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E-Commerce Shipping Platform

in a Portuguese Shipping Company

Rafael Veríssimo Santos

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

NOVA Information Management School
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E-COMMERCE SHIPPING PLATFORM
IN A PORTUGUESE SHIPPING COMPANY

by

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Master Project presented as partial requirement for obtaining the Master's degree in Information Management, with a specialization in Information Systems and Technologies Management

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DEDICATION

For my wife Martina, my son Lucaas, my parents Fernando e Maria do Carmo and my brother Fábio.

À minha esposa Martina, ao meu filho Lucas, aos meus pais Fernando e Maria do Carmo e ao meu irmão Fábio.

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These last two years were a result of a great journey, with many obstacles that were, sometimes, very difficult to overcome. But accomplishing this goal is the culmination of another stage in my life: the completion of my Master Degree.

Finishing this stage, I would like to thank all the people close to me who helped me to accomplish it, especially:

To my wife, who supported me all the time, especially in the last year during the elaboration of this document, which forced many weekends lost locked at home, in addition to all constraints associated with COVID-19.

To my son, who has not yet been born but gave me a big boost of motivation to finish this stage to have more time for him.

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ABSTRACT

The globalization supported with internet evolution is creating a new open door for many traditional industries. One of them is the shipping industry. Online platforms are transforming this industry in an industry available 24/7 and worldwide for clients as well, since the vessels never stop. With containers distributed all around the world and all countries needing to import cargo to achieve some primary internal demands, the shipping industry is reinventing its way of working, creating e-commerce platforms. In this specific project, the goal will be to create a conceptual model of an e-commerce shipping platform for a Portuguese Shipping Company, being an opportunity to reinforce its presence in the national market and to expand to international market. This conceptual model was created based in the platforms existent in the market and validate with published articles. This model was discussed with the stakeholders to adapt it to the reality of the market. An analysis was performed in order to determine the best solution to implement this platform, looking for the cost and the adaptability. Of course, results will show that the cost and adaptability do not go in the same direction, and could be a point to analyse while looking for a better solution in long-term.

KEYWORDS

Shipping Company; E-commerce; Internet; Shipping Platform

RESUMO

A globalização em conjunto com a evolução da Internet abre novas portas para diversas indústrias tradicionais. Uma delas é a indústria do Transporte Marítimo. As plataformas online estão a transformar esta indústria numa indústria disponível para clientes de todo o mundo 24 horas por dia, 7 dias por semana, sendo que os navios nunca param. Existem contentores distribuídos pelo mundo inteiro e todos os países necessitam de importar mercadoria para responder a alguma necessidade primária que tenham e a indústria do transporte marítimo tem-se reinventado na forma como trabalha criando plataformas de *e-commerce*. Neste projeto especificamente, o objetivo será criar um modelo conceptual de uma plataforma de transporte marítimo para *e-commerce* para ser utilizada numa empresa portuguesa de transporte marítimo, sendo uma oportunidade para reforçar a sua presença no mercado nacional e, ao mesmo tempo expandi-la para o mercado internacional. Este modelo conceptual foi criado baseado nas plataformas já existentes no mercado e validado através dos artigos publicados. O modelo foi discutido com os *stakeholders* de forma a adaptá-lo à realidade do mercado em questão. Também foi analisada qual seria a melhor solução a ser implementada na perspetiva de custo e de adaptabilidade, sendo que os resultados mostram diferenças entre a perspetiva do custo e da adaptabilidade, tornando-se um ponto a analisar quando for estudada qual a melhor solução a longo prazo.

PALAVRAS-CHAVE

Empresa de Transporte Marítimo; *E-commerce*; Internet; Plataforma de Transporte Marítimo

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LIST OF ABBREVIATIONS AND ACRONYMS

TEU	20-foot equivalent unit
E-commerce	Electronic commerce
B2B	Business to Business
B2C	Business to Consumer
C2C	Consumer to Consumer
O2O	Online to Offline
KPI	Key Performance Indicators
CRM	Customer Relationship Management
LCL	Less than Container Load
FCL	Full Container Load
BL	Bill of Lading
eBL	Electronic Bill of Lading
EDI	Electronic Data Interchange
ETA	Estimate Time of Arrival
VGM	Verified Gross Mass
SOC	Shipper Owned Container
IMO	Dangerous and Hazard cargo classified by International Maritime Organisation
LCDP	Low Code Development Platform

1. INTRODUCTION

1.1. CONTEXT AND MOTIVATION

In the last years, international commerce has been suffering changes. The globalization resulted in 793 million TEUs handled in container ports and 11 billion of tons moved worldwide in 2018. These numbers represent about 90% of the total trade volume, excluding crude oil. The prevising of growth from 2019 to 2024 is 3.4% per year, which results in a sector in constant expansion but dependent of industry growth and international relationships between the countries (UNCTAD, 2020).

On the other hand, with the evolution of Internet, we can observe a growth of the utilization of e-commerce platforms being present in almost all areas of the market, B2B (Business to Business), B2C (Business to Consumer), C2C (Consumer to Consumer) and O2O (Online to Offline). The Internet creates the opportunity to have a 24/7 business availability and gives new services to the clients (Lu, hung Lai, & Cheng, 2007).

With these two factors combined and also the market of containers, we are talking about a market with a total capacity of all vessels of 24.133 million of TEUs, where 80.7% of TEUs are handled by the TOP 10 biggest shipping companies in the world (Alphaliner, 2020). This creates a situation in which the smallest shipping companies experience some difficulties and are obliged to evolve to survive in the market.

The shipping industry is a traditional industry with many years in the world and with more than twenty parties involved in the process. This process is mainly done by telephone and e-mail, using many artificial documents that have no legal value, creating several errors and low efficiency that affects the parties' business (Ying et al., 2016). The number of Portuguese shipping companies is small, and the market is supplied by international companies. This makes the Portuguese Companies need to reinvent themselves and create new ways to work with their clients and to reach more international clients with whom sometimes the physical presence is not possible.

This project will be about a Portuguese Shipping Company that carries domestic cargo from Portugal mainland to Azores and to Madeira and international cargo from Spain and Portugal to Cape Verde and Guinee-Bissau. This company is the result of the merger of other companies that occurred in the past years, resulting in a biggest company working to consolidate his position in the market.

Since the universe of Portuguese shipping companies operating is small and none of these companies has any online platform to serve their clients, the creation of an online platform to be used in a shipping company will be proposed.

1.2. PROBLEM DEFINITION AND OBJECTIVES

The digitalization aligned with the growth of investment of the shipping companies is creating many alternatives to traditional ways for clients to book their containers to be shipped to any part of the world, since almost all shipping companies already have their platforms or have shared platforms. These strategies are increasing the difference of service offered by the companies to the clients, since the existence of an e-commerce platform can simplify the life of the clients. For some authors

the investment in e-commerce platforms can be seen as a way to survive in the evolution process of business technology (Ying et al., 2016).

The objective is to study how an e-commerce platform can be created to answer the needs of the Portuguese clients and at the same time some the needs of international clients, i.e., to understand what are their needs and the needs of the company to give the correct answer using the correct processes.

How to create an E-Commerce Shipping Platform for a Portuguese Shipping Company?

To answer this question, we propose the following objectives:

Research Objective 1: Identify what functions need to be present in the platform;

Research Objective 2: Identify the services offered by the other shipping companies;

Research Objective 3: Identify the company's stakeholders;

Research Objective 4: Propose a conceptual model;

Research Objective 5: Develop an artifact to help in the decision-making of an e-commerce platform;

Research Objective 6: Evaluate the artifact.

1.3. METHODOLOGICAL APPROACH

The investigation methodology of Design Research Methodology (DSRM) will be adopted and to achieve the objectives of this thesis the following methods showed in Table 1 will be used:

Table 1 - Methodological Approach and Objectives

	Objective	Method
RO1	Identify what functions need to be present in the platform	Literature Review
RO2	Identify the services offered by the other shipping companies	Evaluation of e-commerce platforms o the biggest shipping companies
RO3	Do a stakeholder analysis	Do a stakeholder analysis
RO4	Propose a conceptual model	Develop a conceptual model based in Literature Review and the information collected
RO5	Develop an artifact to help in the decision-making of an e-commerce platform	Create a multicriteria evaluation artifact
RO6	Evaluate the artifact	TCO study Multicriteria evaluation with practitioners

1.4. THESIS STRUCTURE

This document will be organized using the normal organization of master thesis, divided in six parts.



Figure 1 - Thesis Structure

The first section is the Introduction, where there is a contextualization of the problem, the definition of the Problem, the objectives to resolve it and the methods used. The second section is the Literature Review where will be reviewed the most important literature about the subjects approached in this thesis and will be done the state of the art. The third section is the Methodology, where will be explained the methodology adopted to resolve the problems, the methods used for each phase and will be presented the conceptual model. In the fourth section we can find the results of all work done to evaluate the solutions to implement the conceptual model. The fifth section will be the discussion of the results, where we discuss the evaluation done and choose which is the best solution. In the sixth section will be presented the conclusions of this thesis and all limitations found during its realization.

2. LITERATURE REVIEW

In this chapter we will present the theoretical concepts that will be used during this thesis to justify the answers to the question and help the construction of the conceptual model.

2.1. E-COMMERCE PLATFORM

The E-Commerce is the way of electronic for buying or selling, servicing of customers, collaboration with business partners, conduct of transactions over the Internet, intranets or extranets (Peñaloza, Brooks, & Marche, 2007). E-commerce is being developed over time, since the six biggest container companies are implementing ways of e-commerce in their systems, intranet, with the objective to optimize their operations. With the evolution of the Internet this process began to open to a customer perspective to create new market opportunities. The E-Commerce began to be considered a competitive advantage, since having E-commerce in the company can result in fewer costs and better performance.

E-Commerce gives the hypothesis for the clients to create an online booking with some advance, that offer the company the opportunity of having a better planning of their schedules knowing the demand previously. This planning can result in reducing operational costs of the shipping companies and at the same time increasing the profits, because the best price of slot costs to the customer can be calculated. This way, companies adjust the price to the customers and at the same time plan the schedules depending on the bookings that they already have. This can improve their relation with the clients as well as increase competitiveness they since are always adapting depending on the needs of the market. (Hu, Huang, & Zhao, 2019)

These E-Commerce platforms give the opportunity to customers consult the sailing schedule, create or checking their bookings, tracing containers and some of them checking the shipping space. These platforms do not only improve the productivity of the shipping companies but improve their clients' productivity too. With the necessity of interchanging data, many of them use electronic data interchange (EDI) to facilitate the flow of information between the parties. All of these processes of e-commerce result in reducing many physical documents since all companies are working together, sometimes with customs authorities, to the digitalization of the documentation. (Lun & Quaddus, 2011)

For authors Lun & Quaddus (2011), that studied if the firm size and the firm performance are affected by e-commerce based on diverse reasons, what could motivate the firm to use tools of E-commerce in commercial activities was:

- Managerial staff and/or owner manager advocating;
- Top management willing to devote resources;
- Improvement in productivity;
- Reduction in communication cost;
- Boosting of the company image;
- Reacting more quickly to changes,
- Response to competitors' action;
- Demands or requests from customers.

The result of this study was that the biggest firms will have better performance, like we can see by the result of the SEM in this study.

The authors Peñaloza et al. (2007), that studied the evolution of E-commerce in containers companies between 1992 and 2002, noted that the importance of investment in e-commerce is growing, independently of the size of the company. These authors identify these platforms as B2B platforms where we can note that some differences between customers are created, that can be identified like key customers, business partners and others business partners. In this case we can note that there is a differentiation of treatment related to alternatives to e-commerce. Related with motivation, it does not change between 1992 and 2002, the main motivations continue being operational and cost efficiencies, customer-oriented motivations and competitive imitation. The barriers to the implementation of E-commerce had change, while in 1992 the barriers were very related with lack of knowledge about the e-commerce platforms, lack of technical people, high cost of the investment and resistance to change to the paper processes, in 2002 some barriers had changed to doubts about the cost-benefits, digital divide, lack of critical mass and the difficulties of e-commerce system with partners. The only barrier that had been maintained was the resistance to change to the paper processes. In 2002, companies' strategies were almost equal. They bet in e-commerce like a tactical tool in strategy implementation, developing e-commerce every day with the e-commerce becoming a business necessity to them.

The authors Ying et al., 2016 did a study about the e-commerce platforms available in China, that could help us to understand some features presented in these platforms. After doing a survey to people related with maritime transport, authors could see what were the most expected features to have in an e-commerce platform, in order of importance:

- On-line booking
- Cargo inquiry
- Arrival notice of cargo
- Freight rate inquiry
- Shipping schedule inquiry
- Ship's location inquiry
- Client service
- Document operating
- On-line payment

Only one feature had less than 50% of the proportion in the survey, on-line payment, that collected 47.6% of the respondents. But freight forwarders, that many times are the intermediary between the client (shipper or consignee) and the shipping company, have other factors to be used on the e-commerce platforms:

- Data updating
- Customer Management system
- Information's service level
- Customer's satisfaction
- Comprehensive strength platform
- Viscosity of the platform
- Platform awareness

After collecting all this data the authors (Ying et al., 2016) do a suggestion of e-commerce platform for a shipping company, that we will show only the suggestion to containerized cargo.

Table 2 - Suggestion of Conceptual Model

Description	(Ying et al., 2016)	(Lun & Quaddus, 2011)
Integrated E-commerce shipping platform		
Shipping capacity	X	X
Cargo inquiry	X	X
On-line operating	X	X
On-line payment	X	X
Customer Relationship management	X	-
Database service	X	-
Freight forwarder access entry	X	-
Shipping Capacity		
Type of Transportation	X	X
Description of Goods	X	X
Loading Port	X	X
Discharging Port	X	X
Loading Date	X	X
Cargo Inquiry - Liner Shipping Service		
FCL		
Type of Merchandize	X	X
Loading Port	X	X
Discharging Port	X	X
On-line Operating		
On-line inquiry		
Port code inquiry	X	X
Cargo code inquiry	X	X
Freight rate inquiry	X	X
On-line Document Printing		
On-line form	X	X
Shipping Order	X	X
Bill of Lading	X	X
Other Transportation Documents	X	X
On-line Booking	X	X
On-line Customs Declaration		
Export Declaration	X	X
Import Declaration	X	X
On-line insurance		
Insurance Forms	X	
Fill out online	X	
On-line Payment		

E-Billing		
Port Charge	X	X
Freight	X	X
Basic freight	X	X
Additional freight	X	X
E-invoicing		
Calculating	X	
On-line printing	X	X
Financial Settlements		X
Account Reconciliations		X
CRM		
Customer service		
The customer login	X	
Customer information	X	
Customer message	X	
On-line help	X	
Advertising	X	
Storage and Analysis of Customer information	X	
Customer Business Process	X	
Information Feedback	X	

For some clients, one of the most important functions is the tracking of their containers, which is why the most present function in websites is the cargo tracking. This function may provide different types of information to the client (Dimitrova, 2013). The majority of the websites can track the cargo using the container number, Bill of Landing number or booking number giving back some information like route, vessel, container and port information, other give the schedule or the transit time.

In the last years the companies are investing in the development of these platforms, creating new features for their clients and employees at the same time that they are creating environment and security polities based in the digitalization. For example MAERSK and IBM or Accenture, APL, Kuehne + Nagel and AB InBev are working since 2018 in a platform using Blockchain, (Chang, Iakovou, & Shi, 2020). These type of platforms are joining shipping companies to technology companies and, in some cases, clients too.

2.2. CRM

The first point of this thesis is the Customer Relationship Management (CRM). This concept is in a fast-growing, since it can help the companies in several segments and create the possibility of the companies to customize the service or the products that are offered to their clients. The biggest outputs of using a CRM in a company will be the improvement of the quality of the service and the capacity of the salesperson to make better decisions in favour of the client.(Yang & Nguyen, 2011). This CRM software can create a faster response to customer needs that is essential to survive in the market of container shipping, since it is a very dynamic market, which is why, many companies are adding online services to CRM (Durvasula, Lysonski, & Mehta, 2004). The evolution of technology and digitalization result in a new type of CRM, the e-CRM, which creates a tool that will be multinational, since is possible contact the company from any part of the world using only the internet(Caber, Aksu, & Albayrak, 2012).

In the following Table 3, it can be observed the benefits pointed by some authors related to the usage of CRM by order of importance for each of them. The words of each of them can be different, but we can see that all the authors reference the importance of having a good response time of each solicitation of the clients, searching for the feedback of the clients to improve continually, having the information the salesperson needs available every time to best answer the needs of the client and, at the same time, giving all information to the client about his cargo or complaint. The use of CRM will result in bigger satisfaction relationship with the client, which combined with better satisfaction level of service quality, segmentation of customers in five groups and high-quality sales representatives, will result in an increase of the likelihood of customer retention due. (Chen, Chiu, & Chang, 2017). The utilization of CRM will not be the only responsible for the better results of the company or the retention of the clients, but will be the software that will help the salesperson to have better information, give a better service to the client and at the same time give more information in less time and using less resources than before, which creates new opportunities to the company.

Table 3 - Benefits of CRM

	(Durvasula et al., 2004)	(Yang & Nguyen, 2011)	(Garg & Kashav, 2019)
1	Continually improves services	Customer feedback	Real time responsiveness and follow ups
2	Good on-time performance	Tracking of customer interaction	Proper assistance in case of accidents and damages
3	Efficient in complaint handling	Call management system	One platform for data sharing
4	Prompt availability of delivery status information	Help desk	Promotion of services through various modes
5	On-time pickups and deliveries	Customer self service	Creating user friendly interfaces
6	Effectiveness of tracking system	Contact management system	Customers' feedback after service
7	Has latest equipment / technology / facilities	Contact center	Ensuring safety of cargo and on time communication during transit
8	Settles claims quickly	Online media	Data integration
9	Informs promptly of any problems	Order management system	Real time responsiveness and follow ups
10	Has quality certification (ISO 9K)	Sales forecasting system	Proper assistance in case of accidents and damages
11		Website design	One platform for data sharing
12		Banner advertising	
13		Sales presentation	

3. METHODOLOGY

The methodology that will be applied in the project is based in the Design Science Research Methodology (DSRM) Framework. To understand better this framework, we can look first for a model of Nunamaker, Chen and Purdin presented in 1991 where they show an analysis of the objectives of IS research. (Jarvinen, 2000)

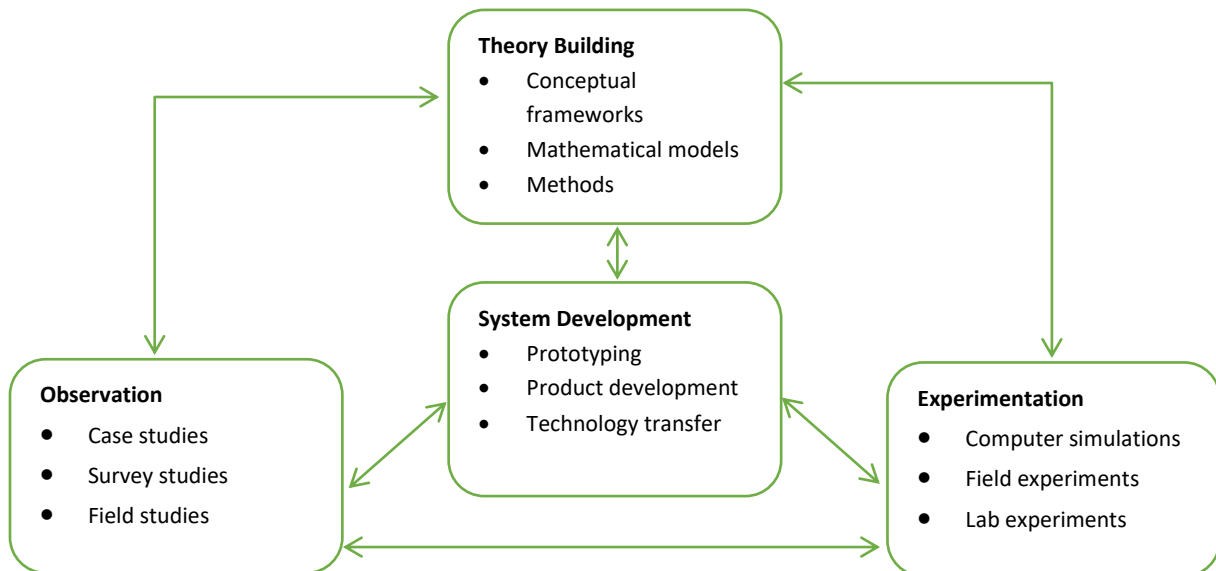
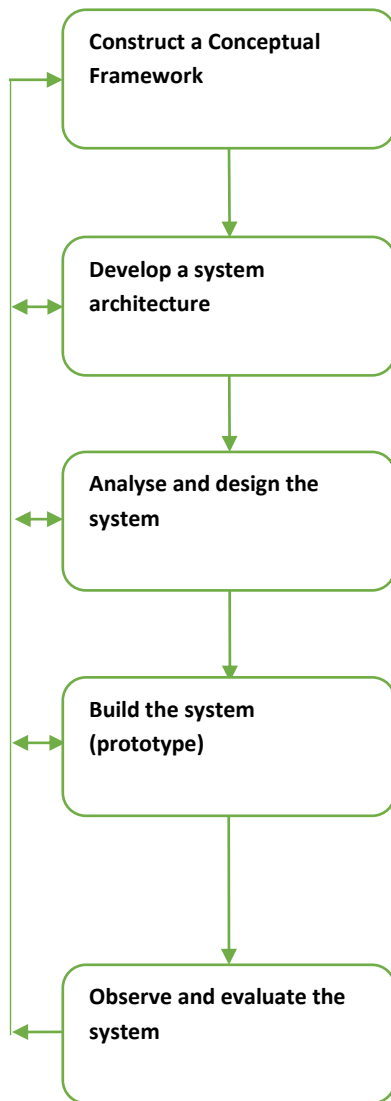


Figure 2 - Multi-methodological approach to IS research of Nunamaker, Chen and Purdin (1991)

The model represented before we need to understand that the central point of the process is the construction of the artifact. The utilization of this model in a System Development research process has the objective to find solutions to the problems existent. In social sciences we can find this objective too, where is determine a research problem, are created hypothesis, after that are formatted the research design, gathered data, analysed data and finally the results are interpreted like the hypothesis. This process used in social sciences was used too in the process of system development, this way the authors work in a framework that join the social sciences and the engineering of systems. For that the authors defended that this process should be divided in four methodologies that after that will be subdivided in sub-methodologies.

System Development Research Process



Research Issues

- State a meaningful research question
- Investigate the system functionalities and requirements
- Understand the system building processes/procedures
- Study relevant disciplines for new approaches and ideas
- Develop a unique architecture design for extensibility, modularity, etc
- Define functionalities of system components and interrelationships among them
- Design the databases/knowledge base schema and processes to carry out system functions
- Develop alternative solutions and choose a solution
- Learn about the concepts, framework, and design through the system building process
- Gain insight about the problems and the complexity of the system
- Observe the use of system by case studies and field studies
- Evaluate the system by laboratory experiments or field experiments
- Develop new theories/models based on the observation and experimentation of the system's usage
- Consolidate experiences learned

Figure 3 - A Process for Systems Development Research (Nunamaker, Chen, & Purdin, 1990)

This process helps to transform the action of building a system in a process of research too, since the action of just building a system are not research since is nothing justified.

In 2004 Hevner, March, Park and Ram presented a new framework to be used in information systems research. This framework has the objective of join two paradigms essential for information systems, the behaviour science and the design science. The behaviour science is essential to understand and predict human or organizational behaviour and the design science is essential to creating new and

innovative artifacts. This way the authors presented a new conceptual framework with clear guidelines.

The conceptual framework is divided in three parts, Environment, IS Research and Knowledge Base, being the IS Research sub-divided in two parts, Develop/Build and Justify/Evaluate.

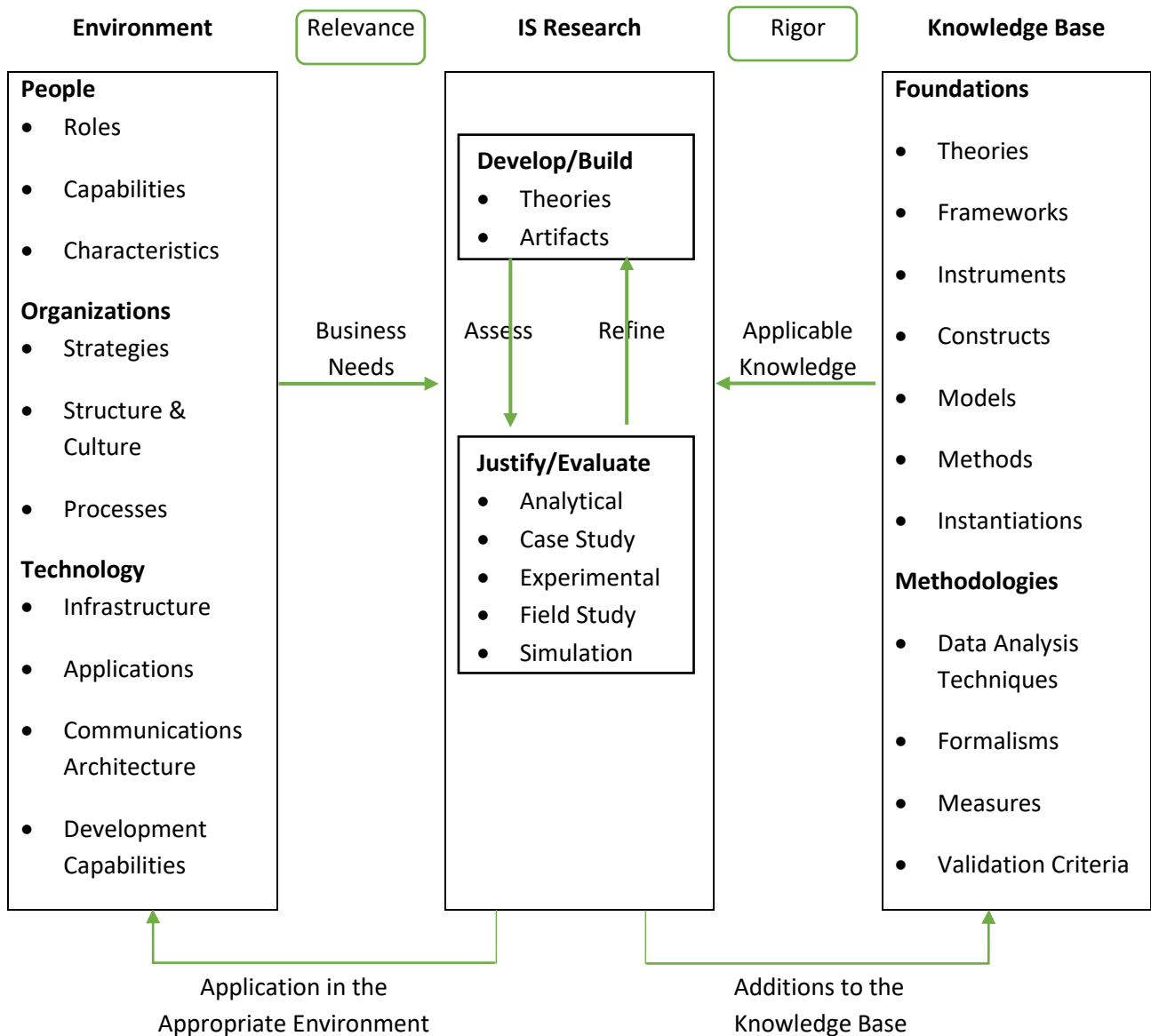


Figure 4 - Information System Research Framework (Hevner, March, Park, & Ram, 2004)

This framework indicates the need of knowing the people that will be affected by the result, the organization that will be intervened and the technology that is available, making it possible to understand the environment where this artifact will be developed. Besides that, to develop the artifact, there is the need to acquire knowledge from the information that already exists and the correct measures and validation criteria that must be used. Finally, the artifact will constantly be in development until it answers the problem, being this process called the IS Research (Hevner et al., 2004).

The Environment has the objective to define business needs or problem that will be resolved during the research, this problem must be framed to assure the research relevance. In IS research, will use the behavioural science to develop and justify the theories that explain the phenomena related to the identified business need, and after that the design science will be build and evaluate the artifact designed to answer the business need identified. Summarizing this process, the objective of behavioural science is to discover the truth and design science is to discover the utility that are complementary.

The knowledge has the objective of study results from reference disciplines to help with foundations used in develop and build phase of a research study and methodologies used in justify and evaluate phase. In this point the rigor is very important since it is only achieved by correct usage of foundations and methodologies.

The authors Vaishnavi and Kuechler presented in 2004 a list of processes of using DSRM that was composed by six phases that will be followed during this work.

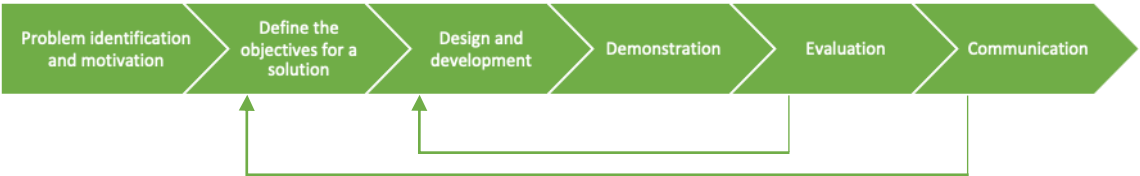


Figure 5 – The six phases of a DSRM Process

Table 4 - The six phases of DSRM Process with outputs

Phase	Activity name	Output
1	Problem identification and motivation	Lack of e-commerce platforms in Portuguese companies
2	Define the objectives for a solution	Develop an online portal for clients use
3	Design and development	Functions that be presented will be defined by the using of DSRM aligned with the literature review
4	Demonstration	Create the solution proposed with the company and validate if it answers the problems identified.
5	Evaluation	Confirm if all functions are answered to the objectives defined and if needed redesigned, define some future upgrades to the project.
6	Communication	Is the result of this document

3.1. CONCEPTUAL MODEL PROPOSAL

3.1.1. Stakeholder analysis

The starting point of this analysis will be identifying the stakeholders of this new platform, that will be divided in internal or external stakeholders. For the perspective of internal stakeholders (Figueiredo et al., 2012) we have the figure of the Board, the functional departments, and the company departments. From the external stakeholders we have the clients, the competitors, governments, and suppliers.

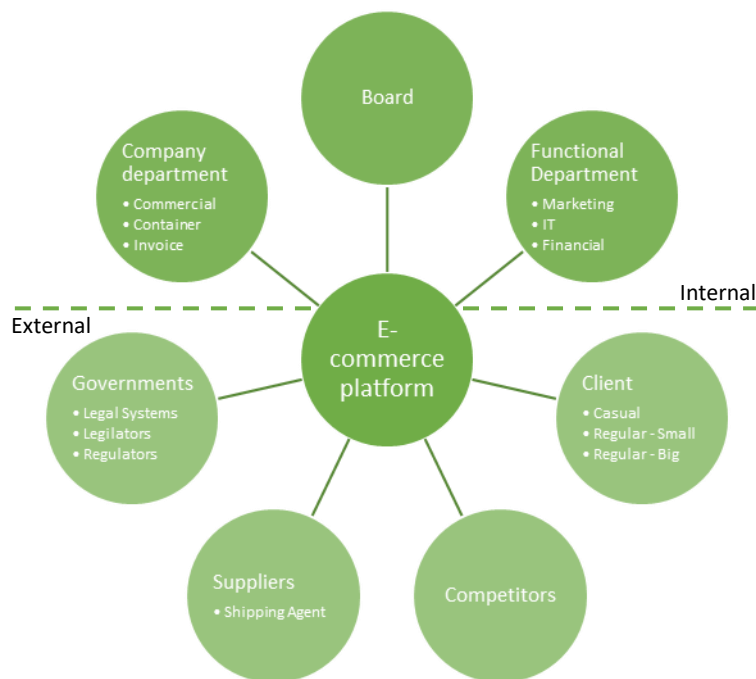


Figure 6 - Stakeholder Analysis

Using the figure 6 now we can classify the stakeholders by their influence and interest using the stakeholder matrix. The stakeholders that are classified as most high influence and interest are the commercial and container departments, that will be directly affected by the e-commerce platform, where they will be the two essentials to develop this platform with the collaboration of IT department, at the same time this platform must be centralized in the biggest clients' regulars.

The Board will be essential to the approval of this project, like the financial department and Marketing that will be essential to develop the layouts and divulgate all the information of this platform.

The Casual Clients and the small clients are not very influent but are important since that could be new clients that must be suffered investment to improve their performance and give opportunity to increase. The shipping agent since are different suppliers but at the same time develop this activity for different shipping companies, are used to adapt to new ways of work depending on the client, this way has high interest but low influence.

Finally, the legal system, legislators or regulators have the only influence that the platform must comply all the needs appoint for them.

Influence	High	<ul style="list-style-type: none"> • Board • Financial Dept. • Marketing Dept. 	<ul style="list-style-type: none"> • Client Regular – Big • Commercial Dept. • Container Dept. • IT Dept.
	Low	<ul style="list-style-type: none"> • Legal system • Legislators • Regulators • Competitors • Invoice Dept. 	<ul style="list-style-type: none"> • Client Regular – Small • Client Casual • Shipping Agent
		Low	High
		Interest	

Figure 7 - Stakeholder Matrix

3.1.2. Functions of E-Commerce Platform Observed

The first step to understand better what functions should be present in our conceptual model, is needed to analyse some e-commerce platforms of the biggest companies of the world, this way we can have an idea that what functions are usual to be offered to them clients:

Table 5 - Services Provider

Features	Websites													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Notification of containers ETA	X	X	X	X	X	X	X		X	X	X	X	X	X
Tracking Container/Booking	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Online Payment	X			X										
Request a change or correction in Booking	X		X	X	X	X			X		X	X		
Check the historic	X	X	X	X	X	X			X		X	X	X	X
Duplicate booking	X	X	X	X					X	X	X	X	X	X
Request approve of danger cargo	X	X	X	X	X	X			X	X	X	X	X	X
Send VGM	X	X	X	X	X	X	X		X	X	X	X	X	X
Verification of container Tare			X	X	X	X	X	X		X	X		X	X
Create a new booking	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Choose type of container (Dry/Reefer)	X	X	X	X	X	X	X	X	X	X	X	X		
Check Schedule	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Check cut-offs	X	X	X		X	X	X							
Confirm the BL	X	X	X	X	X	X	X		X	X	X	X	X	X
Print a BL copy not negotiable	X	X	X	X	X	X	X		X			X	X	X
Consult the legislation	X	X	X	X	X	X			X	X	X	X	X	X
Request a release of cargo	X			X							X			
Claim invoice	X								X					
Check and reprint invoices	X	X	X	X	X	X	X		X		X		X	X
Account statement	X	X	X				X				X		X	X
3rd party (agent) access	X			X										
Send a proof of payment	X													
Request a personalize quote	X	X	X	X	X	X	X	X		X	X		X	X
Instant quote	X	X	X	X	X	X								
Check taxes	X	X	X	X	X	X		X	X	X	X	X	X	X
EDI service	X	X	X	X	X	X	X			X				
Feedback area			X						X		X			
eBL	X										X			X
Check costs of Demurrage/Detention	X	X	X	X					X	X	X	X	X	X

Legend:

1. (Maersk Line, 2020)
2. (Mediterranean Shipping Company, 2020)
3. (COSCO SHIPPING Lines, 2020)
4. (CMA CGM, 2020)
5. (Hapag-Lloyd, 2020)
6. (ONE, 2020)
7. (Evergreen Marine, 2020)
8. (Unifeeder, 2020)

9. (Korea Martine Transport, 2020)
10. (Wan Hai Lines, 2020)
11. (Zim Integrated Shipping Services, 2020)
12. (Pacific International Lines, 2020)
13. (YangMing Marine Transport, 2020)
14. (Hyundai Merchant Marine, 2020)

Based on Table 5 it is possible to do the following frequency table, to help us understand the functions most present in e-commerce platforms.

Table 6 - Frequency table of functions existence

Function	Frequency	%
Tracking Container/Booking	14	100%
Create a new booking	14	100%
Check Schedule	14	100%
Notification of containers ETA	13	93%
Send VGM	13	93%
Confirm the BL	13	93%
Check taxes	13	93%
Request approve of danger cargo	12	86%
Choose type of container (Dry/Reefer)	12	86%
Consult the legislation	12	86%
Request a personalize quote	12	86%
Check the historic	11	79%
Print a BL copy not negotiable	11	79%
Check and reprint invoices	11	79%
Duplicate booking	10	71%
Verification of container Tare	10	71%
Check costs of Demurrage/Detention	10	71%
Request a change or correction in Booking	8	57%
EDI service	8	57%
Account statement	7	50%
Check cut-offs	6	43%
Instant quote	6	43%
Request a release of cargo	3	21%
Feedback area	3	21%
eBL	3	21%
Online Payment	2	14%
Claim invoice	2	14%
3rd party (agent) access	2	14%
Send a proof of payment	1	7%

In table 6 we could see the most common functions of the platforms explored, the option of tracking a container or a booking, create a new booking or check schedule, we can assume that are functions essential for all platforms, since that are presented in all of the platforms. Other functions that are essential but not present in every websites analysis, but presented in more than 70% of the websites are the reception of notification of containers ETA, send VGM, confirm the BL, check taxes, request

approve of danger cargo, choose type of container, consult the legislation, request a personalized quote, check the historic, print a BL copy, check and reprint invoices, duplicate booking, verification of container tare or check costs of Demurrage/Detention. Adding to these functions, we can consider that functions between 50% and 70% continuing to be essential, since at least half of the platforms have these functions, in this group we have request a change or correction in booking, EDI service and Account statement.

The other functions missing depending on from the type of the market of each company and the internal strategies, looking for each function. Check cut-offs is just adding a new field of date that could be easily updated this way helping the client without need contact by email or phone call doing the question, is not difficult to add and most of the time it only says "24 hours before the date of vessel ETA". But the instant quote, create the opportunity to have a quote where required by the client, without intervention from the commercial department, could be an advantage to the client, but need to be regularly updated for every origin and could be difficult since need a system to support all the information.

Request a release of cargo will substitute email exchanges or phone calls, since this could be important in the market in which this company is present, that have many small clients that need to be controlled. This substitution, allied with send a proof of payment or online payment, will help to optimize the process. The feedback area could be a helpful investment since it could give an idea of company performance, collecting opinion from the clients about the service provider and how it could be improved. The claim invoice will be a method of reducing the communications by email or phone calls, giving the opportunity to claim the invoice directly in the platform.

The eBL is a new way of companies working allied with policies of less paper and at the same time security. It is a technology emerging in the market, this way only a few companies have this type of technology. It could be compared to electronic invoices but in this case is about the BL, that is the most important document in shipping industry.

3.1.3. Conceptual Model

Based in the literature review and in the E-Commerce platforms observed, we can begin to create our conceptual model aligned with the needs of the market where this company is present. The first step will be to create some functional areas to aggregate the functions identified until now, after that the functions will be classified by the functional areas.

The functional areas chosen were:

- Booking Costs (BC) — this type of functional area has the objective of inform the clients of all the costs that all associated with their booking;
- Booking documentation (BD) — this type of functional area has the objective of the client providing all information to the company and confirm it to issue the documentation, at the same time giving the opportunity to request the correction of the information provider;
- Container Information (CI) — this type of functional area has the objective of informing the client about the equipment: what can be used and what are the characteristics;

- CRM — this type of functional area has the objective of reusing some information available in the e-commerce platform with the information provided by the clients that use the platform to provider a better customer service;
- Documents (D) — this type of functional area has the objective of providing all documentation needed in the process;
- Financial (F) — this type of functional area has the objective of providing all information about invoices, payment and give opportunity of clarifying some commercial dispute;
- Information about cargo (IC) — this type of functional area has the objective of providing all information about the shipment of cargo to the client;
- Information about the service (IS) — this type of functional area has the objective of providing all information about the service of the company to their clients;
- Legal Documentation (LD) – this type of functional area has the objective of providing all legal information/documentation to the client;
- Online Booking (OB) – this type of functional area has the objective of providing a service where the client can book online instead of by phone or email;
- Quote (Q) — this type of functional area has the objective of provider a service where the client can request a quote online in place of by phone or email.

After this division is possible to classify all the functions detected, analyse what stakeholders will use them and which technology can be used in which of them. Some functions were deleted since they were duplicated in the two tables or it is not possible to implement in the business model.

Table 7 - Functions detected categorized

Service	Types of Users	Functional Areas
Check costs of Demurrage/Detention	Clients, Agent and Container Dept	BC
E-Billing freight	Clients and Invoice Dept	BC
E-Billing Port Charge	Clients and Invoice Dept	BC
Confirm the BL	Clients and Agent	BD
Request a change or correction in Booking	Clients and Agent	BD
Send VGM	Clients and Agent	BD
Verification of container Tare	Clients, Agent and Container Dept	CI
Check the historic	Clients and Commercial Dept	CRM
Claim invoice	Clients, Commercial and Invoice Dept.	CRM
Customer Business Process	Clients and Commercial Dept	CRM
Customer information	Clients and Commercial Dept	CRM
Customer message	Clients and Commercial Dept	CRM
Feedback area	Clients and Commercial Dept	CRM

Service	Types of Users	Functional Areas
On-line help	Clients and Commercial Dept	CRM
Request a release of cargo	Clients, Agent and Commercial Dept	CRM
Storage and Analysis of Customer information	Clients and Commercial Dept	CRM
The customer login/3rd party (agent) access	Clients	CRM
eBL	Clients	D
On-line Bill of Lading Printing	Clients and Agent	D
On-line Shipping Order Printing	Clients and Agent	D
E-invoicing Financial Settlements	Clients and Invoice Dept	F
E-invoicing On-line printing	Clients and Invoice Dept	F
Send a proof of payment	Clients, Commercial and Invoice Dept.	F
On-line Payment	Clients and Invoice Dept	F
Notification of containers ETA	Clients and Agent	IC
Request approve of danger cargo	Clients, Agent and Commercial Dept	IC
Tracking Container/Booking	Clients	IC
Check cut-offs	Clients and Agent	IS
Check Schedule	Clients	IS
Shipping Capacity – Goods, Ports and transport	Clients, Agent and Commercial Dept	IS
Consult the legislation	Clients	LD
Choose type of container (Dry/Reefer)	Clients, Agent and Container Dept	OB
Create an on-line booking	Clients	OB
Duplicate booking	Clients	OB
EDI service	Big Clients	OB
Request a personalize quote	Clients and Commercial Dept	Q
Verify historic of quotes	Clients and Commercial Dept	Q

To adapt better this table to the needs of the company, it was presented to some people inside the company. They were chosen based in the position of management of the company and in the function, since the objective was always choosing the employees that will be benefited by the portal or that have more hours with the clients to understand better what clients need or what they need to answer to the clients.

During this process, it was possible to understand that inside the company there are different processes or needs for different segments of the market, that create some challenges to create a universal portal for all the markets. However, the company understand the needs of going online in order to follow the digitalization of the market, but not closing the door to traditional clients, that don't have access to digitalization.

After the meetings was created a new table of the needs of the portal to the company.

Table 8 – Functions chosen after meetings

Service	Types of Users	Functional Areas
Home Page	All register users	DH
Check costs of Demurrage/Detention	Clients, Agent and Container and Commercial Dept	BC
Confirm the BL	Clients and Agent	BD
Request a change or correction in Booking	Clients and Agent	BD
Verification of Container Tare and Payload	Clients, Agent and Container Dept	CI
Check the historic	Clients and Commercial Dept	CRM
Claim invoice	Clients, Commercial and Invoice Dept.	CRM
Customer Business Process	Commercial Dept	CRM
Customer information	Clients and Commercial Dept	CRM
Customer message	Clients and Commercial Dept	CRM
Online Help	Clients and Commercial Dept	CRM
Request a release of cargo	Clients, Agent and Commercial Dept	CRM
Storage and Analysis of Customer information	Clients and Commercial Dept	CRM
The customer login/3rd party (agent) access	Clients	CRM
eBL	Clients	D
On-line Bill of Lading Printing	Clients and Agent	D
On-line Shipping Order Printing	Clients and Agent	D
E-invoicing Financial Settlements	Clients and Invoice and Commercial Dept	F
E-invoicing On-line printing	Clients and Invoice and Commercial Dept	F
Send a proof of payment	Clients and Accounts Receivable	F
Payment Receipt On-line printing	Clients and Accounts Receivable	F
On-line Payment	Clients	F
Notification of containers ETA	Clients	IC
Request approve of danger cargo	Clients, Agent and Commercial and Operational Dept	IC
Tracking Container/Booking	Open to all	IC
Check cut-offs	Open to all	IS
Check Schedule	Open to all	IS
Consult the legislation	Open to all	LD
Choose type of container (Dry/Reefer)	Clients, Agent and Container Dept	OB
Entities available	Clients, Agent and Commercial and Invoice Dept	OB
Create an on-line booking	Clients, Agent and Container and Commercial Dept	OB
Duplicate booking	Clients, Agent and Container and Commercial Dept	OB

Service	Types of Users	Functional Areas
EDI service or CSV files	Clients, Agent and Container and Commercial Dept	OB
Request a personalize quote	Clients and Commercial Dept	Q
Verify historic of quotes	Clients and Commercial Dept	Q
APP Mobile	Clients	

Related to the significance of the functions during the meetings with the practitioners was asked to the people implicated to answer to a small poll between 1 and 5, to understand what functions should be implemented firstly. Some functions cannot appear in this table, since it was decided to add after the pool was realized.

Table 9 - Function Significance

Service	Significance
Tracking Container/Booking	5
Check Schedule	5
Check cut-offs	5
Confirm the BL	4
Create an on-line booking	4
Choose type of container (Dry/Reefer)	4
The customer login/3rd party (agent) access	4
Customer message	4
E-invoicing Financial Settlements	3,67
E-invoicing On-line printing	3,67
Customer information	3,67
Check costs of Demurrage/Detention	3,67
APP Mobile	3,33
Duplicate booking	3,33
EDI service or CSV files	3,33
On-line Bill of Lading Printing	3,33
Notification of containers ETA	3,33
Request a release of cargo	3,33
Requests approve of danger cargo	3,33
Request a change or correction in Booking	3,33
eBL	3
Storage and Analysis of Customer information	3
On-line Shipping Order Printing	3
Verification of Container Tare and Payload	3
Online Help	2,67
Request a personalize quote	2,67
Verify historic of quotes	2,67
Check the historic	2,67

Service	Significance
Entities available	2,33
Send a proof of payment	2,33
Customer Business Process	2,33
Claim invoice	2,33
On-line Payment	1,67
Consult the legislation	1,33

Based in table 9 it is possible to conclude that the most important functions to the portal were the functions related with tracking container or booking, consulting the dates of the services, create bookings online and confirm them and inform clients using messages from company to them. Those are the essential functions to clients use the portal, since are done every day by email or by phone. Despite this conclusion based in significance, the company admit that nowadays all the functions are important, since most of them are offered in the market and are to be presented to company to continue competitive in the market.

3.1.4. UML Model

For understand better all interactions of the users with the functions select by the stakeholders in table 9, was created a use case diagram of the portal, figure 8. In this figure we can observe the functions and how to interact between them. Many of the functions depend on the login since the users must have a login to control the accesses.

The users represented in the figure are most of the people that interact with the process of transport a container, begin in the client, that will interact with various roles of the company and end with the client. These functions will be more detailed in the processes, since the objective of these functions is a generalization of all the processes involved in the portal.

Not all of the functions will be a process on portal, this way we have some users with a reference “by system”, these functions will be done by the users using a system that already is implemented in the company and these actions will result in answer from the portal. Since the objective of this portal is not substitute the system already implemented but create a new approach to the client, adding a new door to them that will be connected with the system already used in the financial and operational processes.

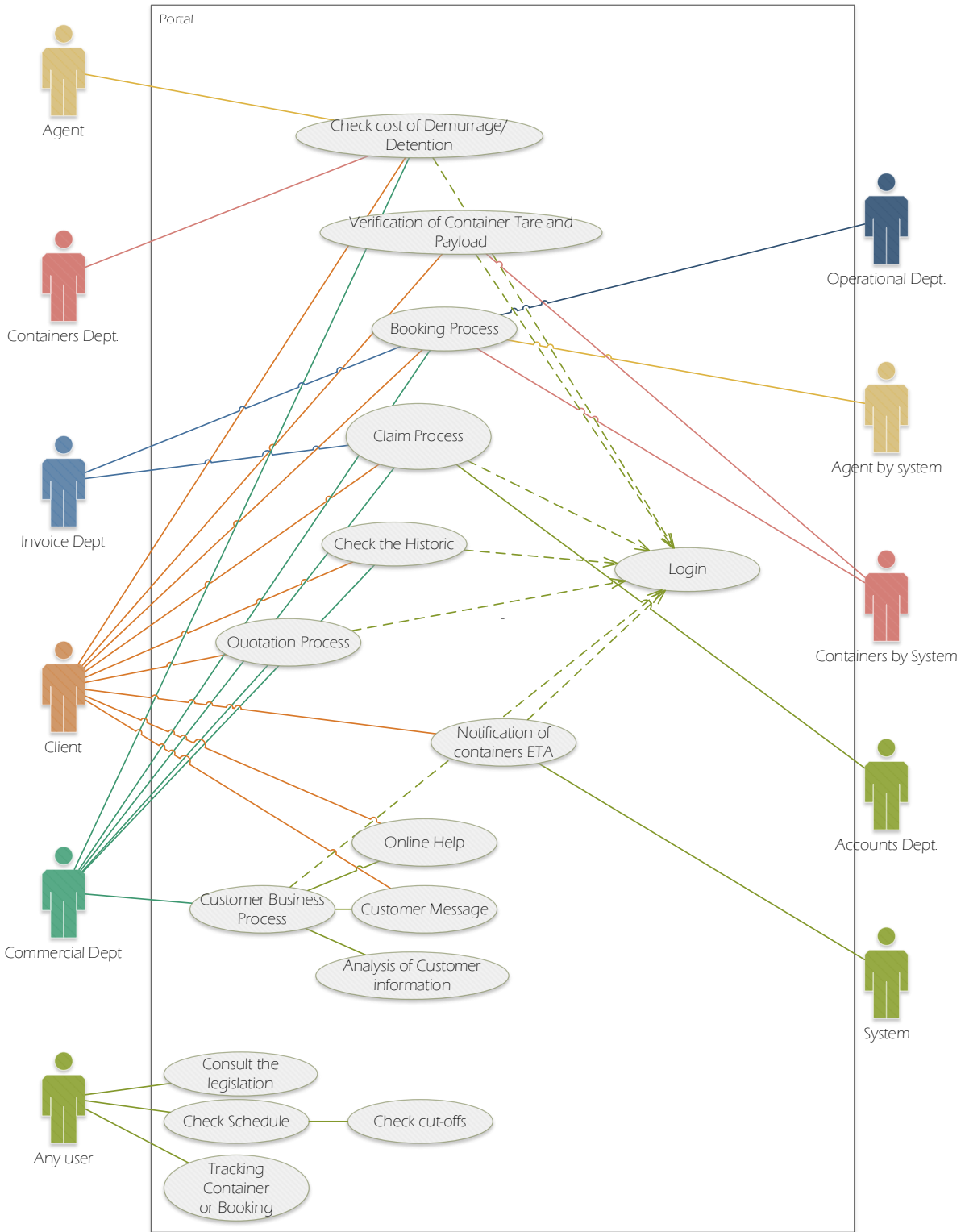


Figure 8 - Use Cases Diagram

After seeing this diagram, we can observe better some of the main processes that will be used in the portal, one of them being the most important process and will be the biggest reason of development of this portal, the Booking Process.

The Booking Process Activity Diagram, figure 9, is a resume of all activities that happen since the moment that the client creates a new booking with the company until the moment that the client receive his container in the destination.

This process has various users, and sometimes some users could be different people interact. Using this process all the users' work is improved, since this process already exist but using emails that are answered by different users at the same time creating some disagreements.

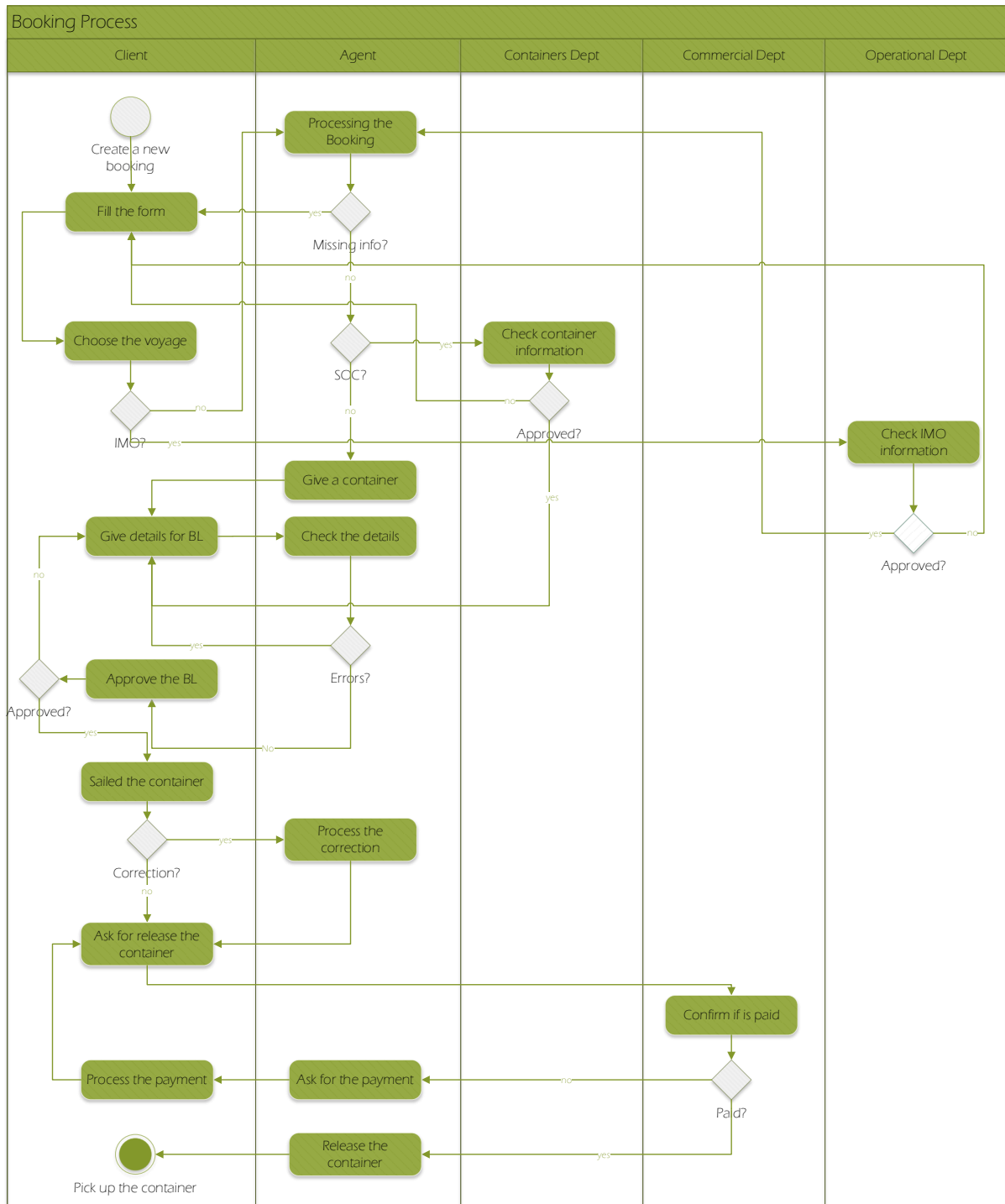


Figure 9 - Booking Process Activity Diagram

This process gives the option to the client to create a new booking Online, give all information need for creating a booking, to the company approve his request, the client approve to all information received from the company and verify if everything is fine to receive his container of the booking. The client could monitor the steps of the process, every time creating a better satisfaction and improve to all the process. This will happen since all the users will have the knowledge of the parts of the process that are pending of these actions.

The Claim Process Activity Diagram, figure 10, is a resume of all activities that occurred when an invoice is claimed by email. Passing this process to portal, will increase the control of all users knowing better what is happening with each invoice and improve the process reducing email changing. In this process the client when consult the invoice could send a claim that will be answered with a response or a credit note and after that he can process the payment of this invoice.

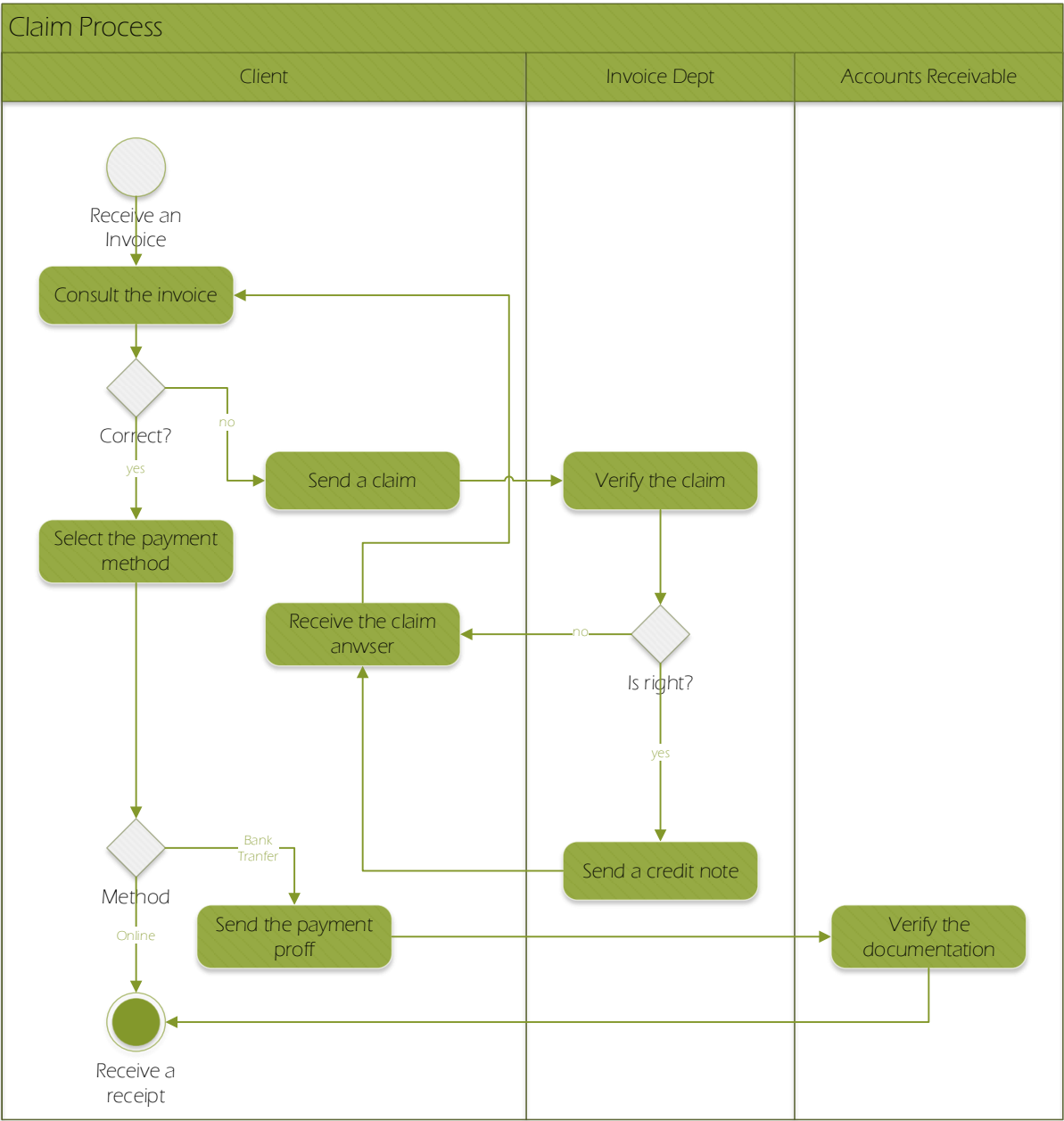


Figure 10 - Claim Process Activity Diagram

The last process is the Quotation Process Activity Diagram, figure 11, this process can offer a new experience to the client, since the client could confirm in the portal if he has quotation valid to do his bookings and if not, he could only ask for renovation or ask for a new quotation. For commercial department could give more information about the clients that are waiting for renovation or for new quotation and give a better situation of follow-up.

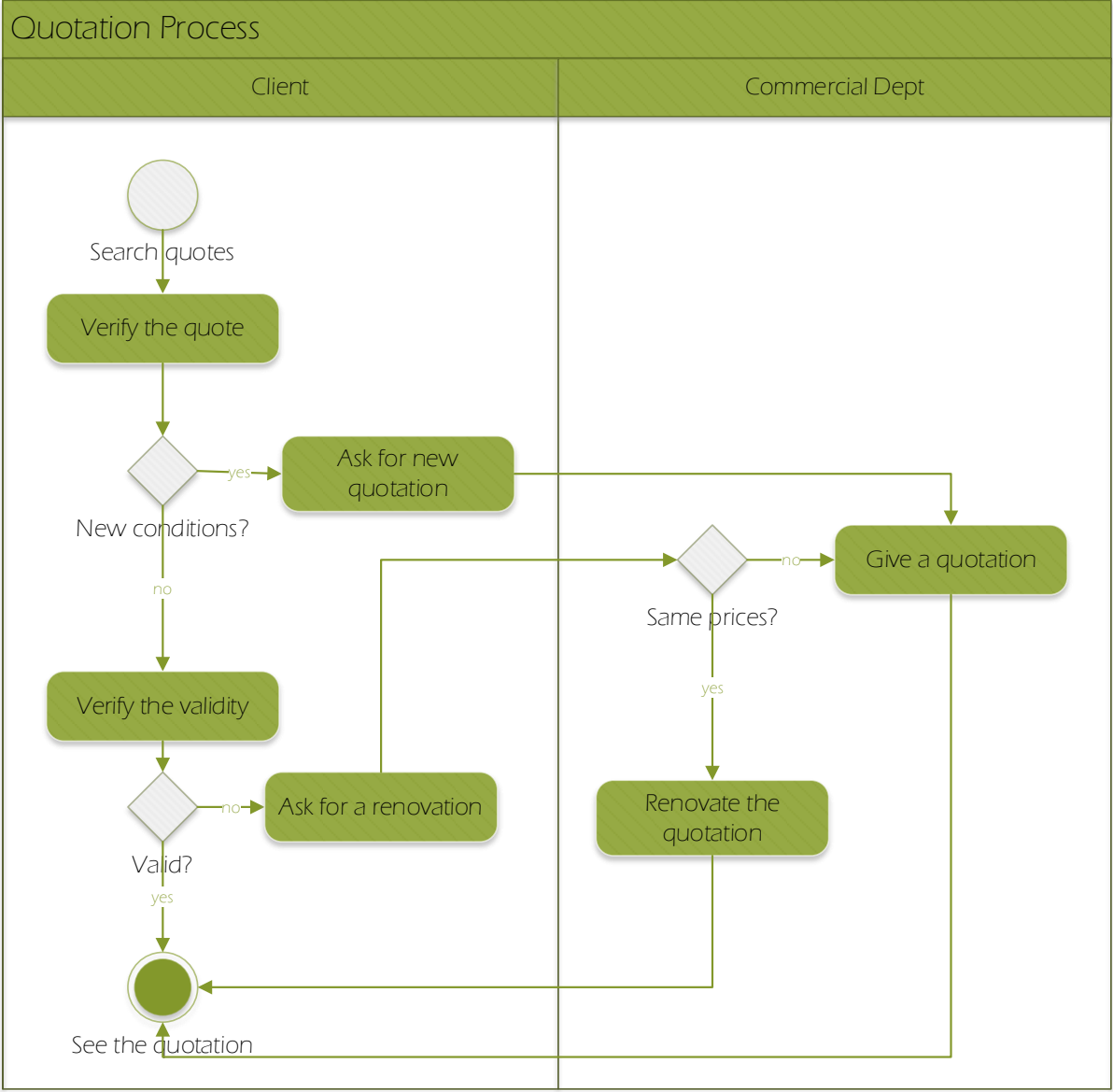


Figure 11 - Quotation Process Activity Diagram

4. EVALUATION APPROACH

Proceeding the development of the portal, after all the interviews done to various employees of the company, join with the portals already available and drawing diverse models to understand better processes of the portal, we need to choose the way of will be used to develop the portal.

Initially was chosen 4 options to develop the portal to be evaluated:

- **Option 1** – SAP NetWeaver Portal
- **Option 2** – Dynamics 365 integrated with module sales and PowerApps
- **Option 3** – Salesforce
- **Option 4** – Web service using .NET

Firstly, was done an interview with technical department to define what was the most important factor to choose an option and was concluded that the most important factor was the costs. To answer this factor will be done firstly a TCO evaluation to understand and compare all the options.

After evaluation the cost of each portal, a Multi-Criteria Decision-Making (MCDM) was done, where it was asked to stakeholders to rank the importance of each function and technical to rank each product by function. This evaluation showed us if the cheaper option cheaper was the best option to answer the needs of the clients.

During the first search was concluded that SAP NetWeaver need to be integrated with the module of SAP Transportation Management and the change of all system is a process more expensive and is not the objective at this point for the company, since the objective is only creating an online portal that was possible to integrate with the existence systems. Because of that, this option was removed for the evaluation, passing to the following options:

- **Option 1** – Dynamics 365 integrated with module sales and PowerApps
- **Option 2** – Salesforce
- **Option 3** – Web service using .NET

4.1. TCO EVALUATION

The TCO evaluation is an estimative of the total costs involved in development and maintenance of each solution, where are considered all costs with hardware acquisition, software acquisition, installation, training, support, maintenance, infrastructure, downtime, and space and energy. The objective of using a TCO model is to help the decision-maker to choose an option after acknowledge the costs involved with each one (Laudon & Laudon, 2019).

The calculation of TCO is based in the model present in Bibi, Katsaros, & Bozaris, 2012 with some simplifications, since the objective of this analysis is different. To calculate the TCO of each solution, it was needed to determine some assumption. This assumption can suffer some changes related with the differences in subscriptions of each option.

The time of development that we consider in all the process of develop the system from the start to production have like base the option 3, since the option 1 and 2 are low-code development platform (LCDP). Related to LCDP a study concluded that the use of LCDP in a development for a platform can improve the time needed in 50%-90% comparing with classical coding languages (Sahinaslan, Sahinaslan, & Sabancioglu, 2021). Based in that for option 1 and option 2 we consider 70% of the time of option 3.

Table 10 - Option 1 assumptions

Cost Type	Cost Source
Time of development 13 weeks (520 hours)	Own source based in option 3
Cost of development 130€/hour	(Thibeault, 2020)
27 500 logins per month with a cost of 27€/100/month	('Preços – Power Apps', 2021)
100 000 views per month with a cost of 84,30€/month	

Table 11 - Option 2 assumptions

Cost Type	Cost Source
Time of development 13 weeks (520 hours)	Own source based in option 3
Cost of development 145 €/hour	(‘Salesforce Implementation Costs CRM Consulting’, 2021)
Licence for External Apps for 1250 per month member for usual clients, based in 5 accounts per client login with a cost of 35€/login/month	(‘Editions & Pricing - Lightning External Apps’, 2021)
Licence for External Apps for 100 per month login for non-usual clients with a cost of 15€/login/month	
License for Sales and Service Cloud 10 logins for commercial department with a cost 25€/login/month	(‘Editions and Pricing - Service Cloud’, 2021)
License Basic Email, Mobile, and Web Marketing with a cost of 400€/month	(‘Marketing Cloud Pricing & Email Marketing Costs’, 2021)

Table 12 - Option 3 assumptions

Cost Type	Cost Source
Time of development 36 weeks (1440 hours)	Based in information given by the technical
Cost of development 55€/hour	(‘Average .NET Consultant Hourly Pay PayScale’, 2021)
50 000 logins per month buying two servers with two CPU Xeon Silver 4114, 64 GB of RAM and 2 TB of memory in the value of 5 000€/each and with an electric consume of 220€/year/each	(‘What’s the Cost of a Server for Small Business’, 2021) (‘Intel Xeon Silver 4114 @ 2.20GHz’, 2021)
Hiring an IT technical to give support to server and web service 46 818€	(‘Exame Informática Salários de programador em Portugal. Veja os empregos tecnológicos mais bem pagos em 2021’, 2021) (‘Simulador de Custo de Funcionário’, 2021)

Table 13 - TCO

System installation costs	Option 1	Option 2	Option 3
Software cost, Professional Services, Integration	67 600 €	75 400 €	80 080 €
User training	10 000 €	10 000 €	5 000 €
Hardware-middleware	- €	- €	10 000 €
Operational expenses	- €	- €	- €
Totals	77 600 €	85 400 €	95 080 €
Annual costs			
Subscription fee	90 112 €	550 800 €	- €
Software maintenance	- €	- €	5 000 €
Hardware maintenance	- €	- €	500 €
Professional Support fees	- €	- €	- €
Customization	- €	- €	- €
Totals	90 112 €	550 800 €	5 500 €
Operational expenses			
Administrator/IT staff	- €	- €	46 818 €
Switches, routers, wireless	- €	- €	- €
Network infrastructure and Internet	- €	- €	- €
Power, electricity	- €	- €	440 €
Floor space (for hardware)	- €	- €	- €
Totals	- €	- €	47 258 €
Total cost of ownership			
Up-front expenses	77 600 €	85 400 €	95 080 €
Recurring annual fees	90 112 €	550 800 €	5 500 €
Operational expenses	- €	- €	47 278 €
Total TCO for 1 year	167 712 €	636 200 €	147 838 €
Total TCO for 5 years	528 158 €	2 839 400 €	358 871 €
Total TCO for 10 years	978 716 €	5 593 400 €	622 662 €

Some of the costs in table 13 were considered 0 € because they are associated with infrastructures that already existed in the Company. This way can be reutilized like an economy of scale.

Analysing table 13 first, we can see that Option 1 and 2 that are two SaaS based in LCDP have lower costs of software installation than Option 3. Although the option 1 and 2 have the highest cost per hour, the time needed to develop and implement are much less, and don't require any type of hardware.

In contrast, the subscription fee in option 3 doesn't exist, since this option is free of subscription only with the costs of server maintenance, power costs and an IT staff to support the web service. In option 1 and 2 we can find subscription fees that includes support services, but we can find a big difference between the cost of Option 1 and Option 2.

Comparing option 1 and 2 in functionality, both have the same objectives and if we have to choose one, we can choose option 1 since is part of universe of Dynamic, already implemented in the company, and have much lower subscription fee costs.

Between option 1 and 3 we can see that option 3 is the cheaper option in long term and without subscription fees, but doesn't have many extra features like option 1.

4.2. MCDM EVALUATION

The MCDM evaluation is a process where we involved the technical and the stakeholders to analyse all the functions. The stakeholders will only evaluate the importance of each feature in the perspective of the service that will provide to them and to their clients. This interview was made independent of interview of previous table 8, since it was done using other process and with a different objective. In the case of the technical will evaluate the adjustability of each solution for each feature. This evaluation method was based in evaluation presented in (M. C. G. Reixa, 2012).

For this process was used the information already collected during the construction of conceptual model, this was the MCDM evaluation was the conclusion of all the process of the proposal the conceptual model and for the interviewed in the evaluation was the last meeting of all this process.

This evaluation was done by interviewing two stakeholders. After evaluation of stakeholders was asked to four technical the options for developing the portal. Since there were two technical with knowledge in Option 3 but without knowledge in Option 1 and 2, was chosen others two technical to evaluate option 1 and 2.

The survey was done based in Likert scale, with the differences between stakeholders and the technical was the question to evaluate each feature.

Table 14 - Scale and questions used in surveys

Value Given	This feature is important?	This solution is the best for this feature?
1	Strongly disagree	Strongly disagree
2	Disagree	Disagree
3	Neither agree nor disagree	Neither agree nor disagree
4	Agree	Agree
5	Strongly agree	Strongly agree

All evaluation was done with of objective of the sum give 100% and the results showed from stakeholders and from technical was result of an average between all evaluation received.

After that will be done the multiplication between the values of ranking from stakeholders and the rankings from technical and will be summed to give the score for each option.

$$A_j = \sum \bar{S}_i \cdot \bar{E}_{ij}$$

Equation 1 - Based in article (M. Reixa, Costa, & Aparicio, 2012)

A_j - final score for option j

\bar{S}_i - Stakeholders average evaluation to service i

\bar{E}_{ij} - Technical average evaluation to service i and option j

For this process was followed the following steps:

Table 15 - Process of implementation of MCDM evaluation

Step	Description of the Process	Author	Stakeholder	Technical
1º	Development and Presentation of conceptual model	X	X	X
2º	Selection of potential solutions	X		
3º	Selection of the specialists	X		
4º	Training and explanation of the objectives	X	X	X
5º	Elaboration of survey related with importance of each feature	X		
6º	Reply to the survey with the importance of each feature		X	
7º	Elaboration of survey related with adjustability of each solution	X		
8º	Reply to the survey with the adjustability of each solution			X
9º	Calculate the final scores	X		
10º	Compare the final scores	X		
11º	Analysis the scores	X		

After following the process explained above and calculating the result of the surveys, we can observe the average of survey results in Table 16 and the application of Equation 1 in Table 17.

Table 16 – Average of Evaluations

Service	\bar{S}_i	Option 1	Option 2	Option 3
		\bar{E}_{i1}	\bar{E}_{i2}	\bar{E}_{i3}
Tracking Container/Booking	5%	5%	3%	5%
Notification of containers ETA	4%	3%	2%	2%
Check Schedule	5%	5%	2%	3%
Check cut-offs	4%	5%	2%	3%
Create an on-line booking	4%	5%	1%	5%
Choose type of container (Dry/Reefer)	2%	2%	1%	2%
Home Page	2%	2%	5%	3%
Check costs of Demurrage/Detention	2%	2%	2%	2%
Confirm the BL	4%	3%	2%	3%
Request a change or correction in Booking	3%	2%	2%	3%
Verification of Container Tare and Payload	4%	2%	2%	2%
Check the historic	2%	2%	2%	2%
Claim invoice	2%	3%	4%	3%
Customer Business Process	4%	2%	5%	2%
Customer information	3%	2%	4%	2%
Customer message	3%	2%	3%	2%
Online Help	3%	2%	4%	4%
Request a release of cargo	4%	3%	4%	2%
Storage and Analysis of Customer information	2%	3%	3%	2%
The customer login/3rd party (agent) access	2%	2%	2%	2%
eBL	2%	2%	2%	2%
On-line Bill of Lading Printing	3%	4%	3%	5%
On-line Shipping Order Printing	2%	4%	3%	5%
E-invoicing Financial Settlements	3%	2%	2%	3%
E-invoicing On-line printing	3%	3%	3%	3%
Send a proof of payment	3%	2%	2%	2%
Payment Receipt On-line printing	3%	3%	3%	2%
On-line Payment	3%	2%	5%	4%
Requests approve of danger cargo	3%	2%	3%	2%
Consult the legislation	2%	1%	1%	2%
Entities available	2%	3%	2%	2%
Duplicate booking	3%	2%	2%	2%
EDI service or CSV files	2%	3%	3%	5%
Request a personalize quote	4%	4%	5%	3%
Verify historic of quotes	3%	4%	3%	2%
APP Mobile	3%	2%	3%	2%

Table 17 – Total results of evaluation

Service	\bar{S}_i	Option 1	Option 2	Option 3
		\bar{E}_{i1}	\bar{E}_{i2}	\bar{E}_{i3}
A_j	-	295,50	280,00	285,50

After this evaluation, it is possible to conclude that the best option based in this analysis is option 1, that is based in create the Portal using PowerApps. But in second place is option 3, that is creating the portal as a webservice using .NET. We can observe that these options don't have many differences between them.

5. DISCUSSION

The utilization of portal in shipping transport of containers are changing the e-commerce, with the biggest companies implementing their own portals and continuing to improve them. The lack of an e-commerce platform for the clients of this shipping company was identified like a problem for them.

The answer to this problem was proposed to research between academic research and e-commerce platforms that already exist in the market. After that this information was worked with stakeholder to arrive to their objectives. Thereafter, was created a conceptual model with the features needed to develop the portal and to decide how it should be done was done a TCO and a MCDM evaluation.

The first step was to understand using academic research what the authors consider about what features should be presented in a portal to answer to customers, partners, and collaborators of the shipping companies, resulting in table 2. Secondly was done the research between other platforms that already are offered by other shipping companies to understand what features are offered by them to the clients resulting in table 6. With all information reunited was done various meetings with the company to understand what features should be applied to them, since each market have each specification and platforms need to be adapted for each market, and what features should be added to the portal, with the result of table 8. Based in table 8, some UML models were created to illustrate the interactions with the portal.

Based in that conceptual model, a TCO evaluation and a MCDM evaluation was done after to decide what was the best solution to implement the portal in the company in question. The TCO evaluation was done to measure which would be the cheaper solution and the MCDM was done to verify if this solution is or is not the best solution.

Beginning with TCO evolution comparing the price of development of each solution is possible to conclude that option 1 is the cheaper with the value of 77 600 €, with option 2 in second place with the value of 85 400 € and finally in last place option 3 with the value of 95 080€. After the development we need to consider the values related with subscription and IT staff that will be frequent. Adding these values will turn option 3 in the cheaper solution, passing option 1 to second place and option 2 to last place.

The solution suggested in option 1 and option 2 we can observe that the turnaround occurred when we added the values of subscription fees that add 90 112€ to option 1 and 550 800 € to option 2 per year. Of course, analysing these values with a TCO for 10 years, we can observe a big difference between each solution, where the option 3 continuing being the cheaper, given a direct saving around of 350 000 € comparing with option 1 and around to 5 000 000 € comparing with option 2. This way based in the prerequisite from the company of choosing the cheaper solution, the solution that will be developed should be option 3, i.e., the solution based in .NET.

To understand if option 3 was the best solution for the company, was done to a MCDM evaluation, where the best solution after application of equation 1 result of surveys done to stakeholders and technical was option 1, option 3 can be found in second and option 2 in third place.

The results obtained in these two evaluations continue to answer the needs of the company and follow the most important factor, the costs, but can leave us with other question, that cheaper

solution may not be the best solution sometimes. Of course that we are comparing two different types of solutions, since option 1 is based in LCDP and option 3 is based in classical coding languages.

The option 1 being based in LCDP and not in classical coding languages, although being a little more expensive and dependent on subscription fees, can be better compared to option 3 when looking for a long range. Firstly, using a LCDP make it easier to update or maintain the platform used, since LCDP don't have a big dependency of very qualified technical skills. This way after the release it is possible to train employees to do this work, without it being necessary to contract again an external software house to develop. Using the subscription models can give us some advantages too, since the technical support is included and the responsibility to maintain the platform online is removed, since the platform is cloud based (Sanchis, García-Perales, Fraile, & Poler, 2020). The final point is option 1 adapt more quickly to the number of users by only reducing or increasing the number of licences purchased, while option 3, being a solution without any subscription fee, will require more hardware to be bought, which can take some time, or will require hardware to be deactivated, in case of reducing the number of users.

6. CONCLUSIONS

The objective of this project was to develop a conceptual model to create an e-commerce shipping decision-making artifact for a Portuguese shipping company, this artifact has the objective to answer to a need of this company in a very competitive market. The creation of the conceptual model is composed by a CRM function significance multi-criteria artifact to help decision-makers. In this study it was also proposed a used cases model to a CRM system for a shipping company, as well as de definition of two processes for the business: quotation process activity and claim process activity diagram. Here it is presented the evaluation results of the artifact, conducted with various internal practitioners, the solution chosen to implement the conceptual model was the option 3, a solution based in a webservice developed in .NET.

This objective was accomplished after checking the literature existent related with shipping platforms and various websites of other shipping companies. After summarizing all this information was presented to the stakeholders to be adapted to the market of the company in question, all the features were discussed and adapted to the market, creating the conceptual model that was proposed. To the implementation firstly was chosen some possible solution between the offer from the market and others suggested by the technical from the company. This study includes a TCO analysis of CRM systems solutions, constituting a tool for better support the decision-making in the shipping company. To understand what solutions should be used in implementation two evaluations were done, a TCO evaluation where an analysis of all the costs related to the development, implementation and utilization of each solution was performed, and a MCDM evaluation where surveys were done to stakeholders and technical to rate the importance to the client of each feature and the adaptability of each solution.

For future works it is important to conduct an evaluation to the CRM portal implemented, where the stakeholders provide their feedback related to the solution, as well as an evaluation with the customers to understand their perception of experience, particularly a study on the effects of customer's satisfaction, ease of use, and perceived usefulness of the future portal.

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