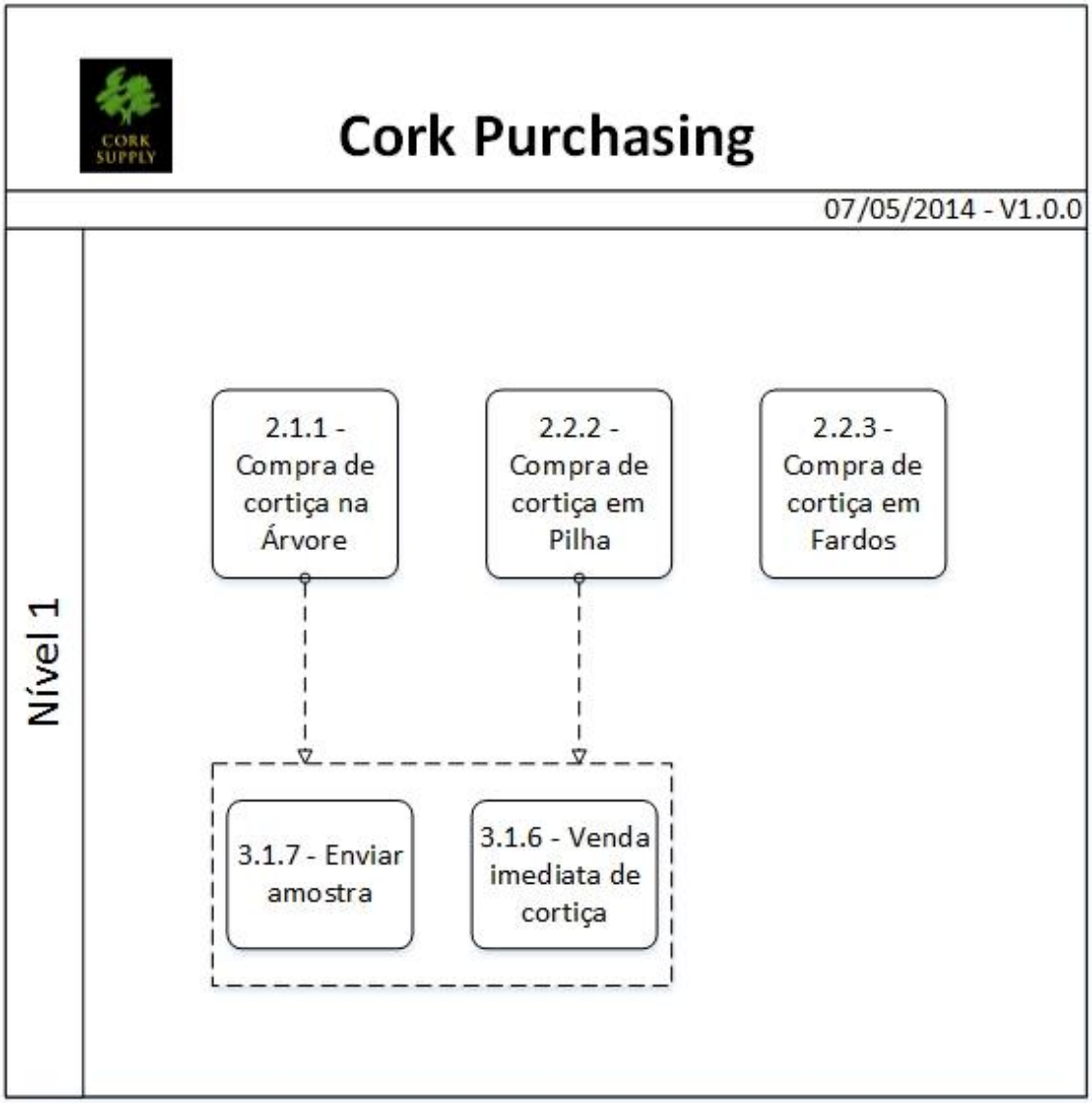
Appendix A – Business Process Map



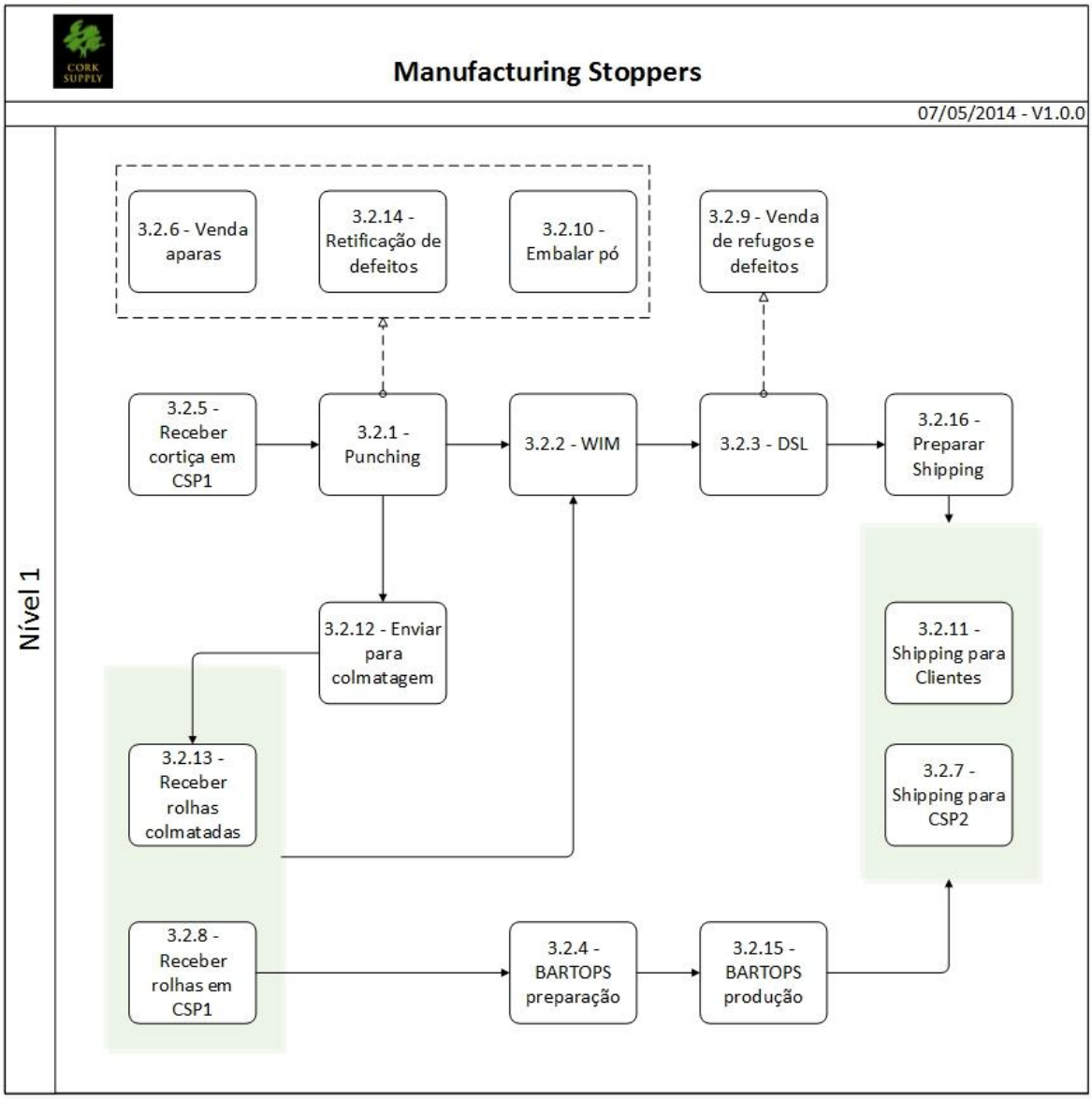
Appendix B – CSP Level 0



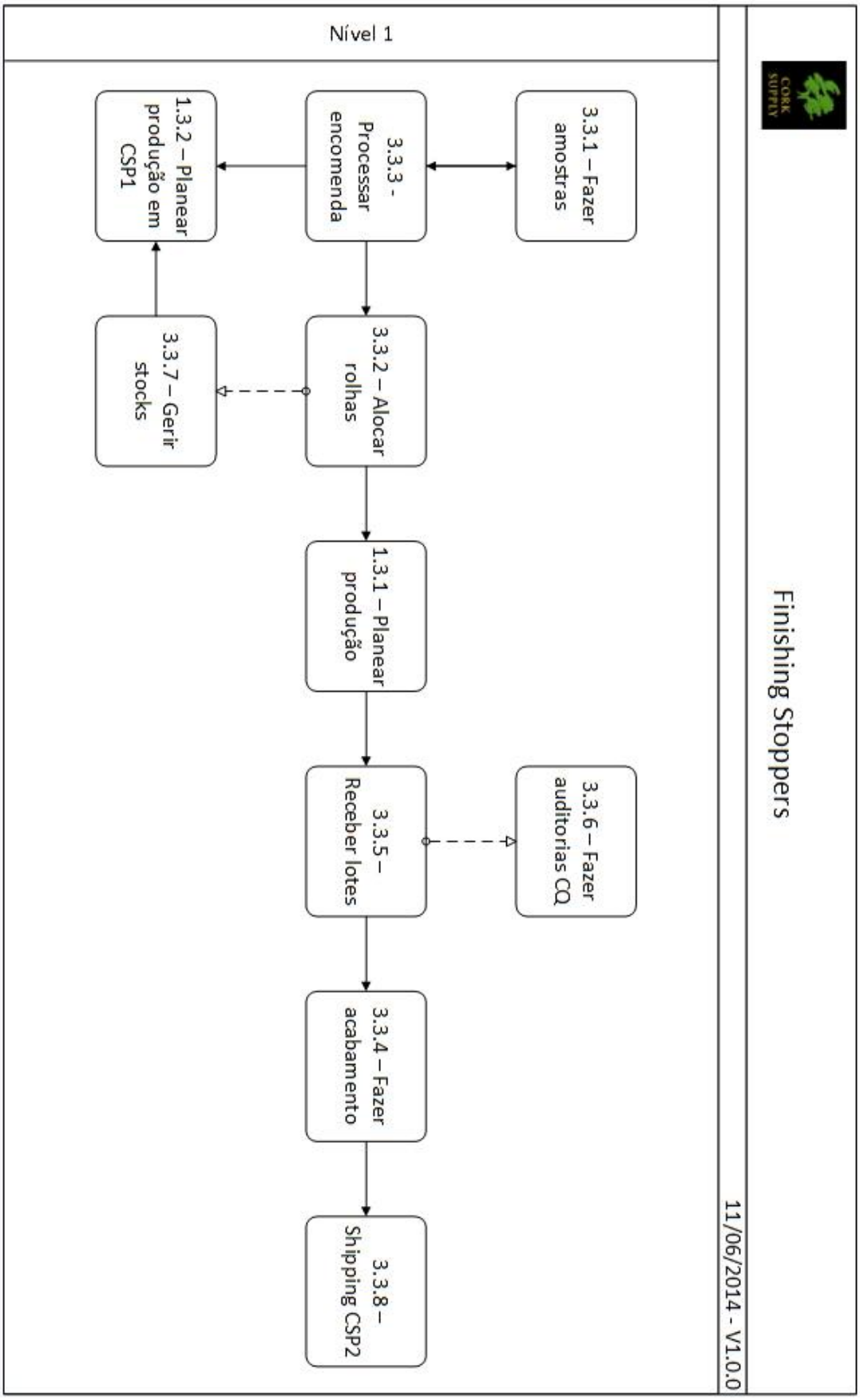
Appendix C – CSP Level - Cork Purchasing



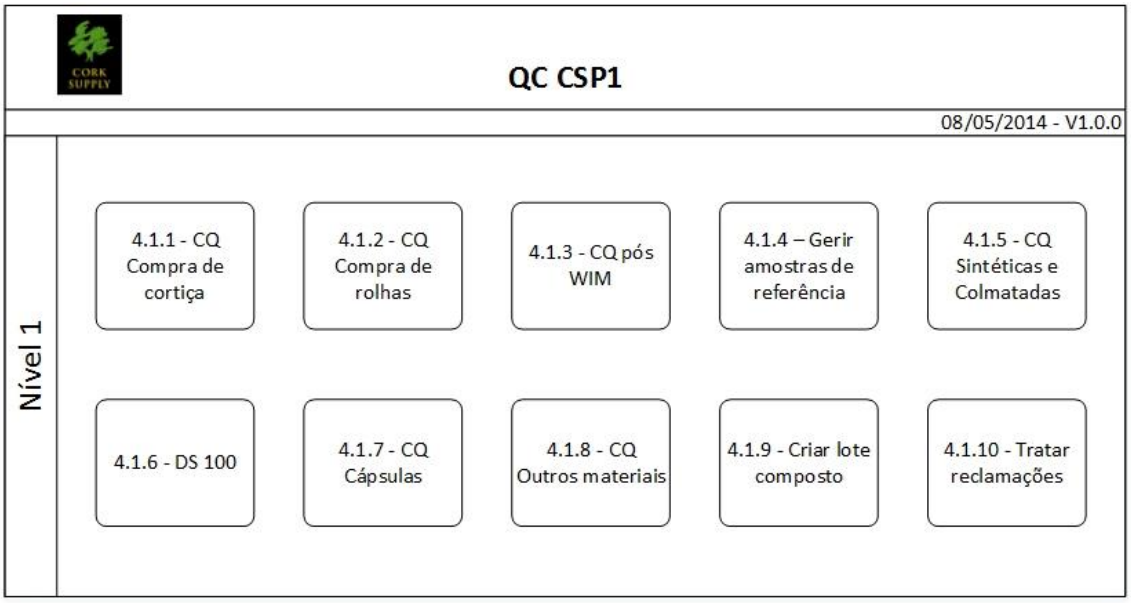
Appendix D – CSP Level 1 – Manufacturing Stoppers



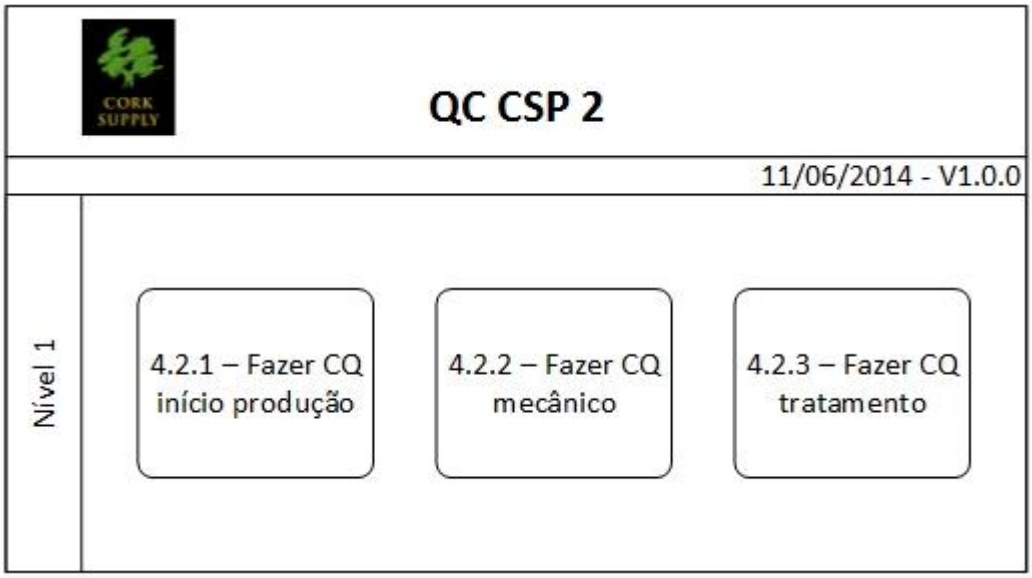
Appendix E – CSP Level 1 – Finishing Stoppers



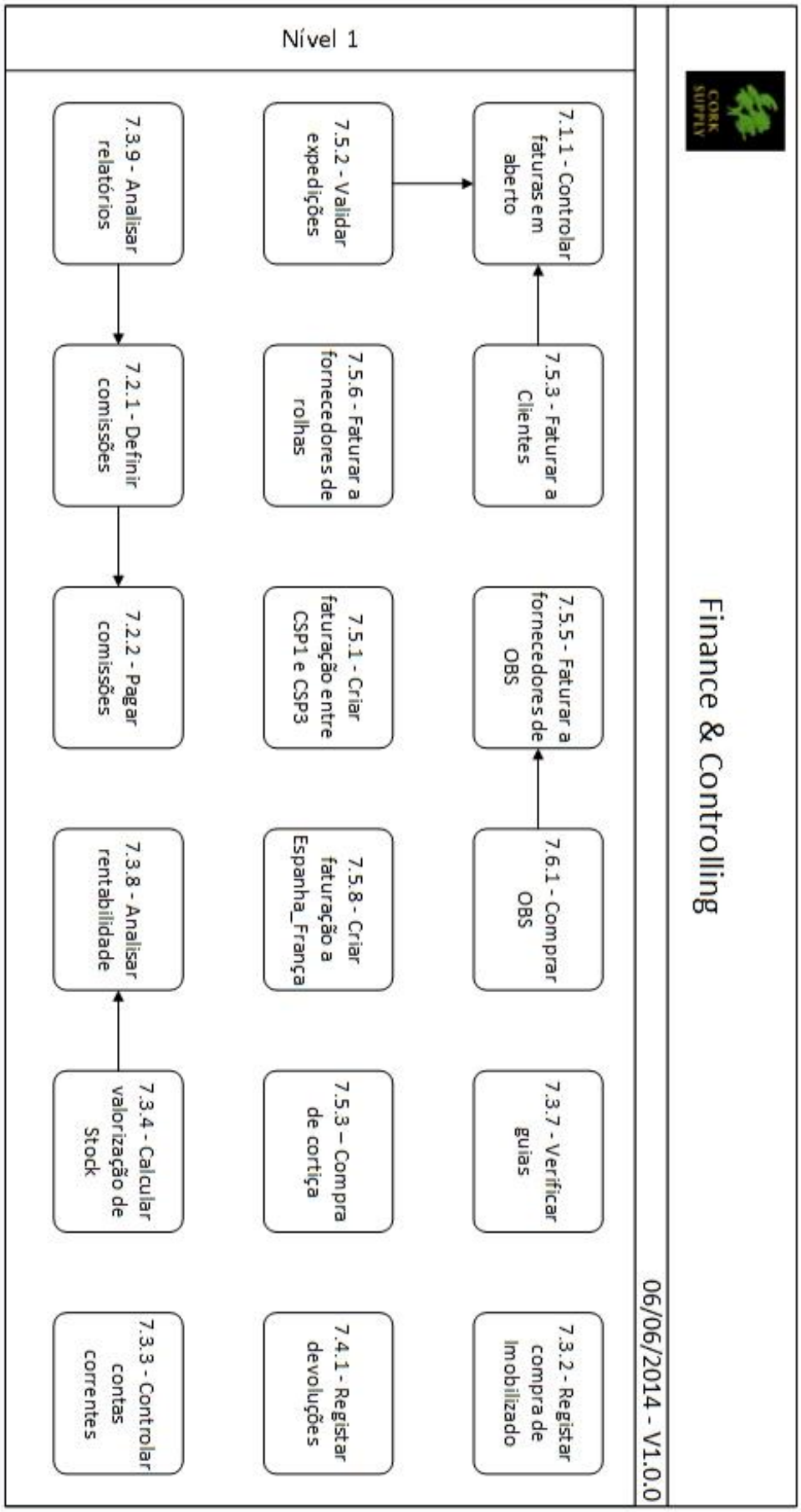
Appendix F – CSP Level 1 – QC CSP1



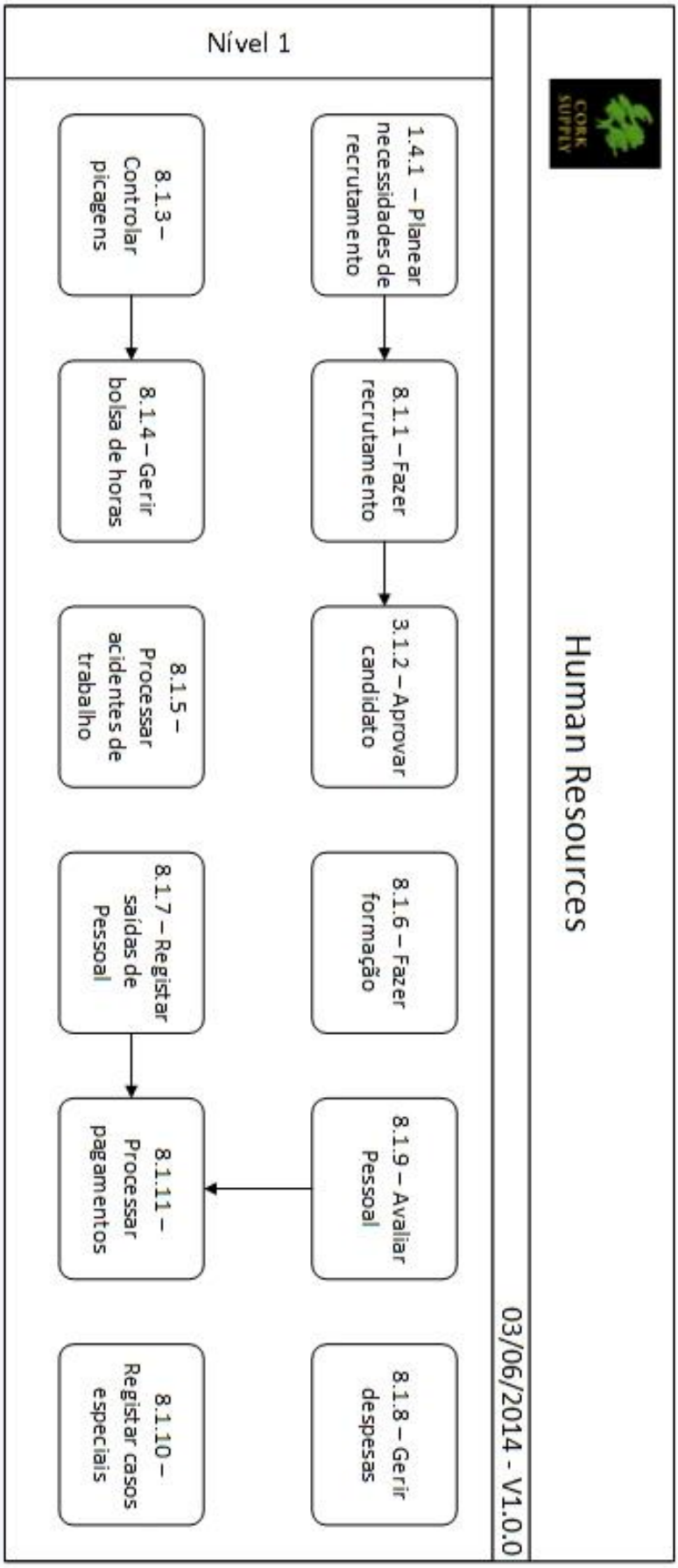
Appendix G – CSP Level 1 – QC CSP2



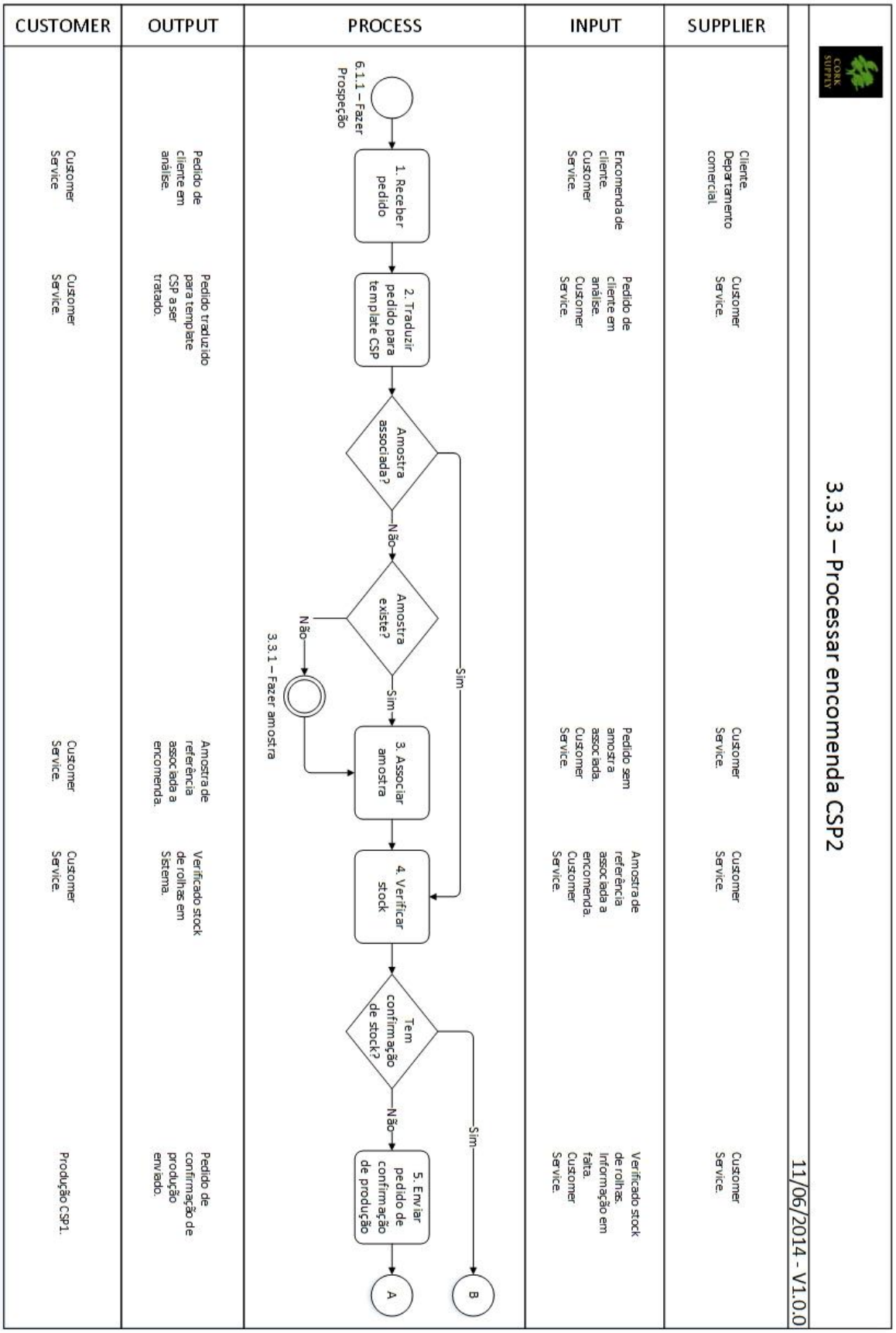
Appendix H – CSP Level 1 – Finance & Controlling



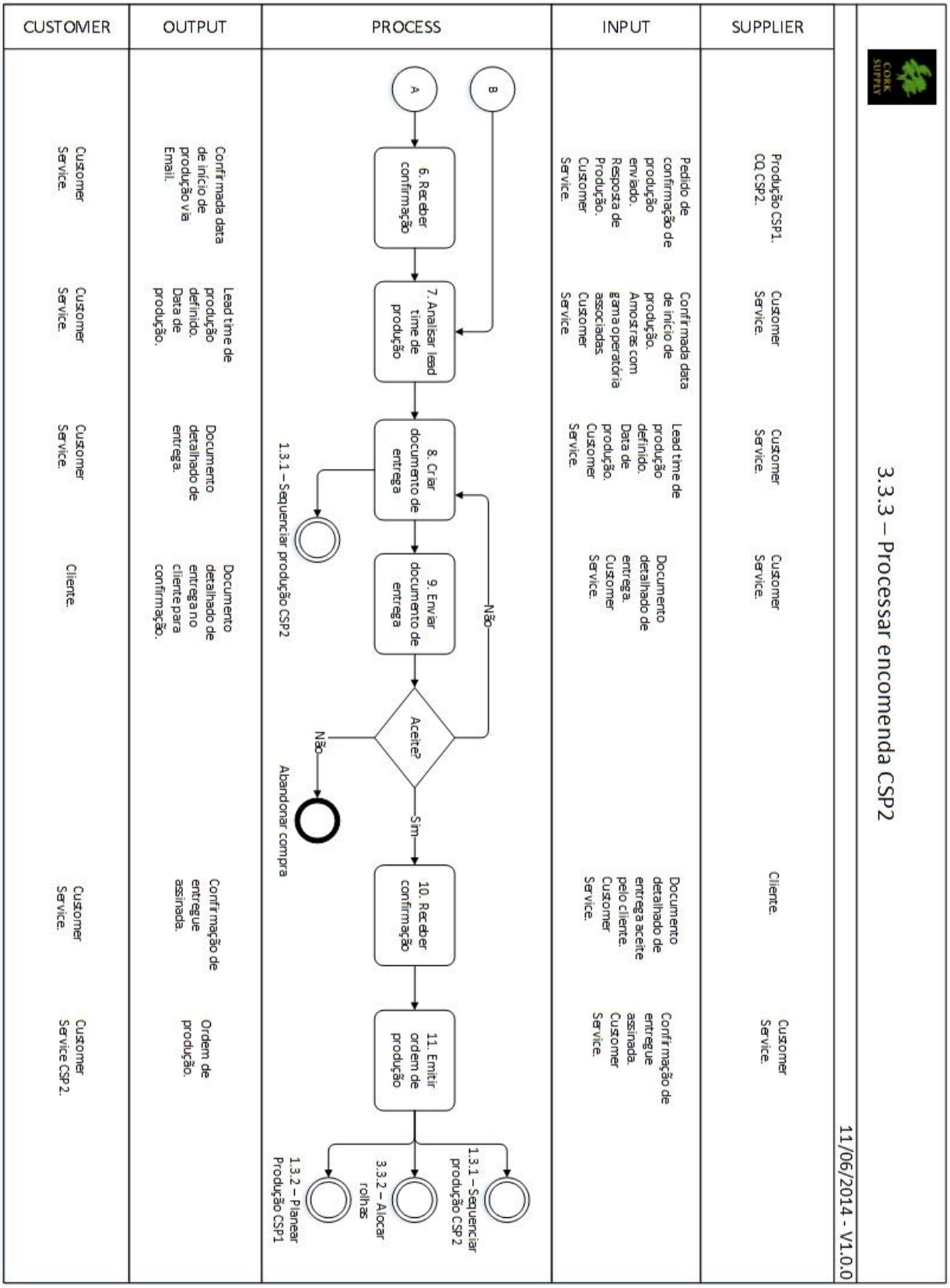
Appendix I – CSP Level 1 – Human Resources



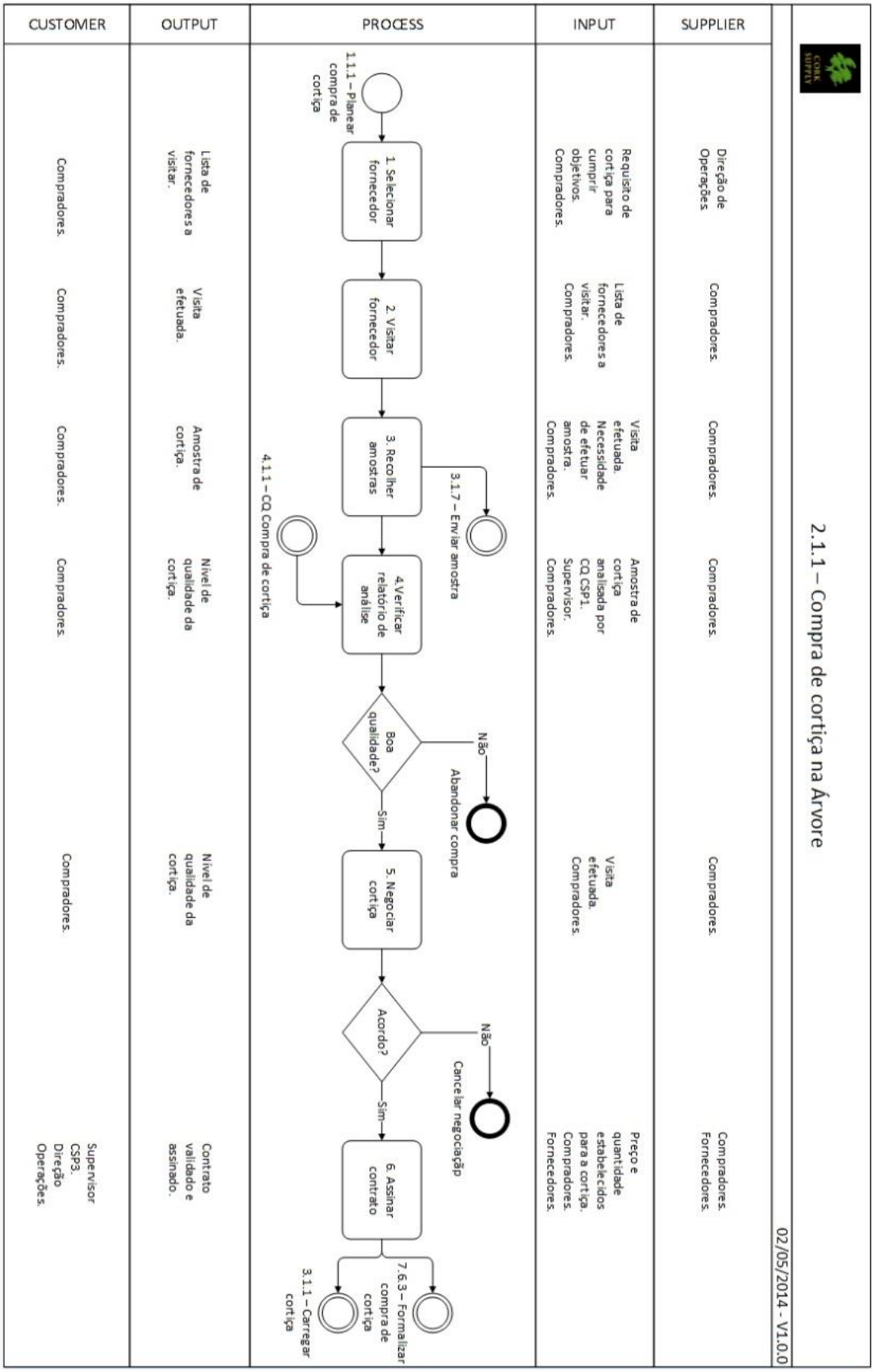
Appendix J – CSP Level 2 – Order Processing 1 (AS-IS)



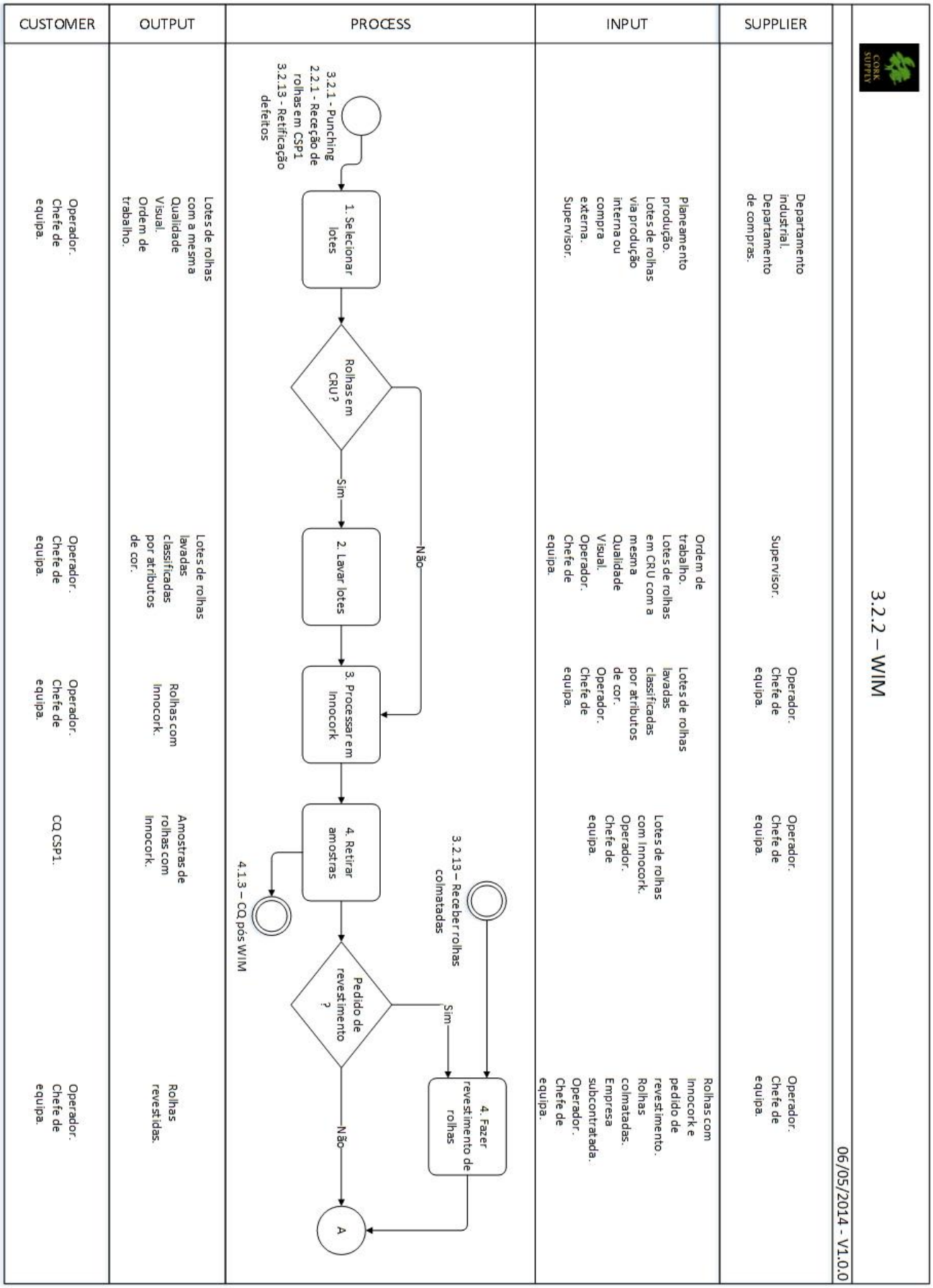
Appendix K – CSP Level 2 – Order Processing 2 (AS-IS)



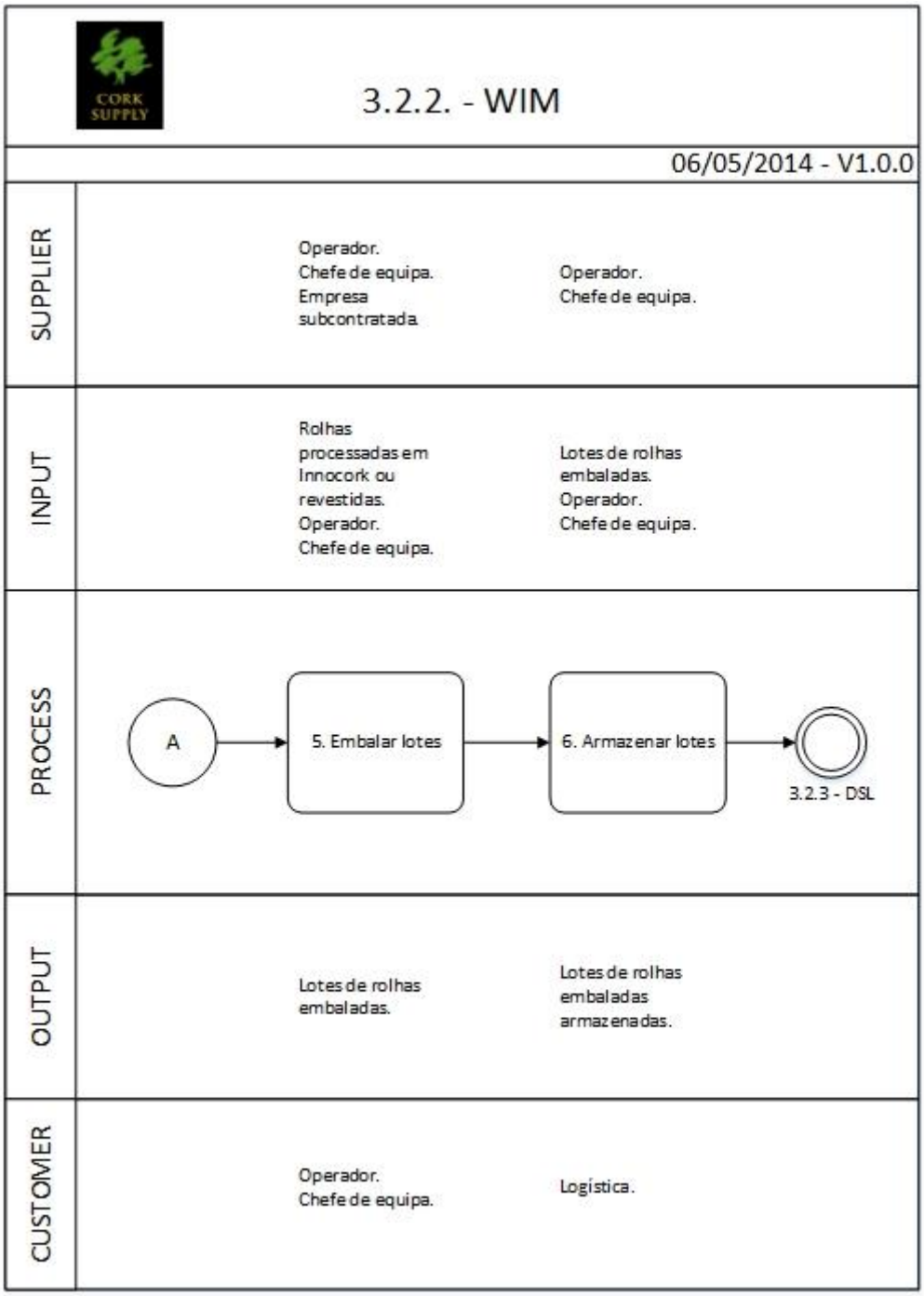
Appendix L – CSP Level 2 – Cork Purchasing in the Tree (AS-IS)



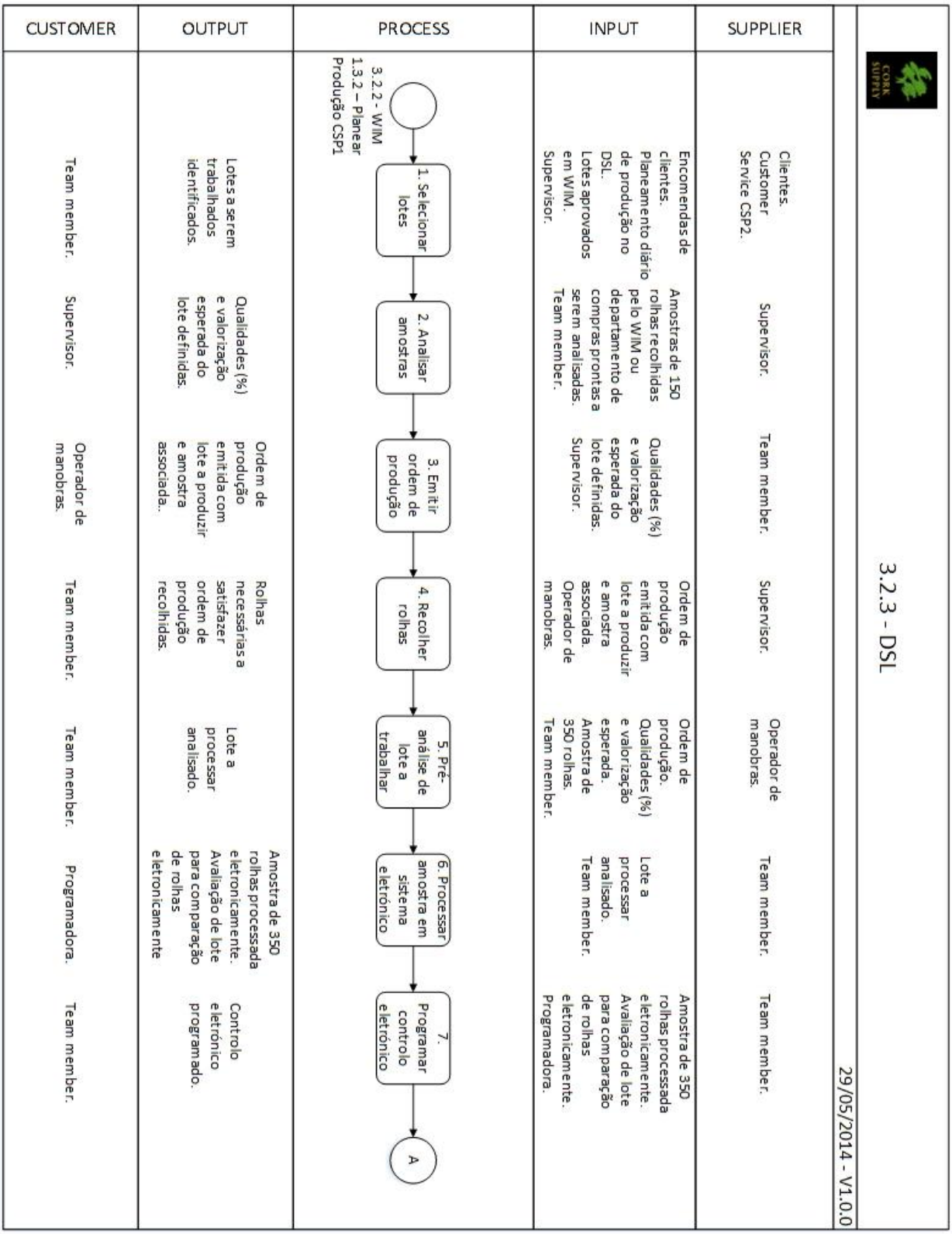
Appendix M – CSP Level 2 – WIM (AS-IS) 1



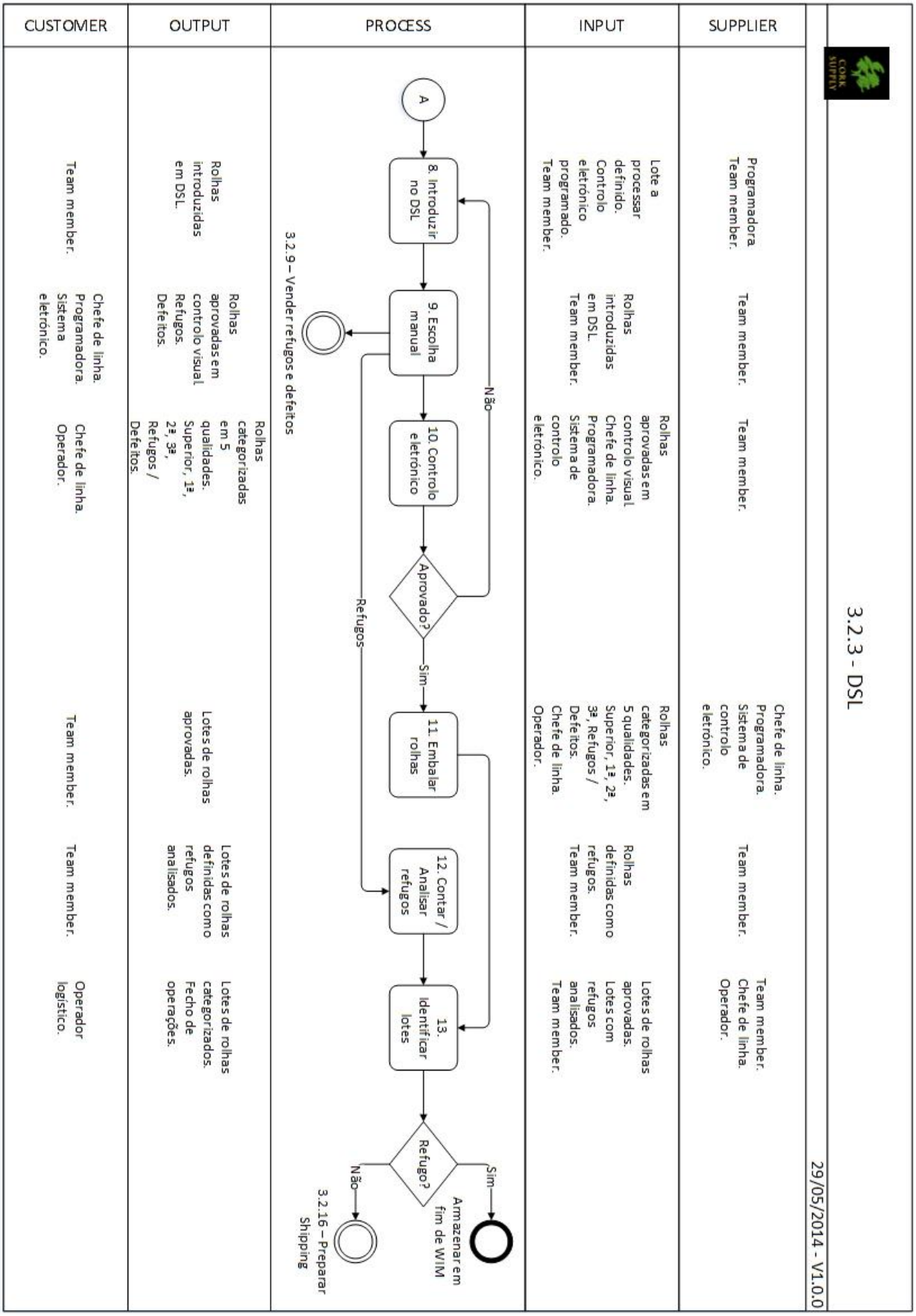
Appendix M – CSP Level 2 – WIM (AS-IS) 2



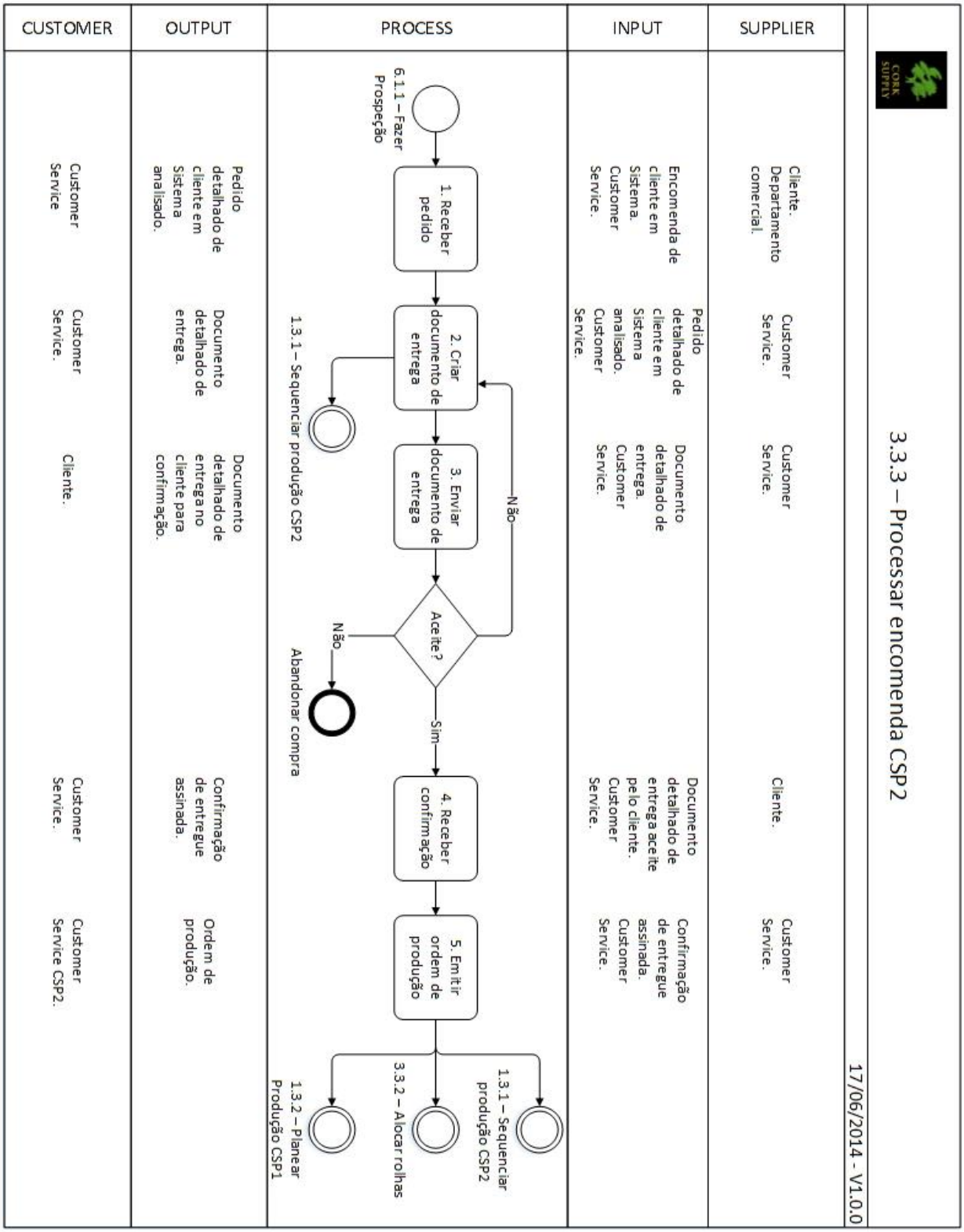
Appendix N – CSP Level 2 – DSL (AS-IS) 1



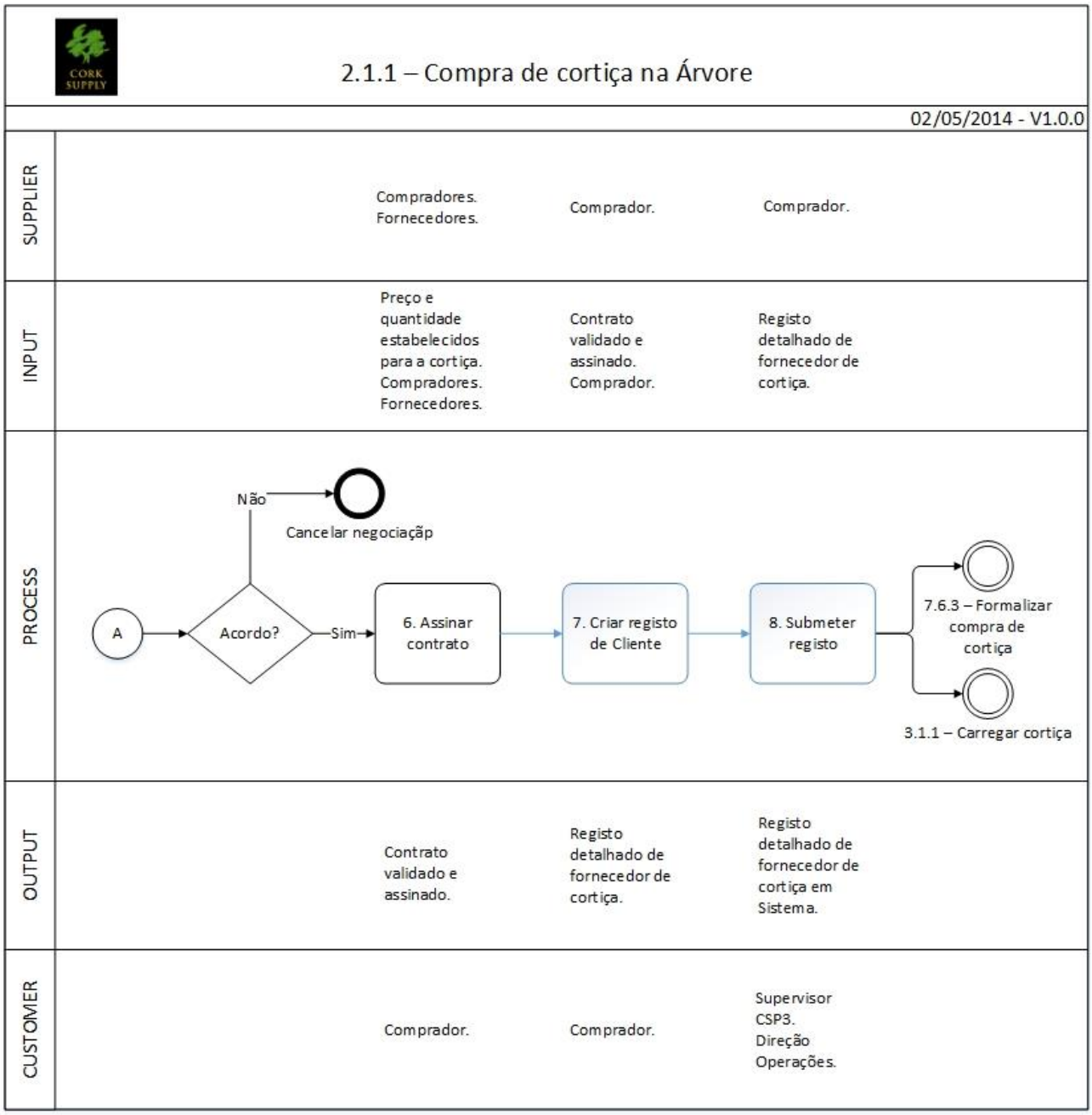
Appendix O – CSP Level 2 – DSL (AS-IS) 2



Appendix P – CSP Level 2 – Order Processing (TO-BE)



Appendix Q – CSP Level 2 – Cork Purchasing in the Tree (TO-BE)



Appendix R – CSP Level 2 – QC BARTOPS