Work Project presented as part of the requirements for the Award of a Masters Degree from NOVA – School of Business and Economics

Consulting Project for the Logistics Centralization of Clinical Consumables in order to sustain Operational Excellence in the José de Mello Saúde Group

Consulting lab carried out under the supervision of:

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Finally we would like to value our **parents, families, friends** and to all those who encouraged us through the whole project.

AGENDA

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List Abbreviations, Acronyms and Initials

AS IS - Current situation, one warehouse in each hospital unit

TO BE - Logistics centralization, creation of a central warehouse

LC - Logistics Center

CW - Central Warehouse

LD – Logistics Department

HU - Hospital Unit

HCD - Hospital CUF Descobertas

HCIS - Hospital CUF Infante Santo

HCC - Hospital CUF Cascais

HCTV - Hospital CUF Torres Vedras

HCS - Hospital CUF Santarém

CCA - Clínica CUF Alvalade

CCB - Clínica CUF Belém

CCM - Clínica CUF Miraflores

CSDR - Clínica CUF São Domingos de Rana

CMFR - Clínica CUF Mafra

CCS - Clínica CUF Sintra

PO - Purchase Order - *Notas de Encomenda*

Invoices – *Faturas*

JCM – Dr. João Costa Macedo

FL - Dr. Filipe Loureiro

AGENDA

1. Executive Summary
2. Methodology
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4. Cost Analysis
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JOSÉ DE MELLO SAÚDE

CONSULTING LABS

This field laboratory gives the possibility to offer a hands-on approach for students with little or no experience in the labor market

OVERVIEW

Through the Consulting Labs, students have the possibility of experiencing a consulting project. Our work group has taken on an important study that led to the definition and clarification of the advantages of the clinical consumables logistics center's creation for the company José de Mello Saúde. All the work was developed with the tutoring of a teacher with professional experience in consulting companies.
All the work was done with effort and dedication. The last 3 months were spent at the company JMS, headquarters in Carnaxide, where with commitment the group was able to build a strong working relationship based on trust. It is believed that the team added value to the company in the certainty of moving forward with a project with positive results.

ADVISORS

Advisors:
Dr. Rui Diniz - Vice-President
Dr. Rui Raposo - Executive Commission
Dr. Filipe Loureiro - Director of the Logistics Department
Dr. João Costa Macedo - Manager of the Logistics Department

Advisors:
Prof. Constança Casquinho

OBJECTIVES

- Achieve the ultimate goal of solving the true consulting challenge by assimilating the client's corporate culture;
- Apply in the project the theoretical concepts learned during the academic life;
- Meet or even exceed the client expectations and add real value to a company;
- Adaptation to the business world for the learning of work methods and soft skills - teamwork, empathy, syndication - that will be useful throughout the student's professional careers.

TEAM

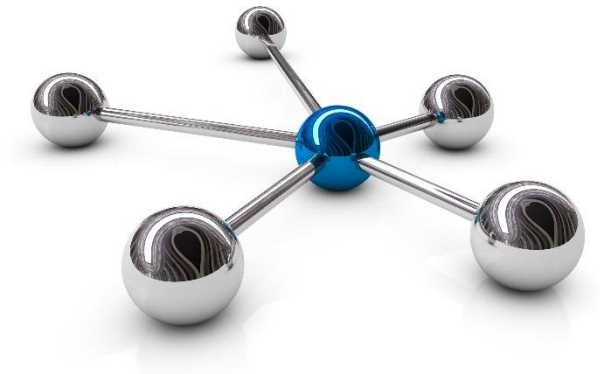
João Santa Bárbara
Leonor Roquette Rodrigues
Maria Carvalho
Sofia Bettencourt
Vera Salema

1. Executive Summary – Context

About José de Mello Saúde

With more than 70 years of history, José de Mello Saúde is the **leading firm of healthcare service provisions in Portugal**. The firm has a strong presence in our country with **its 15 private hospitals, named CUF**, and **2 other public-private hospital** units in Braga and Vila Franca de Xira. In 2015, JMS provided more than **2 million medical appointments**, an increase of 13% compared to 2014, and operated about **84 thousand patients**, 9% more than in 2014. All this activity, aligned with others, resulted in an **operating income of 560 million euros in 2015**. Despite this great results of 2015, JMS continues to **increase its footprint in Portugal**, with several projects on the way. In 2017, JMS will open its **expansion of CUF Descobertas**, duplicating then the size of its most profitable hospital unit. Furthermore, in 2018, **Hospital CUF Tejo in Lisbon will be opened** and substitute the current Hospital CUF Infante Santo, an investment of more than 100 million euros designed to fight and treat future diseases. JMS is with no doubt **one of the firms that is most contributing to the development of both the health sector and the country**.

About the Project



With JMS's **sharp growth and increase in its business volume**, aligned with its **promising projects for the future**, it is essential to analyze **improvement opportunities in the firm's logistic chain**. In other words, it is crucial to evaluate if its current logistics model can sustain all the growth that the firm is experiencing, and even if it can, if there are any opportunities of **becoming more efficient**. Therefore, the group was assigned to **study the current logistics chain of clinical consumables of JMS** for the cluster of Descobertas (3 hospitals and 2 clinics) and Tejo (2 hospitals and 4 clinics). In this study it was expected an identification of some constraints about the AS IS model, and an analysis of a possible improved scenario which would, not only eliminate the problems identified before, but also make the firm more efficient. More precisely, **the group had to analyze the company's current non-centralized logistics** and compare it with a **possible centralized one**, leaving us the question: **which logistics model is the best to meet the needs of José de Mello Saúde?**

Executive Summary - Context

About the Project

The value creation through the construction of a central warehouse will be focused on two clusters: Descobertas and Tejo. Each cluster is composed by three different types of units: A, B and C. The type A hospital units are the ones with the biggest dimension, HCD and HCIS. Moreover, the type B hospital units have a smaller size, HCC, HCTV and HCS. Finally, with the smallest size are the type C units, which represents all the clinics, CCA, CCB, CCM, CSDR, CMFR and CCS.

There are no warehouses in the hospital units of type C (clinics). All the clinics are currently being supplied by the type A hospital unit of their cluster. Therefore, CCA and CMFR are being supplied by the HCD and CCB, CCM, CSDR and CCS by HCIS. For this reason we did not have information about the stocks and consumption specifically for each clinic. Hence, in the analysis made, the group considered only the costs related with both the type A (2) and B (3) hospitals.
Finally, it is important to clarify that JMS already had a study about the optimal location of the Central Warehouse: Sacavém. This was assumed to be the optimal location in this project too.

- **Cluster Descobertas**
- Hospital CUF Descobertas (A)
- Hospital CUF Santarém (B)
- Hospital CUF Torres Vedras (B)
- Clinica CUF Alvalade (C)
- Clinica CUF Mafra (C)
- **Cluster Tejo**
- Hospital CUF Infante Santo (A)
- Hospital CUF Cascais (B)
- Clinica CUF Belém (C)
- Clinica CUF Miraflores (C)
- Clinica CUF São Domingos de Rana (C)
- Clinica CUF Sintra (C)
- Possible location of the Central Warehouse

1. Executive Summary – Main Challenges and Deliverables of the Project

Main Challenges

- How is the process flow diagram of the current clinical consumables provision?
- What are the main constrains of the AS IS situation? What are the possible solutions for these problems?
- What is the possible reduction in the safety and cyclical stock with a logistics centralization? How much is the variation in the holding costs?
- What is the total cost difference between a centralized and a non-centralized scenario?
- How much is the total investment in order to implement a logistics centralization?
- Which logistics model is the best to meet the needs of José de Mello Saúde?
- How can José de Mello Saúde implement this optimal logistics model?
- Who are the stakeholders affected with this change in the business model? How can JMS attenuate this change?

Deliverables of the Project

1. Analyze the actual warehouse organizational structure of Jose de Mello Saúde and calculate its respective costs of provisioning and storage of clinical consumables.

2. Define the warehouse organizational structure “Target Model” for clinical consumables, identifying the total cost difference with the AS IS situation and including the initial investment necessary to implement it.

3. Design an Implementation Strategy including its respective costs and identify all affected stakeholders as well as ways of mitigating their change in their work environment. Recommend which is the best logistics model for JMS.

1. Executive Summary – Action Plan

Action Plan

Can the logistics chain of José de Mello Saúde related to clinical consumables sustain its sharp growth and its promising projects for the future? Which logistics model is the best to meet the needs of JMS: the current non-centralized logistics or a centralized one?

Diagnosis

Analyze the current logistics model of storage and provisioning of clinical consumables.

Cost Analysis

1 - Determine all the costs of the AS IS Scenario for the next 5 years.
2 - Predict all the costs, for the next 5 years, of the "Target" model (Logistics Centralization).
3 - Compare the total costs of both scenarios.

Recommendations

1 – Create a sensitivity analysis for the opening of a new Hospital Unit.
2 – Create an Implementation Strategy including its costs and a change management plan.
3 – Recommend which model is the best for JMS, based on all the analysis made before.

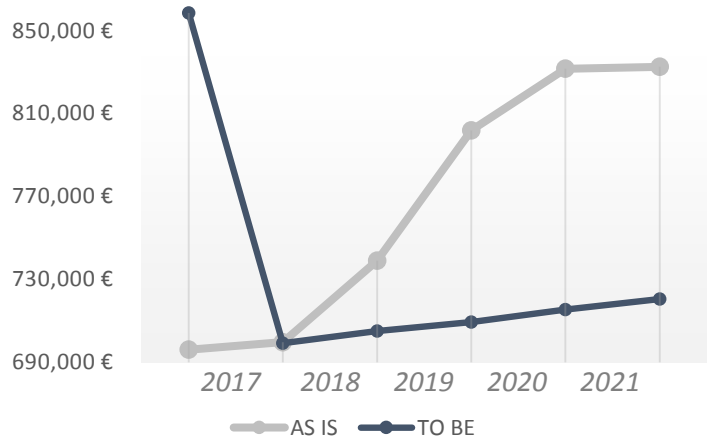
Executive Summary – Recommendations

Analysis

AS IS - Main Constrains

- Low control on the conference and reception of clinical consumables in the warehouse;
- High congestion of suppliers in the Hospital units;
- Low normalization of products which leads to an excessive number of references;
- Low process automation which depends a lot on the staff experience;
- High waiting time in the distribution of clinical consumables within the Hospital units;

Costs AS IS vs TO BE



Included Costs: Holding Costs; External Services and Supplies; Full-time employees; Distribution; Capex.

Sensitivity Analysis

How much are the savings or extra costs that JMS would have with the opening of a new type B hospital unit, considering that it already has a logistics center completely operational?

	Distance of the new HU to the south of HCIS		
Cost DELTA	100 KM	130 KM	200 KM
TO BE – AS IS	- 173 474 €	- 161 513 €	+ 17 173 €

Included Costs: Holding Costs; External Services and Supplies; Full-time employees; Distribution; Capex.

Reasons

Due to the possibility of solving all the problems identified in the AS IS scenario.

Due to the clear efficiency gains with a logistics centralization, which are in part reflected on a 5 years savings of 146 129 €.

Due to the scalability gains of having a centralized logistics, aligned with the expansion projects of JMS.

Conclusion

Advance to a Centralized Logistics

Take on an implementation per Hospital Unit and a change management plan in order to reduce the change in all affected stakeholders

Consumption growth and Inflation rates

All the data was from 2016, and it was considered an analysis period with a duration of five years, starting in 2017 and finishing in 2021. Therefore for some data it was essential to take into account the estimations for the next years of the consumption and inflation variation. The estimations for the consumption rates were given by José de Mello Saúde, while in the case of the inflation rate that information came from the Stability Program 2016-2020 of the Finance Ministry.

Annual Expected Growth Rates per each HU[1]

	2017	2018	2019	2020	2021
HCD	7%	30%*	3%	2%	2%
HCIS	7%	7%	20%*	20%	10%
HCTV	7%	40%*	3%	2%	2%
HCS	7%	1%	3%	2%	2%
HCC	7%	3%	3%	2%	2%
CL	7%	10%	6%	10%	6%

* Consumption growth that only occurs in the second half of the year.

** Estimation of the consumption considering the current material's consumption in each hospital unit's warehouse.

Concerning the growth rates for the HCD and the HCTV in 2018 and the HCIS in 2019, the expected growth occurs only in the second half of the year. This is a result of the hospital units' expansion (HCD and HCTV) or opening (HCIS, which will be the CUF Tejo) that only happens in the second half of 2018 and 2019, respectively.

Harmonized Index of Consumer Prices (HICP)[3]

	2017	2018	2019	2020	2021
Inflation (%)	1,6	1,7	1,8	1,8	1,8

Regarding the inflation rates, our period of analysis is between 2017 and 2021 but the Stability Program of the Finance Ministry used to take that information is only from 2016 to 2020. Therefore, it was assumed that the inflation rate for the final year would be the same as in the two previously years.

Care indicators of JMS[2]

JMS presents a significant growth in all the care areas, being the medical appointments the one with the highest growth between 2014 and 2015 (10,7%). Therefore, by looking to this data, we believe that the health sector will continue to grow in the next years which, aligned with expansion projects for the future of JMS justifies the expected growth rates that were given to us.

Thousands	2014	2015	Variation %
Medical Appointments	1 827,8	2 022,7	+ 10,7%
Urgencies	545,2	562,6	+ 3,2%
Operated patients	77,9	82,9	+ 6,4%
Outgoing patients	73,5	76,9	+ 4,6%
Days of hospitalization	429,9	451,9	+ 5,1%
Birthdays	7,2	7,5	+ 5%

* Does not include the patients leaving the UCIP and the HCS.

1 - Sustainability Report JMS – 2015; 2 - JMS Business Plan; 3 - : Stability Program 2016-2020 - Ministry of Finance

AGENDA

Methodology

Phase 1 - Diagnosis

Part A – Process Flow Diagram

Part B – Main constrains of the process

Sep 19th - Oct 13th

Phase 2 – Cost Analysis

Part C – Stocks

Part D – ESS

Part E – FTEs

Part F – Distribution & CAPEX

Oct 13th – Nov 24th

Phase 3 - Recommendations

Part H – Sensitivity Analysis

Part I – Change Management Plan

Part J – Implementation Strategy

Nov 24th – Dec 27th

Methodology – Phase 1: Diagnosis

Part A – Process Flow Diagram

Objective: Compare the logistic process of warehouses in its different activities (Reception, Storage, Picking, Distribution and Storage in the point of consumption) in practice (field study) with the theoretical description of the same activities in order to be familiar with the whole process and understand the differences. With this study, the processes flow diagrams were performed.

Method: Firstly, the team met with the Logistics Managers, Dr. João Costa Macedo, Dr Filipe Loureiro, Dr. Rui Raposo, in order to learn the history and logistics path of José de Mello Saúde and review the organizational resources and capabilities (which include human resources, informational resources, financial resources and supply resources). Subsequently, in bi-weekly meetings with Dr. JCM the team was assimilating information about the current operation of existing warehouses and the future objectives of the institution regarding the operational logistics department. In order to compare the estimated activities with the real activities, the team was divided into two groups and followed the process of reception, storage, picking, distribution and storage in the warehouses in HCIS (3 elements) and HCD (2 elements). Afterwards, the members of each team shared what was observed in each unit against what was theoretically projected and were able to design all the processes flow diagrams that enable the group to have a deeper knowledge about the whole process.

Main Activities:

Process model	Firstly, the group started by analyzing the information that was transmitted and designed the respective mappings of the activities that happen in the operational routine.
Practice analysis	Then the team, with the help of Dr JCM, selected two UH's (HCIS and HCD) with the greatest impact and compared the previously designed processes in detail with the observed activities. The group also adapted the mappings originally elaborated and identified the main differences, reporting all the improvement points.
Process review	The team met with the logistics managers to present the key findings and the suggested improvement points.

Methodology – Phase 1: Diagnosis

Part B – Main constrains of the process

Objective: Identify the main problems of the AS IS situation that could improve with the creation of the logistics center.

Method: The team, through on-site observation and by the bi-weekly meeting with JCM, had the opportunity to verify the main problems of the AS IS situation which could lead to less positive results. Thus, after identifying these spaces for enhancement, the team had to study to what extent the logistics center could fill these flaws, and proposed some other future activities and improvements. Moreover, due to the big concern about one of the problems identified, the team was asked to have deeper analysis in the lack of products standardization within the hospital units. In order to do so, the group analyzed all the clinical consumables that were consumed or purchased in each HU warehouse and investigated how much they were common to all 5 HUs. Furthermore, it was also identified all the products that just exist in type B hospitals, something that does not make much sense due to the non-existence of exclusive services in this type of HU.

Main Activities:

Local Observation	The team went to the warehouses of the hospital units and observed how the macro-logistics processes were developed and compared it with the theory learned in the weekly meetings with JCM. With these results, as external viewers, the elements of the working group were able to identify improvement points for the success of results.
Team analysis	After local observation and during the development of the proposed work, the team identified activities to be adopted in order to fill some gaps. For each improvement space identified, the team presented a resolution proposal that was accepted by the logistics managers.
Products Standardization	Based on JMS Data, analyze the range of products consumed and ordered in all Hospital Units and its type of hierarchy. Study how much they are common for all the Hospital Units and determine what can be changed in this issue.

Methodology - Phase 2: Cost Analysis

Part C - Stocks

Objective: Calculate the Average Inventory for AS IS and TO BE situations. Subsequently to this, estimate the Holding Costs also for both the TO BE and AS IS situations and compare it. In addition, with these results, determine the number of Purchase Orders and Invoices issued by JMS in each situation.

Method: For the situation AS IS, in order to calculate the total Average Inventory it was used the information from the last day of September of 2016 and assumed to be the usual average stock in each warehouse of the Hospital Units. Everything was added in order to have the total value for the 5 HU. With this information, the unitary Holding Cost was estimated for each product and it was possible to determine the total Holding Costs for 5 years for the situation AS IS, by applying the consumption growth rates estimated by JMS. In terms of the situation TO BE, it was necessary to construct a model to estimate the Average Inventory. In order to do so, the EOQ Model (Economic Order Quantity) was used to find the optimal quantity to order that would minimize the total cost (Ordering and the Holding Costs). With this quantity, it was feasible to estimate the Average Inventory. However, this model didn´t had into account the variation of the demand, the service level or the lead time of the suppliers. In that sense, a model for the Safety Stock was performed that had into account all these variables. Thus, the group added the Average Stock found by the EOQ Model to the Safety Stock and that was the total Average Inventory for the situation TO BE. Consequently, with the unitary Holding Costs mentioned before, it was possible to calculate the Total Holding Costs for 5 years and compare it with the situation AS IS.

Main Activities:

Analysis AS IS	With the **AS IS** Data provided from the previous period and by adding everything it was possible to know and to analyze: Average Inventory; The quantity and the number of orders for each product; The number of Purchase Orders and Invoices emitted.
EOQ Model	Conduct the EOQ Model by estimating all the variables associated with the formula in order to have the optimal order quantity for each product. This information would allow the group to determine the following, for the TO BE situation: Average Inventory; The quantity and the number of orders for each product; The number of Purchase Orders and Invoices emitted.
Safety Stock Model	Conduct the Safety Stock model in order to know the values for the Safety Stock (quantity, value and in days) and to strengthen the EOQ model in terms of Average Inventory. In addition to this, calculate the values for the Reorder Point in the **TO BE** situation.

Methodology - Phase 2: Cost Analysis

Part D - External Services and Supplies (ESS)

Objective: Estimate the Total Costs of ESS, which are the costs incurred by the warehouses, for the AS IS situation (5 warehouses) and for the TO BE situation (only one warehouse) and compare it in order to determine the savings or additional costs of having a central warehouse.

Method: For the whole analysis, all the cost items analyzed were used based on the actual ESS costs for the year of 2016 in the 5 warehouses of JMS and for the calculations the group decided to use the unitary annual costs per m^2. These unitary annual costs per m^2 were estimated by the ratio of the annual total costs of each specific cost item per HU and the total area of each HU (m^2 of the warehouses of clinical consumables, not including the m^2 concerning the Hospital Garments). Then, the group did the average of all the unitary annual costs per HU in each item. By having the unitary annual costs in 2016 as a base, it was possible to reach the total costs per item in each year and for any situation just by multiplying by the area. For all the years of analysis (starting in 2017) and for both situations, the area for the Hospital Garments was considered because it will also be transferred to the central warehouse. In the AS IS, the areas of the warehouse vary through the years due to JMS' expansion. In terms of the TO BE, the costs were calculated also with the same logic, with the total m^2 constant through the years (1000 m^2), the only difference was the rent that was found by the group by a benchmarking research. Some of the costs items were affected by the inflation rates considered for each years such as water, electricity, cleaning, security and trash. Finally, with all the costs estimated for the 5 years in both situations, we were able to compare it.

Main Activities:

Estimate the ESS costs AS IS for 5 years	Firstly, the group estimated the unitary annual costs per m^2 of each cost item based on the costs of 2016 by the ratio of the annual total costs of each specific cost item per HU and the total warehouse's area of each HU. Then, the product between the unitary annual costs and the total areas of each HU was performed to achieve the total costs for 2016. Subsequently, the same was done for all the years taking into account the inflation rates and the expansion of the warehouses including the m^2 for the Hospital Garments. Finally, the cost for the 5 years of analysis were calculated in order to later compare it with the TO BE situation and estimate the Delta. Regarding the rent of the HCD and the HCTV, since the total warehouse + hospital garments area will increase in the 2nd half of 2018 due to an expansion of these two HUs, for the first half of that year it was considered the old total area and multiplied by half of the unitary annual cost and for the second half of the year we considered the new area and also half of the unitary annual cost. The same logic was applied to the rent of the HCIS in 2019, but the difference is that in this case it is not an expansion but a move to a new building (CUF Tejo) and because the future rent per m^2 will be similar to the HCD, it was considered the annual unitary cost of the HCD for the calculation of the total rent cost for the 2nd half of 2019 for the HCIS and the subsequent years.
Estimate the ESS costs TO BE for 5 years	In this case, the group used the same base of the AS IS, unitary costs per m^2 of each cost item based on the costs of 2016 by making the average of all unitary annual costs of all the 5 HU. Then, the product between the average unitary annual costs and the total area of the central warehouse was performed to achieve the total costs, excluding the rent cost. Subsequently, the same was done for all the years taking into account the inflation rates and with the area of the central warehouse (1000 m^2) that it is always constant and includes the space for the Hospital Garments. Concerning the rent, the group made a market research in terms of price per m^2 of similar warehouses to the one that was needed for JMS and considered that 3,4€/ m^2 was a reasonable value. Finally, the cost for the 5 years of analysis was calculated in order to later on compare it with the AS IS situation.

Methodology - Phase 2: Cost Analysis

Part E – FTEs

Objective: Estimate the five year costs of all employees of the logistics' department for both the non-centralized and the centralized scenario. Then, compare the total costs of both scenarios for the period of analysis.

Method: Firstly, the team got the total annual cost that JMS had per employee of the logistics department in our base year, and calculated the average annual salary per job type. Secondly, for the non-centralized scenario, it was estimated the evolution of the personnel needed in each of the years of analysis, as well as its respective costs. This estimation was based on JMS' Business Plan. Thirdly, for the centralized scenario, the team projected the number of workers needed and its costs, so that there is no reduction on the service level. In this part, the group started by defining the jobs that would suffer an alteration, if JMS would change its warehouse organizational structure. Then, based on both Dr. JCM's expertise and the variation of the cycle stock, the new number of workers was determined. Finally, after having the five year costs for both scenarios, the cost difference was calculated.

Main Activities:

AS IS	The group started by determining the total number of workers in the logistics department, as well as its respective annual salary. Then, based on the JMS' Business Plan we were able to project the variation of the personnel needed for the next five years. With all this information, the group can finally determine the total cost that the logistics department would have with its staff for the next five years in a non-centralized situation.
TO BE	Firstly, estimate the number of people needed for this scenario for each year of analysis. Then, based on the average annual salary calculated before, get the total annual cost that the logistics department would have with its staff for the next five years in a non-centralized situation. Include the severance pay costs in this scenario if needed.
Delta	Calculate the difference of the number of people needed in both scenarios, for each of the five years of analysis. Additionally, determine the savings or extra costs from a centralized scenario to the non-centralized one.

Methodology - Phase 2: Cost Analysis

Part F – Distribution & CAPEX

Objective: Estimate the five year costs that JMS would have related to the distribution from the central warehouse to each one of the hospital units. Furthermore, predict the initial investment that José de Mello Saúde would have to incur in order to equip the warehouse.

Method: In this part, the group had to take into account three different types of costs: leasing costs of the van, normal distribution costs, which included gas and tolls, and emergency costs. For the leasing costs, the car leasing firm IVECO was contacted and gave us directly this information. Then, for the normal distribution costs, the group had firstly to create a distribution itinerary. Finally, for the emergency costs, the group contacted the firm Jet Express and got this information.
In the CAPEX, it was assumed that the warehouse material such as shelves, ladders and seats, would not be a cost, since this material already exists in the current warehouses and just needed to be transferred. However, there is always the cost of renovating the warehouse and making it more modern and in line with needs of JMS. To determine this value the group contacted the infrastructures department at JMS.

Main Activities:

Leasing Costs	Contact a car leasing firm to give us this information.
Normal Distribution	Create a distribution itinerary based on the weekly supply needs of each hospital unit. Then, based on this itinerary, calculate the total costs related to tolls and gas. Fuel costs depend on the consumption of the van and tolls were subject to inflation in each year of analysis.
Emergencies	Estimate the number of weekly emergencies each hospital would have. Then, contact a specialize firm to give us information about the prices of this service. Finally, with both this information, determine the total cost that JMS would have in emergencies from the central warehouse to the hospital units.
CAPEX	Contact the infrastructures department.

Methodology - Phase 3: Recommendations

Part G – Sensitivity Analysis

Objective: Perform a sensitivity analysis to access the farthest possible location where JMS can have a new hospital unit in order to compensate having a logistic centralization of the clinical consumables instead of current logistics model.

Method: In order to perform the sensitivity analysis it was studied the possibility of opening a new hospital unit of a large or medium dimension (type A or type B), considering several possible distances from the HCS and the HCIS which are the hospital units located further north and further south, respectively, when compared to all of the others. To perform the analysis all the information that was used for the type A hospital unit was from the HCIS and for the type B hospital unit it was from the HCTV. To access the total cost of opening a new hospital unit for both scenarios (AS IS and TO BE), several factors were analysed: the cost of the extrenal supplies and services; the cost of the full time empoyees that would be necessary to have with the new hospital unit; the cost of the stock's ownership; the cost with the initial investment needed to equip the warehouse, as well as the costs with the distribuiton from the central warehouse to the hospital units.

Main Activities:

ESS	To calculate the cost with ESS, it was determined the unit cost of all the elements that belong to this category for HCIS and HCTV and used to know the average cost with ESS for a type A and B hospital unit. Regarding the HCIS's rental unit cost, it was not used the current one as it is not realistic because it was negotiated many years ago and it is about to change for the new CUF Tejo. Therefore, that value came from the HCD.
FTEs	In order to access the number of employees that would be needed in both scenarios, AS IS and TO BE for type A and B hospital units, it was used the methodology for the FTEs, previously explained.
Stocks	For the cost of the stock's ownership, it was calculated the one for the HCIS (representing a type A hospital unit) and for the HCTV (representing a type B hospital unit), meaning that it was used the stock that these two hospital units currently have in their warehouse and assumed that it would be the same for the new HU.
Initial Investment	For the initial investment, for the case where there is not a change in the current logistics model, it was used the cost of equip a new warehouse for both types of hospital units, A and B, given by JMS which includes shelves, transport cars, forklifts, computers, printers, Pdt's, cabinets, desks, chairs, hangers, lockers… With a central warehouse there is not an extra investment for having a new hospital unit.
Distribution	As for a type A hospital unit the distribution from the central warehouse to the HU would need to be on a daily basis, while it needs to be only three times a week for a type B hospital unit, the distribution plan was optimized for the four options (North, type A and type B and South type A and type B) in order to deliver the stock to the maximum HUs with the same motorist and car. This cost includes the costs with the car's renting, the gasoline and the tolls, .

Methodology - Phase 3: Recommendations

Part H – Change Management Plan

Objective: Analyze how Portuguese people generally react to changes, identify the stakeholders of JMS that will be affected with the change of the current logistics model and find corrective actions to smooth the move to a logistical centralization.

Method: Initially, it was done some research in order to find theoretical models that could help us to better understand how Portuguese people generally react to changes and the need or not to have a Change Management Plan. After knowing that JMS should have a Change Management Plan, the group identified all the stakeholders that directly or indirectly are involved in the logistics process and thus would be affected with the change of the logistics model. The objective was to see how this change would affect them, as well as suggest possible corrective actions that would smooth the move from the current logistics model to a logistics centralization model. Several corrective actions were developed in order to comprise all the identified stakeholders, by being simple and possible to put into practice.

Main Activities:

Change Management Plan	In order to study the need for JMS of having a Change Management Plan, several research was done with the goal of finding theoretical models and other information about how the Portuguese people generally react to changes. By doing this, it was concluded that a plan to smooth the impact of this change really should be recommended to JMS.
Stakeholders	Knowing that JMS should have a Change Management Plan, all the stakeholders who would be directly or indirectly affected by the change in the logistics model were identified. The purpose was to understand how they work today, as well as their role in the logistics process and how it would be for them in the future with a logistics centralization.
Corrective actions	With all the stakeholders identified, it was possible to develop several corrective actions in order to comprise everyone that would be affected by this change. The goal was to find simple and possible actions that would contribute to smooth the change of the logistics model .

Methodology - Phase 3: Recommendations

Part I – Implementation Strategy

Objective: Analyze how the approach to set up the Logistic Center will be implemented. For each of these scenarios the respective costs, risks and advantages and disadvantages for each scenario. After the three scenarios had been tested we also have recommended which one would be the most appropriate for JMS.

Method: After a careful analysis we have developed different possible scenarios for the implementation strategy. The three main scenarios we settled were: By Product, By Supplier and By Hospital Unit. The scenario By Hospital Unit has four scenarios within it. For all scenarios we have considered the same duration for the Implementation Strategy – eight months, this is the time that it takes to have all Products, Suppliers and UH's integrated in Logistic Center. Regarding the costs we also have analyzed the same cost items for all the scenarios: Full-Time Employees, Distribution costs, External Services and Suppliers and finally the Holding cost. In order to be able to calculate the costs for each scenario we attempted to analyze what would be the extra costs for JMS compared with the TO BE scenario. (Scenario where we have the Logistic Center already working with all Units). More precisely: first we calculate what are the costs for each phase, taking the time of each phase in consideration, using the scenario TO BE. In this case the costs are the same for all scenarios, what changes is the duration of each phase. Second we have calculated the costs with the Implementation Strategy, this costs are going to decreasing in time, depending on the needs of JMS. The real cost with the implementation is the difference between this two scenarios- TO BE and Implementation Strategy.

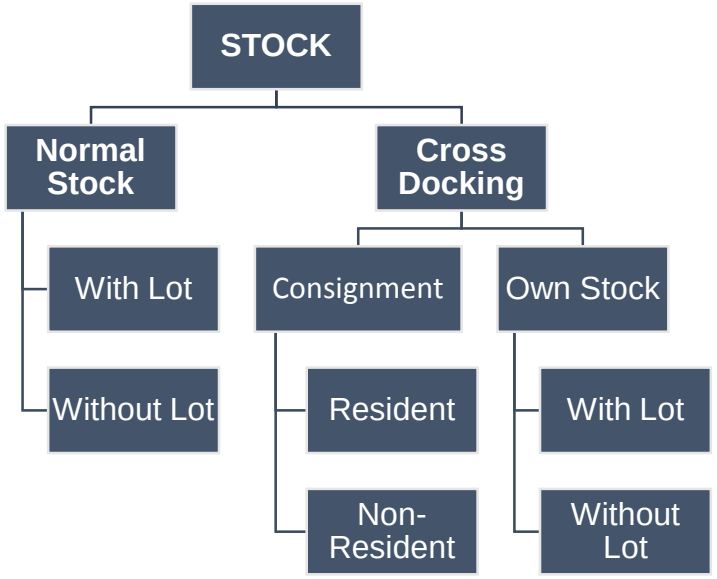
Main Activities:

By Product	Scenario where there is a gradual Implementation Strategy made by Products. We started by integrating the products that are in common to all Hospital Units (234 Products), second the products that are common to four Hospital Units (200 products), then common to 3 Hospital Units (247 products) and final add all the independent products (1103 products).
By Supplier	In the scenario by supplier, centralization would be implemented based on the number of trips of each supplier to the HUs. That is, initially centralizes the suppliers that more often move to the UHs finishing in those that less move.
By Hospital Unit	There are a number of possible combinations in this scenario. We considered four main scenarios in this category. By Hospital Unit, where we first integrate HCD and CCMFR, second HCIS and CCM, third HCTV, HCC, HCS and in the last all the other clinics CCB, CCS, CCSDR. By Cluster, in this case we start by integrating all HU from *Descobertas' Cluster* and then all HU from *Tejo's Cluster.* By Type of HU, beginnig with all HU from type A, followed by HU from Type B and final with Type C. The last category we have analyzed was By Cluster By Unit, in this case we integrate each HU of each Cluster at a time. However, after a more in-depth analysis, the group came to the conclusion that the one with the lowest level of risk and the greatest feasibility of execution is By Cluster By Unit.

AGENDA

Part A: Process Flow Diagram – Different Types of Stocks

Before pursuing on the process analysis, it was important to identify the different stock types because they are associated with different macro logistic processes.



Different types of stock arrive daily at JMS warehouses. Stock is divided into **Normal Stock** and **Cross Docking**

Normal stock - Material that is received and which is stored in the warehouse until being directed to the advanced warehouses upon a previous request. This is the type of stock that is stored more than 24 hours and storage at a specific location.

In turn, the Normal Stock can be divided more specifically into two other types of stock:

With lot - Required the lot registration in the system. Instead of recording the total quantity of the purchase order, it needs to register lot by lot. A lot corresponds to a different characteristic of a product. For the system, each lot is a different product.

Without lot – It is necessary to check the reference through the bar code and see if it is in the order form or not.

Cross Docking - Is the distribution process in which the goods received are redirected to the services without prior storage.

Cross Docking, in the same way, is also divided into three types of stock:

Consignment stock

Resident Consignment - It is a product that does not belong to JMS, it is a virtual information. When the product is registered, it remains in the computer system as pending.

It is always located at the point of consumption (cross docking). The entire resident consignment is registered to the patient, the system issues two emails at the time of consumption: E-mail to the purchasing department to say it was consumed and e-mail to the suppliers, to ensure that the supplier issues the goods earlier .

Non-resident Consignment- The material does not belong to JMS, it is requested for immediate consumption, registration is done after use. (See Mappings on Appendix 3.1.3)

Own Stock (See Mappings on Appendix 3.1.1 and 3.1.2)

With lot - Required the lot registration in the system. Instead of recording the total quantity of the purchase order, I have to register it lot by lot. A lot corresponds to a different characteristic of a product. For the system, each lot is a different product.

Without lot - Check the reference through the bar code and see if it is in the order form or not.

Part A: Process Flow Diagram – Macro Logistics Processes

Macro Logistic Processes - Normal stock with and without lot

Reception

The supplier delivers the order to the warehouse, and confirms that the purchase order matches the delivery note. Then it checks the critical factors and inputs the material information in the system. The collaborator must follow the reception rules (described in the mappings).

Storage

After receiving, another employee arranges the material in accordance with the rules of storage. Places the products with longer shelf life behind, and those with the shortest shelf life in the first row. Must obey to the material storage rules.

Picking

The warehouse employee receives from a specific service an order on the picking machine. It should remove the material requested from the shelf, pick the bar code, input the quantity taken in the system and place the material in the box.

Distribution

Once the order has been prepared, the employee will distribute it to the specific service. He leaves the warehouse, picks up the elevator and goes to the service. This process can be very time-consuming, since priority to clients and stretcher bearers should be given in the elevator.

Storage at point of consumption

In the point of consumption, the employee who takes the material, places the product in their respective shelf following the FEFO rules. Each material has a proper place of storage that was defined by the chief nurse of each service.

Macro Logistic Processes – Cross Docking

Reception

Distribution

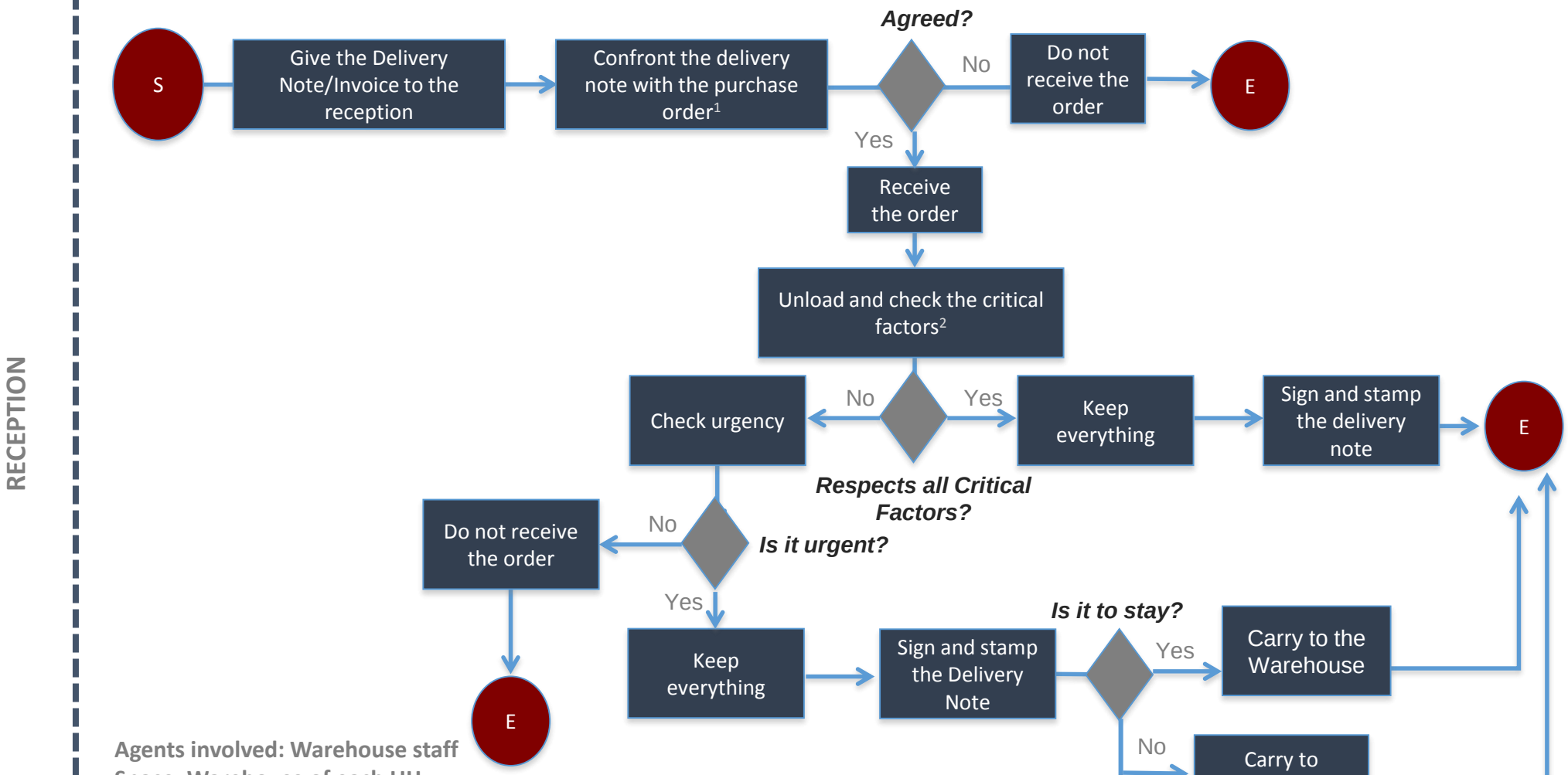
Storage at point of consumption

In the cross-docking there is no storage process since this type of material, does not remain more than 24 hours in the warehouse. Thus, the material is received by the warehouse manager and then it is taken to the service that requested it. Finally, it is used immediately or storage at the point of consumption

Despite the different types of stock, for the study to be developed, the team with the managers decided to consider only the normal stock.

Part A: Process Flow Diagram – Normal Stock

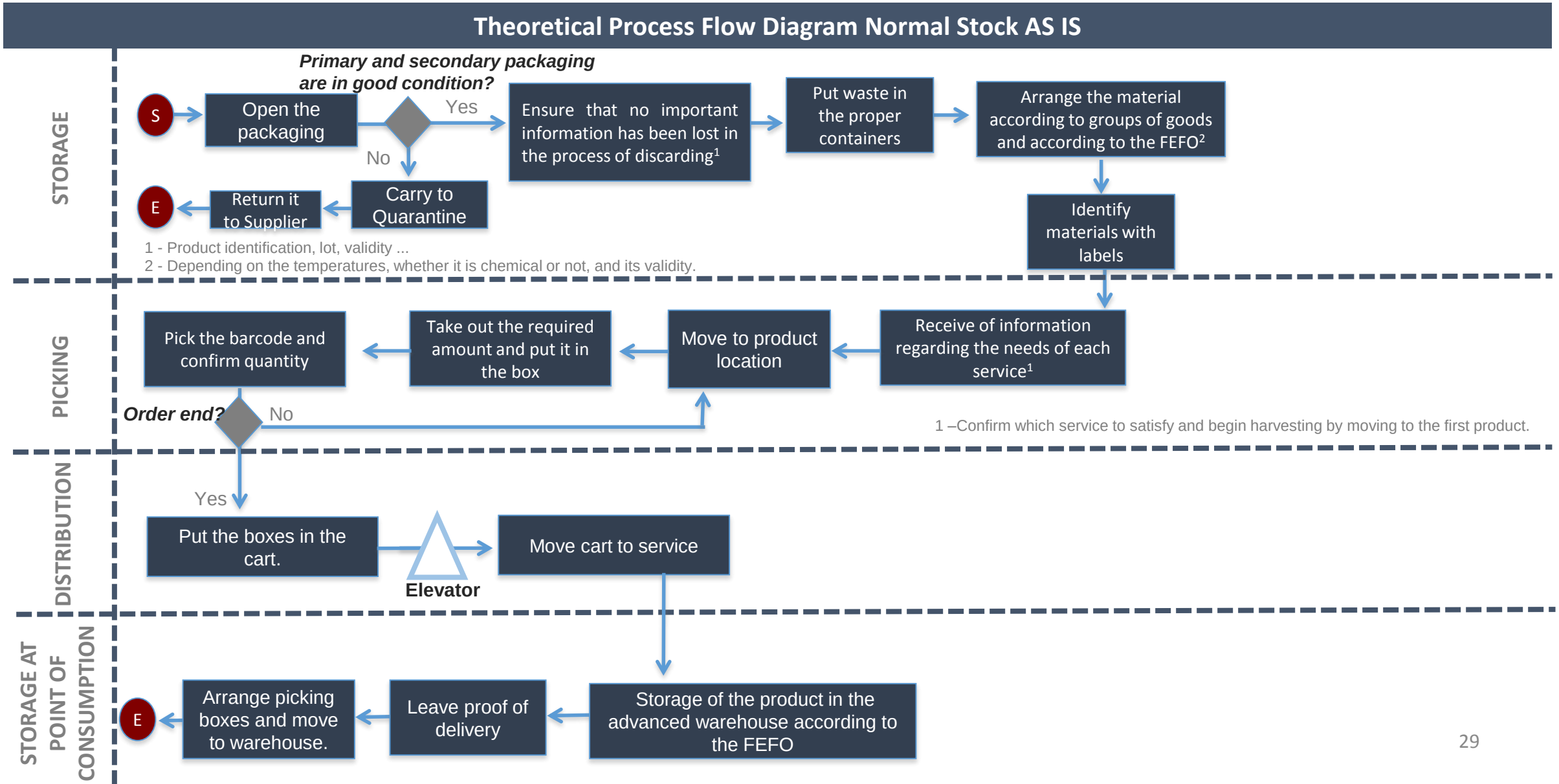
Theoretical Process Flow Diagram Normal Stock AS IS



Agents involved: Warehouse staff
Space: Warehouse of each UH

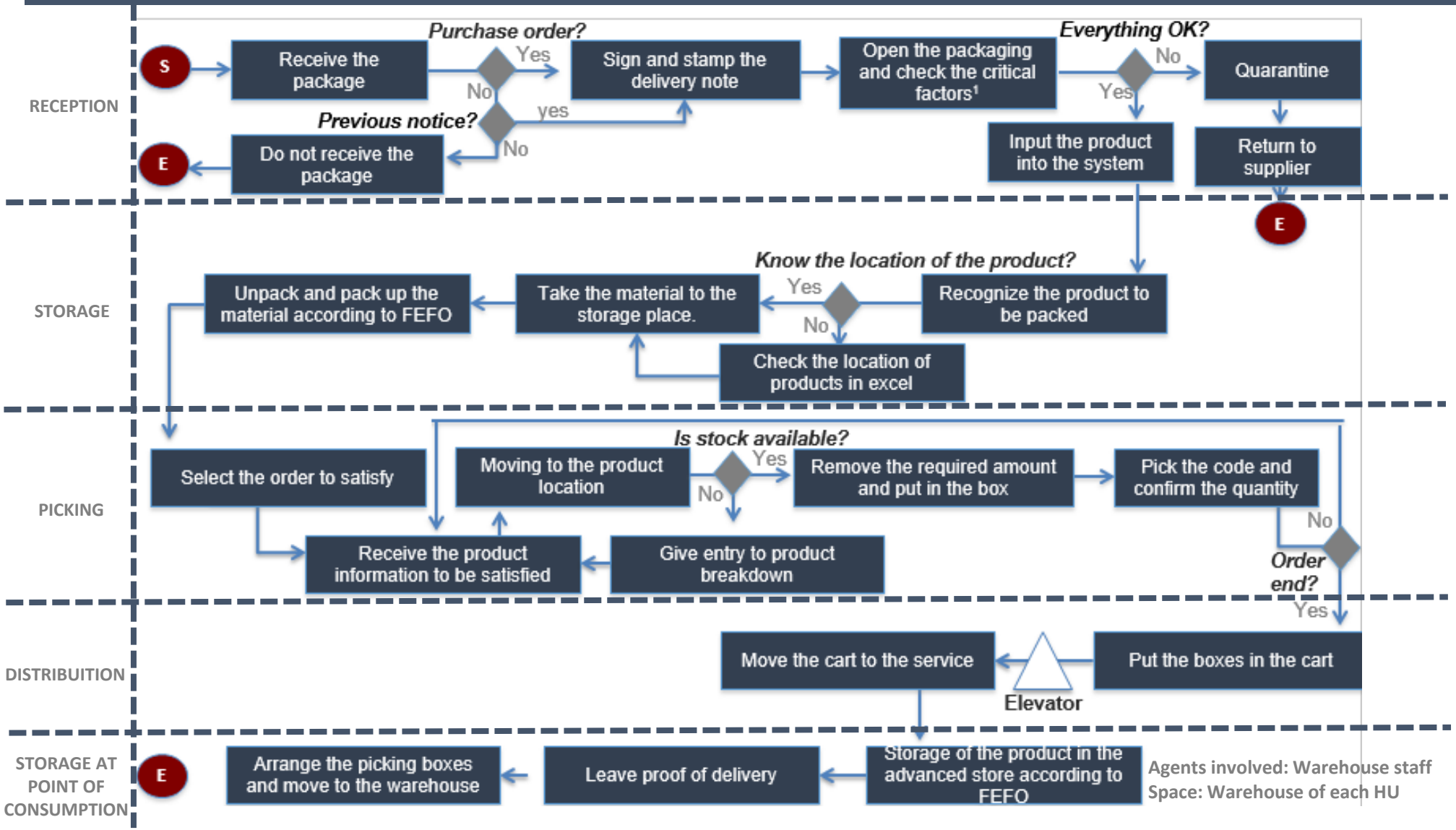
1 - 4 factors: article, reference, quantity, price
2 - critical factors: article reference, visual appearance of the packaging, validity

Part A: Process Flow Diagram – Normal Stock



Part A: Process Flow Diagram – Normal Stock

Practical Process Flow Diagram Normal Stock AS IS



Agents involved: Warehouse staff
Space: Warehouse of each HU

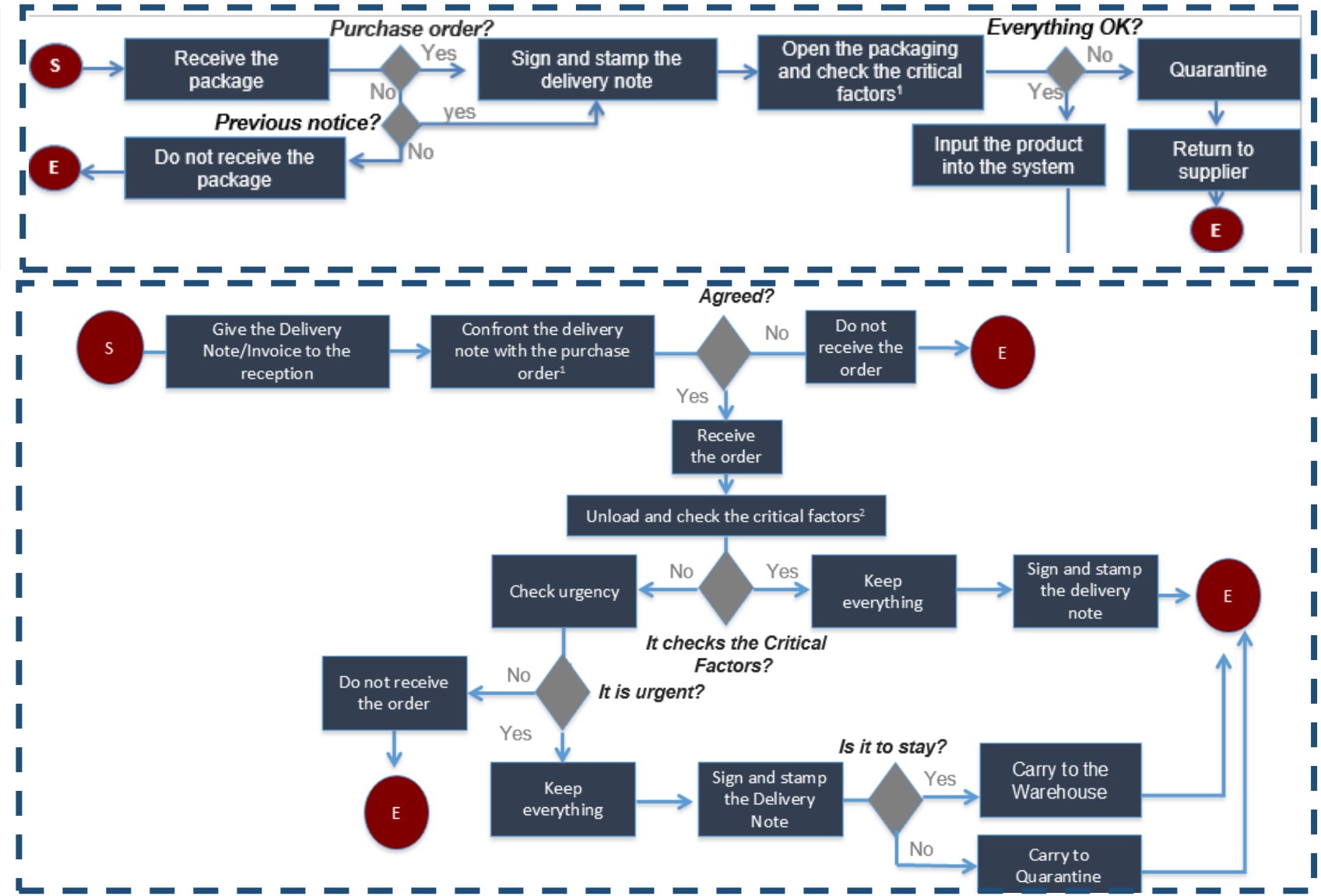
Initially JCM transmitted how reception, storage, picking, distribution and storage at the point of consumption should be processed. However, the group considered that it would be interesting to observe the same processes on the ground. For this, a team was divided into two groups, that went to two different HU and observed in practice how the process was done.

After moving to the HCD and HCIS warehouses, the team encountered differences, specially, in the reception process.

The process of reception in theory differs from that observed in practice which took the group to the questions: which is the most effective process? How can JMS ensure that what happens in practice is the same as in theory?

Part A: Process Flow Diagram – Normal Stock

Process Flow Diagram Normal Stock AS IS – Theory Vs Practice



The main differences identified:

- Delivery note is signed before verification of critical factors. There are three critical factors, article reference, visual appearance of the package and validity, who in theory, if not verified are sufficient for the material not to be accepted in the warehouse and returned to the supplier.
- The existence of a purchase order, in theory, is another decisive factor, for the course of the order. In practice, the order is placed whenever there is a purchase order or a prior notice of the non-existence of a purchase order (by the purchasing center). In theory, the order is not received without having a corresponding order form.

AGENDA

Part B: Main constrains of the process

With the team's visit to the warehouses and all the differences identified from the theoretical flow diagram to the practical one, it was possible to highlight some improvement points. All these points were related to some of the macro logistics processes explained before. Furthermore, almost all of the problems identified may be solved with a possible warehouse centralization.

Problems identified in AS IS

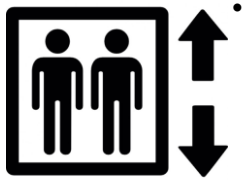
Reception

- Lack of control in the conference and reception of clinical consumables
- High congestion of suppliers. On average, there are 120 suppliers going to all the five HU every working day.

Storage

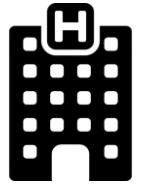
- Low process automation, a lot dependent on the personnel's experience.

Distribution



- High waiting time in the distribution due to the joint use of the elevator for different purposes (clients, warehouse managers, stretcher bearer…).

HUs



- Low standardization of products. More or less 52% of the total number of references are present in one hospital unit only, something that does not make much sense given the similarity between all the HUs

Part B: Main constrains of the process

Problems identified in AS IS

Reception

Room for improvement of the control in the conference and reception of the products. In other words, make sure that there is a match between the delivery note and the order form.

Solutions with the creation of a logistics center.

Apply the blind conference system (explained bellow).

BLIND CONFERENCE[4]

This conference process allows to make sure that the quantity of items in the purchase order is in accordance with what was physically received and stored.

Arrival of the material to the warehouse	Operator 1	Operator 2
		
Goods arrive at the warehouse.	The first operator makes sure that there is a match between the purchase order and the delivery note.	The second operator does the blind count (meaning that he does not know how many units the supplier is suppose to deliver) and inserts this information in the software. The system will automatically check if everything is in accordance and that there are no deviations.

The application of this process will not only reduce the errors in the stock reception, but also give more control to JMS about what really enters in the warehouse.

4 - http://blog.mahagestao.com.br/conferencia-do-recebimento-de-compra/

Part B: Main constrains of the process

Problems identified in AS IS

Reception

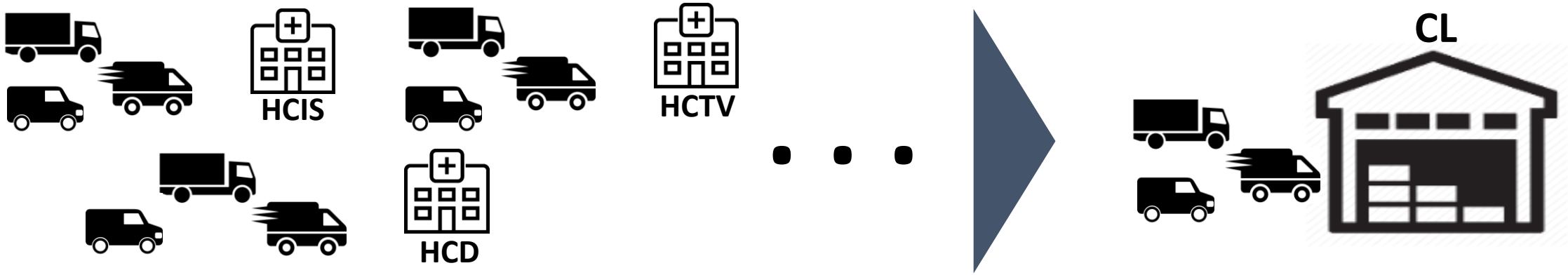
Congestion of the suppliers in the warehouses of the HUs and difficulty in receiving the products in the available space (on average 120 suppliers in all the five HU every working day)

Solutions with the creation of a logistics center.

With the creation of a central warehouse, all the suppliers would deliver their products only in one place instead of 5. This fact eliminates all the consequences of the high congestion of suppliers in the HU.

In the visit to the warehouses of the hospital units the team verified that there were moments of great influx of suppliers and others in which this number was smaller and gradual. The fact that there was a large congestion can increase the reception error due to the speed of the process. Moreover it causes traffic congestion in the hospital units, which may impact client satisfaction. Finally, it also causes some lack of security due to the high number of suppliers entering in each hospital unit per day.

With a creation of a logistics center, deliveries are no longer made in the warehouses of each hospital unit. Thus, there will be no more traffic congestion in the hospital units due to the presence of suppliers. Additionally, in the LC suppliers will only have to deliver its supply in one place instead of five. Nevertheless, suppliers delivery plan should be created in order to have a better functioning of the logistics center.



Part B: Main constrains of the process

Problems identified in AS IS	Solutions with the creation of a logistics center.
Storage Very low automated process, very dependent on the personnel's experience.	With only one warehouse it will be easier to control and manage a more automated storage process

In each unit the team verified that the time spent in the arrange process depended, to a large extent, on the employee's experience, being very intuitive.
At the Logistics Center, it is expected to create a storage process that allows a quick adaptation to those who are integrated. On the other hand, this storage mapping must presuppose a logic that facilitates and minimizes the execution time of this Macro Logistic process.

Distribution High waiting time for the joint use of the elevator for various purposes (customers, stretcher bearer, warehouse managers).	With a LC, the distribution of the products to the HUs will be done only once a day and can be made during periods of low traffic (during the night for example).

One of the complaints of the employees who do the distribution is the waiting time for the elevator. Priority should be given to customers. Thus, as experienced by the team, the employee can stay about 30 minutes waiting for an elevator just to perform a small part of their work.
With the Logistics Center, the distribution is done only once a day (except for some urgency). So, this distribution can be done at an hour with less movement, at night or in the morning. For this purpose, it is necessary to adapt the distribution carts by reducing the noise in order not to affect the patients.

Part B: Main constrains of the process – Products Standardization

Problems identified in AS IS

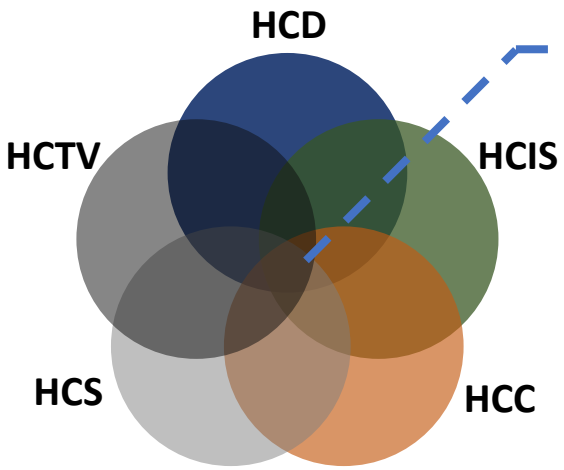
HUs

Low standardization of products among HUs, which leads to an excessive number of references.

Solutions with the creation of a logistics center.

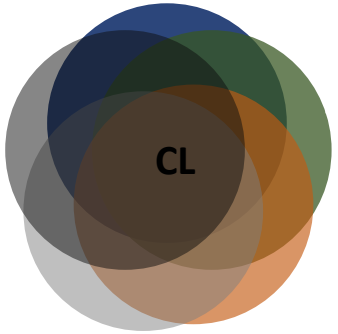
With the creation of a CL the trend will be to normalize the maximum among the HUs.

AS IS



234 common references to 5 HUs
200 common references to 4 HUs
247 common references to 3 HUs
362 common references to 2 HUs
1103 independent references

TO BE

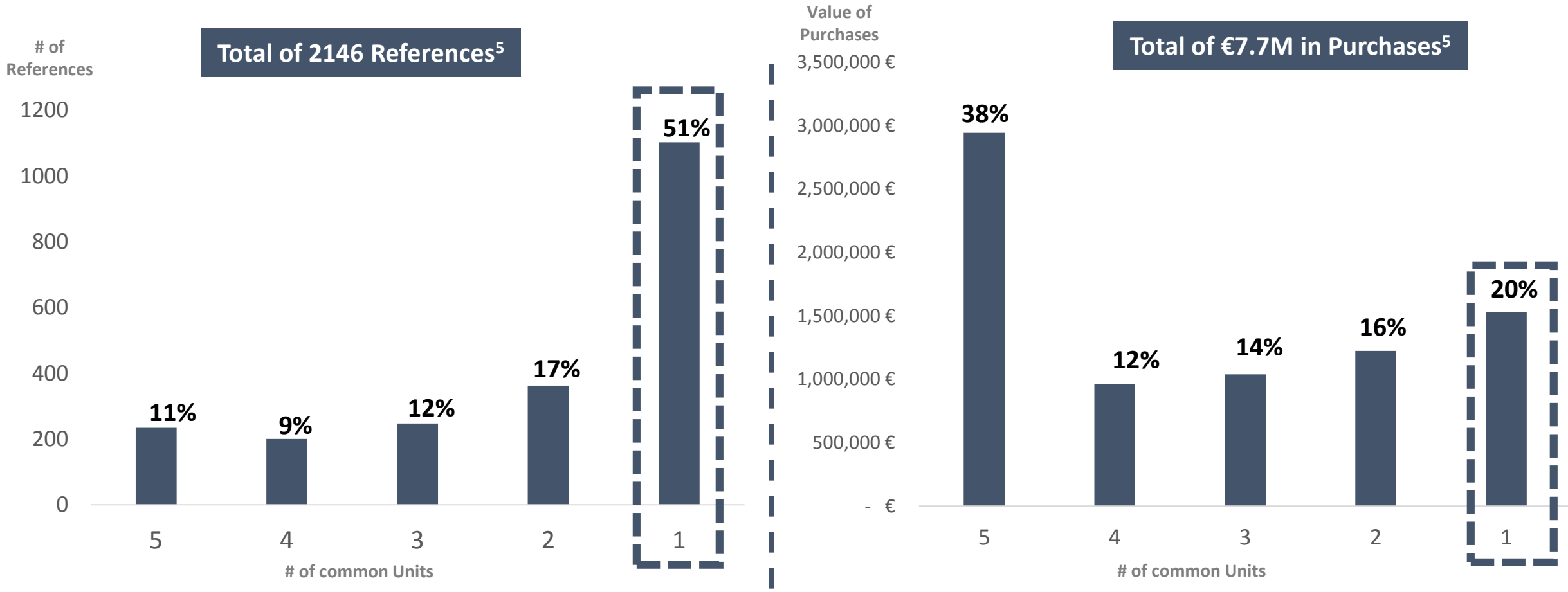


After analyzing the consumption and purchases of the different hospitals, the team concluded that there is a very low number of products common to all the five hospital units. Something that does not make much sense due to the similarity between all five HU. Due to the dimension of this problem, it was asked by some members of the executive commission for the team to analyze deeper this issue. Thus, an effort was made in order to understand which group of products deviated the most from normality, and in which hospital unit this deviation happens.

There is then a great opportunity for improvement in product standardization among the five JMS Hospital Units. Of course that the creation of a Logistics Center will help to attenuate this issue, since it will not make sense to have many references of the same product without a plausible justification of its necessity. However, due to the dimension of this problem, it is still important to analyze which products are deviating the most from normality and to act over them even if there is not a logistics centralization.

Part B: Main constrains of the process – Products Standardization

As it is likely to verify, half of the references (51%) of clinical consumables are mainly used in one unit, something that doesn't make much sense due to the similarity that it is verified through the 5 HUs (only HCD and HCIS have exclusive services). However, it is essential to see how much this means in terms of value of Purchases in order to identify the weight of the problem for the company. This group of products represented 20% of total of the Purchases by JMS in 2016, approximately €1.5M, which it still a significant value.

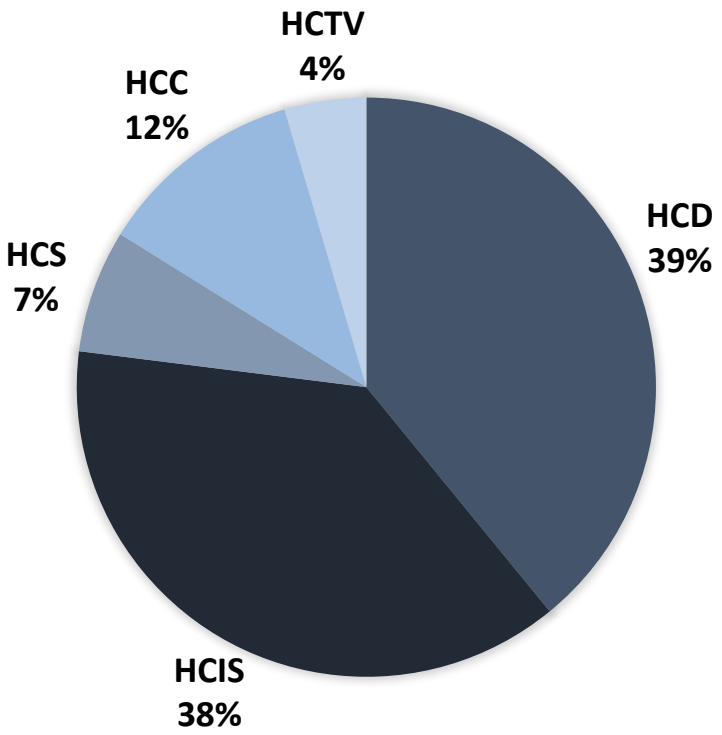


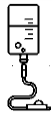
5 - Data from JMS with all consumptions and purchases (including suppliers and their lead time) made in each Hospital Unit from Oct 2015-Sep.2016.

Part B: Main constrains of the process – Products Standardization

As it was identified before, the major opportunity for improvement is situated in the products that are present in just one Unit, these products are mainly present in the Hospitals Type A (HCD and HCIS). About 40% of the Purchases of this materials are represented in just 7 types of hierarchy of products in a total of 107. Some of the hierarchies are understandable due to the exclusive services, for example the Biopsy Material the sets or the Ophthalmology products. Still, there should be space for improvement in other hierarchies.

€1.5M in Purchases

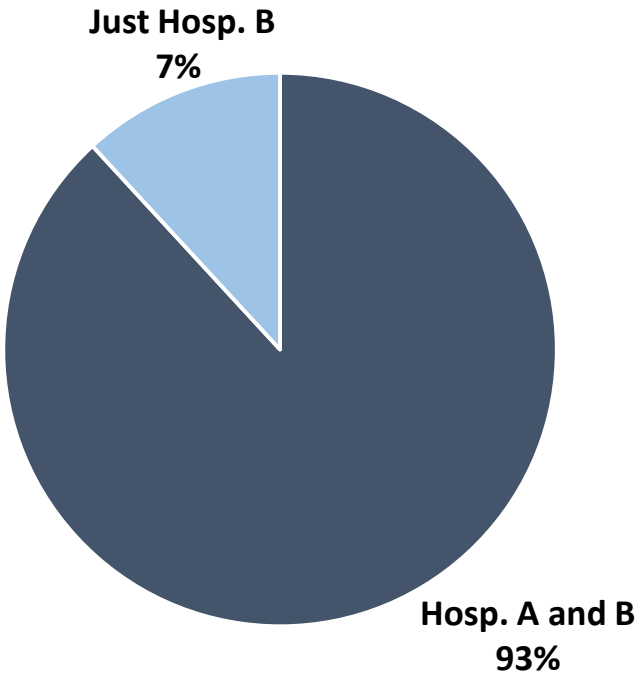


	Product´s Hierarchy	Total €	% of Total	Cumulative
	Biopsy Material	189 223€	12%	12%
	Fields, bundles and sets	128 847€	8%	20%
	Ophthalmology kits	95 616€	6%	26%
	Ophthalmology surgical material	57 560€	4%	30%
	Dressing, bandages, dressings, adhesive and cotton	54 299€	4%	34%
	Fluid administration system	51 368€	3%	37%
	Laparoscopic Forceps	48 369€	3%	40%

Part B: Main constrains of the process – Products Standardization

At the same time, in order to have a more complete analysis, the group decided to analyze the products that are only present in the Hospitals B. These type of Hospitals represent 7% of the Purchases, which correspond to about €0.6M. This value is significant taking into account that none of this hospitals have any exclusive services, so the number of independent products should be lower and the products should be more in concern with what is ordered by the hospitals Type A specially in the more administrative Hierarchies like Envelops.

€7.7 M in Purchases



Product´s Hierarchy	Total €	% of Total	Cumulative
Paper equipment - electro medical equipment	124 581€	22%	22%
Laparoscopic Forceps	48 369€	8%	30%
Gastro surgical material	46 302€	8%	38%
Envelops	41 352€	7%	45%
Sterilization material	38 823€	7%	52%
Ophthalmology kits	38 203€	7%	59%

Part B: Main constrains of the process – Products Standardization

It is believed that this problem will be largely solved with the logistics centralization. However, the group believes that it is imperative for JMS to act over this problem, since it will not be totally corrected with a change in the logistics model. As a result, JMS should implement actions with specialized personnel concerning the products that have more opportunities to be standardized, in order to reduce to the maximum the independence of the products in the Hus and become more efficient.

Conclusions for the Standardization of Products

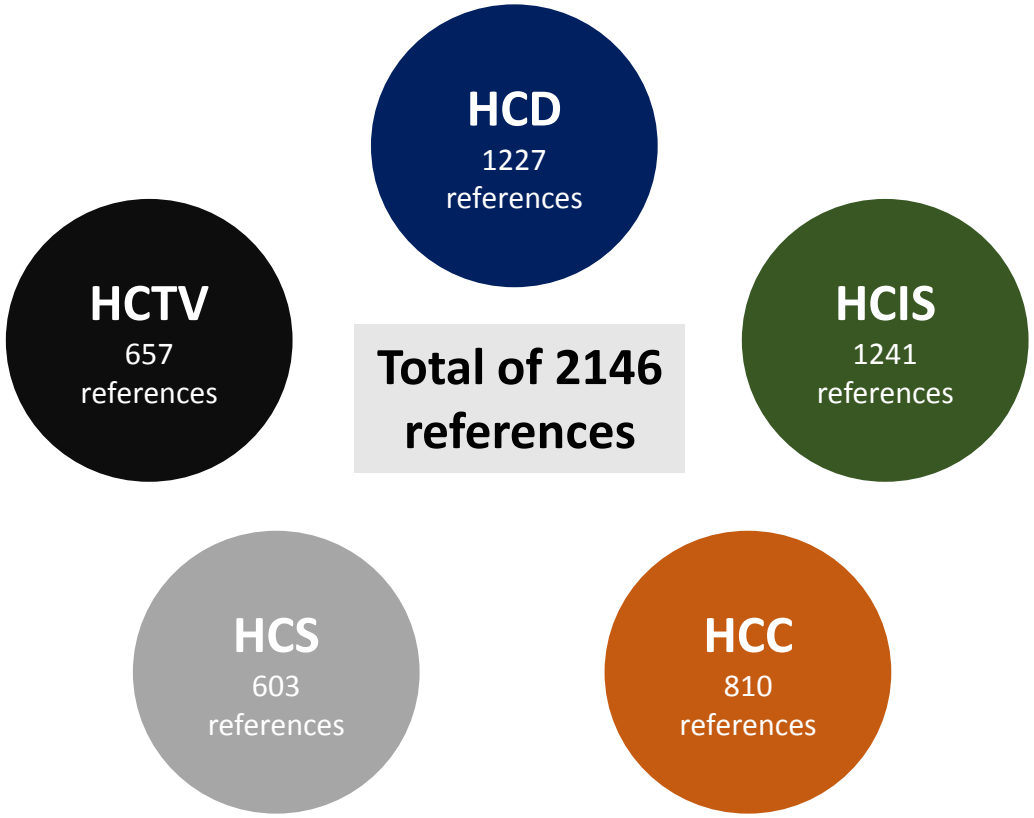
Logistics Centralization	The Logistics Centralization will definitely be a big help to solve this problem since the Purchases will be completely centralized and with all the stocks in the same warehouse, **the trend will be to supply the HUs with completely equal products**.
Independent Referencies	As it was identified, **51% of the referencies are independent**, which corresponds to €1.5M of the purchases. Even tough it is partially inevitable, this number is still very high and must be reduced.
Exclusive Referencies in Hosp. B	About €0.6M of the value of the Purchases is only present in the Hospitals B. As it was mentioned, this doesn't make much since **none of this Hospitals has an exclusive service.**

AGENDA

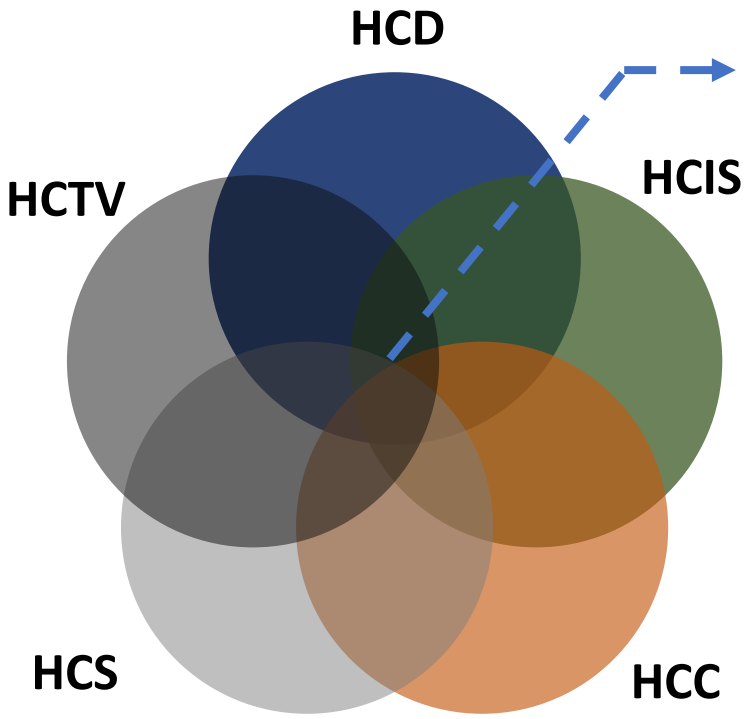
Part C: Stocks – Products Standardization

For the study of the stocks, all the consumed and ordered products by each Hospital Unit were used, independently if they were common to all units or not. It is important to notice that the Hospitals Type A (HCD and HCIS) have exclusive services, such as maternity services, so it is normal to have some interdependence in their products.

At this moment, the Stock Management is done in a completely independent way from each Hospital Unit. Each Hospital Unit has its own Purchase Orders and it manages its particular consumables. The total number for references for all Hospitals is 2146.



In the **TO BE situation**, all HUs will be managed in a centralized way. However, as it was identified before, the number of common products to all Units is very low, a strong concern for JMS. In that sense, the benefit with the centralization in terms of stock is not so evident. However, the group believes that there are still possible gains for JMS, which will become even larger as the normalization increases.



-234 common references to 5 HUs
-200 common references to 4 HUs
-247 common references to 3 HUs
-362 common references to 2 HUs
-1103 independent references

Part C: Stocks – AS IS Analysis

With the past information from JMS and by aggregating all the values for the 5 HU, it was possible to analyze and estimate all the Stocks value's for the situation AS IS in the command to have a profounder study on the process and it´s costs at this moment, and to compare it with the situation in a possible centralization scenario. All the information was based in data from Oct. 2015 to Sep. 2016 unless the information regarding the Purchases and Purchase Orders that it was from 2014 but it is believed that it is still relevant and valid for the current year of 2016.

Analyzed Items

- Average Inventory and Holding Costs
- Costs of processing Purchase Orders
- Costs of processing Invoices

AVERAGE INVENTORY[5] (at 30/09/2016)

Average Inventory
782 314 €

Average Inventory = Unitary Cost x Average Inventory (Quantities)

- **Average Aggregate Inventory (Quantities):** Sum of the total Stocks in warehouse on 09/30/2016 of all HUs (in quantities). It was assumed that this value from the end of September was accurate for the Average Inventory since the demand doesn't use to vary much during the year.

- **Unitary Cost of Acquisition :**

1. Cost of Unit Acquisition: For each HU and per product, the ratio between the total value corresponding to the consumption and the total of the consumed quantities, over a year and not considering the values for the reverse logistics.
2. Average Unit Acquisition Cost: Average of the unit costs of the 5 HUs per product during a year.

5 - Data from JMS with all consumptions and purchases (including suppliers and their lead time) made in each Hospital Unit from Oct 2015-Sep.2016.

Part C: Stocks – AS IS Analysis

HOLDING COSTS

Total Holding Costs
93 979€

- **Total Holding Costs = Average Inventory (Quantities) x Holding Costs Rate**

- **Holding Costs Rate (H) = Tied Capital Ratio x Unitary Cost of Acquisition + Unitary Cost of Storage**

-Tied Capital Ratio = 6,7%. This is the interest that JMS pays to the bank in order to have the stock retained in the warehouse without making any profit.

-Unitary Cost of Acquisition:

1. Cost of Unit Acquisition[5]: For each HU and per product, the ratio between the total value corresponding to the consumption and the total of the consumed quantities, over a year and not considering the values of the reverse logistics.
2. Average Unit Acquisition Cost: Average of the unit costs of the 5 HUs per product.

-Unitary Cost of Storage: (See Appendix 4.1.4)
Total number of products to be considered: Sum of the total of products that were ordered and / or consumed during a year. As some of the products have a larger dimension, their Unit Cost of Storage had a higher ponderation, it was considered that these were worth 3 times more. In that sense, the group was able to obtain the total number of products that didn't correspond to the reality but that allowed to reach more correct conclusions;

1. Annual Warehouses Rent: The average monthly rent for the 5 HUs was obtained by multiplying the price per m^2 by the area of each warehouse. This amount was multiplied by 12 to obtain annual income;
2. Storage cost per product: Ratio between the Annual Warehouses Rent and the total number of products;
3. Unit Cost of Storage: Ratio between Storage Cost per product by its Average Inventory, multiplying this cost by 3 for larger products.

5 - Data from JMS with all consumptions and purchases (including suppliers and their lead time) made in each Hospital Unit from Oct 2015-Sep.2016.

Part C: Stocks – AS IS Analysis

COST OF PROCESSING PURHCASE ORDERS

HU	# Order Forms 2016	Unitary Cost of Processing an Order[6]	Total Cost of Order
HCD	5962	1,67€	9957€
HCIS	5437	2,42€	13158€
HCC	3647	3,68€	13421€
HCTV	2861	3,58€	10242€
HCS	1551	2,58€	4002€
TOTAL	**19458**	**2,61€**	**50785€**

Average number of products per Purchase Order	1,59

- Each Purchase Order can have **many different orders** for different products that probably are from the same supplier;
- **Unitary Cost per Order:** Ratio between the sum of the total cost with Purchase Orders (Costs with Employees involved in processing Purchase Orders + Administrative Costs + ESS costs associated with the employee) and the total number of Purchase Orders in 2014. This value can vary between HU because it will depend on the person who is attributed to processing it in each HU (Some people are more expensive than others).

COST OF PROCESSING INVOICES

HU	# Invoices 2016	Total Cost of Invoices
HCD	6537	2615€
HCIS	5897	2359€
HCC	3878	1551€
HCTV	3015	1206€
HCS	1679	671€
TOTAL	**21006**	**8402€**

Unitary cost per Invoice[6]	0,4 €
Average number of Invoices per Purchase Order	1,1

- Each order can have **many different invoices.** The different invoices are emitted in different dates. In order to find the number of Invoices, the group studied the number of different release dates in each order.
- The **unitary cost** of processing a Invoice is constant for all the Hospital Units: 0,4€
- The **financial department** is the one responsible for the emission of invoices but since it depends on the number orders (Logistics Department), it was also important to be studied.

6 - Data from JMS with all unitary costs of processing a purchase order and an invoice per Hospital Unit in 2014.

Part C: Stocks – TO BE Analysis

After estimating all the costs for the AS IS, it was necessary to calculate for the centralized scenario. In order to have a good analysis for the Stocks in the TO BE situation, it was indispensable to conduct a model that would estimate the Average Inventory with the central warehouse. The group have decided that the EOQ Model was the most appropriate one. Nevertheless, to check if it was actually the best model, two other additional models, proposed by JMS, were tested.

1

Models used to find the optimal quantity to order

- Fixed Safety Stock (2 days) + Lead Time
- Fixed Safety Stock (4 days) + Lead Time
- Economic Order Quantity (EOQ)

2

Afterwards, with the goal of finding the more efficient model, the following cost items were compared:

- **Average Inventory** – Value of the Average Inventory that JMS will have in the warehouse.
- **Holding Costs**– Cost of tied capital plus the storage cost.
- **Number of Purchase Orders**
- **Number of Invoices Emitted**

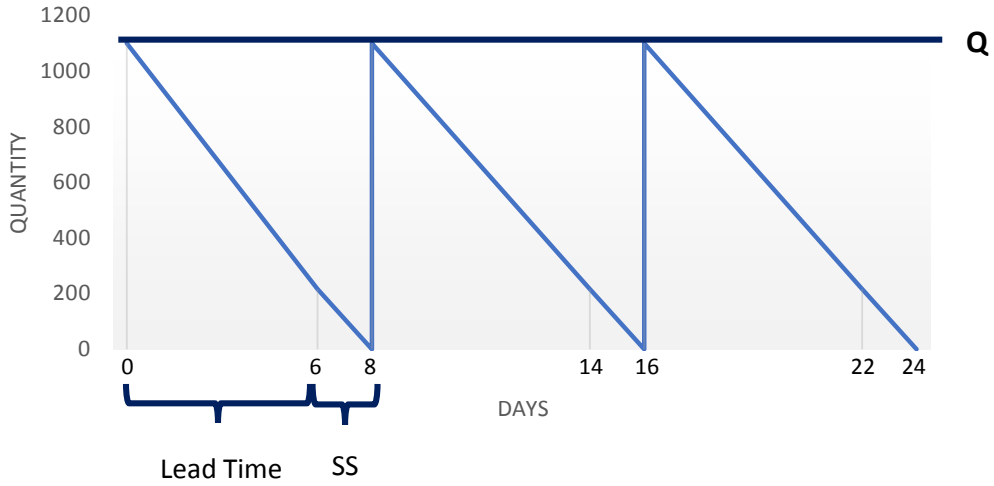
Part C: Stocks – Fixed Safety Stock (2 days) + Lead Time

The first Model tested was the Fixed Safety Stock of 2 days plus the Lead Time. Contrary to the EOQ Model, it was believed that this model would estimate smaller quantities in each order and a lower value for the Average Inventory. It was key to have both analysis.

Fixed Safety Stock (2 days) + Lead Time

In this model, the optimal order quantity (Q) is the one that satisfies a safety stock of 2 days plus the Lead Time of the suppliers. This model assumes a continuous and high order system (for this example, every 8 days) and a lower value for the average inventory (smaller Holding Costs but a higher Ordering Costs).

Example for Cottons



Analysis for all products

	COST 2016
Holding Costs	35 538 €
Ordering Cost	108 342 €
Invoice Issue Cost	17 925 €
TOTAL	**161 805 €**
Average Inventory	**229 572 €**

→The quantity is set by the number of days:

- **Quantity of Safety Stock (Q(SS)):** 2* Daily Consumption
- **Quantity to order (Q*)** : Lead Time * Daily Consumption + Quantity of Safety Stock
- **Average Inventory:** Q*/2

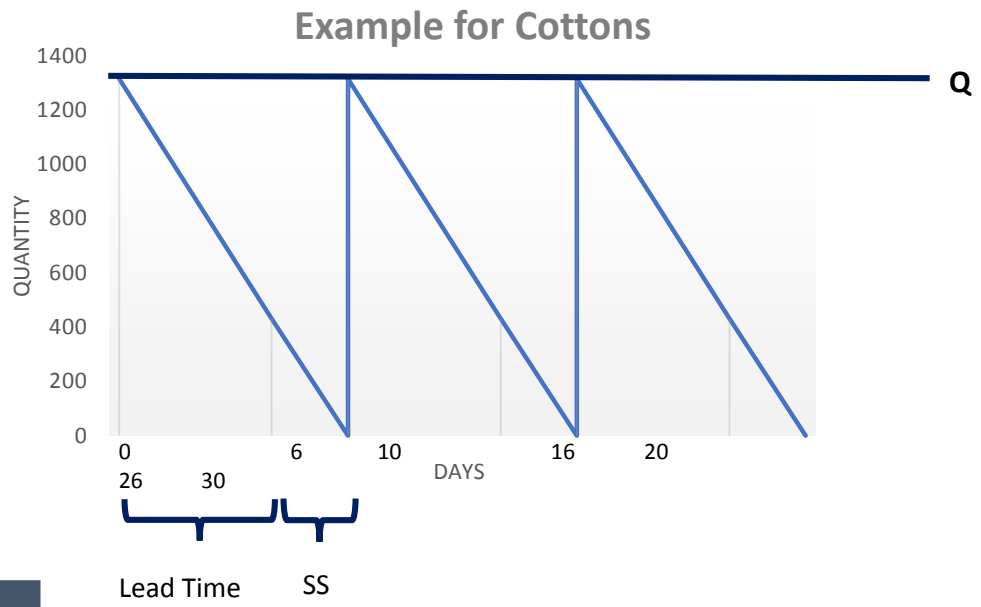
→The ordering Costs and Invoice Issue costs depend on the order quantities.

Part C: Stocks – Fixed Safety Stock (4 days) + Lead Time

The second Model tested was exactly the same as the previous one but with the Fixed Safety Stock of 4 days plus the Lead Time. It was benefic to see the difference of adding 2 days in the security stock and see what would be the differences in terms of costs.

Fixed Safety Stock (4 days) + Lead Time

In this model, the optimal order quantity (Q) is the one that satisfies a safety stock of 4 days plus the Lead Time of the suppliers. This model assumes a continuous and high order system (for this example, every 10 days) and a lower value for the average inventory (Smaller Holding Costs and Higher Ordering Costs, but lower than in the model of 2 days of Safety Stock).



Analysis for all products

	COST 2016
Holding Costs	37 453 €
Ordering Cost	85 352 €
Invoice Issue Cost	14 121 €
TOTAL	**136 927 €**
Average Inventory	**247 610 €**

→The quantity is set by the number of days:

- **Quantity of Safety Stock (Q(SS)):** 2* Daily Consumption
- **Quantity to order (Q*)** : Lead Time * Daily Consumption + Quantity of Safety Stock
- **Average Inventory:** Q*/2

→The ordering Costs and Invoice Issue costs depend on the order quantities.

Part C: Stocks – EOQ Model

Based and inspired in the concepts of EOQ Model[7,8] from the Operations Management course from the Masters, the team decided to study the Model and apply it to project believing that it was the best option. The model has a formula to achieve the optimal order quantity that minimizes costs (Holding and Ordering Costs) and some assumptions that were important to take into account.

MODEL ASSUMPTIONS:

1. Annual demand is constant;
2. The process continues indefinitely;
3. There are no restrictions on the quantities to be ordered or on the storage space;
4. Suppliers are able to meet all orders within the established time;
5. The unit acquisition costs of each product do not vary with time;
6. There can be no rupture of stocks;
7. There are no quantity discounts.

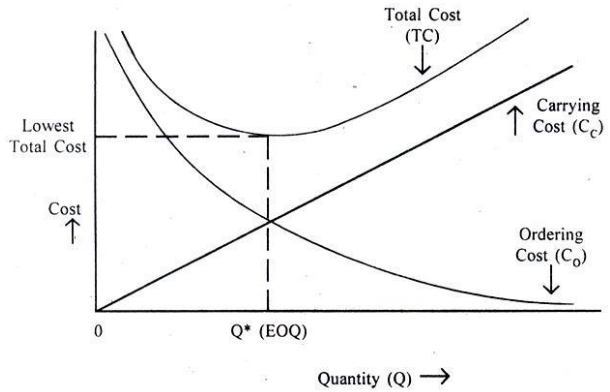
Q*: Optimal quantity to order in each Purchase Order
S: Unitary cost per Purchase Order
D: Aggregate annual consumption
H: $H = I \times C + A$

- I: Tied Capital Rate
- C: Average Unitary Acquisition Cost
- A: Storage Unitary Cost *(added by the group to the model)*

$$Q^* = \sqrt[2]{\frac{2 \times S \times D}{H}}$$

Average Inventory= Q*/2

In the optimal point (Q*), the Total Holding Costs and the Total Ordering Costs are equal. In this point, the quantity given is the one that minimizes the Total Costs.



$$\text{Total Holding Costs} = (I \times C + A) \times (Q^* \div 2)$$

$$\text{Total Ordering Costs} = S \times (D \div Q^*)$$

$$\text{Total Costs} = (I \times C + A) \times (Q^* \div 2) + S \times (D \div Q^*)$$

$$\frac{\partial CT}{\partial Q*} = 0 <=> \frac{1}{2}(I \times C + A) + \frac{(S \times D)}{Q*^2} = 0 <=>$$

$$<=> \frac{(S \times D)}{Q*^2} = -\frac{1}{2}(I \times C + A) <=> Q^{*2} = \frac{2 \times S \times D}{I \times C + A} <=>$$

$$<=> Q^* = \sqrt{\frac{2 \times S \times D}{H}}$$

By making the derivative of the Total Costs equal to zero, it was possible to find the optimal order quantity that minimizes the costs (Q*).

7 - Operations Management Slides from Alper Nakas, Session 12- NOVA SBE; 8 - José Crespo de Carvalho (2010), "Logística e Gestão da Cadeia de Abastecimento", chapter 6.

Part C: Stocks – EOQ Model

It was required to perform several calculations to obtain all the various components that are considered in the formula of the EOQ Model. The following explanations will permit to understand how everything was calculated

- **Holding Costs Rate (H) = Tied Capital Rate (I) x Unitary Cost of Acquisition (C) + Unitary Cost of Storage (A)**

$$Q^* = \sqrt[2]{\frac{2 \times S \times D}{H}}$$

- Tied Capital Ratio = 6,7%. This is the interest that JMS pays to the bank in order to have the stock retained in the warehouse without making any profit.

-Unitary Cost of Acquisition[5]:

1. Cost of Unit Acquisition: For each HU and per product, the ratio between the total value corresponding to the consumption and the total of the consumed quantities, over a year and not considering the values of the reverse logistics.
2. Average Unit Acquisition Cost: Average of the unit costs of the 5 HUs per product.

-Unitary Cost of Storage: (See Appendix 4.1.5) *(added by the group to the model in order to be more real in terms of constraints regarding storage space)*

Total number of products to be considered: Sum of the total of products that were ordered and / or consumed during a year. As some of the products have a larger dimension, their Unit Cost of Storage had a higher ponderation, it was considered that these were worth 3 times more. In that sense, the group was able to obtain the total number of products that didn't correspond to the reality but that allowed to reach more correct conclusions;

1. Annual Warehouse Rent: The product between the average monthly rent for the central warehouse (3,4€/m2) and the area of the warehouse, applying a VAT rate of 23%. This amount was multiplied by 12 to obtain annual income;
2. Storage cost per product: Ratio between the Annual Warehouses Rent and the total number of products;
3. Unit Cost of Storage: Breakdown of storage cost per product by its Average Inventory, multiplying this cost by 3 for larger products.

- **Unitary Cost per Purchase Order[6] (S)**: Ratio between the sum of the total cost with Purchase Orders (Costs with Employees involved in processing order notes + Administrative Costs) and the total number of order notes. This value can vary between HU because it will depend on the person who is attributed to processing it in each HU (Some people are more expensive than others).

- **Aggregate annual consumption[5] (D):** Sum of the annual consumptions per product of all HUs, not considering the consumption corresponding to reverse logistics.

- **Average aggregate stock[5]:** Sum of the total stocks in warehouse on 09/30/2016 of all HUs (used to calculate the unitary storage cost).

5 - Data from JMS with all consumptions and purchases (including suppliers and their lead time) made in each Hospital Unit from Oct 2015-Sep.2016
6 - Data from JMS with all unitary costs of processing a purchase order and an invoice per Hospital Unit in 2014

Part C: Stocks – Best Model for the TO BE situation

After estimating all the overheads of the Fixed Safety Stock and EOQ Model, the group compared all the cost items and understood that the EOQ Model was still the best choice, with less orders with more quantities and consequently a much higher Average Inventory. In the next slides, the group will show a deeper analysis on the chosen Model and how it was calculated.

		AS IS	TO BE	DELTA
EOQ Model	Average Inventory	583 919 €	784 280 €	- 200 362 €
	Holding Costs	87 414 €	93 979 €	- 6 565 €
	Ordering Costs	23 946 €	50 785 €	- 26 839 €
	Invoice Issue Costs	3 962 €	8 402 €	- 4 441 €
	Delta	115 322 €	153 167 €	**- 37 845 €**
Fixed Safety Stock (2 days) + Lead Time	Average Inventory	229 572 €	784 280 €	- 554 709 €
	Holding Costs	35 538 €	93 979 €	- 58 441 €
	Ordering Costs	108 342 €	50 785 €	57 557 €
	Invoice Issue Costs	17 925 €	8 402 €	9 523 €
	Delta	161 805 €	153 167 €	**+ 8 638 €**
Fixed Safety Stock (4 days) + Lead Time	Average Inventory	247 610 €	784 280 €	- 536 670 €
	Holding Costs	37 453 €	93 979 €	- 56 526 €
	Ordering Costs	85 352 €	50 785 €	34 567 €
	Invoice Issue Costs	14 121 €	8 402 €	5 719 €
	Delta	136 927 €	153 167 €	**- 16 240 €**

Optimal model that reflects the greater reduction of costs with centralization. This savings are a consequence of the following factors:

- Reduction of the Average Inventory: **200 362€**
- Reduction of Purchase Orders: **10 283 PO** (- 53%)
- Reduction of Invoices Issued: **11 101** (-53%)

Apply the EOQ model in order to estimate the optimal quantity to order, as well as the average inventory, the holding costs and the number of purchase orders and invoices for all the period of analysis (2017 – 2021)

Part C: Stocks – Safety Stock

Even tough it was believed that EOQ was a consistent model, the group found out that the model might had some problems due to its assumptions mentioned before. So, it was necessary to adjust the model and try to arrange a solution.

Model EOQ **does not take into account:**

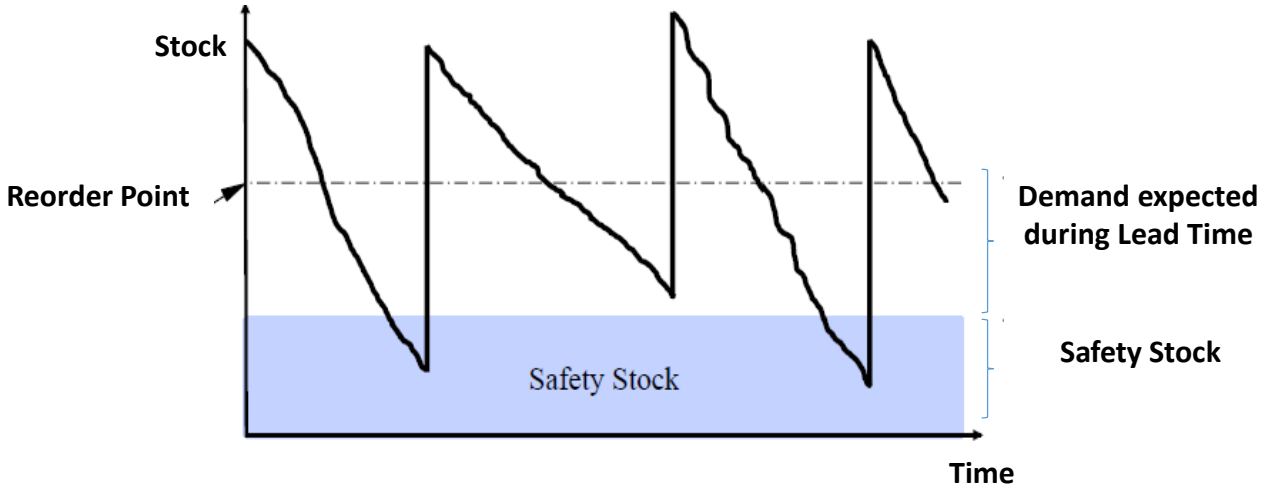
-Variation of demand
-Service level
-Lead time of the Suppliers

SOLUTION

Calculate the Safety Stock that takes into account the Standard Deviation of consumption patterns, the Lead Time of Suppliers and Service Level.

Average Inventory: Q*/2 + SS

Safety Stock[7,9] is the term used to describe the extra stock levels needed to maintain in order to reduce the risk of stock break due to uncertainties in supply and demand and to preserve a desired service level. It is believed that by adding the Safety Stock calculated by the model, the Average Inventory will be more realistic and the probability of stock out will be lower. Moreover the company will have less risk in the decision of centralizing.



7 - Operations Management Slides from Alper Nakas, Session 12- NOVA SBE; 9 - José Crespo de Carvalho (2010), "Logística e Gestão da Cadeia de Abastecimento", chapter 3

Part C: Stocks – Safety Stock

In order to find the best model for the Safety it is crucial to determine which variables are uncertain. We can have: uncertain Lead Time or Supply; uncertain Demand or even uncertain prices. This last scenario, we didn't analyzed since the prices don´t change during the time. So we have analyzed the other two models: Safety Stock with demand and Lead Time Uncertain and Safety Stock with Demand uncertain. By holding inventory we provide hedge against uncertainty.

Safety Stock with Demand Uncertainty[7,9]

$$SS = Z\sqrt{L\sigma^2}$$

Model Inputs:

A: Availability (z=NORMSINV(A), where z is the service level – inverse distribution function of a standard normal distribution)

L: Lead Time

Demand per Period:

μ: Average demand per period

σ: Standard deviation of demand per period

Assuming that the demand for each period is normally distributed with mean (**μ**) and standard deviation (**σ**), the demand within the lead time will be normally distributed with mean (**μ x L**) and standard deviation ($\sqrt{L \times \sigma^2}$) (See Appendix 4.1.1, 4.1.2 and 4.1.3)

The team considered that the Lead Time of suppliers is not a "real" value of the time the suppliers take to deliver the products, since this number varies according to supply and demand.

What it matters in the Lead Time is how fast the supplier takes to deliver the products, this number was settled by using the average excluding the outliers. For that reason we have chose to use the Safety Stock model with Demand Uncertain, which assumes that the standard deviation of the Lead Time is zero. For this model the Demand is the amount of items consumed by the customers, which is a random variable normally distributed. The last variable is the Service Level, which is the desired probability of meeting demand during the Lead Time without a stock out.

7 - Operations Management Slides from Alper Nakas, Session 12- NOVA SBE; 9 - José Crespo de Carvalho (2010), "Logística e Gestão da Cadeia de Abastecimento", chapter 3

Part C: Stocks – Safety Stock

Several calculations were performed to obtain the various components necessary to properly calculate the Safety Stock. Obviously, the group had to calculate the Safety Stock to add to the EOQ Model as it was mentioned before. But on the other hand, it also had to calculate, by the same model, the values of the Safety Stock for the AS IS situation since there was no information about what were the Safety Stock levels in each HU at the AS IS situation. JMS gave to the group the information about the Average Inventory AS IS as whole and not discriminating how much represented the Safety Stock. So, in order to compare the values about the Safety Stock, the group also used the model for the AS IS situation.

Safety Stock[7]= $Z\sqrt{L\sigma^2}$

z : Service Level, value associated with the probability of stock rupture by a company.
L : **Lead Time** – Time the supplier takes to deliver the product since the order time.
σ^2 **:** Variance of demand per period.

Expected Demand Over L *Safety Stock*

Reorder Point[7] (R*)= $\mu * L + Z\sqrt{L\sigma^2}$

Safety Stock for the situation AS IS

- **Service Level of 97%** - 3% probability of stock rupture. The Z value was found in the Normal Distribution table such that the area of the left reaches the service level intended.
- **Lead Time of Suppliers[5] -** Average Lead Time of each product for each HU (excluding the outliers; Eg: Higher Lead Times than the Average plus the standard Deviation)
- **Agglomerated daily variance of each product** – The standard deviation for the consumption of each product was computed during one year (Oct. 2015- Sep. 2016) and then it was possible to find the variance

Safety Stock for the Logistics Center:

- **Service level of 97% and 99%**- At this moment, JMS has a service level of 97%, which means that there is a 3% probability of stock rupture. However, as the central warehouse will not be in the HU, the group also studied the possibility of a Safety Stock of 99%, which means that there is a 1% probability of stock rupture, to have a safer hypothesis in case of any emergency. The Z value was found in the Normal Distribution table such that the area of the left reaches the service level intended.
- **Lead Time of Suppliers[5]** – The group used the average lead time of the two bigger HU (HCD and HCIS) for each product.
- **Agglomerated daily variance of each product** – The standard deviation for the consumption of each product was computed during one year (Oct. 2015- Sep. 2016) and then it was possible to find the variance.

The group also though that it would be interesting to determine the Reorder Point, as an additional information for the project because it didn´t influence any calculation for the model. The reorder point shows which is the level of inventory when the company should order again, basically the optimal order point.

5 - Data from JMS with all consumptions and purchases (including suppliers and their lead time) made in each Hospital Unit from Oct 2015-Sep.2016
7 - Operations Management Slides from Alper Nakas, Session 12- NOVA SBE

Part C: Stocks – Safety Stock

With the creation of a Logistics Center in the year of 2016, it was estimated that the Safety Stock would reduce in 20%, keeping the actual Service Level of 97%. In terms of quantities, as it was also expected the Safety Stock would reduce around 30%. It is possible to notice that, in terms of quantities, the Safety Stock reduces in more than one Hospital Unit equal to HCD, so it is a noteworthy value.

Safety Stock 2016

AS IS

HCD	HCIS	HCTV	HCC	HCS
79 196€	101 124 €	13 473 €	33 152 €	26 343 €

Total = 253 288 €

TO BE

Logistics Center	
Service Level 97%	**202 781 €**

Safety Stock in quantities 2016

AS IS

HCD	HCIS	HCTV	HCC	HCS
123 334	225 664	38 105	70 382	44 308

Total = 501 793 €

TO BE

Logistics Center	
Service Level 97%	**346 401**

Delta Safety Stock	
Service Level 97%	**- 50 507 €**

Delta Safety Stock in quantities	
Service Level 97%	**- 155 392**

Part C: Stocks – Safety Stock, Lead Time and Reorder Point in days

In TO BE situation, it might happen, on average, a reduction of 1 day in the Lead Time, 2 days in the Safety Stock and 2 days in the Reorder Point. Since the Safety Stock decreases when comparing with the situation AS IS, it is normal that the Reorder Point reduces too, JMS will have to order 2 days earlier due to this decrease.

Average Lead Time 2016

	HCD	HCIS	HCTV	HCC	HCS
AS IS	4 days	5 days	5 days	5 days	6 days
	5 days				
TO BE	**Logistics Center**				
	4 days				

Safety Stock 2016

	HCD	HCIS	HCTV	HCC	HCS
AS IS	10 days	13 days	15 days	12 days	15 days
	13 days				
TO BE	**Logistics Center**				
	Service Level 97%	**11 days (1515 products)**			

Reorder Point 2016

	HCD	HCIS	HCTV	HCC	HCS
AS IS	14 days	16 days	20 days	15 days	19 days
	17 days				
TO BE	**Logistics Center**				
	Service Level 97%	**15 days (1515 products)**			

Part C: Stocks –Reorder Point

In addition, it is predictable that the Reorder Point would suffer a reduction, in value, of around 15% with the actual service level. The Reorder Point in quantities would reduce around 29%. This means that, the quantity needed in stock of each reference in order to emit a new purchase order will be lower with the central warehouse. This is a result of the decrease in the safety stock, as with lower stock in the CW, as well as increased consumption, there is a need to order each product more frequently to satisfy the total demand.

Value Reorder Point 2016

AS IS

HCD	HCIS	HCTV	HCC	HCS
111 279 €	131 576 €	18 219 €	43 720 €	32 180 €

Total = 336 974 €

TO BE

Logistics Center	
Service Level 97%	292 944 €

Delta	
Service Level 97%	- 44 026 €

Reorder Point in quantities 2016

AS IS

HCD	HCIS	HCTV	HCC	HCS
237 189	310 855	62 869	114 352	58 922

Total = 784 178 €

TO BE

Logistics Center	
Service Level 97%	610 238

Delta	
Service Level 97%	- 173 949

Part C: Stocks –Reorder Point AS IS vs TO BE

In 2017, it is expectable a reduction of 15% in the value of the Reorder Point, as it is possible to see in the graph. This value will increase over the years both in the AS IS and TO BE situations, being the AS IS always higher. The increase in the value of the Reorder Point through the five years in both situations can be in part explained by the increase in the safety stock over these years, as the quantity needed in stock of each reference in order to be emitted a new purchase order will also increase. Therefore, increasing the correspondent value.

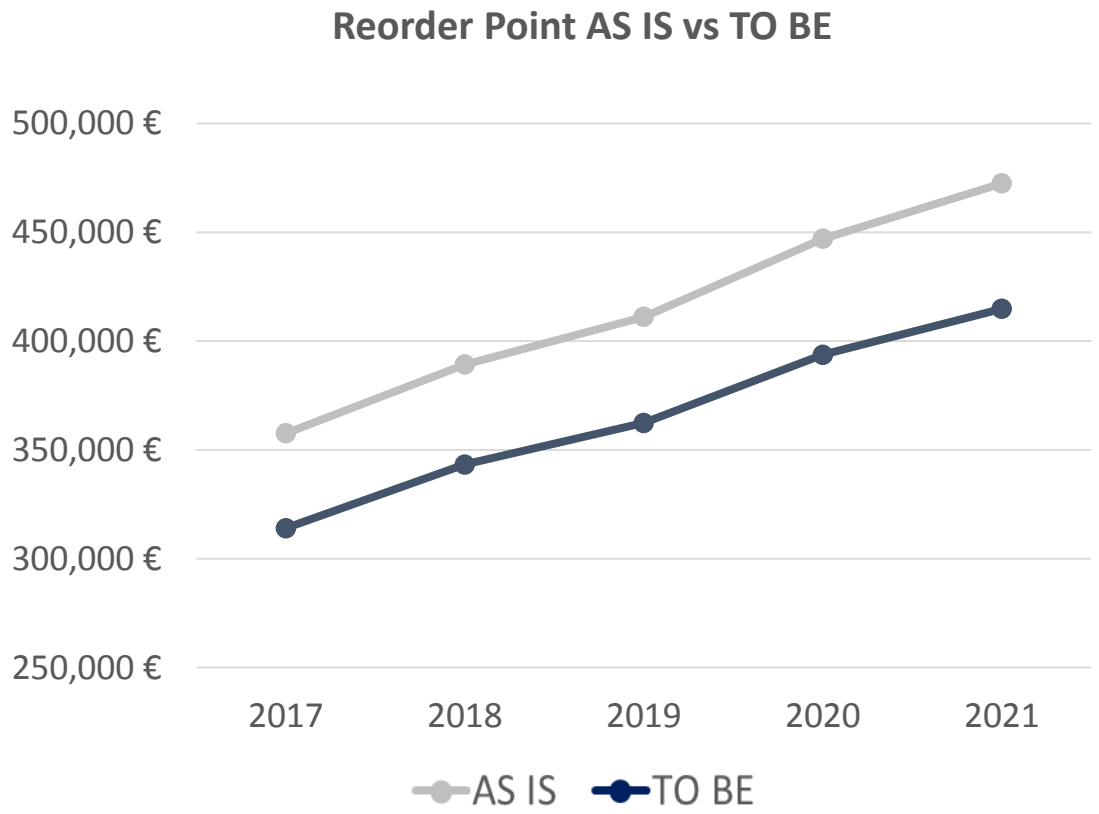
Value Reorder Point

AS IS

2017	2018	2019	2020	2021
357 678 €	389 245 €	411 183 €	447 069 €	472 515 €

TO BE

2017	2018	2019	2020	2021
314 026 €	343 295 €	362 427 €	393 789 €	414 889 €



Part C: Stocks –Safety Stock + EOQ Model

As it was mentioned before, the safety stock was added to the Average Inventory found by the EOQ Model (Q*/2) in order to have a more accurate value for the Total Average Inventory. In this case, the Average Inventory will reduce around 26% and the Holding Costs will reduce 7%, for the same service level. This decrease on the Average Inventory comes, undoubtedly, from the synergies that happen when JMS concentrates all the stocks in only one central warehouse, specially from the products that are common to all 5 HUs.

AS IS

Average Inventory 2016				
HCD	HCIS	HCTV	HCC	HCS
212 023 €	221 983 €	56 234 €	186 924 €	105 150 €
Total = 782 314 €				

TO BE

Logistics Center	
Service Level 97%	583 919 €

Delta	
Service Level 97%	- 200 362 €

AS IS

Holding Costs 2016
All five HUs aggregated
93 979 €

TO BE

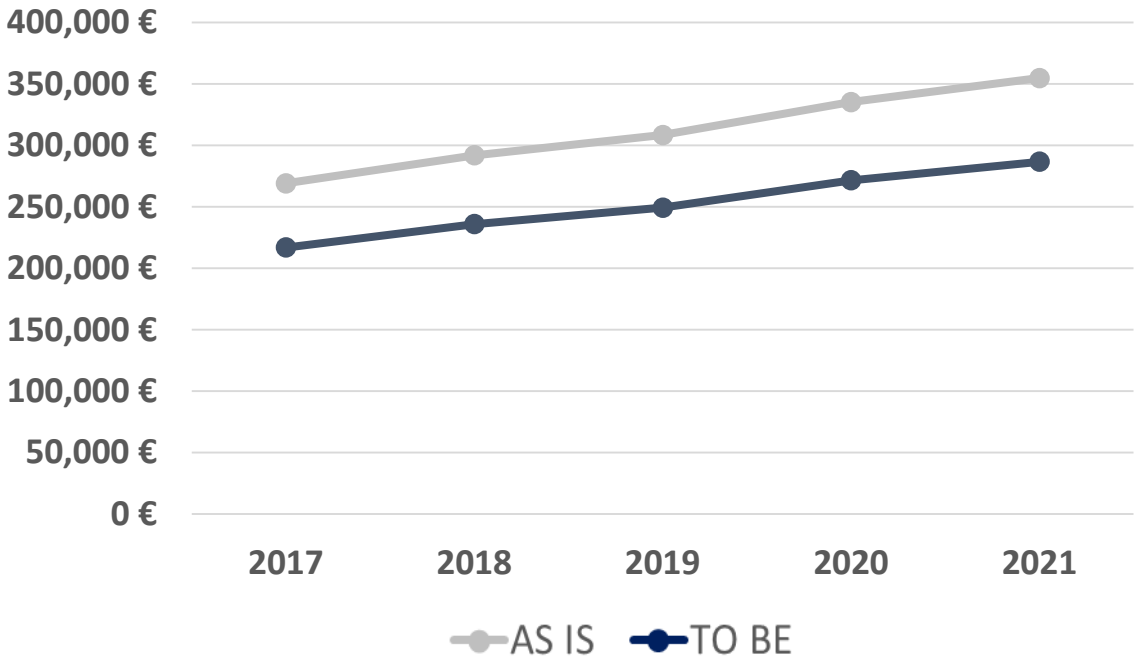
Logistics Center	
Service Level 97%	87 414 €

Delta	
Service Level 97%	- 6 565 €

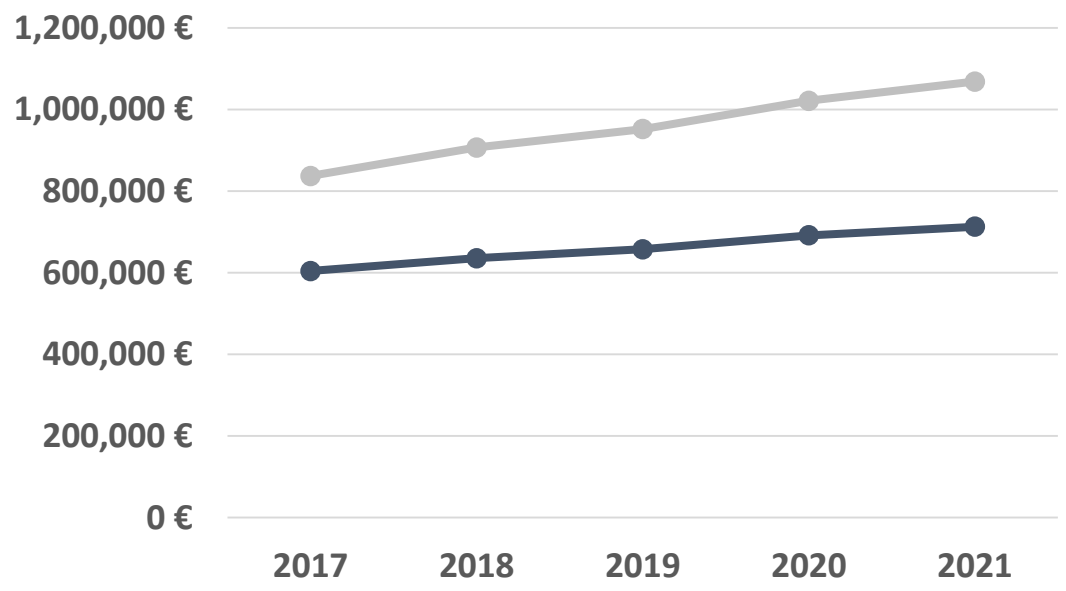
Part C: Stocks – Conclusions

The group did the exact same calculations for the next 5 years of analysis, being the only change the value of the consumption, which increased in the same proportion as the one predicted in every year. In 2017, there will be a reduction of 19% in the Safety Stock and of 28% in the Average Inventory. Through the years of investigation, this reduction will be more impactful in the Average Inventory, reaching in 2021 a reduction of 33% in the Average Inventory. The Average Inventory and the Safety Stock suffer a constant slightly increase through the years most probably due to the increase in the consumption because of JMS growth and expansion. However, the values for the AS IS are always higher than the values from the TO BE situation in all years of analysis which is a positive aspect.

Safety Stock AS IS vs. TO BE



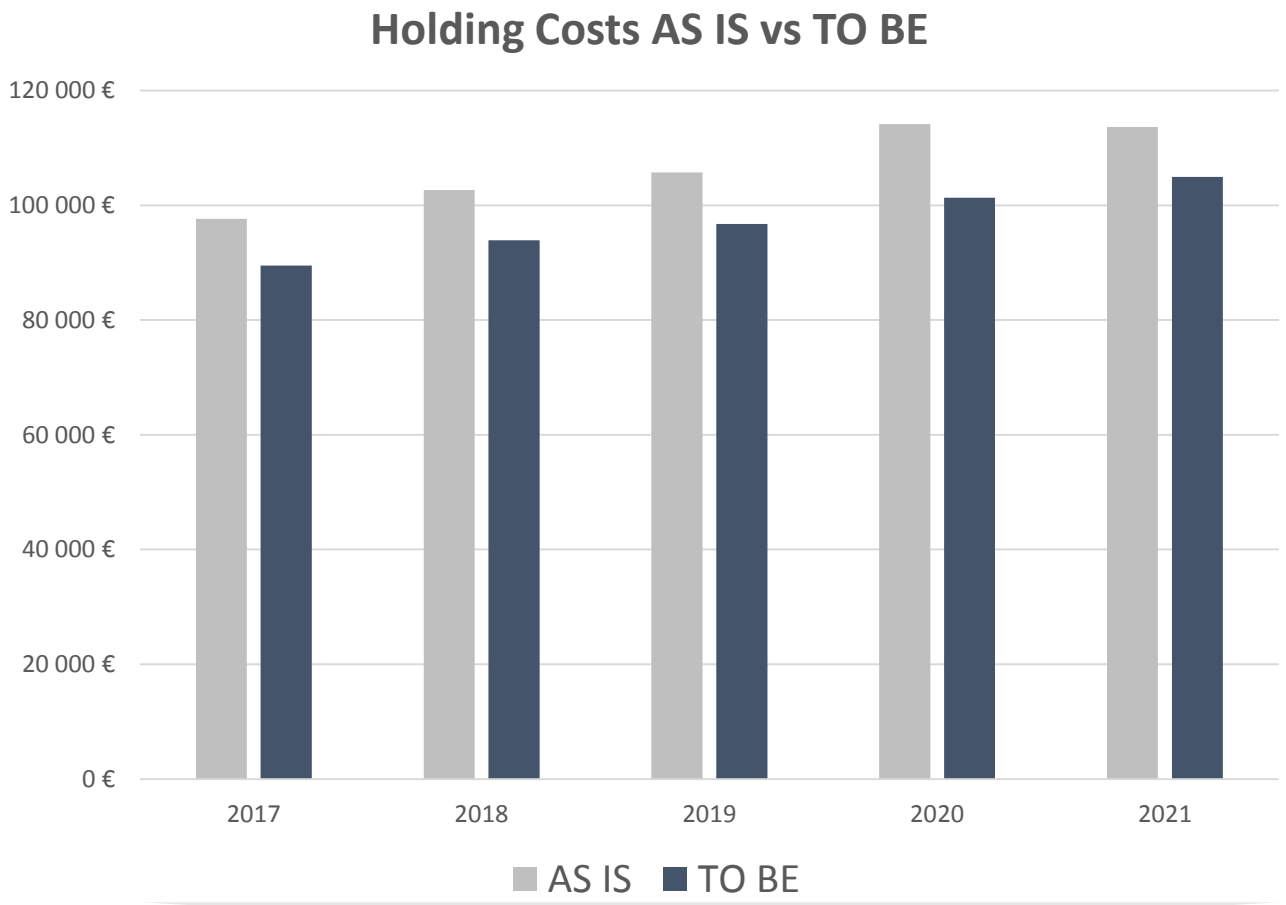
Average Inventory AS IS vs. TO BE



$$\sum Average\ Inventory\ HU > Average\ Inventory\ Logistics\ Center$$

Part C: Stocks – Conclusions

Given the value for the Average Inventory, the Holding Costs both in the TO BE and AS IS situation will increase through the years in a constant way, being the costs in the AS IS always higher than the costs of the TO BE. Consequently, the cost delta will suffer non significant changes (on average - 9400€ per year). Despite not being a very high value per year, it is a significant through the years of the project and a positive trait to reinforce the decision of centralizing.



Total Delta 5 years = - 47 420 €

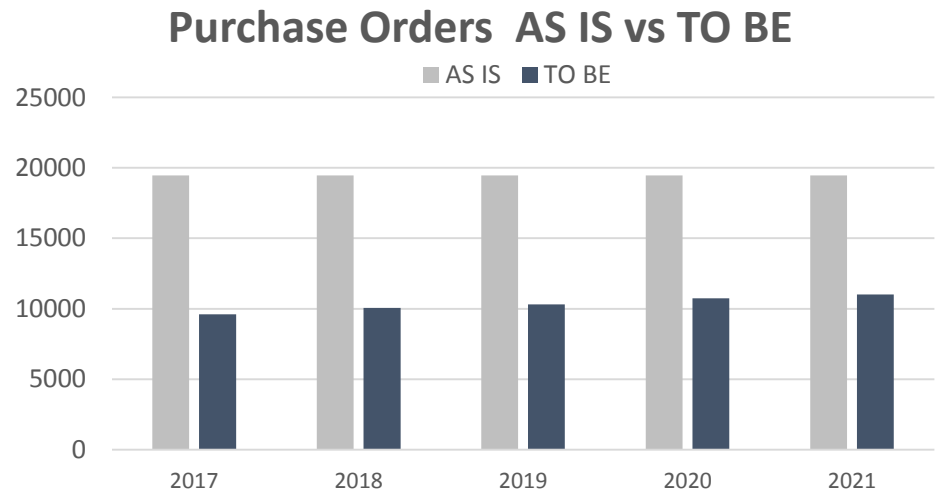
Additional Holding Costs of increasing the Service Level

With the Logistics Center (far away from most of the HUs), the service level will very likely have to be increased from 97% to 99% in order to reduce the probability of stock break. Increasing the Service Level will correspond to an increase of the Holding Costs (since the Average Inventory will increase by the Safety Stock). In terms of Invoices and Order Purchases there is no significant change. The table bellow presents the total extra holding costs related to an increase in the service level.

	Additional Costs for JMS in the Holding Costs for a service level of 99%
2017	6 123 €
2018	7 365 €
2019	7 174 €
2020	7 911 €
2021	8 426 €
Total	**30 877 €**

Part C: Stocks – Conclusions

The number of Purchase Orders and Invoices AS IS will be constant since it was assumed that the number of orders wouldn´t change, just the quantities per order. However, in the TO BE situation there will be a significant reduction in the number of Purchase Orders and Invoices processed through the years. In the TO BE situation it was necessary to recalculate those values since the Average Inventory and the Quantity Ordered changed. It was believed that the number of Purchase Orders would decrease so as the number of Invoices emitted.



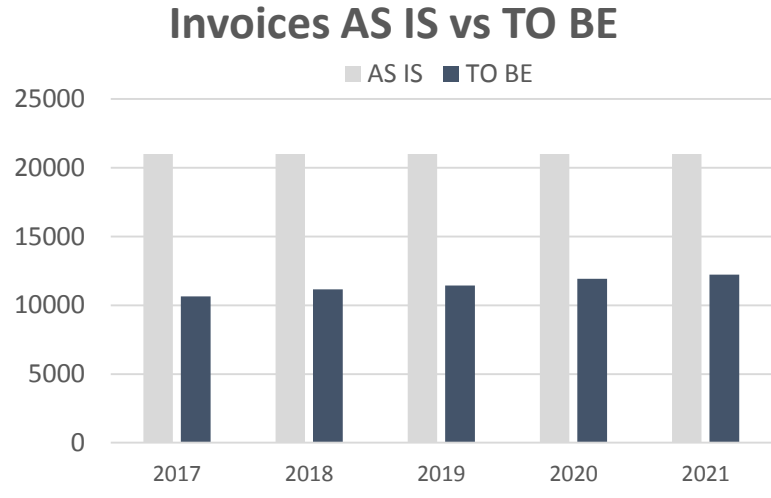
$Average\ Reduction\ of\ PO\ per\ year: 9119$

Number of Purchase Orders TO BE:

1. Total number of product requests: Calculated by the ratio between the annual consumption for each product and optimal order quantity given by the Model (Q*);

2. Average Number of Products per Purchase Order: It was assumed that the proportion of orders for each order note in 2014 (see slide 45) would remain constant with a possible centralization. This was calculated by dividing the total number of products requested by the total number of Purchase Orders issued in that same year.

3.Number of Purchase Orders: Obtained through the product of the total number of product requests (point 1) and the Average Number of Products per Purchase Order (point 2).



$Average\ Reduction\ of\ Invoices\ per\ year: 9528$

Number of Invoices TO BE:

1. Total number of AS IS invoices: For all the Purchase Orders, the emission and delivery dates were observed, with each different delivery date corresponding to an invoice. Thus, through the sum of the different delivery dates it was possible to know the total number of invoices per year.

2. Average Number of Invoices per Purchase Order: Ratio between total invoices and total Purchase Orders for each respective year

3. Total number of TO BE invoices: Determined through the product between the number of Purchase Orders and the ratio calculated in point the point before.

AGENDA

Part D : ESS – AS IS vs TO BE

The change in the AS IS costs will depend on the expansion of the warehouses through the years (HCD and HCTV in 2018 and HCIS in 2019, see appendix 4.2.5) and on the inflation rates used for the whole project applying for the costs of water, electricity, cleaning, security and trash. In the TO BE, the costs will only depend on the inflation for the same type of costs since the area of the warehouse is always constant. The delta is always negative (saving) , growing and very significant , except in the first year which is positive (additional costs). The information used to calculate the AS IS costs was from 2016 and it was considered the costs with the warehouses and hospital garments areas (see appendix 4.2.3). Regarding the central warehouse, the average cost per item was calculate using only information about the costs with the five warehouses, not including the hospital garments (see appendix 4.2.1)

YEAR	AS IS[10]	TO BE	DELTA
2017	171 597 €	193 417 €	**+ 21 819 €**
2018	201 116 €	194 705 €	**- 6 411 €**
2019	251 426 €	196 093 €	**- 55 333 €**
2020	267 981 €	197 505 €	**- 70 475 €**
2021	269 454 €	198 943 €	**- 70 511 €**

- 129 % → **Expansion of HCD and HCTV (both only in the 2nd half of the year)**

- 763 % → **Expansion of HCIS (only in the 2nd half of the year)**

Central Warehouse:

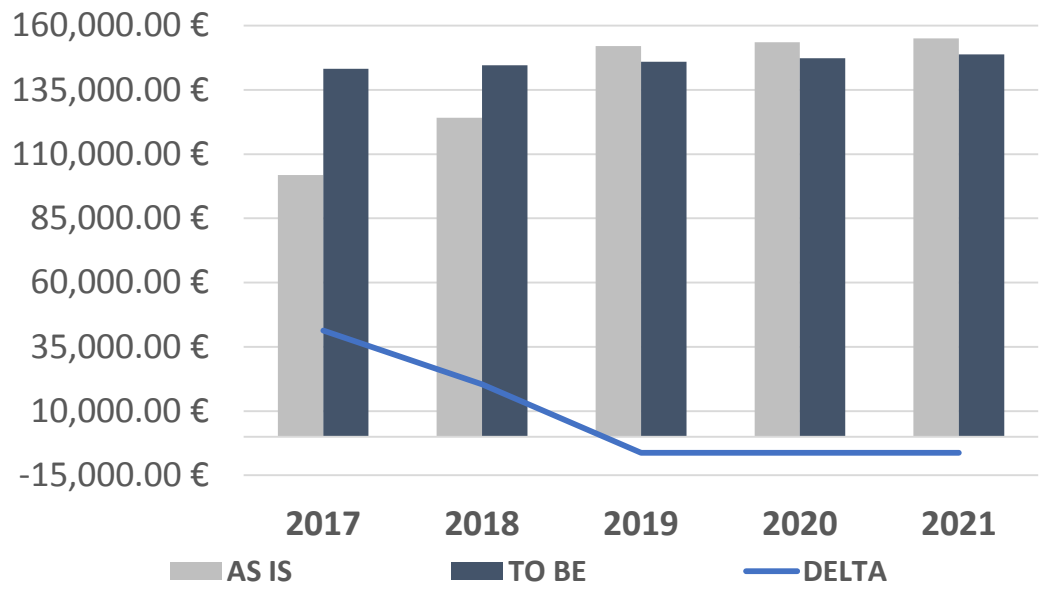
- 1000 m^2 for the total area (Consumables and Hospital Garments) – there will be no need to increase the area of the warehouse through the years, even with the JMS expansions;
- 3,4 €/ m^2 for the rent per month; ("Benchmarking Logic"- the group performed an intensive market research for warehouses in the same area and with similar characteristics and the following price was very accurate according to how the prices are stetted in the market)
- All costs were calculated by the product of the average of the square meter costs of each cost item of the AS IS situation with the total size of the central warehouse (1000 m^2) (see appendixes 4.2.2 and 4.2.4)

10 – Data from JMS with all costs of external services and supplies per hospital unit for the year of 2014

Part D : ESS – AS IS vs TO BE

As it possible to see, what makes the situation TO BE worth more than the AS IS situation is, clearly, the warehouse rent. The group decided to perform the two following graphs in order to show in a more evident way how the rent affects the savings. The area where the central warehouse is (a suburban area) has a much lower rent cost than the actual rents of the HU in the city center. In the graph with the rent, the savings between the two situations are much bigger.

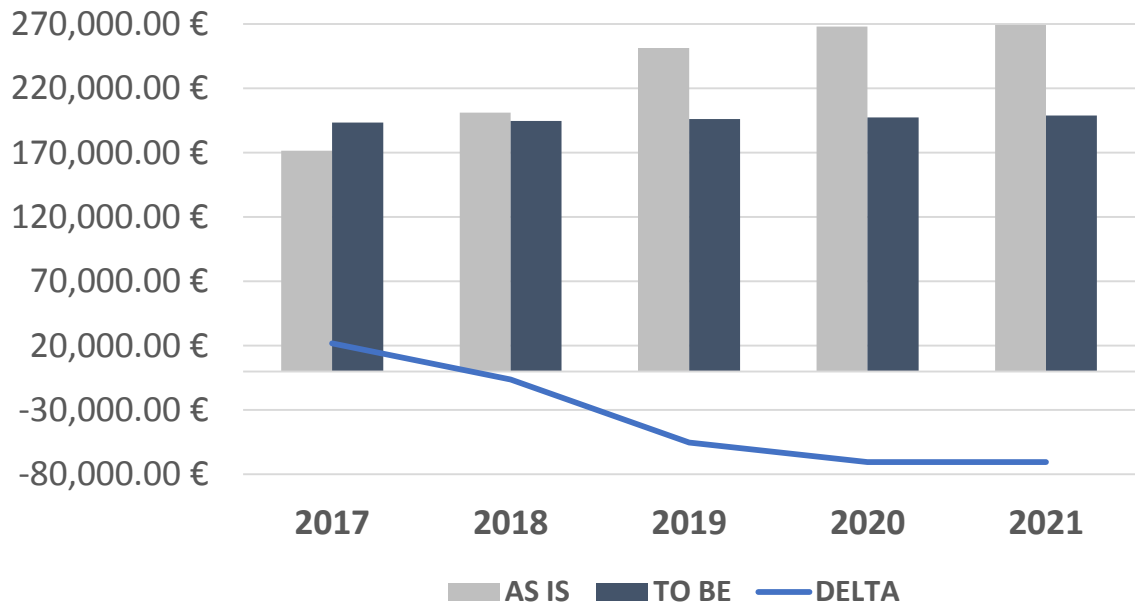
ESS Total Costs without the rent



	2017	2018	2019	2020	2021
DELTA ESS (Without rent)	+ 41 397 €	+ 20 388 €	- 6 205 €	- 6 240 €	- 6 275 €

In the first two years there are still additional costs, after the savings are around 6000 €.

ESS Total Costs with the rent



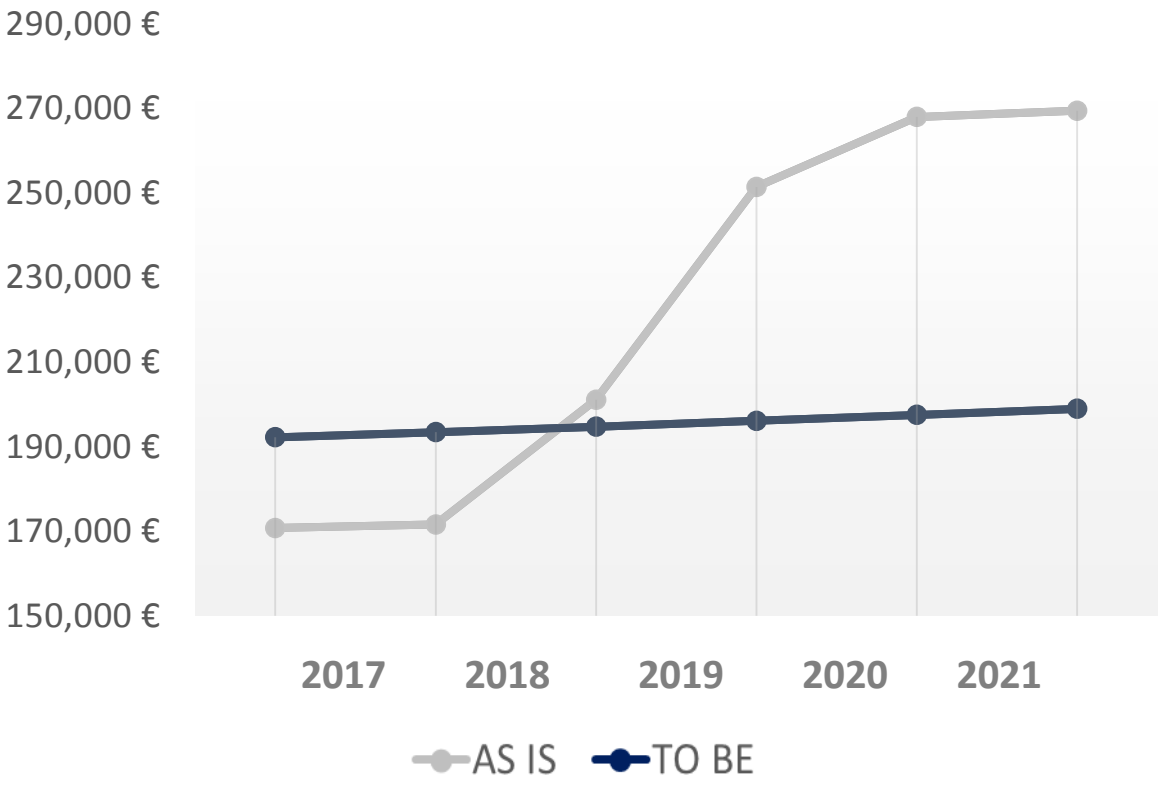
	2017	2018	2019	2020	2021
DELTA ESS (W/ rent)	+ 21 819 €	- 6 411 €	- 55 333 €	- 70 475 €	- 70 511 €

The savings start in the second year and are significantly much bigger than the savings without the rent.

Part D : ESS - Delta

There is a substantial saving in terms of ESS with the centralization, this aspect is one of the most powerful ones when considering the Central Warehouse for consumables since the gains are very visible and significant through all years of analysis. This saving comes, especially, from a large reduction of costs in terms of the rent of the Central Warehouse, which is much lower when compared with the actual warehouses of the HU.

ESS AS IS vs TO BE



Total Delta 5 years = - 180 911 €

TOTAL COSTS ESS 5 YEARS

	AS IS	TO BE
2017	171 597 €	193 417 €
2018	201 116 €	194 705 €
2019	251 426 €	196 093 €
2020	267 981 €	197 505 €
2021	269 454 €	198 943 €

At the beginning, it is possible to notice that the costs of the central warehouse are bigger than the AS IS costs. However, as JMS starts growing by building and expanding the Hospitals, the total area of the warehouse starts increasing as well as the costs of ESS for the AS IS scenario. In that sense, as the expansion of JMS gets bigger and bigger, the Central Warehouse will be compensating the costs more and more. In the years of analysis, the TO BE costs remain more or less constant and always lower than the AS IS costs. The huge difference in terms of costs for the AS IS scenario starting in 2019 can be mostly explained by the opening of the CUF Tejo (replacing the HCIS) as the rent and dimension of the warehouse are much higher than the current ones.

AGENDA

Part E – FTEs AS IS 2016

Currently, there are 37 employees working for the logistics department[11]. However 15 of them do not work directly with clinical consumables, and therefore their work will not suffer any alterations with a logistics centralization. On the other hand, there are 22 staff members whose work would vary with a logistic centralization.

Warehouse Manager	Hospital Garments Manager	Purchase Order Emission - Lisbon	Purchase Order Emission - others	Logistics Coordination & Surgery Blocks
x11	x9	x2	x7	x8
- Warehouse managers are responsible for the reception, tidiness, picking and distribution of clinical consumables - 4 workers in HCD - 4 workers in HCIS - 1 workers in HCC - 1 workers in HCS - 1 workers in HCTV	- Hospital garments managers are responsible for the distribution of clothes through the Hospital units - 4 workers in HCD - 4 workers in HCIS - 1 workers in HCC	- Responsible for the purchase order emission of clinical consumables of the center area - 2 workers in JMS headquarters, Carnaxide	- In charge for the emission of purchase orders of non-clinical consumables, such as medicines - 7 workers based in JMS headquarters, Carnaxide	-2 coordinators, one for the cluster of Descobertas and other for Tejo. Responsible for the coordination of the warehouses. -6 workers in the surgery blocks controlling the consignments (2HCD, 2HCIS, 1HCC, 1HCTV)
Total Annual Cost = 104 253€	**Total Annual Cost = 85 298€**	**Total Annual Cost = 27 147€**	**Total Annual Cost = 101 869€**	**Total Annual Cost = 111 958€**
Average annual cost = 9 478€	**Average annual cost = 9 478€**	**Average annual cost = 13 573€**	**Average annual cost = 14 553€**	**Avg. annual cost (LC) = 29 192€** **Avg. annual cost (SB) = 8 929€**

22 Employees whose work **will vary** with a **logistic centralization**

15 Employees whose work **will not vary** with a **logistic centralization**

Total annual FTE cost = 430 524 €

11 – Data from JMS with all employees from the logistics department as well as its annual salary and job type for the year of 2016

Part E – FTEs AS IS: 2017 to 2021

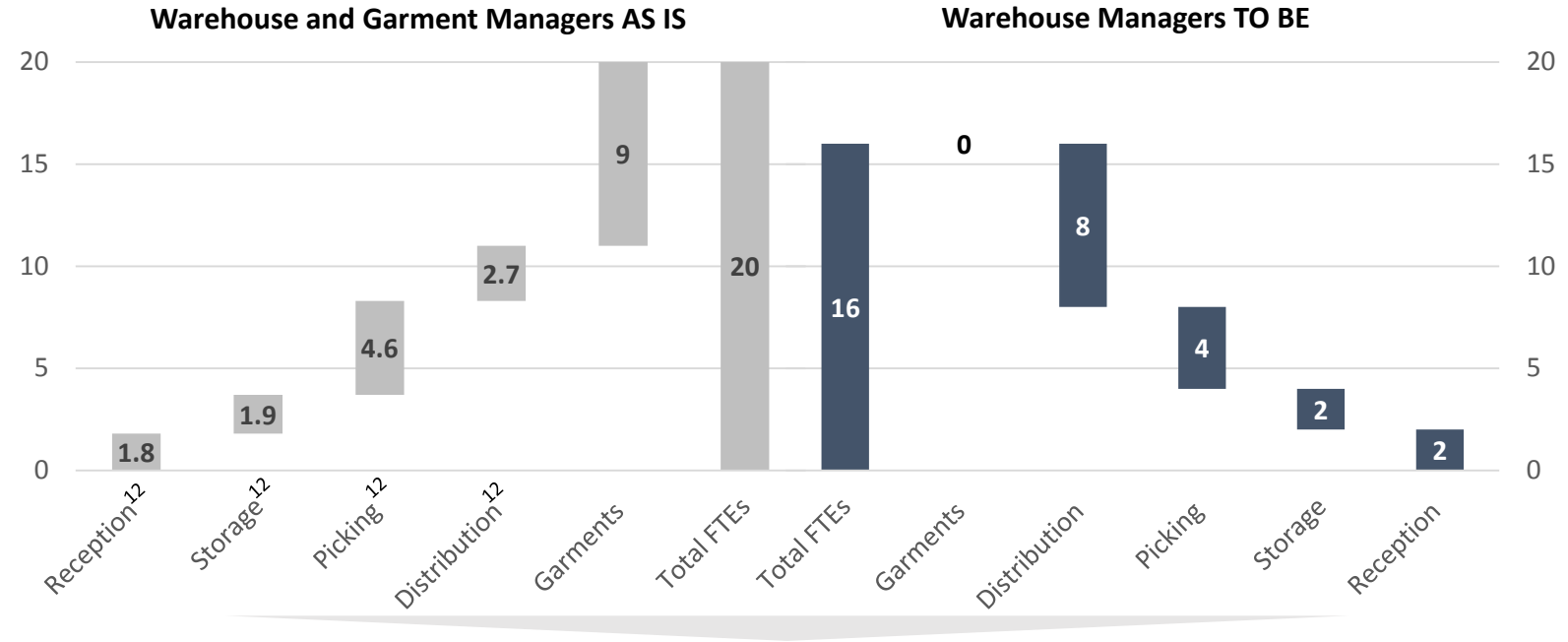
It was assumed that the increase in consumption only increases the quantity per order of each service and not the number of orders. As a consequence, the number of warehouse managers are the only rubric who has to change in order to satisfy the increase in demand. The table bellow shows the variation of personnel for the next five years, which is present in the Business Plan of JMS. In both cases, the increase of one warehouse manager happens in the middle of the year.

	2017	2018	2019	2020	2021
Variation	-	+ 1 Warehouse manager in HCD	+ 1 Warehouse manager in HCIS	-	-
	37	38	39	39	39
€	430 524€	435 263€	444 740€	449 479€	449 479€

Total 5 year FTE cost = 2 209 485 €

Part E – FTEs TO BE: 2017 to 2021

With a logistics centralization, it is important to preview how many employees (from the 22 whose work will vary with a logistic centralization) will be necessary in the purchase order emissions, in the central warehouse, in the hospital units and in the connection between the last two. It is essential to ensure that there is no breakdown on the service level. Please note that these new number of employees remains constant for all the five years of analysis.



- 1 worker for the purchase order emission, center area

Due to the huge reduction in the number of purchase orders, in a centralized scenario, JMS will only need one worker to perform this job. Even with the increase in purchase orders in the future, 1 worker is still sufficient to satisfy the total amount of work.

- **8 workers in the central warehouse (2 for the reception; 2 for storage; 4 for picking)**
- **1 driver making the distribution from the central warehouse to the hospital units (included in distribution)**
- **7 workers making the distribution within the hospital units (2 in HCD; 2 in HCIS; 1 in HCC; 1 in HCS; 1 in HCTV)**

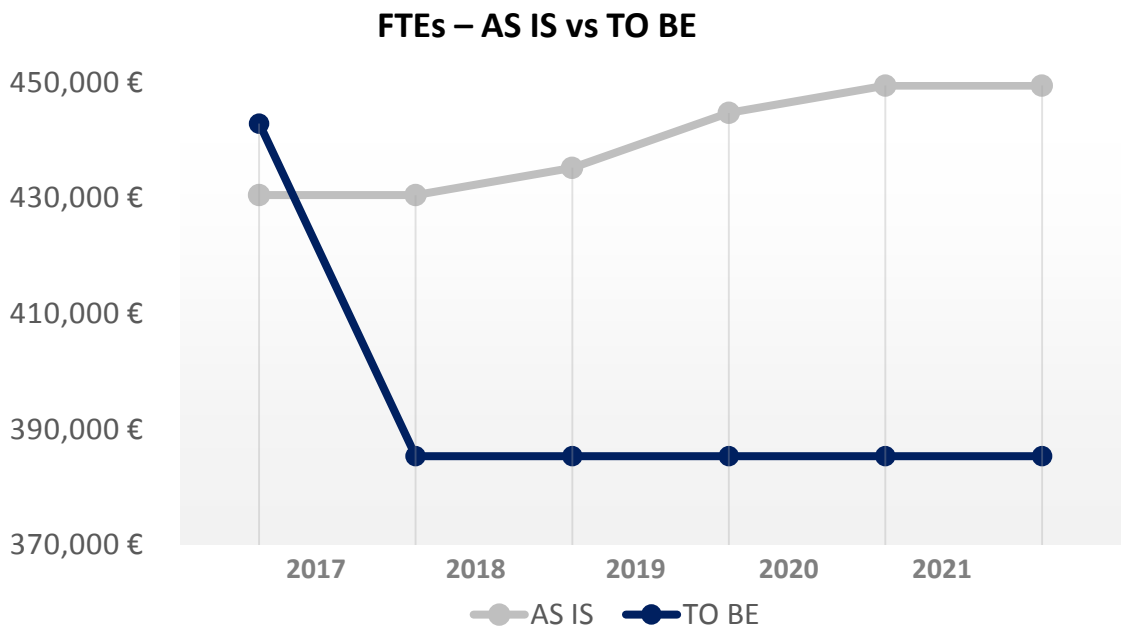
It is important to take into account that in a centralized scenario the workers will be 100% focused on one task, therefore they will be much more efficient. For the reception (which was considered two workers in order to increase the control in this task and apply the blind conference system), storage and picking there will be more or less the same number of workers as in the AS IS situation. However, in the distribution within the Hospitals, there is a huge gain since it was assumed that the distributers would be responsible, not only for clinical consumables, but also for the garment.

12 – Study from JMS with the number of warehouse managers per activity type and per hospital unit for the year of 2014

Part E – FTEs DELTA

There are a lot of efficiency gains with a logistics centralization. Among others, the biggest part of these gains are reflected in the number of employees needed, which is much less in a centralized scenario. Consequently, the costs will be way smaller as well, - 225 096€ in five years.

		2017	2018	2019	2020	2021
TO BE	👤	32	32	32	32	32
	€	442 914€	385 369€	385 369€	385 369€	385 369€
AS IS	👤	37	38	39	39	39
	€	430 524€	435 263€	444 740€	449 479€	449 479€
DELTA	👤	- 5	- 6	- 7	- 7	- 7
	€	+ 12 390€	- 49 894€	- 59 372€	- 64 110€	- 64 110€



As it is possible to observe, in a centralized scenario, there is a constant number of 32 employees for all the five years. This total number equals to the 16 warehouse managers described in the last slide (van driver included), plus the one person for the purchase orders emission and the 15 other employees whose work do not vary with a centralization.
In 2017, there is a positive delta since the severance pay costs[13] of 57 545€ related to five workers were included (equals delta). Then, from 2018 to 2020, the savings increase since there is a need to add more workers in an AS IS scenario in order to satisfy the demand.

This graphic shows the variation, in the five years of analysis, of the total cost of FTEs for both scenarios. As it can be concluded, there are lot of savings with a centralization, which becomes even more visible with the growth of JMS.
The total delta for the five years of – 225 096€ reflects the biggest part of the gains in efficiency with a centralized logistics.

13 - These costs were calculated in a government simulator (http://www.act.gov.pt/%28pt-PT%29/CentroInformacao/Simulador/Paginas/default.aspx). It was assumed that the workers had been 15 years in the firm and had already used their vacations.

AGENDA

Part F – Distribution: Basis of Analysis

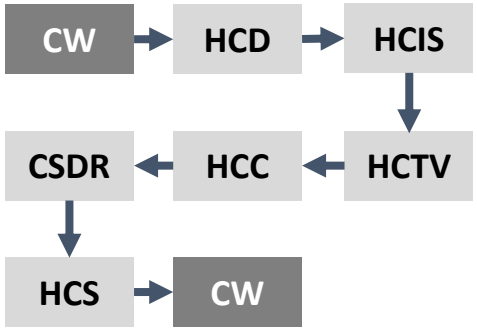
In order to determine the total 5 year costs with distribution, the group had to make several assumptions and decisions. All these assumptions were based both on our critical judgement and Dr. JCM's expertise and experience. Bellow, it is possible to observe the basis of our distribution analysis for the TO BE scenario. It is important not to forget that this is a complete extra cost that JMS would have in a centralized scenario.

Itinerary	To construct a weekly itinerary the group had firstly to analyze the weekly needs of each hospital unit. It was decided that for type A hospitals, due to their great size, a daily supply would be needed. Then, for medium size hospitals (B type), 3 times a week, every other day, so that there is no more than one day without supply. Finally for the clinics, 1 supply per week. Despite probably not being the most economic itinerary, the group believes it is the one that involves less risk.
Transport Type	For the transport type, the group contacted the firm IVECO, which suggested a van with a gross weight of 7200 KG and a useful load of 4700 KG. More than enough to satisfy the daily needs of JMS. Furthermore, it was considered that JMS would enter in a leasing contract to get the ownership of the van.
Type of Distribution	Due to the higher distance between the hospital units and the central warehouse, the team considered that it must be two distribution types: normal one (described in the first point of this slide) and emergencies. For the emergencies, it as considered that there would be 4 in A type hospitals and one in B type, per week. This number of emergencies was also assumed to happen in all the five years of analysis, which is a bit to pessimist, but the worst possible scenario.
Insourcing or Outsourcing	For the normal distribution the group assumed it to be made insourcing due to its uncomplicated routes and small distances between the central warehouse and the hospital units. On the other hand, the emergencies, were considered to be made by a specialize firm. The base of our decision was the fact that each emergency is uncertain, and therefore it is better to make it depend on a variable cost (pay per emergency) and not a fixed one.

Part F –Distribution: Normal Distribution

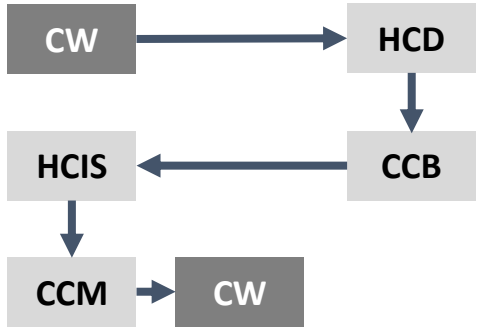
As mentioned before, the group had to construct a daily itinerary in order to calculate the normal distribution costs. Bellow, it is possible to observe this itinerary, as well as its totals costs, distances and time spent. Note that, it was assumed that the driver would take 15 minutes every time it has to unload the van. Moreover, toll costs[14] were subject to inflation every year. Finally, for the fuel costs[15], the van has a consumption of 0.15 liters/km (see next slide for the van characteristics) and the cost per liter of diesel is 1.15€.

Monday



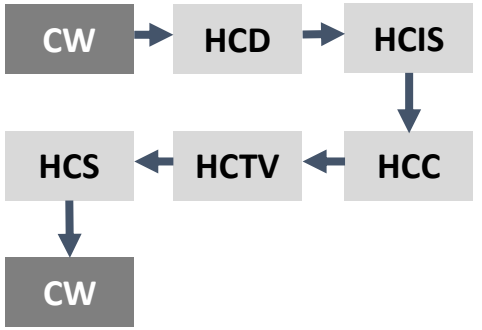
Distance	291 km
Time	346 min
Fuel	50.20€
Tolls	30.94€
Total	**81.14€**

Tuesday



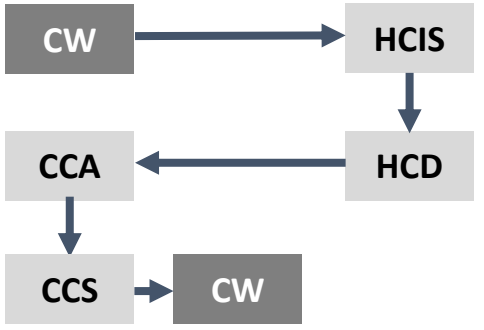
Distance	49 km
Time	159 min
Fuel	8.45€
Tolls	0.00€
Total	**8.45€**

Wednesday



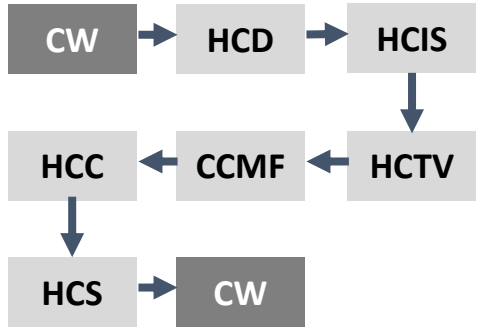
Distance	281 km
Time	330 min
Fuel	49.68€
Tolls	27.64€
Total	**77.32€**

Thursday



Distance	88 km
Time	161 min
Fuel	15.18€
Tolls	0.00€
Total	**15.18€**

Friday



Distance	237 km
Time	335 min
Fuel	40.88€
Tolls	22.96€
Total	**63.84€**

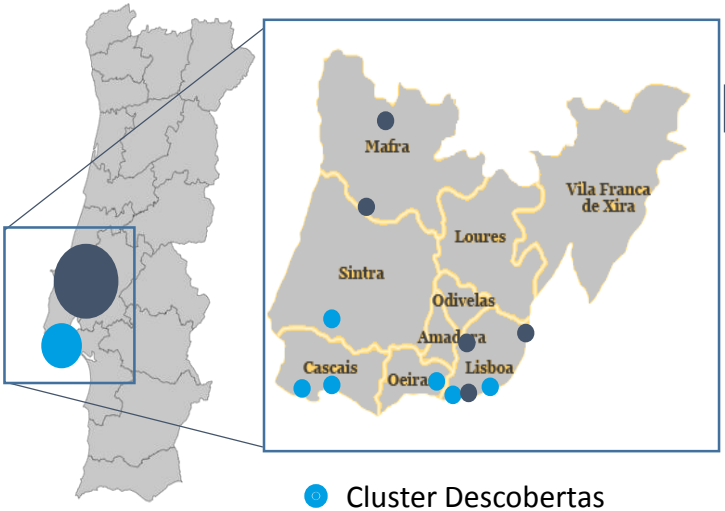
Total Weekly	**246€**	X 52 →	Total Annual	**12 788€**	X 5 → Total 5 Years **64 700€**

14 - https://www.acp.pt/ResourcesUser/files/OClube/TurismoLazer/Viajar_de_Carro/Portagens.pdf; 15 - http://www.precoscombustiveis.dgeg.pt/

Part F –Distribution: Urgent Distribution and Transport Type

In order to calculate the total costs with distribution, the group had to determine the cost with emergencies, as well as the leasing cost with the van which would be used to perform the normal distribution. Note that the cost with the van driver was included in the FTEs, therefore we did consider it as a distribution cost.

Emergencies



As it was already mentioned, JMS would contract a specialize firm to perform this service. The group contacted the firm Jet Express[16] in order to get an idea about the prices:

- 15€ inside Lisbon area
- 60€ outside Lisbon area

Furthermore, the group assumed that there would be 4 weekly emergencies inside Lisbon are (HCD and HCIS) and 1 outside (HCS, HCC and HCTV). For the other clinics, there is no need to account for emergencies due its more basic service.

Total Weekly	120€
Total Annual	6 240€
Total 5 Years	31 200€

Transport Type

For the transport type the group contacted the firm IVECO, who gave us, not only all the information related to the type of van we needed for the service, but also the leasing costs of this transport.

Consumption	0.15 liters / Km	Gross Weight	7200 KG
Fuel Type	Diesel	Useful Load	4700 KG

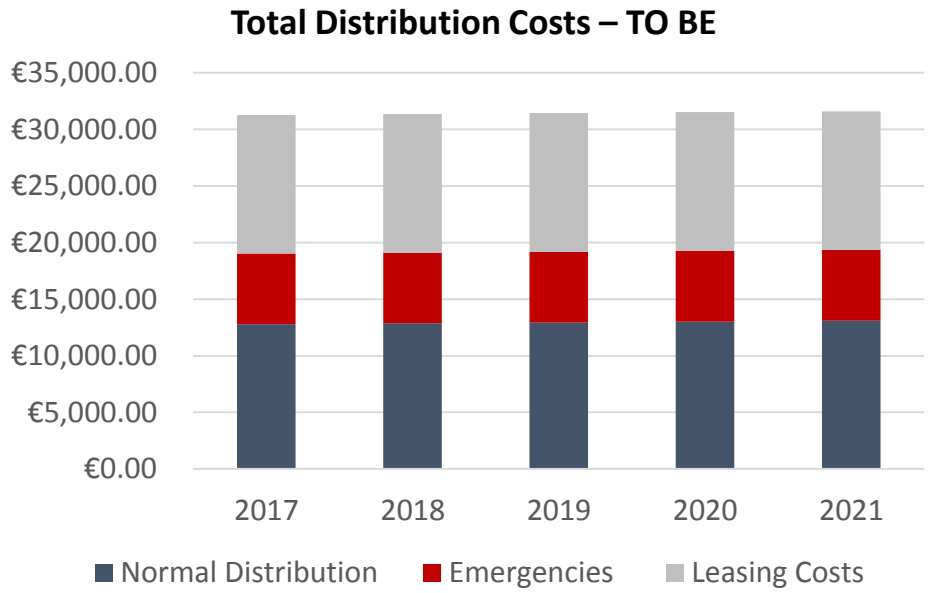
Leasing Costs		
	Total Monthly	1 022€
	Total Annual	12 264€
	Total 5 Years	61 320€

16 - http://www.jetexpress.pt/servico_estafetas.php?id=14

Part F –Distribution: Total Cost

The group estimates that, without counting with the driver cost (already taken into account in the FTEs), JMS would spend around 157 298€ in five years in distribution from the central warehouse to the HU. This cost accounts with the fuel and tolls in the normal distribution, emergency costs (outsourcing) and leasing costs. Moreover, it is always important to remember that this is a complete extra cost that JMS would have with a centralization.

	2017	2018	2019	2020	2021
	12 788€	12 860€	12 934€	13 017€	13 179€
	6 240€	6 240€	6 240€	6 240€	6 240€
	12 264€	12 264€	12 264€	12 264€	12 264€
€	31 292€	31 364€	31 438€	31 521€	31 683€



By looking at the table and the graphic above, it is possible to conclude that the total costs for distribution does not vary much from year to year. Actually, there is just a small variation due to inflation. Moreover, normal distribution and leasing costs take the biggest part of the total distribution costs, being emergencies just 20% of the total amount. Finally, for the five years of analysis, it is estimated that JMS would spend 157 298€.

Part F – CAPEX

It is also important to consider the initial investment that JMS would have to incur in the central warehouse. In the worst case scenario, the warehouse will not have the working conditions desired by JMS. Therefore there will be the need to renovate it and install specific working conditions such as bathrooms, electricity, arrange the floor and the walls, among others.

Investment Type	Cost per Square Meter	Total Cost
 Cost of renovating and installing specific working conditions in the central warehouse.	**150 € / m^2**	**150 € x 1000 m^2 = 150 000 €**
 Cost of equipping the logistics center with warehouse material such as shelves, ladders, banks and trolley carts.	Not considered. This material already exists in each hospital unit warehouse, therefore it just needed to be transferred.	Not considered.

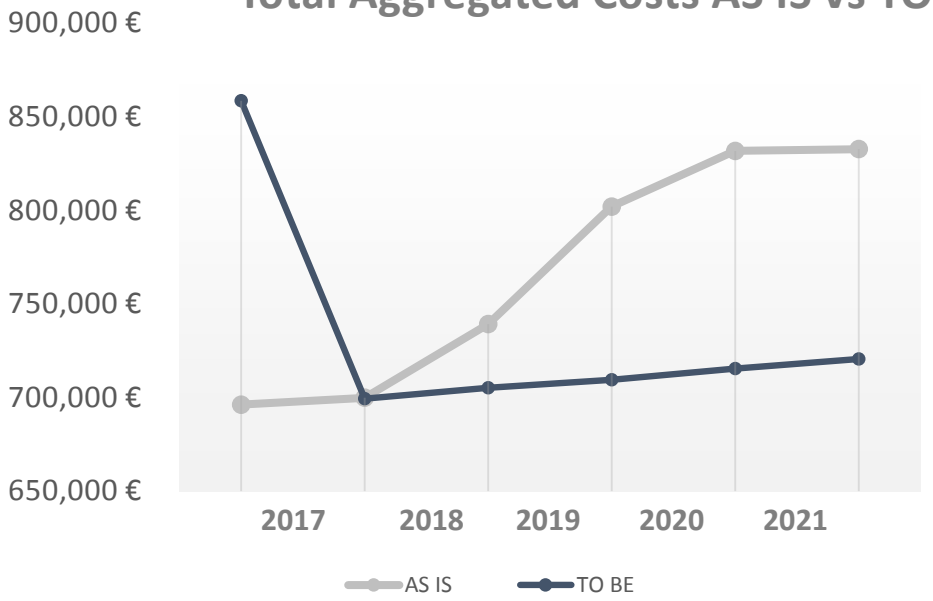
Total CAPEX = 150 000 €

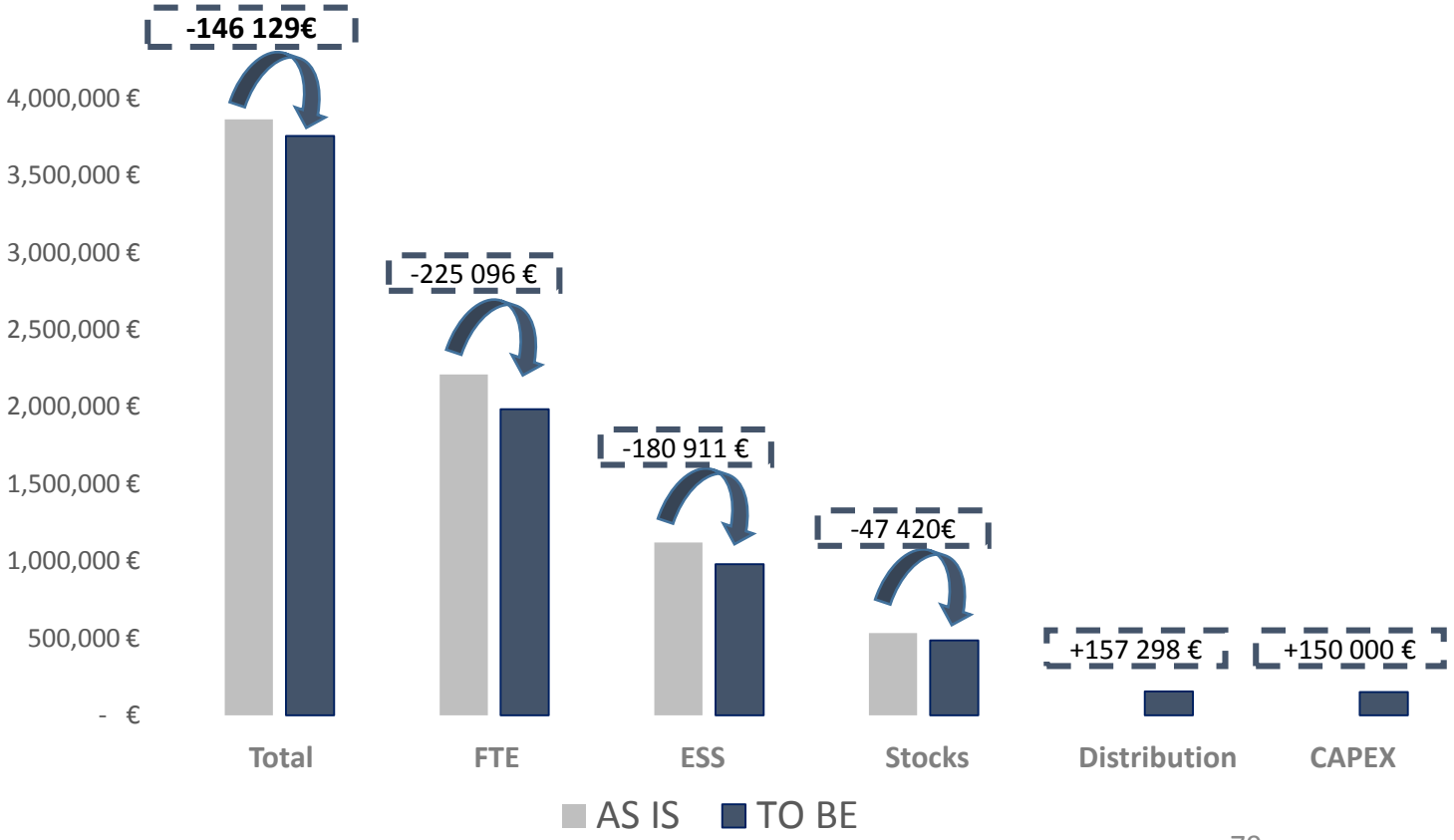
Note that this total cost was considered to happen only in the first year of the project. Therefore, the group did not amortized this initial investment over the total life of the warehouse, which would be more correct in a financial way. However, for the project and the specific needs of the client, we considered to be a more useful and realistic information to take the total amount into account in the first year.
The information about the costs (150 €/m2) was given by the infrastructures department of JMS.

Phase 2: Cost Analysis- Conclusions

As it is visible, there is a significant saving with the centralization in the 5 years of analysis, except in the year of investment (2017) where the costs TO BE are higher than the AS IS due to the CAPEX value and the cost of reducing the team. However, in 2018 the costs TO BE decrease a lot and remain nearly constant and always lower than the AS IS. With JMS expansions, the increase of costs in a decentralized situations is higher than the increase of costs in a centralized one.

With the creation of a Logistic Center the total savings for 5 years will be equal to 146 129€. This value results, mostly, from the reduction in the FTE and ESS costs which are the items with the most impactful savings. In the stocks, there is also a positive value but not so significant. The Distribution and the Capex are additional costs when compared with the situation AS IS. So, it is concluded that, in terms of costs, the centralization will compensate. What is important to note is that savings increase through the years with all the expansions considered by JMS. Meaning that, the more JMS expands, the more it compensates to have a central warehouse.





AGENDA

Part G – Sensitivity Analysis

For the sensitivity analysis of the costs' impact for JMS of a new hospital unit's opening for both types A and B, it was calculated the total costs for two scenarios: with or without a logistics centralization of clinical consumables, and assuming that JMS already has the centralized model completely operational. After having the costs for both scenarios it was possible to compare them and observe whether or not JMS should have a central warehouse, which would be the case if it would need to incur in lower costs when opening a new hospital unit, compared to the scenario where the current logistics model is sustained. In the case of having a central warehouse and opening the new hospital unit, a distribution plan had to be considered and adapted to each option (North, type A and B HUs and South, type A and B HUs) in order to make that plan the most efficient possible and less costly.

Analyzed Categories	In order to acess the costs of opening a new hospital unit, several factors were analyzed as: the cost of the extrenal supplies and services; the cost of the full time empoyees that would be necessary to have with the new hospital unit; the cost of the stock's ownership; the cost with the initial investment needed to equip the warehouse, as well as the costs with the distribuiton from the central warehouse to the hospital units.
Analyzed Travelled Distance	This analysis was made considering hospital units situated north of the HCS and south of the HCIS as they are the hospital units located further north and further south, respectively, when compared to all of the others. The distribution plan was made in a way that it would have the **lowest possible costs**. However, sometimes **it can be riskier than the one showed before** as for the type B hospital Units, requiring a distribution three times a week, the driver goes two consecutive days in all scenarios for certain type B HUs instead of going Monday, Wednesday and Friday. Even so, it is feasible as each hospital unit should have a safety stock for four days. The distribution plan was composed including all the other hospital units and clinics and changed for each option to add the new one, while maximizing the travelled distance with the same driver and van (see appendixes 5.1.1, 5.1.2, 5.1.3 and 5.1.4). It was taken into account the time a driver needs to go through all the waypoints, the time he needs to discharge the consumables, as well as the total time a driver can work per day and needed breaks.
Analyzed HUs' Types	The sensitivity analysis was done for two types of hospital units: A and B, which influenced all the costs that were analyzed. While the first ones are HUs with a big dimension that would need to have a daily distribution the others are HUs of a lower size that only require a distribution three times a week.

Part G – Sensitivity Analysis: AS IS vs TO BE for the 5 years

Inside each type of hospital unit, the only cost that changes is the one with the distribution from the central warehouse to the HUs, being only positive for the scenario of a logistics centralization. This is because the cost with the tolls changes depending if the new HU is situated to the north of the HCS or to the south of the HCIS, as well as the starting point. For a type A HU there is a significant difference in terms of distribution's cost for both options in the central warehouse's scenario. The reason is that the HCS, situated in Santarém, has a smaller dimension and thus would only need to have a distribution three times a week. Therefore, with a new hospital unit requiring a distribution 5 days a week (type A), in 2 of the 5 days, the motorist would have to go on purpose to that HU situated after Santarém, incuring in extra costs.

Opening a type A HU	ESS	FTEs	Cost of Stock's Ownership	Distribution	Initial Investment
Current logistics model	251 744 €	10 = 473 878 €	185 542 €	-	350 €/m² (70 000 €)
With logistics centralization	-	5 = 236 939 €	53 607 €	For 50 km: 76 748 € (North) and 47 310 € (South)	-

Opening a type B HU	ESS	FTEs	Cost of Stock's Ownership	Distribution	Initial Investment
Current logistics model	110 868 €	2 = 94 776 €	67 878 €	-	350 €/m² (28 000 €)
With logistics centralization	-	1 = 47 388 €	16 723 €	For 50 km: 40 482 € (North) and 38 340 € (South)	-

Part G – Sensitivity Analysis: AS IS vs TO BE

With the opening of a new hospital unit, it is possible to verify that regardless of its distance to the central warehouse, if it is a type A HU, there will be always significant savings for the 5 years in the case of a logistics centralization when compared to the current model. For type B HUs the same does not happen since after 200 Km, the total cost is higher with a central warehouse than with the current logistics model. Moreover, there is a point where JMS starts to need another car and driver but will still have lower costs in the logistics centralization scenario. Finally, the costs with opening a new hospital unit are much higher if this is of a type A rather than type B, but the savings by having a scenario of logistics centralization instead of the current logistics model, are even higher. The deltas were calculated by doing the difference between the TO BE and AS IS situations (see appendixes 5.1.5, 5.1.6, 5.1.7 and 5.1.8)

		50 Km	75 Km	100 Km	130 Km	200 Km	250 Km
Hospital Unit Type A	North	-613.871 €	-596.971 €	-449.498 €	-	-383.381 €	-353.576 €
	South	-643.308 €	-	-608.742 €	-451.038 €	-400.185 €	-366.904 €
Hospital Unit Type B	North	-196.928 €	-	-174.268 €	-19.407 €	14.270 €	35.105 €
	South	-199.071 €	-	-173.474 €	-161.513 €	17.143 €	41.454 €

+1 +1

= =

+1 +1

Savings without the need to have one extra car and driver

Savings with the need to have one extra car and driver

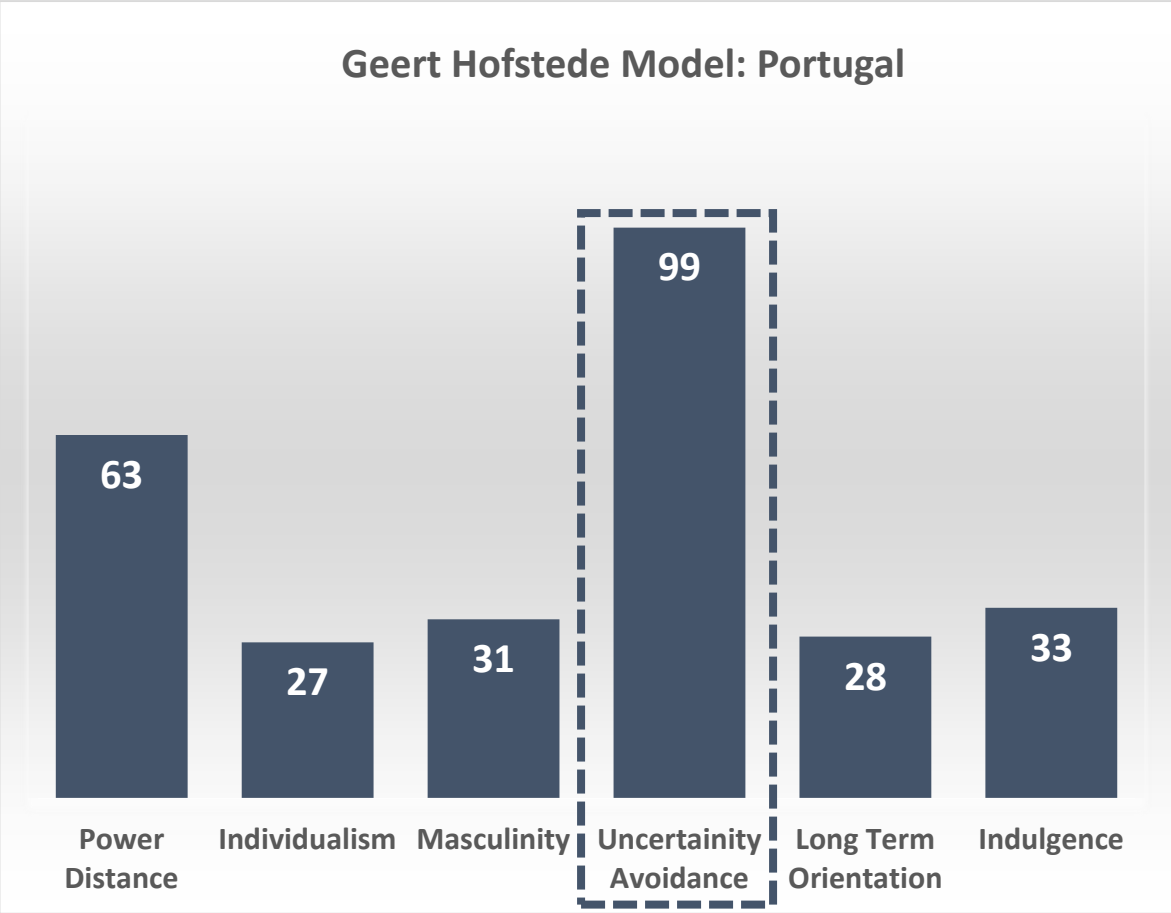
There are no savings

Total cost for the 5 years with an extra car and driver: 140 360 €

AGENDA

Part H – Change Management Plan: Geert Hofstede Model

The Geert Hofstede model is an empirical study about the cultural differences, consisting of six dimensions, which studies how values in the workplace are influenced by culture. The conclusion of this model is that differences in the way companies work are a result of their employees' culture, as well as the culture of the country.



Accordingly to this model, if there is a dimension that defines Portugal very clearly, it is **Uncertainty Avoidance**. Portugal scores 99 on this dimension and thus has a very high preference for avoiding uncertainty.

The Uncertainty Avoidance dimension expresses the degree to which the members of a society feel **uncomfortable with uncertainty and ambiguity**. As Portugal displays a high level in this dimension, the country should maintain rigid codes of belief and behavior.

At the moment:		**In the future:**
Existence of a warehouse in each hospital unit	→	Central warehouse

This change in the logistics model can lead to feelings of insecurity and concern in all the stakeholders who are involved in the process.

Huge importance of defining a Change Management Plan to smooth the impact of this change

17 - https://geert-hofstede.com

Part H – Change Management Plan

By having a central warehouse and eliminating each hospital unit's warehouse, internal clients (e.g. Nurses) will feel probably more insecure about the satisfaction of their requests on time and will want to increase the stock in the advanced warehouse. Moreover, as they will be afraid to have a stock break, the number of urgencies will probably increase as well. Therefore, it is really important the development of a change management plan in order to have everything working in the most efficient way.

In the Central warehouse:

Concentration of all the stock from the 5 Hospital Units

Elimination of each hospital unit's warehouse

In the Hospital Units:

More insecurity concerning the requests' fulfillment on time

- Increase the stock in the advanced warehouses
- Increase the number of emergencies

AS IS

BEFORE IMPLEMENTATION

AS IS / TO BE

IMPLEMENTATION

TO BE

AFTER IMPLEMENTATION

CHANGE MANAGEMENT[18]

ACCEPTANCE

Explain what will change and how the change can affect people directly or indirectly. What challenges will come and what strategy needs to be designed.

MAXIMIZATION

After insight the situation, ensure understanding for the success of the results.

SUSTAINABILITY

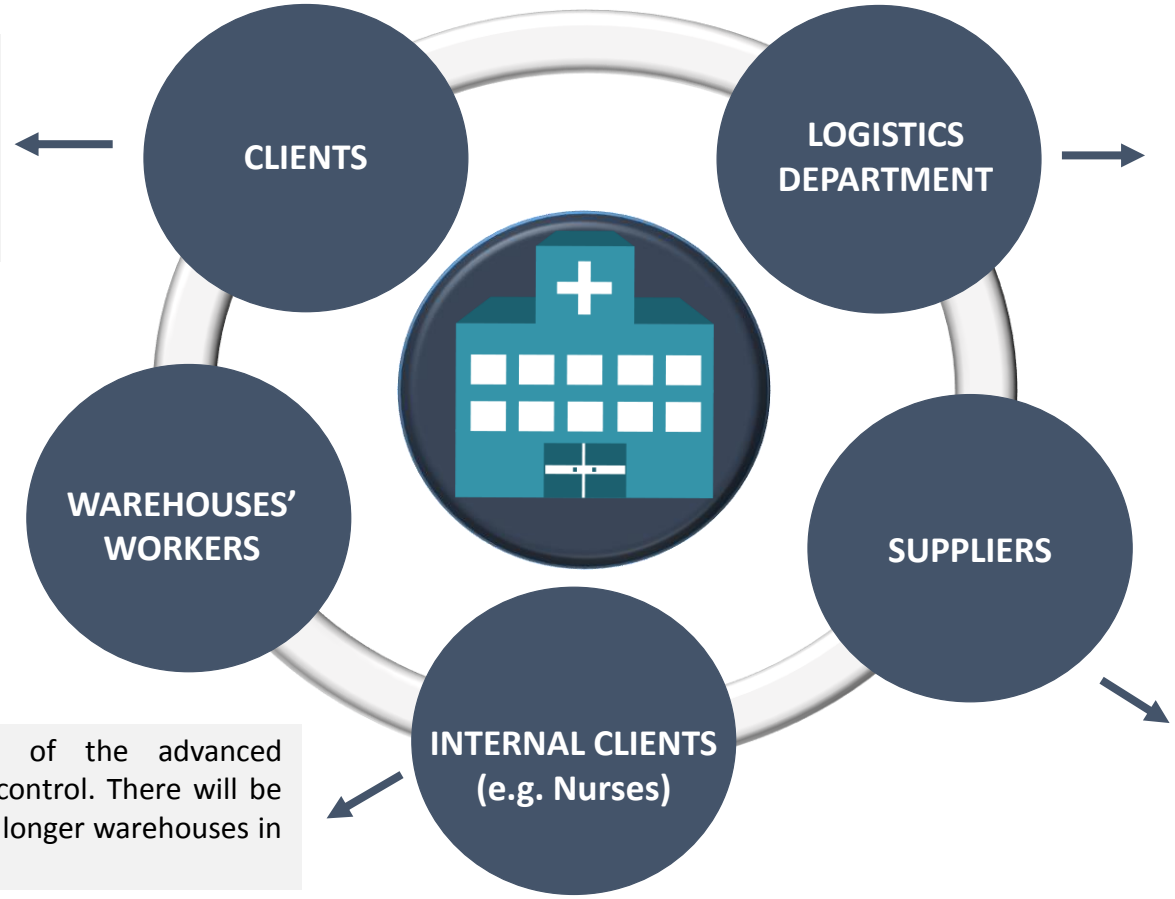
Keep the healthy environment and prevent disorientation. Receive feedback from employees, act on improvement points.

The change management should be worked with transparency by informing people about what will happen in the upcoming times, as well as their role in the future scenario of logistics centralization. Moreover, all the stakeholders who will be affected by the change in the current logistics model should be involved during all the process of change.

18 - "A transição na gestão da mudança", available in https://books.google.pt

Part H – Change Management Plan: Stakeholders of the process

After understanding the importance of having a change management plan in order to smooth the impact in all the stakeholders of a change in the current logistics model, as well as make this transition the most efficient possible, the stakeholders were identified. There are five stakeholders that participate in the logistics process and will be affected by this change: the clients, the warehouses' workers, the internal clients (namely the nurses), the suppliers and the logistics department. Knowing how they will be affected, it is possible to think about possible corrective actions.



The clients will not be directly affected by the change in the current logistics model. However, it is important to guarantee the same level of service, as well as do not run out of stock.

Change to a completely centralized management (purchases and logistics coordination)

Change of their workplace (some will work in the central warehouse and the rest will perform other functions). The way the work will be executed in the central warehouse will also change in some aspects (e.g. blind conference).

Change of the delivery point, instead of delivering the consumables in the 5 hospital units, with the logistics centralization, the suppliers only have to deliver in the central warehouse. Therefore, this will probably lead to changes in the negotiations with the suppliers.

Change in the stock's management of the advanced warehouses, it will be needed a higher control. There will be more insecurity because there will be no longer warehouses in each hospital unit, only AA

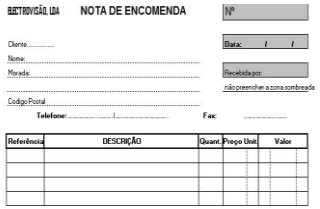
Part H – Change Management Plan: Corrective Actions

Anxieties Management

Stakeholders: Internal Clients

1

Creation of a computer system that enables the monitoring of the order status



RETROVISÃO, LDA NOTA DE ENCOMENDA Nº

Cliente.....
Nome:
Morada:
Código Postal
Telefone: ..... Fax: .....

Data: / /
Recebida por:
não preencher a zona sombreada

Referência	DESCRIÇÃO	Quant.	Preço Unit	Valor

Elaboration of the purchase order

Computer system that enables the internal clients to know if the stock they want to order is available in the central warehouse. Moreover, it allows to control the order status, namely the start and end of the stock's picking, as well as when the consumables are ready to be distributed in the hospital units.

Delivery of the order in the hospital unit

This computer system would decrease the anxieties in what concerns the expectations of the consumables' delivery (depending on the stock), as well as the delivery deadline. Moreover, it would avoid the need for time consuming in telephone contact

2

Have a collaborator in the central warehouse able to answer the phone calls from the hospital units regarding material orders, delivery failures and delivery deadlines

This would decrease the anxieties in what concerns the expectations of the consumables' delivery (depending on the stock), as well as the delivery deadline. Moreover, for emergency's orders, it would enable the whole process of making the picking and distribution from the central warehouse to the hospital units to be much faster. Regarding delivery failures, by having one person in the central warehouse responsible to keep the contact with the hospital units, it would be easier to make complaints if any order was not correct or did not arrive on time.

Part H – Change Management Plan: Corrective Actions

Improvement of the process of change

Stakeholders: Warehouses workers, Logistics Department and Internal Clients.

3

Create a phone or email line where all the collaborators and people who are involved in the logistics process can send their appreciations and suggestions of improvement for the administrators of each hospital, then they will work on this information with the logistics managers.

It will increase the involvement of all the collaborators in the process' improvement, which will consequently generate a higher motivation, commitment and recognition.

4

Weekly meetings with the administrators of each hospital unit and the logistics' responsible in order to monitor the process of change, as well as act in eventual improvement points.

It will increase the involvement of all the collaborators in the process' improvement, which will consequently generate a higher motivation, commitment and recognition.

5

Period of training/information of all the changes in each specific area.

Create a training period in which should be transmitted all the information concerning the central warehouse and the consequential changes.

It will decrease the anxiety in relation to the process of change, which will lead to a higher involvement of all the collaborators. Moreover, it will allow the discussion and exchange of ideas, as well as decrease the future's errors.

Part H – Change Management Plan: Corrective Actions

Communication

Stakeholders: Suppliers

6

Communicate with the suppliers the changes that will occur as a consequence of the logistics' centralization. At the end of the change's process the suppliers will only need to deliver their material in the central warehouse instead of going to the five hospital units.

Inform the suppliers about the change from the five delivery points to only one delivery point.

Negotiate with the suppliers, if possible, alterations in the final price or ways of payment as a consequence of the decrease in the number of delivery points.

Inform about the alterations in the purchases department.

It will reduce the error in the distribution and failures of communication.

AGENDA

Part I – Implementation Strategy: Introduction

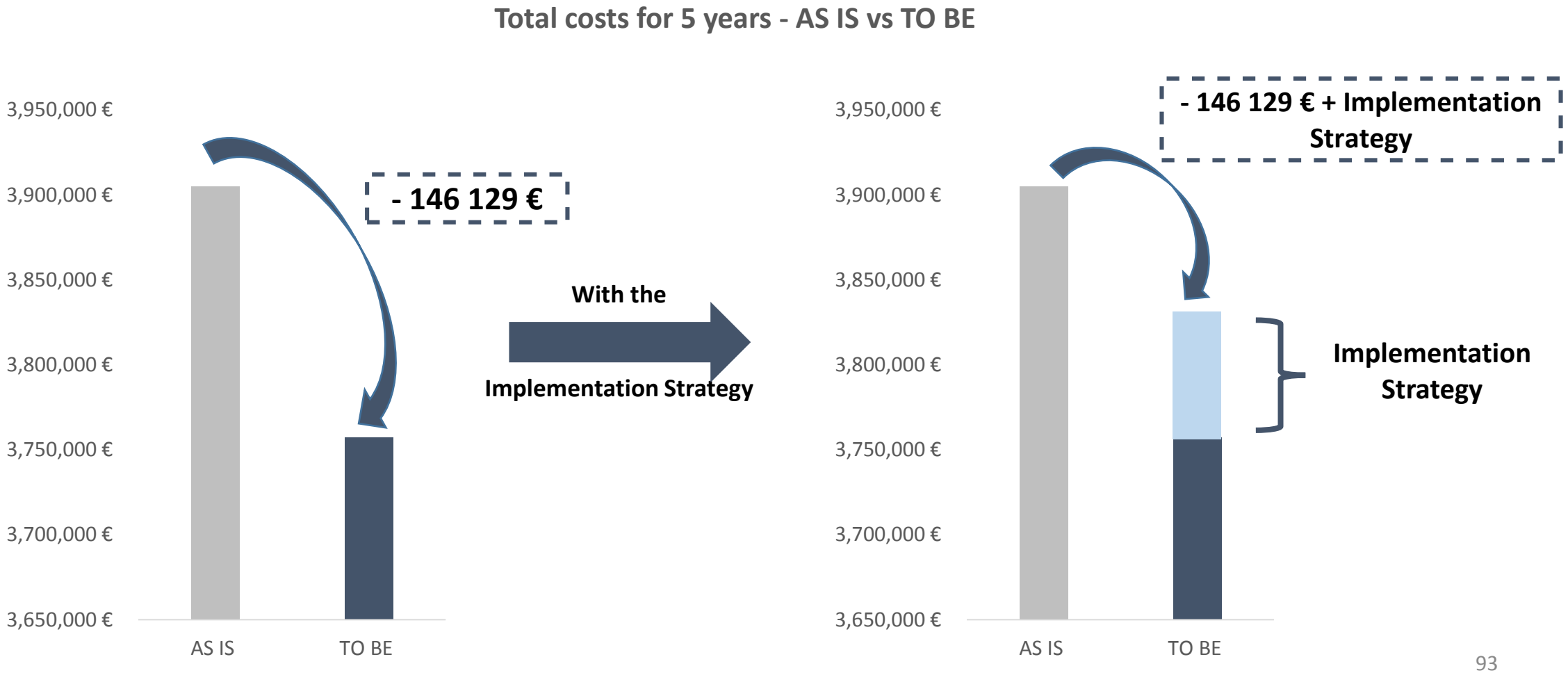
In order to find the best Implementation Strategy for the logistics centralization, it was tested three different implementation scenarios, all with the same duration of eight months. For each scenario all the categories presented before (FTEs, ESSs, distribution and holding costs) were analyzed with the purpose of having the total costs for each phase of each Implementation Strategy. Moreover, after having the important costs that should be taken into account in our final choice, it was also possible to analyze the risks, advantages and disadvantages of each scenario and make a final recommendation to JMS.

Implementation strategies (8 months)

By Hospital Unit	There is a huge number of possible combinations in this scenario that were also tested (see appendixes 5.3.2, 5.3.3 and 5.3.4). However, after a deep analysis, it was possible to conclude that the one that presents the **lowest level of risk**, as well as the **highest feasibility of execution**, is the Implementation Strategy **By cluster By unit**.
By Type of Product	In this scenario, the implementation would be done accordingly to the **presence of each article in each hospital unit**. Therefore, firstly JMS should centralize all the products that are common to the five hospital units, corresponding to 11% of the total articles. Secondly, it should centralize the ones that are common to four HUs, then to three and after the ones that are common to only two. Finally, the last articles to be centralized would be the ones which are exclusive of each Hospital Unit.
By Supplier	In the implementation scenario by supplier, the centralization would be implemented **accordingly to the number of times each supplier needs to go to each hospital unit to deliver the consumables**. Therefore, firstly JMS should centralize the suppliers that need to move more times to the five HUs, finishing with the ones that need to go fewer times.

Part I – Implementation Strategy: Introduction

It is important to take into account that the implementation costs were calculated over the TO BE scenario. In this is sense, it is possible for JMS to know the extra costs that it has to incur in order to implement a logistics centralization, as well as the new delta.



Part I – Implementation Strategy: By Cluster By Unit

Objective: Gradual Implementation By Cluster By Unit criterion for 8 months. Starting with the Descobertas' Cluster and finalizing with the Tejo's Cluster.

Phase 1 – Preparation LC	Phase 2 – HCD	Phase 3 –HCTV and CCMFR	Phase 4 – HCS, and CCA	Phase 5 – HCIS and CCM	Phase 6 – HCC,CCB, CCSDR, CCS
All work related to the of the warehouse, structure, layout, etc. The warehouse should be prepared at 100% to initiate the integration of the Hospital Units.	**Move HCD** to the **Logistic Center** with the release of the costs related to the warehouse and full time employees of this HU. Add all the necessary costs needed to move HCD to the Logistic Center.	**Move HCTV** and **CCMFR** to the **Logistic Center** with the release of the costs related to the warehouse and full time employees of this HU. Add all the necessary costs needed to move HCTV and CCMFR to the Logistic Center.	**Move HCS** and **CCA** to the **Logistic Center** with the release of the costs related to the warehouse and full time employees of this HU. Add all the necessary costs needed to move HCS and CCA to the Logistic Center.	**Move HCIS** and **CCM** to the **Logistic Center** with the release of the costs related to the warehouse and full time employees of this HU. Add all the necessary costs needed to move HCIS and CCM to the Logistic Center.	**Move HCC** and **CCSDR** and **CCS** to the **Logistic Center** with the release of the costs related to the warehouse and full time employees of this HU. Add all the necessary costs needed to move HCC, CCB, CCSDR and CCS to the Logistic Center.
1,5 months	**1,5 months**	**1,5 months**	**1 month**	**1,5 months**	**1 month**

Part I – Implementation Strategy: By Cluster By Unit

The reduction of FTE's is gradual throughout the 6 phases, and in the 5th phase they reach the number of FTE's required for the operation of the warehouse. With regard to the FSE's, only in the 6th stage is there a total release of the warehouses from all the UH's.

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Total	DELTA
FTE's Implementation Strategy	X 37 = 46 128 €	X 36 = 45 790 €	X 35 = 44 775 €	X 35 = 28 044 €	X 33 = 42 744€	X 32 = 27 526€	235 007 €	14 796 €
FTE's TO BE	X 32 = 41 290 €	X 32 = 41 290 €	X 32 = 41 290€	X 32 = 27 526€	X 32 = 41 290 €	X 32 = 27 526€	220 211 €	

See Appendix 5.3.1

Alocation FTE's

Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
x 37	- 6 HCD → +5 CW	- 1 HCTV	No change	- 6 HCIS → + 4 CW	- 1 Purchase Order

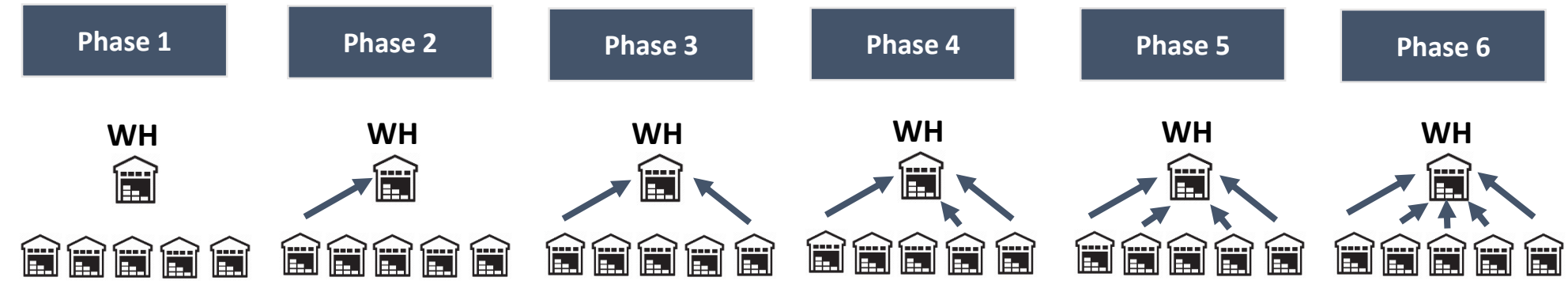
On the last phase the Implamentation Strategy reaches the number of FTE's proposed in the TO BE scenario

Part I – Implementation Strategy: By Cluster By Unit

The item cost, External Services Supplies represents 78% of the Implementation Strategy. This cost includes rent costs and all expenses related to the warehouse.

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Total	DELTA
ESS Implementation Strategy	X 6 = 45 627 €	X 5 = 38 770 €	X 4 = 36 023 €	X 3 = 22 044 €	X 2 = 28 268 €	X 1 = 16 118 €	186 883 €	57 939 €
ESS TO BE	X 1 = 24 177 €	X 1 = 24 177 €	X 1 = 24 177 €	X 1 = 16 118 €	X 1 = 24 177 €	X 1 = 16 118€	128 944 €	

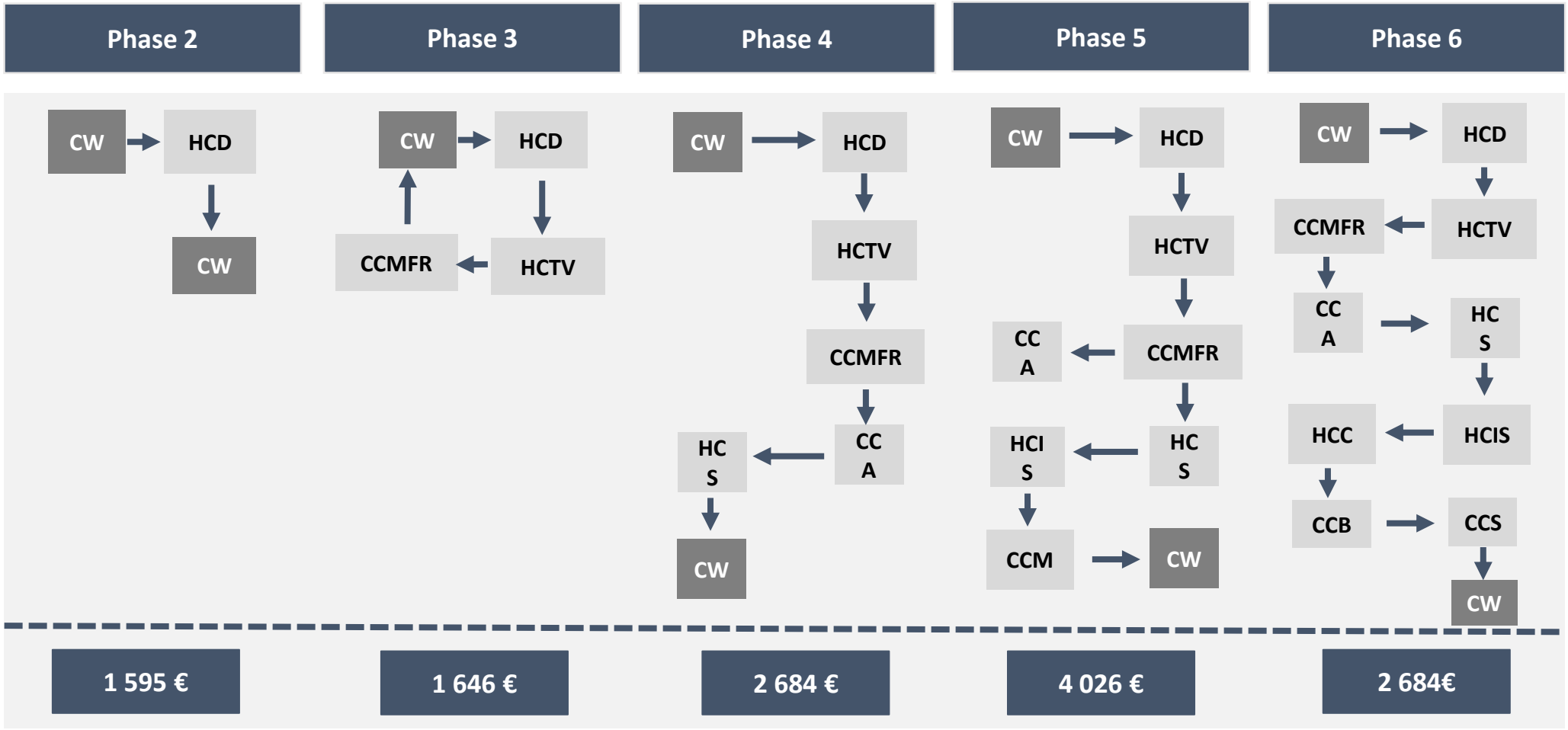
See Appendix 5.3.1



On the last phase the Implamentation Strategy only has the Logstic Center and no other warehouses in the Hospital Units

Part I – Implementation Strategy: By Cluster By Unit

In the TO BE scenario the distribution costs are all the same and equal to the last phase, where the distribution is working 100%.



On the last the phase, the distribution starts to be completed, with all units being integrate in the Logistic Center

DELTA

- 8 031 €

See Appendix 5.3.1

Part I – Implementation Strategy: By Cluster By Unit - Conclusions

Here we can see all cost items in each phase and compare it to the centralization/ TO BE scenario.

	Centralization	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Delta
Duration	-	1,5 Months	1,5 Months	1,5 Months	1 Month	1,5 Months	8 Months
FTE	32	37	36	35	33	32	+ 14 796 €
ESS							+ 57 939 €
Distribution		-					- 8 031€
Holding cost							+ 8 127 €
							+72 830 €

See Appendix 5.3.1

Part I – Implementation Strategy: By Cluster By Unit

Advantages

Significant **savings on ESS and FTEs** throughout implementation. Both warehouses and employees are being released throughout the plan, not just at the end

Easier identification of errors and management of each UH. It will be easier to start a new strategy only in a HU with its logistic coordination and management panel

Gradual liberalization, from the outset, **of suppliers' constraints on HUs**

Easier to communicate with suppliers, instead of delivering in a specific HU will deliver in CL.

For the purchasing area, **the process of order centralization will be facilitated**, because being by UH, it will be centralized gradually adding the UHs that are going to the CL

Level of risk for the integration of this new project is smaller: if something worse happens, it will not be operating at all UH yet

Disadvantages

Cost of distribution will be paid in full in terms of leasing and driver agreement from the outset. These resources will not be used at 100% capacity .

In terms of **integration and the choice of employees to operate in the logistics center,** the choice may be limited, since at the outset, it will be the warehousing professionals of the 1st UH to centralize that will go first to the CL: it is a more complicated management

Part I – Implementation Strategy: By Product

Objective: Gradual Implementation By Products following the criteria of common products during 8 months. The implementation would begin with the group of products that are common to all 5 HUs believing that this would benefit and potential the product standardization challenge that was verified before.

Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
All work related to the works of the warehouse, structure, layout, etc. The warehouse should be prepared at 100% to initiate the integration of the Hospital Units.	Move all products that are in common to the 5 Hospital Units to the Logistic Center. This represents about **234 products** (11% of the products)	Add the products that are in common to 4 Hospital Units to the Logistics Center. This represents **200 products**.	Integrate the products that are in common to three of the Hospital Units to the Logistic Center. In this face we are moving about **247 products**.	Move the product that are in common to 2 Hospital Units. In this face **362 products** are moving to the Logistic Center.	Add all the independent products, the products that are only in one Hospital Unit. In this face we are moving about **1103 products**. Normalize the operation o f the Logistic Center.
1,5 months	**1,5 months**	**1 month**	**1 month**	**1 month**	**2 months**

Part I – Implementation Strategy: By Product

The reduction of FTE's is gradual throughout the 6 phases, and in the 5th phase they reach the number of FTE's required for the operation of the warehouse. With regard to the FSE's, only in the 6th stage is there a total release of the warehouses from all the UH's.

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Total	DELTA
FTE's Implementation Strategy	X 37 = 46 128 €	X 38 = 47 821 €	X 38 = 31 881€	X 38 = 31 881€	X 38 = 31 881€	X 32 = 55 053€	244 643 €	24 433 €
FTE's TO BE	X 32 = 41 290 €	X 32 = 41 290 €	X 32 = 27 526€	X 32 = 27 526€	X 32 = 27 526 €	X 32 = 55 053€	220 211€	

See Appendix 5.3.5, 5.3.6, 5.3.7 and 5.3.10

Alocation FTE's on the CW

Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
x 37	→ +1 Driver	→ No change	→ No change	→ No change	→ - 5 Warehouse or Garments Staff - 1 Purchase Order

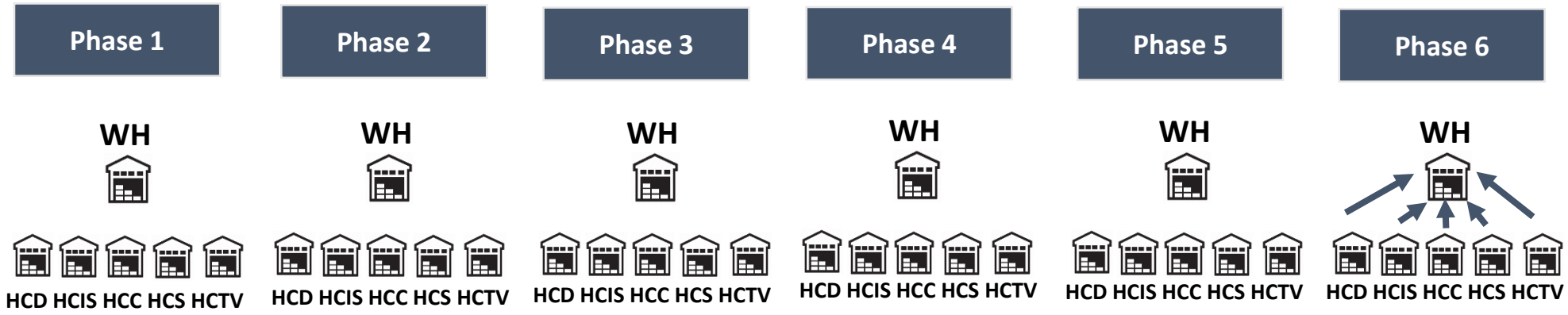
On the last phase the Implamentation Strategy reaches the number of FTE's proposed in the TO BE scenario

Part I – Implementation Strategy: By Product

The item cost, External Services Supplies represents the most signicant cost of the Implantation Strategy. This cost includes rent costs and all expenses related to the warehouse.

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Total	DELTA
ESS Implementation Strategy	X 6 = 45 627 €	X 6 = 45 627 €	X 6 = 30 418 €	X 6 = 30 418 €	X 6 = 30 418 €	X 1 = 32 236 €	214 743 €	85 799 €
ESS TO BE	X 1 = 24 177 €	X 1 = 24 177 €	X 1 = 16 118 €	X 1 = 16 118 €	X 1 = 16 118 €	X 1 = 32 236 €	128 944 €	

See Appendix 5.3.8, 5.3.10



In the last phase, the Implementation Strategy only has the Logistic Center and no other warehouses in the Hospital Units

Part I – Implementation Strategy: By Product

After the 8 months, there will be a total additional costs to the desired situation TO BE of 118 358 €, there will be significant additional costs in FTEs and ESS. In the Distribution there is no variation along the 8 months since it starts with full costs in the Phase 2 until the last one, there is a positive saving in the end because there are no distribution in first 1,5 months of preparation of LC.

	Centralization	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Delta
Duration	-	1,5 Months	1,5 Months	1 Month	1 Month	1 Month	2 Months	8 Months
FTEs	32	37	38	38	38	38	32	24 433 €
ESSs								85 799 €
Distribution		-						-3 875 €
Holding Cost								8 127 €

+ 118 358 €

See Appendix 5.3.10

Part I – Implementation Strategy: By Product

Advantages

Reduction of the average stock since the beginning of the implementation. By starting with the products common to all the HUs, there will be an earlier use of the synergies in relation to the stocks.

Easier in the housekeeping strategy according to the common items units.

There may be an opportunity to potentiate products that are common to 5 UH in the first place: It will be easier to figure out which products are the most common and least common. In this way, a **better knowledge of the products themselves can help a lot to the normalization of the products.**

Easier integration and choice of employees to operate in the logistics center

Disadvantages

High distribution costs since the beginning of implementation. Not using resources at 100% capacity

High cost of ESSs in the warehouses of the HUs that are only released at the end of the implementation. Non-use of resources at 100% capacity

It **hinders the approach to alternative suppliers**. In addition, there may also be dissatisfaction with current suppliers (deliveries in one more location in the first 8 months)

Greater **difficulty for the Purchasing area** to have only some centralized products

Need to invest in SI in order to split the order to the logistic center and warehouse of the respective UH, which **hinders the picking strategy**

Range of products that is adding very uneven.

Greater difficulty in identifying the problems and their consequent solution. This happens because all the UHs begin their process of centralization at the same time

Part I – Implementation Strategy: By Supplier

Objective: In the scenario by supplier, centralization would be implemented based on the number of trips of each supplier to the HUs. That is, initially centralizes the suppliers that more often move to the UHs finishing in those that less move.

Phase 1 – Preparation LC	Phase 2	Phase 3	Phase 4	Phase 5
All work related to the works of the **warehouse, structure, layout**, etc. The **warehouse should be prepared at 100%** to initiate the integration of the Hospital Units.	**Move 9 suppliers to the Logistic Center**. These suppliers represent about 30% of the total number of trips to the Hospital Units to deliver their products.	**Add to the Logistic Center 20 more Suppliers.** These Suppliers represent about 33% of the total number of trips to the Hospital Units to deliver their products.	**Integrate more 33 Suppliers**. These Suppliers represent about 20% of the total number of trips to the Hospital Units to deliver their products.	**Add to the Logistic Center 123 Suppliers,** which represent about 17% of the total trips to the Hospital Units. At this phase, everything should be centralized, suppliers, HU, employees, among others.
1,5 months	**2 months**	**2 months**	**1,5 months**	**1 month**

See Appendix 5.3.11, 5.3.12

Part I – Implementation Strategy: By Supplier

In this implementation there is only a reduction of costs in the FTEs at the end of the implementation. This is a consequence of having both the logistics center and the warehouses of all hospital units functioning at the same time. There is then, no advantage in terms of FTE's costs during the implementation by supplier.

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Total	DELTA
FTE's Implementation Strategy	X 37 = 46 128 €	X 38 = 63 761 €	X 38 = 63 761 €	X 38 = 47 821€	X 32 = 27 526 €	248 998 €	28 787 €
FTE's TO BE	X 32 = 41 290 €	X 32 = 55 052 €	X 32 = 55 052 €	X 32 = 41 290 €	X 32 = 27 526 €	220 211 €	

See Appendix 5.3.13, 5.3.14

Alocation FTE's

Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
x 37	→ +1 Driver →	No change →	No change →	- 5 Warehouse or Garments Staff - 1 Purchase Order

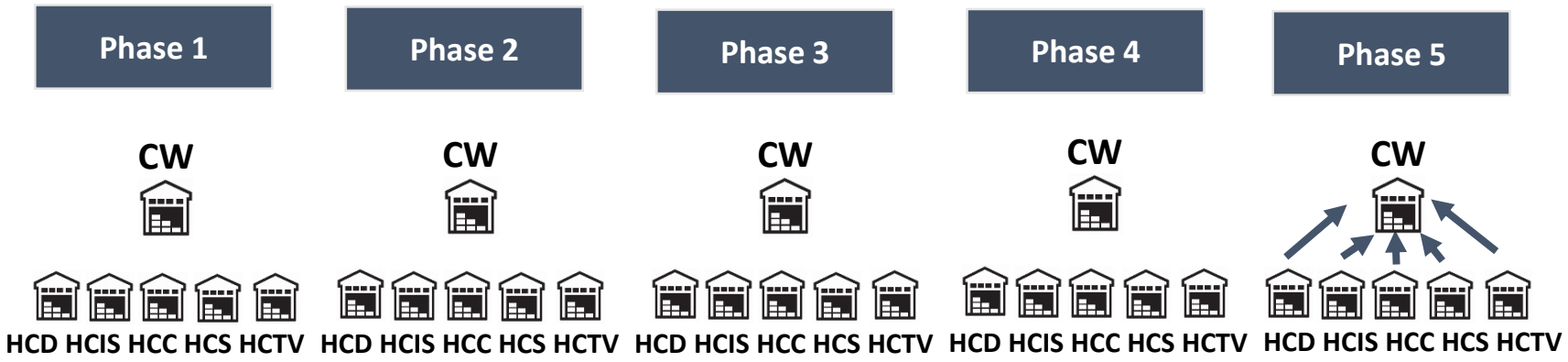
Only at the last phase the Implementation Strategy reaches the number of FTE's proposed in the TO BE scenario

Part I – Implementation Strategy: By Supplier

In this implementation by supplier JMS will only release the warehouses of each Hospital Unit at the end of implementation. This means that JMS will have to pay for the use of each warehouse during 7 months despite not using them in their full capacity.

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Total	DELTA
ESS Implementation Strategy	X 6 = 45 627 €	X 5 = 60 836 €	X 6 = 60 836 €	X 6 = 45 627 €	X 1 = 16 118 €	229 043 €	100 099 €
ESS TO BE	X 1 = 24 177 €	X 1 = 32 236 €	X 1 = 32 236 €	X 1 = 24 177 €	X 1 = 16 118€	128 944 €	

See Appendix 5.3.14, 5.3.15



Only at the last phase of the Implementation Strategy JMS releases the warehouses of each Hospital Unit

Part I – Implementation Strategy: By Supplier

As it is possible to observe, the total implementation cost by supplier, over the TO BE costs scenario calculated before, is equal to 125 011 €. This means that the new delta with this implementation strategy is equal to 22 669 €. In relation to the distribution costs there would just be a saving of 3 875€ since in the first phase there is no distribution. Furthermore, in the holding costs, the group assumed that in the first year there would be no gain. Therefore, it was added the cost of 8 127 € related to the suppose gain in the first year.

	Centralization	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Delta
Duration	-	1.5 Months	2 Months	2 Months	1.5 Months	1 Month	8 Months
FTEs	32	37	38	38	38	32	+ 28 787 €
ESS							+ 100 099 €
Distribution		-					- 3 875 €
Holding Cost							+ 8 127 €
							+ 125 011 €

See Appendix 5.3.14

Part I – Implementation Strategy: By Supplier

Advantages

Reduction of the average stock since the beginning of the implementation. By starting with the common suppliers to all the HUs, there will be synergies from stocks in the first place.

By **facilitating the work of suppliers** from the outset, it will be easier to obtain possible price discounts by reducing their supply chain to JMS.

Easier storage strategy according to the articles / suppliers common to hospital units.

Easier integration and choice of employees to operate in the logistics center

Disadvantages

High distribution costs since the beginning of the implementation. Non-use of resources at 100% capacity.

Need to invest in SI in order to split the order to the logistic center and warehouse of the respective HU, which hinders the picking strategy

High cost of ESS, in the warehouses of the HUs that are only released at the end of the implementation. Not using resources at 100% capacity.

Greater difficulty in identifying the source of the problems and their consequent solution. This happens because all HUs start their centralization process at the same time

Part I – Implementation Strategy: Final Conclusions

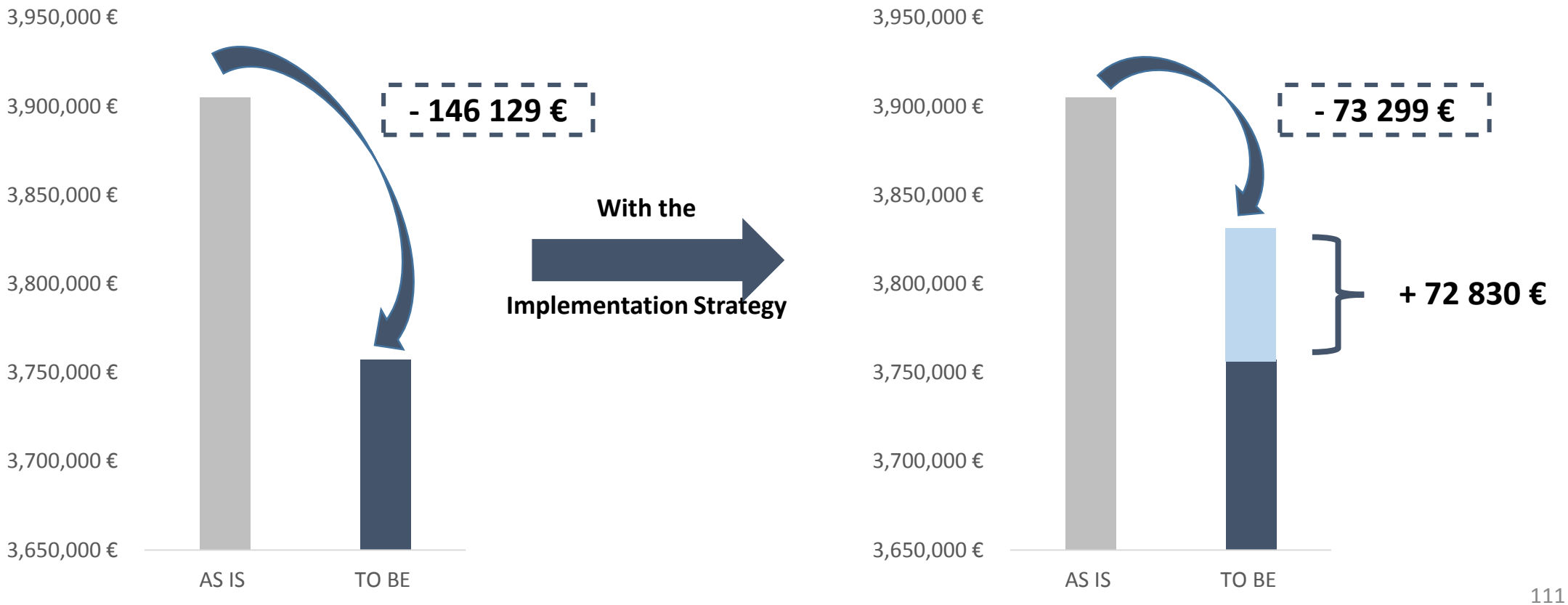
Comparing the three main scenarios we can see that By Hospital Unit represents a better fit for JMS, not only for being less costly but also because of the lower risk level of the implementation. This lower risk comes mainly from the fact that this implementation is the only one that does not centralize all units at the same time, being then easier to identify the error and to retreat in case the implementation does not go so well as expected.

Costs overlay to the TO BE scenario	Scenario 1: By Hospital Unit	Scenario 2: By Product	Scenario 3: By Supplier
FTEs	+ 14 796 €	+ 24 433 €	+ 28 787 €
ESS	+ 57 939 €	+ 85 799 €	+ 100 099 €
Distribution	- 8 031 €	- 3 875 €	- 3 875 €
Holding Cost	+ 8 127 €	+ 8 127 €	+ 8 127 €
Total	+ 72 830 €	+ 118 358 €	+ 125 011 €
Risk Level			

Phase 3: Recommendations - Conclusions

After estimating the final total Delta and studying the best implementation scenario, the group understood that JMS would not have the total savings considered before in the 5 years because the central warehouse will take 8 months to implement. The project has some extra costs to the TO BE situation during the implementation time that were not taken into account in the first Delta. So, with the additional costs of implementation the final delta of the project is - 73 299 €. These costs come, mainly, from the fact that JMS will have to keep a substantial portion of the warehouses at the same time of the Logistics Center.

Total costs for 5 years- AS IS vs TO BE



Final Conclusions of the Project

Reasons to advance

1. **José de Mello Saúde Expansion:** It is clear that as much as expansions occur, more the centralization process in terms of costs compensates to the company. And even in terms of efficiency, it would also be very hard to continuing managing much more warehouses with new expansions.

2. Possibility of **resolution of the main limitations of the process** found in the Diagnosis phase. Mainly in terms of control in the reception process, the constraints of the suppliers in the Hus, time waiting for the elevator, product standardizations and improvement in the automation of the storage process.

3. Visible gains of efficiency with the centralization, which translates into **savings of 73 299 € in 5 years (including implementation costs)**. Most of this gain comes from the reduction in both the personnel needed and the ESS cost of each warehouse.

Advance with a Logistics Centralization

Adopt an implementation by Hospital Unit and apply all the Change Management measures presented before in order to reduce possible anxieties and problems from the most affected stakeholders.

AGENDA

1. Executive Summary
2. Methodology
3. Diagnosis
4. Cost Analysis
5. Recommendations
6. **Individual Reports**
7. References

Individual Report : Belbin Results – João Santa Bárbara #2274

These results from the Belbin analysis were really helpful and interesting in order to confirm the personal characteristics that were more impactful during this project in terms of the work itself and the role and relationship in the team. The results were aligned with what I was expecting.

TOP 3

OPERATIONAL
STRATEGIST
TEAM WORKER

- **Operational** – I am a very analytical and practical person. When I feel the most satisfied at work is when I performing practical tasks.
- **Strategist** – I agree with this trait. Despite being a much more practical person than theoretical, I always like to think about possible strategies before executing them.
- **Team Worker** – I consider myself to be a very good team worker. Most of the times I tend to be co-operative, always ready to help the others and ready to promote harmony within a group.

BOTTOM 3

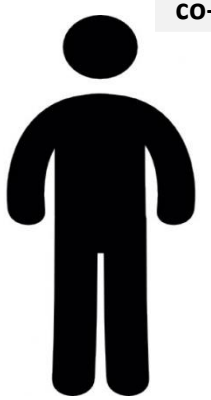
INTELLECTUAL
PROSPECTOR
MONITOR

- **Intellectual** – Once again I agree with this point, I am a much more practical person than intellectual one, preferring to perform the jobs.
- **Prospector** – Apart from the enthusiasm and working under pressure, I am not very good at improvising and I tend to be a little bit more serious while working.
- **Monitor** – I do not like to be always controlling the work of my team member. I usually trust in my colleagues work, being always willing to help in what is necessary.

JOSÉ DE MELLO SAÚDE

Individual Report : Key Learnings – João Santa Bárbara #2274

This project was extremely important for me, not only to strengthen my abilities and professional qualities as well being a strong personal experience of learning and co-working with the group members.



PERSONALITY

Motivation

Sometimes during a project, I learned that it is difficult to be 100% motivated. Since we do not depend just on ourselves for the work to be done, sometimes we have to wait for the client's availability, which may impact our motivation. In such situations it is crucial to be patient and try to do the most with the information we have, even if it is not so valuable to the project.

Feedback

Due to our weekly meetings with Dr. João Costa Macedo, and our three steering committees, the group was constantly receiving feedback about our work. Something that really helped us improve and avoid future mistakes. Moreover, it made understand that one should not demotivate with the feedback received, but try to find ways of improving.

Team Work

This was with no doubt one of the best learnings I had during this project. The opportunity of working every day with the same people made me aware of both the difficulties and the benefits of working in teams. However I am sure that these difficulties were successfully surpassed

PROFISSIONALY

Syndication

One of the main takeovers I had from this consulting project was the importance of syndication, to be in the client's page. In order to do so, it is fundamental to create a good relation with the client and listen to their feedback. The group had weekly meetings with client, and the creation of a good relationship and to listen more and speak less was crucial for the project's success.

New Concepts

In this thesis I had to study about a subject which I was not very comfortable about (due to my finance background), logistics. However, I understood that the bigger the challenge, the more satisfaction I get. Moreover I found out that I am very flexible person, always willing to learn new concepts.

Communication Skills

We had to perform three different presentations to some of our client's managers and administrators. This was with no doubt a big test for me, due the audience's importance as well as the willing to succeed. Now, I am more comfortable in presenting my work to other people, something that it will be a plus in my professional life.

Individual Report : Belbin Results – Leonor Roquette Rodrigues #2731

The results of Belbin Model helped me to understand which role I perform . It had also helped to understant which were my stregths and weakenesses as a team member that I could improve throughout the project and in the future.

TOP 3

OPERATIONAL
PROSPECTOR
TEAM WORKER

- **Operational** – I feel that my specialized knowledge in mathematics it was helpful to get the work done.
- **Prospector** – I consider myself a very curious and creative person, that is always trying to come up with new ideas and approaches.
- **Team Worker-** Help the team to get the work done, by being versatile to identify the work required and complete it on behalf of the team. I consider myself very co-operative, perceptive by listening my colleagues.

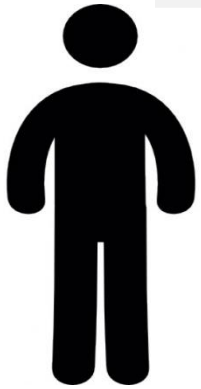
BOTTOM 3

STRATEGIST
FINISHER
MONITOR

- **Strategist** – Sometimes I have difficulties the team's ideas and concepts into practical actions and plans.
- **Finisher** – Not the best person to ensure that have been no errors or omissions. Don't pay attention to the smallest of details.
- **Monitor** – Sometimes I feel that I can lack the drive and ability to inspire others, and also be to much critical

Individual Report : Key Learnings – Leonor Roquette Rodrigues #2731

This opportunity it will be for sure helpful for both my professional and personal life, here are some takeaways from this project.



PERSONALITY

Team Work

To be able to work and adapt to different stituations when working in a team is crucial. By working with others we learn more about ourselves, what we do best and what we have to improve.To find balance between good realtionship with the team and also the ability to set moments to focus on developing the work.

Knowledge

One of the things that I liked the most about this porject was everything that we have learned in such a short time. Every day we would learn something new, and this was what most motivates me in the development of this project. There was no typical day of work, every day we had something different to do.

Resilience

By having this opporutnity I was able to learn how to be more patient and resiliente when facing problems. I t made me see how to turn some problems into challanges and turn aroud some “hard” situations.

PROFISSIONALY

Analytical Skills

Able to use what I have learned from all the years that I have study to solve real work problems.Capable to be creative, efficient and effective when working and showing my point of view.

Client’s Purpose

By working at JMS I realized that one of the most important charateristics a consultant may have is to clearly understand what is the objective of the work. Try to see the “big picture”. Everyday the clientes may tell us diferente things to do or solve. We need to be able to prioritize what it needs to be done.

Receive Feedback

To have constant feedback is a window for improvement. By having daily feedback with João Costa Macedo we were able to clearly understand each step of the project, and to know what we were doing right and wrong. This is a great way to avoid mistakes but most of all to know how to do it in future cases.

Individual Report : Belbin Results – Maria Carvalho #2605

These results from the Belbin analysis were really helpful and interesting in order to confirm the personal characteristics that were more impactful during this project in terms of the work itself and the role and relationship in the team. The results were aligned with what I was expecting.

TOP 3

OPERATIONAL
PRESIDENT
TEAM WORKER

- **Operational** – For me, it is very important and it works really well to be very practical and methodic in order to achieve the perceived goals.
- **President** – I really think that it is key to organize the activities and tasks that have to be done by the group and prioritize them by the level of importance and the deadlines. That was a role that I, regularly, performed with my group.
- **Team Worker** – Share my ideas with the group member, listen to their different point of views and try to balance them to find the best solution. In addition, create a good, comfortable and healthy group environment.

BOTTOM 3

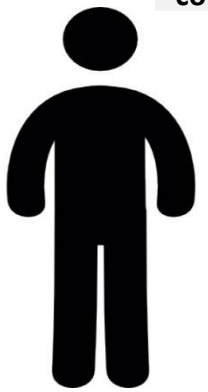
INTELLECTUAL
FINISHER
MONITOR

- **Intellectual** – Since I usually follow more practical and operational ideas, I don't usually study other options more deeply because when I feel the group is on the right path I tend to relax.
- **Finisher** – Low levels of perfectionism, usually trust a lot in the other group members work without seeing it with much detail.
- **Monitor** – Not used to look to all the other options, I usually have a very creased point of views but I´m not used to control very much with the other group member are doing .

JOSÉ DE MELLO SAÚDE

Individual Report : Key Learnings – Maria Carvalho #2605

This project was extremely important for me, not only to strengthen my abilities and professional qualities as well being a strong personal experience of learning and co-working with the group members.



PERSONALITY

Challenge

At the beginning all the project was a truly challenge since it was the first time that I had a more long lasting experience in a real company and I really wanted to present good results to a project that at the beginning looked so complex. It was important to have the ability of being open to learn, curious, adapt to the situation and the environment and to search more than the supposed.

Receive Feedback

During the whole project, it was essential to properly receive feedback, not only from our supervisors but also from our colleagues. Sometimes it is very difficult to accept that I did something worst than you I was expecting but in a project that involves so many points of view and different people, I had to learn to listen to the ideas and learn with them.

Team Work

This was one of the strongest key learnings of this 3 months. We had to work daily with the same persons, it was very important to create a healthy environment where we could share ideas, solve problems and work, but at the same time, have fun and feel comfortable with each other. It is very important for the success of the project the spirit that the team creates and they way we worked together.

PROFISSIONALY

Problem Solving

Having the problem solving mindset is not evident. For a consulting project, it was key for me to gain this characteristic. Face the problems with a more analytical and critical way. I had the opportunity to strongly develop Excel and Power Point skills and all the concepts learned in the university and, at the same time, stimulate my creativity to assemble solutions.

Syndication

For me, one of the bigger challenges was to learn and deal with the syndication. Trying to satisfy all points of view (the different parts of the client) and also the goal of the thesis was very hard. However, balancing and embracing different ideas were characteristics that I definitely developed with this experience.

Communication Skills

We had many different situations where we had to mature our communication skills, the 3 Steering Meetings, the weekly meetings with our advisor at JMS, the meetings with our professor and also the daily discussions with the group. It was important to define the way we organize our ideas and how we transmit it to the established audience.

Individual Report : Belbin Results – Sofia Bettencourt #1541

The Belbin Model has proved to be a fundamental tool for developing critical thinking about my strengths and weaknesses.
Helps improve my posture in a teamwork world, cultivate and strengthen strengths and improve weaknesses.

TOP 3

PRESIDENT
MONITOR
TEAM WORKER

- **President** – The fact that I already have professional experience, already having a family life, can help me in the role of president, the need for clear orientation and structuring of objectives so that I can satisfy all personal, professional and academic activities as well as possible. At the professional level I have already been a team leader. I think I'm a good communicator and coach.
- **Monitor** – Whenever possible, I seek to provide strategic and critical insights
- **Team Worker-** I have a good interpersonal relationship. I manifest and try to lead to a good team spirit. I am attentive to the needs of the team

BOTTOM 3

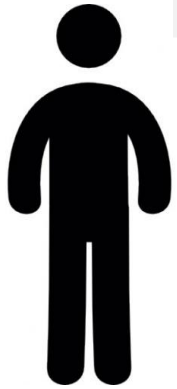
FINISHER
OPERATIVE
INTELECTUAL

- **Finisher** – The fact that I sometimes be too perfectionist cost me some difficulty in coordinating the time to complete a work by paying attention to small details
- **Operational -** Sometimes I have a very own way of organizing my work to reach the ultimate goal
- **Intelectual** – I am a very practical person in decision making. However, I am aware that having an intellectual edge can lead to a good capacity for strategic and creativity thinking. It will be a strand to invest.

JOSÉ DE MELLO SAÚDE

Individual Report : Key Learnings – Sofia Bettencourt #1541

This project presented itself as a great challenge for me. A completely different job that I've developed until then. It allowed me to put into practice knowledge learned in different subjects taught during the masters. In addition it allowed a great learning with the rest of the team. It was a team that worked very well, solidary and with camaraderie. It was a great example of a successful working group. Without doubt, I have a very positive conclusion in terms of learning and team spirit.



PERSONALITY

Team Work

No doubt I think this team was a different team. In fact each with different characteristics, extensive knowledge, we had the ability to take advantage of the best that each one had and add its value to the work. Opinions were given and accepted. The ideas and doubts were discussed without disorder and negative discussion. I learned a lot with all the elements, strengthened my ability to team work.

Knowledge

No doubt my knowledge was greatly enriched. Consulting Lab made me a wealthier person in terms of logistics knowledge. One of my goals would be to combine health and management knowledge. Nothing better than this project to put into practice what I learned in my academic journey. In addition, I am strengthened by all the support and knowledge provided by the members of JMS who have worked directly with us. They were extremely available and provided us with the reality of day-to-day logistics in the health area.

Receive Feedback

At this level I think we have dealt with a very positive reality. All the feed-back we were receiving were constructive reviews. It is extremely important to know how to listen, analyze and put into practice the issues that are transmitted to us. The world of work is this, we are different, we think differently. We must know how to accept judgments (positive or negative) and withdraw some learning.

PROFISSIONALY

Problem Solving

Knowing how to solve a problem of this magnitude in a given period of time was challenging. I had never come across this need (of this nature). So I felt compelled to develop some problem solving skills with a critical and creative sense. This project involved the use of tools of extreme importance in the world of work, such as Excel and Power Point. Knowledge acquired during the master's degree showed to be extremely important and with great practical applicability.

Client's Goal

There is no better result than the customer satisfied. I realized that with the project. It was gratifying, after all the work developed, we came across the positive feed back on the part of the client. Feeling of duty fulfilled. However it is a challenge to work on each piece in order to build the right puzzle.

Communication Skills

Communication skills were developed and improved throughout the development of the project. The first meeting with the administration was more difficult to develop by the nervousness triggered by the communication of ideas to the administrators. However, with the help of the advisors JCM and FL as well as our teacher we learn how we should convey some ideas. Without a doubt, communication is a tool of great value in the world of work.

Individual Report : Belbin Results – Vera Salema #2515

The results that I obtained by doing the Belbin Model helped me to understand what is generally my role in a group work, and more particulary in this project. By knowing my top 3 and bottom 3 characteristics, I know what I should try to improve in the future in order to perform better when working in a team.

TOP 3

OPERATIONAL
MONITOR
FINISHER

- **Operational** – I consider myself a very organized person who likes to work methodically. For me it is essential to firstly clearly define the final goal and the tasks needed to be performed in order to achieve that objective.
- **Monitor** – I identify myself with this role as when making decisions I generally like to think about all the possible options and judge them accurately. This leads me sometimes to take much time to come up with a final decision which can be a problem when working under pressure. Moreover, I always give my opinion and listen the others' opinions as well, which I think is essential when working in a team.
- **Finisher –** I think this is a characteristic that describes me very well as I am a really perfectionist person and normally after the work is done, I like to see everything paying a huge attention, in order to guarantee that there are no errors or omissions and everything is correct.

BOTTOM 3

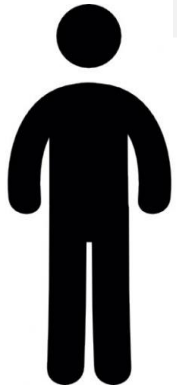
PRESIDENT
PROSPECTOR
INTELLECTUAL

- **President** – Although I am a really organized person who likes to have the objectives and tasks clearly defined in order to finish all the work before the deadlines, sometimes I am not the most proactive person when diving the tasks between the group.
- **Prospector** – Although I am a social and enthusiastic person I tend to be sometimes a bit serious while working. I like to have everything under control and I am not the most creative person, able to come up with different ideas. Moreover, I am not really good at improvising.
- **Intellectual** – I think I am a very practical and objective person and although I like to consider many options in order to make a decision, I am not generally the kind of person who is able to think differently and come up with creative ideas.

JOSÉ DE MELLO SAÚDE

Individual Report : Key Learnings – Vera Salema #2515

With the Consulting Lab, I was able to learn a lot about the professional world and have the opportunity to experience a real consulting project with a real client. Moreover, I was able to learn how to work in a team for a long period of time on a daily basis and improve my ability of dealing with the others' feedback . I am sure that this opportunity will contribute a lot to my future in the consulting area.



PERSONALITY

Team Work

This experience really made me to improve the way I work in a team. I was able to understand the huge importance of being cooperative, give my opinion but also listen others' opinions. During the project I think that we were able to understand the strengths and weaknesses of each one. Moreover, knowing the strengths of each one, we were able to take advantage of that during all the project when dividing the tasks. I believe that I learnt a lot with my team.

Knowledge

I think the Consulting Lab is the perfect way to learn more about the professional world. By having a real project with a real client I feel that I learnt a lot during this three months. We are really lucky because we had the opportunity to be in contact with amazing professionals inside JMS which strongly contributed to our learning experience. With this project I was able to learn a lot about the health sector and about logistics which in my case was great as I have never done any logistics course at university.

Receive Feedback

This was one of the most important lessons that I take from this experience. Sometimes it can be difficult to deal with others' critical judgement about my work but it is a reality that I will face during all my career. Therefore, I think it is essential to handle different opinions about what I do. It is really important to listen others ideas and learn with them.

PROFISSIONALY

Problem Solving

With the Consulting Lab experience, I was able to improve my way of thinking when solving a problem and develop my creativity to find right solutions for the client. Through the project I became more critical when analyzing problems and improved my analytical skills. I truly believe that this project helped me to develop a lot my Excel and PowerPoint skills.

Client's Goal

In this experience I also learnt that the most important thing is to satisfy the final client. We had the opportunity to work really close with Dr. João Costa Macedo and although we always had two weekly meetings during the three months, it was not always easy to understand what the client wanted. Sometimes the client tells us different things and we just need to accept that and make the necessary changes even if that implies lots of additional work.

Communication Skills

By having the three Steering Meetings, I was able to improve my communication skills which I really think that can make a difference in my professional life. I strongly feel that I was getting better and more confident doing presentations over the project. Moreover, not only in our weekly meetings with JCM, but also when working in a team, I found really important to organize my ideas in a structured way in order to better communicate them to others.

AGENDA

1. Executive Summary
2. Methodology
3. Diagnosis
4. Cost Analysis
5. Recommendations
6. Individual Reports
7. References

7. References

1 - Sustainability Report José de Mello Saúde – 2015

2 - José de Mello Saúde Business Plan

3 - Stability Program 2016-2020 - Ministry of Finance

4 - http://blog.mahagestao.com.br/conferencia-do-recebimento-de-compra/

5 - Data from JMS with all consumptions and purchases (including suppliers and their lead time) made in each Hospital Unit from Oct 2015-Sep.2016

6 - Data from JMS with all unitary costs of processing a purchase order and an invoice per Hospital Unit in 2014

7 - Operations Management Slides from Alper Nakas, Session 12- NOVA SBE

8 - José Crespo de Carvalho (2010), "Logística e Gestão da Cadeia de Abastecimento", chapter 6

9 - José Crespo de Carvalho (2010), "Logística e Gestão da Cadeia de Abastecimento", chapter 3

10 – Data from JMS with all costs of external services and supplies per hospital unit for the year of 2014

11 – Data from JMS with all employees from the logistics department as well as its annual salary and job type for the year of 2016

12 – Study from JMS with the number of warehouse managers per activity type and per hospital unit for the year of 2014

13 - These costs were calculated in a government simulator (http://www.act.gov.pt/%28pt-PT%29/CentroInformacao/Simulador/Paginas/default.aspx). It was assumed that the workers had been 15 years in the firm and had already used their vacations.

14 - https://www.acp.pt/ResourcesUser/files/OClube/TurismoLazer/Viajar_de_Carro/Portagens.pdf

15 - http://www.precoscombustiveis.dgeg.pt/

16 - http://www.jetexpress.pt/servico_estafetas.php?id=14

17 – https://geert-hofstede.com

18 - "A transição na gestão da mudança", available in https://books.google.pt