Development of an alternative transportation service for e-commerce deliveries

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“Life is not accumulation, it is about contribution.”

Stephen Covey

Abstract

This report is part of a Master's thesis of the Faculty of Engineering of the University of Porto, held in the e-commerce department of Rangel & Distribuição Logística. The challenge posed is related to the last mile delivery - the last stage in the transport of an order until it arrives at the final destination - of Business to Consumer (B2C) orders from e-commerce. The company intends to offer a B2C delivery service that increases customer satisfaction and differentiates from the competition. Therefore, a theoretical study was made regarding the themes of e-commerce and last mile delivery that indicate its main trends these days, as well as a benchmarking of the companies that work in these segments. The study allowed concluding that a service with enormous potential for Rangel in this segment would be the deliveries made on the same day of purchase, the "Same Day" service. Two days were spent with the driver of the city of Porto to understand closely the inefficiencies of the B2C network, which is currently integrated into the Business-to-Business (B2B) network. Then, in order to perceive the relevance of the Same Day service in the Portuguese market, three online stores and two courier companies were interviewed, and a survey was also launched at FEUP, which obtained 216 responses. With this, what was suggested by the previous study was corroborated. Thus, in addition to developing the Canvas business model of the new service and designing its operational model, SWOT and Porter's 5 forces analysis were done. A financial model that demonstrates the feasibility of the solution by calculating the Net Present Value (NPV) over a period of three years, including an estimation of the market size for this service in Portugal, was followed. The results suggest that Rangel should invests in this service since the VAL calculated was 374.027 € and the estimated Portuguese market was over 42 million euros per year.

Desenvolvimento de um serviço de transporte alternativo para entregas de e-commerce

Resumo

Este relatório surge no âmbito de uma tese de mestrado da Faculdade de Engenharia da Universidade do Porto, realizada no departamento de *E-commerce* da empresa Rangel & Distribuição Logística. O desafio proposto está relacionado com o *last-mile delivery* - a última etapa no transporte de uma encomenda até que esta chegue ao destino final - de encomendas do tipo *Business to Consumer (B2C)*, provenientes do *e-commerce*. A empresa pretende oferecer um serviço de entregas B2C que aumente a satisfação dos clientes e que se diferencie da concorrência. Assim sendo, foi feito um estudo teórico dos temas do *e-commerce* e do *last-mile delivery* que indicam as suas principais tendências nos dias de hoje, bem como um *benchmarking* das empresas que atuam nesses segmentos. O estudo permitiu concluir que um serviço com enorme potencial para a Rangel neste ramo seria o das entregas feitas no mesmo dia da compra, o serviço "Same Day". Foram passados dois dias com o motorista da rota da cidade do Porto para entender de perto as ineficiências da rede B2C, que atualmente é integrada na rede *Business to Business* (B2B). De seguida, de forma a perceber a pertinência do serviço Same Day no mercado português foram entrevistadas três lojas online, e duas empresas de estafetagem, e foi também lançado um questionário na FEUP que obteve 216 respostas. Com isto corroborou-se aquilo que o estudo anterior tinha sugerido. Assim, para além de desenvolvido o modelo de negócios Canvas do novo serviço e desenhado o modelo operacional do mesmo, foram feitas as análises SWOT e 5 forças de Porter, seguidas de um modelo financeiro que demonstra a viabilidade da solução através do cálculo do Valor Absoluto Líquido (VAL) num período de três anos, incluindo uma estimativa do tamanho do mercado para este serviço, em Portugal. Os resultados obtidos sugerem que a Rangel invista neste serviço, uma vez que o valor do VAL calculado foi de 374.027€ e o mercado português estimado foi superior a 42 milhões de euros anuais.

Acknowledgments

This thesis closes an important chapter of my life, for which I could not feel more grateful, since it gave me memorable experiences and made me a better person academically, but above all personally. For that, I would like to begin by thanking FEUP for being my second home for the last five years.

I want to thank Rangel by making this experience possible, to all the company's staff who have been in some way connected with my research, providing essential information for its development, especially to my advisor Ricardo Borges. I'd like to thank the other three interns of Rangel that spent the past five months by my side as well.

I feel lucky to have had Professor Eduardo Gil Costa as my FEUP supervisor, for his constant willingness to help whenever necessary, as well as for his excellent work in the revision of this document, so I want to also thank him for that. I would also like to thank Professor Maria Dulce Lopes for the inputs offered in the financial analysis of this work, and to Professor Ana Camanho, who although did not make a direct contribution to it, was the Professor with whom I created a stronger relationship throughout the course and this certainly influenced me positively.

Some of the strangers in the early months of college are friends for life today, and that was the best gift university gave me, real friends, and I must thank them. If we think about it, this is probably the last step of our lives to make such close friends. We may befriend somebody on a trip, or a job, or another random and unexpected episode, but that would hardly beat the daily living with our university friends. That makes me smile because I'm sure that I have at my side fantastic people, people much better than me. The spirit of comraderie among colleagues was amazing and served as a great learning experience, because, as it happened during these past five years with my colleagues, I believe that generosity and concern for others will transform anyone's destiny for the better.

My path at FEUP was strongly marked by my involvement in associativism, both as a member of ESTIEM but mainly as President of AGE-i-FEUP. What I experienced during my mandate was the most remarkable experience of my student life and I am fortunate to have lived those moments with absolutely incredible people. So, a big hug to all my board members of the 2015/2016 term.

I want to thank my family for their unconditional support since entering college. To my brother, my father who also contributed to the execution of this work, my uncles and cousins, and to my grandparents, especially to my recently deceased grandfather. I dedicate this work to my mother too, who gave me an incomparable support and has always made the biggest effort to give me all the necessary tools to succeed in the last five years.

Lastly and foremost, once I saw a video where the presenter showed that what gives longevity to the human being is the creation of deep and lasting relationships. Therefore, I cannot forget to thank to the person who everyday provides me a relationship as strong as if it was an indestructible bridge, with a pure and true meaning. I can say that I am fortunate to have built such a relationship with the person I consider my love, you, Clara.

Contents

Acronyms

AGV – Automated Guided Vehicle

API – Application Programming Interface

B2B – Business to Business

B2C – Business to Consumer

C2C – Consumer to Consumer

CDP – Collect and Delivery Point

CEP – Courier, Express and Parcel

CF – Cash Flow

CRM – Customer Relationship Management

ETA – Estimated-time-of-arrival

FEUP – Faculdade de Engenharia da Universidade do Porto

NPV – Net Present Value

OC – Omni-Channel

PDA - Personal digital assistent

POD – Proof of delivery

PUDO – Pick Up and Drop Off

SaaS – Software as a Service

SEV – Small eletric vehicle

TMS – Transport Management System

UAV – Unmanned Aerial Vehicle

UMCC – Urban Micro Consolidation Centre

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1 Introduction

This project was carried out within the scope of the final dissertation for the Integrated Masters in Industrial Engineering and Management at the Faculty of Engineering of the University of Porto. The present dissertation is the result of a five-month internship at *Rangel & Distribuição Logística*, who enabled this work-based thesis.

The estimated value for e-commerce sales in the year of 2017 was €1.843 trillion (Abraham et al. 2017). This has led to the increment of the global parcel delivery market, that is not only large, but it is also very scalable with growth rates reaching up to 10% in mature markets such as Germany and United States; and more than 100% in developing markets. (Martin, Florian, and Schröder 2016). This being said, failed or late deliveries become a very frequent problem due to transportation companies not being able to follow the growth of e-commerce. Nowadays, it is expected that 1 out of every 20 online orders is not delivered on the first attempt (PCA Predict 2017).

The above challenge is also an opportunity for a new set of competitors, the so-called on-demand urban delivery providers. These start-ups have entered the B2C delivery market and provided the economy with such logistics model that has attracted almost USD 5 billion in venture capital since 2014 in western markets alone (Netzer et al. 2017). The solution is now based on developing a new type of last-mile delivery to better serve the e-shoppers.

The delivery is the least efficient process between all the transportation phases of parcel delivery, amounting up to 50% of the total supply chain costs in specific cases (Vanelslander, Deketele, and Van Hove 2013), taunting huge financial losses for retailers and logistic partners, as well as brand image damage and customer dissatisfaction. Nevertheless, the concerns go far beyond the economic issue for the business. Delivery is undermining social and environmental questions, mainly and obviously minding metropolitan areas, due to the CO_2 emissions, energy consumption, traffic congestion and the wastes of the impulse buying, reducing the incitation of online shopping (Pan, Chen, and Zhong 2015).

Therefore, fulfilling distribution requirements is essential for any online business that sells physical goods. As new modes of delivery to customers are being developed and optimized, retailers will provide a better service, will improve customer retention and will generate more profit. Undoubtedly, this area is considered the most relevant to achieve excellence in logistics (Hübner, Holzapfel, and Kuhn 2016).

Since the e-commerce boom came later on to Portugal, the last mile delivery is naturally less developed when compared with the main e-commerce economies. However, the estimated e-commerce revenue in this country for 2017 was €4.73 billion (Abraham, Lone, and Couenberg 2017), an increase by over 12% from 2016, whose value was €3.685 billion (CTT 2017). In that same year, one out of three Portuguese shopped online, which makes Portugal a relevant potential growth market since the ecosystem of e-buyers is still lower than the European average - 33% against 55% of the European population (CTT 2017).

1.1 Company Presentation and Project Motivation

This project was developed in Rangel, a Portuguese company that provides logistics services for thousands of other companies. Due to Rangel's recent developments on the e-commerce footprints, it is only natural to aim for becoming the trendsetter on that field. For achieving that goal however, it will be needed to develop a new transportation model for e-commerce deliveries. In light of this, this project was done in the e-commerce department, the smallest but probably the one with the biggest growth potential of the entire company.

Currently, the Rangel's B2C transportation deliveries are integrated within the transport network of the B2B deliveries, generating inefficiencies in the service provided to e-commerce consumers. Since this type of commerce is getting more popular year by year, Rangel is requested to be capable of providing a more personal experience to the final consumers. For instance, additional services such as offering the possibility of two hours slots for deliveries change the hour or delivery address at any time after order is placed, or even giving the option to choose between home delivery and delivery at a pick-up point.

Although e-commerce still represents a modest business turnover inside the entire group, as stated above it is probably the one with the highest potential for the next decade, and therefore should not be neglected. In fact, it is possible to verify that Rangel's CEO has already publicly mentioned "Portugal has a lot to evolve in e-commerce, 2018 will be the strong year of e-commerce". Besides, the company will invest €1.5 millions in e-commerce until the end of 2018. Since Rangel wants to be a player in the e-logistics industry in Portugal, this project had a significant importance since the beginning, with the responsibility to provide concrete solutions in what regards to the e-commerce deliveries, and, moreover, to provide a deep and detailed study about the best practices and trends of e-commerce in the world.

Rangel Distribuição Logística (RDL) was founded in 1993, being part of the Rangel Group, founded thirteen years before. Its creation came in a very successful attempt to add value to the whole group, offering integrated services through a logistics distribution chain. Nowadays, some of the services performed by RDL are insourcing and outsourcing logistics, storage and order processing, inventory management, reverse logistics, among others. In Appendix A is represented the organizational chart of RDL.

Currently, the group offer services in a diverse portfolio of industries, for instance, artwork, pharmaceutical, fashion and wine industries. Regarding the expansion strategy of the group beyond the Portuguese borders, the expansion targeted the Lusophone countries, with the take off in 2007 with Rangel Angola. During the following years, Rangel started its operations in others markets such as Mozambique, Brazil and Cape Verde.

A very important and prestigious factor of Rangel today's operations is that the group is considered a Global Service Participant (GSP) of FedEx, one of the three companies on the top of 2018 Forbes Global 2000 transportation ranking, providing a wide range of express services, focusing on exportation and importation of goods (Gara 2018). This partnership forced the group to create another company, exclusively dedicating its activity to the urgent shipments of FedEx.

The motivation behind this project can be divided in two main points. Firstly, the company itself and its national recognition makes the project impact very high. Secondly and probably the most important, the topic of e-commerce is becoming a habit among millennials, especially among of students. Thus, in the end, it is a great chance to have the opportunity to provide Rangel with the benefits of exploring this developing market.

1.2 Project Presentation

The entrepreneurial spirit that led to the creation of the Rangel Group was the same responsible for the start of the e-commerce projects. Besides, it was also the consequence of the Group's constant willingness to adapt to new market trends, revealing the perseverance that pushes the company to maintain its position of leadership and growth.

In the e-commerce department Rangel is developing a service of full-ecommerce in order to provide to brick-and-mortar stores an opportunity to sell online, that includes developing a website, providing the needed logistics, organize marketing campaigns and offer customer support. In view of this, this project is occurring in parallel, with the aim to understand the possibility of a same day delivery model that Rangel can offer to its B2C clients.

Presently, the company is facing a lack of services in e-commerce deliveries, being the main reason the inexistence of a dedicated fleet to especifically serve these clients. As a direct consequence, B2C deliveries are integrated with the B2B ones with the same routes, vehicles and drivers.

As of today's B2C transportation model, the driver's main concern is to call the recipient in order to know whether he or she is at home. Nonetheless, even this process is not performed perfectly since it is not done until the van arrives to the parcel drop point, leading to wastes of time and fuel moving to the recipient's place with the possibility of the client not being there.

In the likely case of a failed delivery, the driver will return the order to the warehouse, and will try to deliver it the following day. This process is repeated three times, and only at this instance Rangel informs the shipper; then Rangel has to wait for a decision - return the parcel or change the address. Naturally, because of deliveries during work time of the recipients, most people cannot receive the orders on the first attempt. In addition to the dissatisfaction of the final customer, this system leads to high logistics costs that could and should be avoided.

The B2C service can be compared to the experience a client is looking for when going to a restaurant: of course, the main goal is to eat great food, but an outstanding service can raise the overall experience to a new level, increasing customer's attendance rate. Those not-so-little details are crucial because there is nothing that forces someone to choose the same carrier in the next shopping.

Indeed, since appearance is not a job requirement, there is no way to ensure that all Rangel's van drivers are good looking, neither do they have a refined communication nor they treat the recipient with a careful and special approach. This is to be expected, since until now such things were not valued nor required from them, because in the B2B service drivers essentially deal with warehouse's operators, shops or other businesses where these differentials are not critical to performing their functions. The traditional deliveries for the businesses are still seen as priority in this company and this can compromise the future of home deliveries in a close future.

Finally, yet importantly, it should not be forgotten that the level of digitalization and software support in this activity is poor. Apart from the inexistence of an informatic application that would establish the connection between Rangel and the recipient, the company also does not have any route management software in order to guide the drivers according to their orders. As of today, is that the drivers already know a *priori* their destination according to each customer; and so, they are capable of recalculating the route mentally. Sometimes, although, they obviously make mistakes, but during the day those errors are not significant for now.

The scarcity of solutions in the B2C field, allied to the fact that there are already competitors in this market, have led to the creation of this project, which was mainly a back-office project since it required deep research. Expected results were to identify alternative B2C delivery modes from the one is performed today by the company, draw the operational model of the

best solution before identified, obtain feedback from the market regarding the solutions developed, and create a pilot project in the case it is considered economically feasible.

1.3 Aim and Objectives of the Project

The main objective of this project was:

Identify, analyse and validate alternative delivery solutions for e-commerce customers.

This objective can be decomposed into three specific elements in order to represent which specific actions are behind it:

1. Identify: the main goal is to identify and benchmark solutions for e-commerce, to verify which companies or start-ups - inside and outside of Portugal - are solving better this problem and how they are doing it;
2. Analyse: once the trends are identified, the following step would be to analyse those trends and conclude which ones are feasible in the Portuguese context, and more specifically narrowing them to Rangel's context;
3. Validate: finally, to develop an accurate solution built on a solid foundation. This would be possible with operational and financial validation.

1.4 Approach and Methodology

Chronologically, this project started with a theoretical study through the consultation of scientific articles, reports from audit firms and logistic companies, and navigation on dedicated e-commerce websites. The articles were searched on Engineering Village, Science Direct, Scopus, Web of Science and Google Scholar. During this part, it is also included a benchmarking study all over the world which clustered different business models currently practised among main competitors in the last mile delivery market. Thus, the research had a significant impact on every following phase of this report because it is the place from where every further conclusion is based on.

With this being done, the opportunity for same day deliveries as a service to invest in the near future was identified. Thus, further analysis had to be done in order to prove this hypothesis.

The first step in the analysis was to map the current state of the B2C service of Rangel in what regards to last mile delivery, and this was achieved by spending two whole days with the Porto's route driver. Such experience allowed the correct comprehension of how the company is performing B2C deliveries and what are the existent inefficiencies that make the operation not prepared for the Same day service.

In order to get real market insights relating to the needs of same day delivery in Portugal, three interviews were executed with e-retailers and two with courier companies. Aditionally, the relevance of the service was asked in a survey for students from FEUP.

At the end of this stage, two management tools were used with the goal of obtaining a risk analysis, taking in consideration not only internal factors of the company but also external ones that will influence the business model: SWOT analysis and Porter's Five Forces analysis. Right after, it came the process mapping of the final solution, using Bizagi modeller software, and the business model canvas of the new service of same day deliveries of Rangel.

The last method to conclude this report was a financial analysis respecting the new model created. Here, a cost-benefit analysis was simulated and the model provides the net present value through the calculation of the cash flows for three years. It also calculates the market size for this service in Portugal.

To conclude this section, the project approach can be summarized as follows:

1. Research & Benchmarking through articles, reports, websites;
2. In loco observation of the inefficiencies of the current service of Rangel including driver interviews;
3. Interviews with e-retailers and courier companies;
4. Opinion gathering by usage of a survey;
5. Risk analysis: SWOT and Porter 5 Forces;
6. Process Mapping with Bizagi Software;
7. Business Model Canvas;
8. Financial Analysis and calculation of the market size.

1.5 Structure of the Report

Following this introductory chapter, chapter two will be explored literature review that alongside a global review of the e-commerce and last mile delivery, it also presents a comparison between Portugal and international geographies in this field, as well as a worldwide search of companies that are pursuing all the mentioned trends.

The third chapter will focus on the description of the current delivery operations of B2C shipments of Rangel. Relevant insights obtained with the driver that performs the route of the city of Porto nowadays will be included.

The practical part of this project follows in chapter four, where a concrete analysis is done. Starting with why same day deliveries are an opportunity in Portugal, proven with real market interviews and with an estimation of the national market size, following the presentation of a proposed operational model for the new B2C fleet and concluding with a risk and financial analysis in order to support what was introduced before.

In the end, the main conclusions of the whole study are summarized, alongside some suggested topics for future works.

2 Literature Review

The literature researched is clustered by different directions of improvement, all of them related to the last mile delivery of products bought online - the last step of the e-commerce product's journey from the warehouse to the customer hands – and to the e-commerce itself. The goal was to find the "big picture" of the problem in order to develop a better and more consistent solution, one that could take in consideration as many alternatives as possible. At the end of this chapter is shortly presented the research made regarding the business model used afterwards in this report.

The first priority would be to define the scope of e-commerce in which this analysis focuses, since this topic incorporates more than one definition and could be applied to different types of online transactions. Therefore, according to Arnold et al. (2017), there are B2B, B2C and C2C e-commerce.

The first segment abovementioned refers to online orders where a company buy something from another company, for example a car manufacturer that buys a specific component from a supplier through its online store. This particular kind of purchases are not a problem for the last mile delivery service as businesses are always "at home" and there is no space for failures in the delivery unless any other unexpected problem emerges. This can be responsibility of the carrier or manufacturer for example.

The second one is B2C sale of goods, requiring physical delivery to the recipient. Here is where the struggles of supply chain are focused, and where many studies have been focusing on during the past years, mainly caused by the failed home deliveries.

The third one is pure C2C e-commerce that happens in marketplaces such as eBay (or Olx in Portugal). Generally, when people put their belongings on sale in these platforms they do not have any transportation service aggregated, and they need to move from their homes to the meeting point where the buyer will receive the product.

Due to this need of making the seller and buyer lives better in what concerns to transporting goods, eBay acquired Shutl in 2013 (Butcher 2013), a start-up that became popular for the one-hour delivery services provided. Also, Olx has incorporated in its website a similar service, in partnership with CTT Expresso, called CTT e-segue, that covers the delivery of goods until 10kg.

Last but not least, there is yet another type of online transaction that does not demand physical delivery because there are no physical goods to be delivered. These can be for example e-tickets for a concert or a flight, hotel booking or, e-books.

For the purpose of the literature review, only the second and the third definitions of e-commerce will be approached since these are the only ones being affected by constantly failed deliveries, which is the biggest challenge of the e-commerce last mile delivery.

With this being said, the definition of e-commerce presented by Eurostat is the one in which this report is based: "the sale or purchase of goods or services, whether between businesses,

households, individuals or private organizations, through electronic transactions conducted via the internet or other computer-mediated (online communication) networks."

2.1 Urban Delivery Industry

According to the World Bank, nowadays more than half of the world population live in cities. However, in certain countries such as UK and USA, the urban population represents more than 80% of total population. In Portugal, for instance, this percentage is 64% conforming to the same source (The World Bank Group 2014). Therefore, cities are the main boosters of people's over-consumption as an incentive behaviour by companies, advertising and media based there.

If cities are the problem, they can and should be the solution if people who live in cities realize that it is necessary to prepare themselves for a different world from the one they have today. A world where instead of classifying people based on what they have and how they buy it, people value more the usage of services and access to products, without claiming ownership of anything. The idea where temporary access to goods and services is preferred over actual ownership is the concept of Gig Economy, also known as the Sharing Economy, a paradigm shift that is becoming more popular nowadays. The new perspective uses business models based on innovative technology that steers cities to less consumption while density increases. Examples of this technology are driverless cars and 3D printing (Gesing 2017).

Portell, Brown and Ben-Shabat (2017) describe mass customization as the next commercial revolution of America. The authors argue that consumer's behaviour is changing from an "Affluence" model stimulated by ownership, to an "Influence" model where people prioritize access and experiences. In fact, there are already dozens of companies which success is based on this new paradigm such as TaskRabbit, Netflix, Uber, Airbnb or, Spotify.

All of these changes are also visible in the Courier, Express and Parcel (CEP) industry, more specifically in the Last Mile Delivery one as well. In fact, the Gig Economy allows any person living in urban habitats to receive his/her package in a matter of hours, or even minutes. This can have food, clothes, medicine, electronic devices and so on. The paradigm shift of on demand delivery is real, meaning that traditional players have no more the power of establishing limitations on delivery times and locations because there are a bunch of start-ups using the power of crowd and flexible courier services to enable consumers to have their orders delivered anytime, anywhere (Kückelhaus and Chung 2016).

Indeed, as reported by McKinsey&Company (Netzer et al. 2017), dozens of startups offering this type of services have raised almost USD 1.7 billion in 2015. This amount of venture capital is eleven times higher than what was raised in 2013 from the same startups. This means that there are thousands of everyday people willing to pay for this service. Following the same report, among other features, what distinguish these new players from traditional logistic providers is their ability to focus on the end consumer, using dedicated mobile apps or websites that connect the consumer with merchants rather than operating in the background on behalf of merchants and losing control of the customer experience journey.

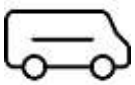
2.1.1 Portuguese Market Overview

The Portuguese e-commerce can be a little late when compared with other countries in the world, however, this activity is already evident, mainly because 86% of the population are internet users and 43% of these have bought something online in 2016 (Abraham, Lone, and Couenberg 2017). Moreover, by 2025, Portuguese market is estimated to achieve €8.9 billion in online B2C sales (ACEPI and IDC 2017). Thus, what is missing in volume remains in growth potential, so Portugal is seen as a start-up country where there is international culture and qualified human resources in what concerns to digital expertise. Moreover, Portugal has

one of the best 3G/4G structure and optic fibre of Europe (Abraham and Lone 2017) and also, Portugal is the first country in Europe to offer an instant transactions service nationwide with MB Way App (Mesquita 2016).

The delivery in Portugal is done with a sprinter van and truck in most part of the cases. Table 1 shows the most popular delivery modes in Portugal.

Table 1: Delivery modes in Portugal. Source: Rangel

	 **Truck**	 **Sprinter van**	 **Car**	 **Motorbike**	 **Bike**
Model Description	Box truck-based delivery	Most popular vehicle for parcel delivery	Typical car based	Normally with additional storage box	Normally with additional storage box
Labor ownership	Contracted			Owned	It is not significant in the Portuguese market
Timing	Multi Day, Same Day	Same Day, Next day	Same Day, Next day	Instant	
Use of cases	B2B	B2B, ecommerce	B2B, ecommerce	Restaurants, Post office	

These vehicles are used throughout the supply chain of parcel delivery (see Figure 1). During the first-mile, goods are transported from the manufacturer to the distribution centre and right after, from this point to the destination platform, what is called line-haul. The first-mile and line-haul are done essentially by truck. From here, goods are transported to the recipient or to the store, what is called the of delivery, and the vehicle used can be a van or a car. In the case of restaurant delivery, the last mile is done by motorbike from the establishment to the recipient. All the information presented in this section was obtained from sources of Rangel.

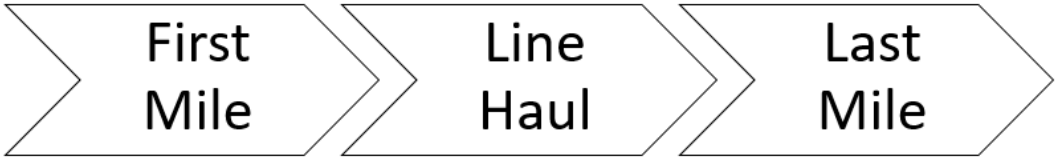


Figure 1: Supply chain of parcel delivery; Source: Rangel

2.1.2 Portugal VS International Markets

As reported by Ecommerce Foundation (Abraham et al. 2017), e-commerce global sales are distributed fundamentally among three main zones, which together, accumulate pratically 98% of the global market share. Those are Asia Pacific (47,48%), Europe (25,64%) and North America (24,86%). This means that the remaining regions of the globe, which are South America and Middle East & Africa, represent only 2% of the e-commerce global market.

With this, it is possible to define two distinct markets, the mature and the emergent ones, each one with its own challenges. During the same report Ingenico Group, a company specialized in e-payments, have referred that developing countries lack of financial inclusion and payment methods and on the other side developed markets concerns are in fraud and legal issues.

Abraham et al. also compare Portugal with the main mature markets such as UK, USA and Japan and with emergent markets like Brazil, India and China. Although all the numbers represent estimated values, it was possible to get a global perspective.

In order to understand the data two terms are defined first:

- **E-GDP or E-commerce GDP**: total of online sales divided by the total Gross Domestic Product (GDP);
- **E-shopper**: also known as online buyer, it refers any individual who bought something through internet, either a service or a good. It represents the percentage of Internet Users who buy online.

Table 2: E-commerce in Portugal vs. International e-commerce
Source: Ecommerce Foundation, Ecommerce News and AICEP

	Portugal	UK	USA	Japan	China	Brazil	India
Population	10.8 million	65.5 million	326.4 million	126 million	1.38 billion	211 million	1.342 billion
Internet Users (Millions)	7.3 (68%)	63.8 (97.52%)	254.1 (77.87%)	116.8 (92.7%)	776.3 (56.26%)	128.7 (61%)	442.8 (33%)
E-shoppers (Millions)	3.1 (42.21%)	51.6 (81%)	198.2 (78%)	88.7 (76%)	450.3 (58%)	52.7 (41%)	75.2 (17%)
E-GDP	1.98%	7,16%	2.26%	1.64%	5.78%	0.74%	1.53%
E-shopper growth	8%	5.66%	4.12%	3.14%	15.6%	10.07%	22%

When the analysis is done country by country instead of by continent, it is possible to observe smaller groups that share similar e-commerce evolution states. In fact, according to Table 1, Portugal is in an intermediary position, together with Japan. In this rank, the first places would be occupied by UK and USA, and the last ones by Brazil and India. Although China indicators are not as high as UK and USA for example, has the biggest population in the world, what makes them a first world country in what touches to e-commerce evolution. The numbers founded in Table 1 also shown what was told before about Portugal, a country with an enormous growth potential in the following years.

2.2 Future Outlook for E-commerce and Last-Mile Delivery

In this subchapter, firstly, the major trends in e-commerce generally will be described, which are not directly related with the act of delivering, but because they reveal behaviours and habits of consumers and online stores' managers, they influence the way last mile delivery companies should organize their strategies in order to optimize their service and better approach recipients. Right after, it is presented what is expected to come in terms of delivery operations.

2.2.1 E-commerce Trends

In this section will be presented some trends of e-commerce nowadays, from an e-retailer perspective.

Internationalization

One of the main drivers of cross border e-commerce is the popularity of marketplaces. Platforms like Amazon, eBay, Alibaba are the biggest players in the e-commerce industry and encourage people buying outside of their countries. This was concluded by a study from the International Post Corporation (2018) which have found that those three marketplaces (Amazon, eBay and Alibaba) accounted for 56% e-commerce items purchased. The same study has found that more than 60% of consumers have received their orders with no delivery costs, another factor boosting international purchases.

According to another study, this time from UPS (2017), more than 70% of european e-shoppers have purchased from an international retailer. This fact made the company suggest that focusing on international customers is a key takeway for e-tailers, who should adopt global mindset and strategy.

Besides that, another study from Accenture (2015) agrees that international routes had faster growth than domestic ones between 2013 and 2017 precisely because of the growth of cross-border e-commerce.

Lastly, Realogistics Group, an important logistics player in China, believes that logistics is the bigger point of difference between cross-border and domestic e-commerce, however, there are a lot of details to take into account when the retailer attemps to target international people, regarding customer experience throughout the website.

Mobile penetration

People around the globe spend on average more than four hours per day on their smartphones (Abraham et al. 2017) and according to the DHL Trend Report Sharing Economy (2017) the world is achieving 3 billion of smartphones in use around the globe right now. Highly connected with the mobile trend is the digital payment that enables people to easily pay their orders by online payment via stored credit card or bank acounf information. Therefore, it becomes difficult to imagine a world without these devices.

Omni-Channel (OC)

Business Insider defines omni-channel as a cross-channel model that connects the presence of a retailer in-store, online and mobile. If retailers want to provide the best customer experience possible they must show coherent information along all the channels – online and offline. With this, the new era of retail requires logistics networks capable to answer to the needs of each channel (Kückelhaus and Chung 2016).

Creating warehouse operations that can supply each channel is a difficult and complex challenge for retailers. Wollenburg et al. (2017) underline some strategies to steer customers to a specific channel, for instance, charging different pick-up and delivery fees across channels. Hübner, Holzapfel, and Kuhn (2016) highlight the most important areas to achieve excellence in OC logistics, and refer “developing and optimizing modes of delivery to the customer” as the most relevant one. During another study, Wollenburg et al. (2018) describe three different typologies of OC logistics networks in grocery retailing and points out the added complexity in such warehouses, driven by the average number of items purchased by order which is much higher than in non-food purhases, and the urgency of this type of shipping.

In conclusion, omni-channel strategies are super important for all retailers that sells online and in brick-and-mortar channels, however they are not easy to implement due to challenges in adapting store systems, inventory integration, IT systems integration, lack of merchandising strategy for both online and offline and obstacles in terms of budget (Pandolph 2018).

3D Printing

This disruptive technology has the potential to completely change logistics by adding new diversity to manufacturing strategies (Kückelhaus and Chung 2016). For instance, Amazon has already a patented 3D printing truck with the goal of deliver goods in a matter of minutes (Krassenstein 2015). The customer places an online order which will be received at the Amazon data centre and which sends 3D manufacturing instructions to the the truck that is nearest from the final destiny. Thus, while the truck is arriving the customer address the order is being printed.

Delivery Innovations

- Try Before you Buy: during a consumer research report of MetaPack (2017), the company found out that more than half of consumers would be more likely to experiment this service. This option would best serve fashion clothing and appareal consumers, offering more convenience and flexibility, because survey respondents also mentioned they normally order more than one size or color to choose the best one afterwards and return the remaining pieces (Example: Amazon prime-wardrobe);
- Loyalty Programmes: Amazon-Prime-like free-delivery programmes have a strong impact to those that buy through e-commerce frequently. The main idea behind this service is to make consumers always buy at the same website, which is great for the e-tailer or marketplace, and offer ilimited deliveries included in the subscription they pay every month/year, which is very relevant for the e-shopper. Also, in the same consumer research report above mentioned, the results have shown that a massive 79% of respondents desire loyalty programmes;
- Eco Delivery: the growth of sustainability awareness among people have made a tremendous change in the way companies fight to be competitive. This has led to a new strategy called fair and responsibe logistics (Kückelhaus and Chung 2016) According to the MetaPack study, e-tailers should offer a delivery service that cover consumer green concerns.

2.2.2 Delivery Trends

In this section will be presented some trends of e-commerce nowadays, from a more operational perspective.

Same Day vs. Instant Delivery

E-shoppers increasingly expect faster deliveries for their goods, thus, it becomes imperative to offer same day or instant deliveries. The difference between the two services is that in instant deliveries there is no consolidation of the load, that is, after collecting the one order, the driver delivers it immediately afterwards, while in the same day service the collection of several orders is made and later the delivery of the same. Therefore, the cost of transport is shared between several requests. In turn, in the instant service, the cost of shipping is incorporated into the delivery value of a single order (Netzer et al. 2017).

No wonder that Uber Rush, Uber's platform dedicated to perform packages transportation "point-to-point" – closed its operations (Dickey 2018) or that the popular start-up Shyp which provided similar service went bankrupt this year (Gibbon 2018). This happens because instant delivery adds significant costs to the last mile, beyond what is required for same day delivery models, caused essently short dense routes with higher number of turns.

According to McKinsey&Company (Netzer et al. 2017) convictions, the market size of delivery will be 10 to 20 times larger than that of instant delivery by 2025. The company believe that instant delivery will keep working mostly in the prepared food category, while same day can carry electronics and fashion items for example.

As stated in a report from BCG (Lukic and Wolfgang 2013), "Same day delivery could potentially be a standalone business, but the greater opportunity is to use It to enhance customer's overall multichannel experience." In the same report is estimated that affluent millennials are the greatest target for same day deliveries.

To conclude this trend, DPD Group has realized a survey in Portugal with 1009 e-shoppers, called e-shopper barometer 2017, where one of the questions was "Would the "to be delivered on the same day " option make you more likely to purchase from a website or retailer?". The results are astonishing with 91% of respondents answering "yes" somehow: 39% - "yes

probably" and 52% "yes definitely". Finally, 48% of them were millennials – between 18 and 34 years old – 45% had between 35 and 55 years old and 7% more than 56 years old (DPD Group 2017).

Crowd Logistics

Another trend in the last mile delivery is the crowdsourcing, called crowd logistics. The concept of crowdsourcing refers a type of an outsourcing strategy where a company send an open call to an undefined group of people to perform a task, in this case, moving goods, which can reduce transportation costs (Mladenow, Bauer, and Strauss 2016).

Companies using this operation model can offer a superior delivery service by being faster, more flexible, more convenient and personal. Moreover, delivery players become able to cover a larger area, and there is no physical asset since the vehicles are from the crowd (Buldeo Rai et al. 2017).

Wang et al. (2016) proposed a delivery model using crowdsourcing model but the authors have also highlighted the challenges of it, those can be mainly related with legal regulations, or even data privacy and confidentiality.

Shortly, the main advantage of crowdsourcing applied to the last mile delivery is the fact that the network of cars and drivers will fit the demand, avoiding unnecessary operational costs. If the driver does not have any parcel to deliver he can do something else, and if there is a peak hour the network can cover it easily (Joerss et al. 2016).

Urban Micro Consolidation Centre (UMCC)

A direct consequence of the e-commerce growth is the increase of the number of parcels to be delivered, which, in turn, puts the logistics operation at a different level of complexity, one much bigger than the one retailers get used to. At the same time, the timing required for delivery is getting smaller. With this, a major logistical trend has been the the implementation of UMCCs, with the goal of penetrating large cities and getting closer to the final consumers. Hence, delivery players can decrease the time on the road needed to achieve the e-shopper, as well as decrease the distance driven per day, what naturally reduce last mile delivery costs. On the other side, there are added costs coming from the added operations and maintenance of the UMCCs (Browne, Allen, and Leonardi 2011). This topic will be touched again in the next section in point 2.3.1.

2.3 Cost Drivers

The literature review shows that the cost of last mile delivery is significant. However, a framework was not developed during this report because Rangel does not use its own fleet, nor does it have its own drivers, so the cost is reduced to the amount charged by suppliers.

Wang et al. (2014) found that although there are common investments, different modes of delivery have different cost components. The authors identified price of work force, material resources and operation efficiency as the cost drivers in the last mile delivery and concluded that the proportion of each component will depend on the delivery mode used.

Vanelslander, Deketele, and Van Hove (2013) proposed a concrete formula to calculate the last mile delivery cost, where they multiply the average number of kilometres per route by the number of routes needed by the cost per kilometre. Moreover, they mentioned that the average number of kilometres per route depends on the customer density in how far is the retailer from the shopper. All the costs related with the van and the driver, for example fuel, maintenance, depreciation of the vehicles and wages were also taken into account. Finally, the authors argue that last-mle delivery can reach up to 50% of the total supply chain cost.

Boyer, Prud'homme, and Chung (2009) the authors explored the issue of customer's density in the delivery zones and proved that it is a very important variable when analyzing the cost of last mile.

2.4 Last Mile Delivery Models

Concerning the delivery models, i.e, to the vehicle in which the parcel achieves the final destination, although there are a few available options in the market, the use of vans is the most popular along all the countries. Vanelslander, Deketele, and Van Hove (2013) argue that van deliveries are benefical for e-tailers once they take advantage of a dedicated fleet network that cover a large area, optimizing last mile deliveries, but it has the disadvantage of the low service level.

With this being said, in this section the challenges and the benefits of the current delivery models besides sprinter vans, cars and motorbikes will be evaluated, following the order: cargo cycles, small eletric vehicles (SEVs), unnamed aerial vehicles (UAVs), autonomous guided vehicles (AGVs) and self-driving delivery robot.

In a report about the parcel delivery, McKinsey&Company propose another vehicle mode, the semiautonomous ground vehicles. However, the literature research regarding this mode is very poor and real cases of this method of transportation were not found. With this, in line with the description given in the referred report, the main advantage is that the capacity of this vehicle is like a van, and while the vehicle is travelling, the employee can use the time to perform other service activities. Nonetheless, further investigation should be done to understand the cost feasibility of this solution.

2.4.1 Cargo Cycles

Cargo cycles have been adopted for a long time ago, since the 19th-20th centuries, but their recognition in the last mile delivery is recent (Choubassi 2015). Over decades, it has been used to transport all kind of goods between people, from letters and newspapers to food such as milk, bread, ice cream, and many more. With the invention of fuel-guzzling cars and trucks, cargo cycles began to be seen as obsolete and useless mainly because the speed and loading capacity. However, in the 21st century, manufacturers all over the world are getting back to the roots, developing a greener pedal-powered freight transport. The cargo bike has the power to change the way we displace all sort of goods and in a cost-efficient and eco-friendly way.

According to Rudolph and Gruber (2017) there are three main reasons that motivate companies to adopt the use of bikes for freight transport: environmental factors, company-specific factors and factors related to the product transported. While the company specific factors are based on the company vision and values, meaning the employees are responsible to decide the use of cargo cycles or not, the remaining ones are a result of external variables and events that will encourage the change of transport method.

Melo and Baptista (2017) developed a traffic simulation for the city of Porto using the AIMSUN Software and did a cost analysis that included the cost of transportation, labor and emissions. It was rather helpful as it was performed in the same city as the current study. As a result, the assumptions and decisions made throughout this report are highly supported by the conclusions and results of this article. However, the model of this report did not include any physical structure that supports the bike network, as for example an urban micro consolidation centre from where the bikes depart and where transfer or goods take place. These authors tested different penetration rates of eletric bikes in replacement of the traditional vans, which assumed values between 0% and 100%. The main findings were that combining eletric cargo bikes with vans in a ratio of 10%-90% respectively could lead to a better traffic performance

and supported by the cost analysis they concluded that cargo cycles are a feasible solution that can easily be part of the last mile delivery, such as the ones generated by e-commerce.

In both above mentioned articles the authors refer the load capacity of cargo bikes as the main challenge of this mode. Nonetheless, the second article points out that using cargo bikes implies the existence and availability of UMCCs from where drivers depart.

Similarly, Arnold et al. (2017) have also recognized the benefits of using cargo cycles for freight transport. At this time, they used this method in simultaneous with collect and delivery points, a topic that will be defined afterwards in this report. The authors concluded combining the resources beforementioned might result in a better population's quality of life. It must be enphasized that the authors also came into the conclusion that using only collect and delivery points to reach the final recipient would decrease operational costs but increase externalities like emissions or traffic congestions. On the other hand, bike deliveries would lead to the opposite effect. Hence, neither the first model nor the second alone would be beneficial for all stakeholders.

2.4.2 Small Eletric Vehicles (SEV)

A SEV, as the name indicates, is a small car powered by an eletric motor. Melo, Baptista, and Costa (2014) concluded that the implementation of this type of vehicle for the last mile delivery still has limited positive effects, so the investment needed is not worth it. The authors also point out that the autonomy restrictions, load capacity and the fact that SEVs need a consolidation centre are obstacles causing reluctance by logistics operators on what concerns to the adoption of this type of vehicles.

In spite of the outcomes of this study, it is possible to find a SEV fleet in Porto, from the post office service, operating in Porto and Lisbon (Junceiro 2017). The company has made a partnership with a Portuguese startup called UOU Mobility that manufactures electric tricycle and they are tesing this new vehicle in the last mile delivery of letters.

In fact, the potential of this new model of parcel delivery must be studied more profoundly because, as seen in the cargo cycles, the benefits a SEV can bring for the quality of life are tremendous, in terms of social and environmental matters. Besides that, it can also benefit from less depreciation costs, easily parked without disturbing traffic among other advantages (Melo, Baptista, and Costa 2014).

2.4.3 Unmanned Aerial Vehicles (UAVs)

UAVs, also known as drones, are autonomous aircrafts capable of carrying small sized parcels to their destinations along the shortest distance possible and with relatively high average speed, picking up and dropping off a single package at a time. According to McKinsey&Company, one supervisor per roughly eight drones is needed (Joerss et al. 2016). During the same study, McKinsey has also concluded that drones are a very expensive option because of the investment on aircrafts, operators and operational facilities required to start projects alike. With this being said, it was also estimated that the investment in this technology is worth only in countries with an average wage above 15€ per hour; moreover, the last mile delivery in these economies is expected to be processed by drones in about ten years. In less developed countries, however, equivalent expenses will have to wait a longer period in order to pay off.

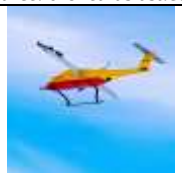
In line with a report of DHL about the impact of this type of vehicles in logistics (Kückelhaus and Niezgoda 2014), no matter how difficult it will be to implement drone’s systems, in the future all the regultaions that do not allow its operations will be changed or adapted since many industries can profit from them. Of course, this mode of delivery will not replace ground-based transportation ways like vans or trucks because, for example, a drone cannot

carry a pallet neither can perform deliveries in apartment buildings. However, these aircrafts will surely save lots of congestion as well as provide value in remote locations.

According to the same above-mentioned report, the two most promising uses of drones in the logistics industry regarding business potential are first and last mile in urban delivery. More specifically in which concerns to urgent express shipments in crowded megacities, and rural deliveries to serve people who otherwise could not have their packages as fast as the drones can do in remote areas.

Even if it seems that this model is too utopic and futuristic, there are already real-case scenarios where UAVs are being used, mainly in healthcare services like Flirtey and Zipline projects, or in the last mile of e-commerce orders as it is shown in the Table 3.

Table 3: Examples of UAVs currently working

Company	Description	Visual
Amazon	Amazon Prime Air was founded in 2016 and is currently under development in many countries. Prime Air will be used to deliver packages that weigh up to five pounds in 30min or less at distances of 10 miles or more.	 Source: dronethusiast.com
DHL	The Parcelcopter of DHL is an unmanned helicopter, with its first example being launched in the end of 2013. The last version is fully automated including take-off and landing, with a maximum airspeed of 70km per hour and payload up to 2kg.	 Source: dpdhl.com
Google	Project Wing, the drone delivery effort under Google parent Alphabet, started with flights tests in 2014, and their vehicles fly up to 400 feet above the ground and are able to safely deliver fragile packages to a spot the size of a doorstep.	 Source: x.company/wing
UPS	UPS is testing drones for residential package deliveries, using the roof of its vans as a mini-helipad, from where drones gain altitude and proceed to the destination. It has a 30-minute flight time and can carry up to 10 pounds.	 Source: ups.com
Matternet	Likewise, Matternet is also testing a model that is part delivery van, part helipad. The company has made a partnership with Mercedes-Benz and is now using drone deliveries for e-commerce packages up to four pounds in Switzerland.	 Source: technologyreview.com

Indeed, the technology has reached a level where it is possible to perform deliveries within a matter of minutes. Nonetheless, it will take time to generate the acceptance and trust needed for the customers to allow drones to fly to their houses for any purpose. Moreover, regulatory hurdles still have to be overcome.

Briefly, UAVs can be the solution for instant deliveries that are too difficult to payoff nowadays due to the higher complexity they have, essentially because it will provide faster customer deliveries through the shortest last mile distance possible. The question that remains is for how long regulations and public acceptance will hinder the implementation of this mode (Pandit and Poojari 2014).

2.4.4 Automated Guided Vehicles with lockers (AGVs)

An AGV is a car that can deliver parcels without any human intervention. Customers are notified of the exact arrival time because every delivery is calculated. Upon arrival at their door, customers are asked to pick up the parcel from the specified locker mounted on the vehicle. As reported by McKinsey (Joerss et al. 2016), this category of vehicles will dominate regular parcel delivery as well as time-window and delivery in urban areas, primarily because of the savings it will bring to the logistics industry. However, likewise drones, the cost advantage only holds if labor costs are above EUR 10 to 12 per hour, the same report states.

Cepolina and Farina (2015) describe an AGV pilot project tested in Potugal, called FURBOT. The authors emphasize the need of an UMCC where freight would first be delivered, through trucks or trains, and highlight the features of the vehicle that would allow to solve current inefficiencies in transportation such as long dwell times at loading and unloading points or low load factors and empty trips. These features are small dimensions, mobility dexterity and electrical power.

Although FURBOT was no more than a test, there are companies such as Udelv and Nuro with the ambition to put AGVs on the road as soon as possible.

2.4.5 Self-Driving Delivery Robot

These vehicles are very promising because contrary to UAVs and AGVs, their security implications are not a big concern since they are small autonomous vehicles, only slightly larger than a regular parcel, delivering parcels to the doorstep, relatively slow at 5 to 10 km/h and use the sidewalk rather than the street to reach their destination. Such robots, also known as droids, also need to be supervised, but due to their size and low speed, developers currently believe that a single supervisor could manage 50 to 100 of them. Because of these characteristics, droids may be a substitute of bike couriers, being used for instant deliveries in urban areas with high density.

From a cost point of view, this transportation mode still has to become cheaper otherwise, its future use can be limited. Moreover, a droid requires a singular packing and theft risks are to be determined (Joerss et al. 2016). In Table 4 four different brands of self-driving delivery robots are represented, all from USA, which is the pioneer country in this type of technology.

Table 4: Examples of Droids currently working

Robby Technologies	Starship	Dispatch	Marble
			
Source: robby.io	Source: starship.xyz	Source: dispatch.ai	Source: marble.io

Shortly, the exact impacts of droids cannot be measured accurately yet, and more studies need to be done in order to understand in how much time these little robots will substitute bike couriers, or if there will always be a place for the traditional non-motorized mode under two wheels.

2.5 Collect and Delivery Points

A Collect and Delivery Point (CDP), as the name says, is a place where the online order is delivered by the driver and collected by the e-shopper. In this report, any place where the driver leaves the order, in the hope that the buyer will receive it, is considered a CDP.

The most popular CDP across countries around the world is the home of e-shoppers. In fact, during a survey completed by Compenhagen Economics, 90% of e-shoppers rated the service "Delivery to the home address" as "somewhat important" or "very important" what puts this feature as the most relevant to the consumers, among all the options in the study (Okholm et al. 2013). Likewise, the results of the e-shopper barometer from DPD Group show that European online consumers normally choose their orders to be delivered at home, with 84% of the respondents saying they receive their orders at home (DPDGroup 2017).

Visser, Nemoto, and Browne (2014), however, raised the issues of home deliveries. Firstly, operation costs for the transport companies are very high due to the disparity of the addresses, and secondly, it is difficult to negotiate a time window for delivery because normally the e-shopper cannot be at home in business hours. As a result, the number of failed deliveries can be significant, bringing additional costs for carriers due to the repeated delivery. According to the same article, 12% of deliveries have to be delivered a second time. Further analysis of the negative impact of home deliveries can be found in this article.

Another drawback of this CDP is that it opens the opportunity to unauthorized people to sign the proof of delivery (Xu, Hong, and Li 2011). These authors have concluded that a CDP network overcomes the challenges of home deliveries, giving to logistic companies a beter efficiency during the delivery. Indeed, a study done by UPS, called UPS Pulse of the Online Shopper showed that 63% of e-shoppers surveyed are interested to collect their orders in a CDP if they can save money (UPS 2017).

It is possible to classify a CDP into two different categories: attended and unattended. Home deliveries, for example, are an attended CDP because there is human contact between the driver and recipient, however, there are more attended CDPs in which there is an intermediary between those intervenients, and where consumers may pay, collect and return their parcels if necessary. For instance, a post office or a petrol station are attended CDPs (Xu, Hong, and Li 2011). On the other hand, parcel lockers that can be opened with a PIN code by the user, after the carrier leaves the parcel there, is an unattended CDP.

A study from McKinsey&Company shows that, even with the possibility of using a 24/7 solution like parcel lockers, customers prefer to have direct delivery to their home if the price of domestic delivery cost less than 3€ (Joerss et al. 2016).

Shuo and Hongjie (2015) describe several types of CDPs, among others, the convenience store chain mode and the scattered little-stores mode, both attended. The first one is a CDP mode used by Amazon according to the article and among all the benefits it provides are the geographic coverage that is wide and the availability which normally is 24h per day. The second type consists of a partnership between the e-retailer and little non-chain stores such as laundry, flower shops or pet shops. These provide CDP service to consumers in exchange for more traffic. In contrary to the convenience stores, these have limited operational time. The authors further develop the factors under which the selection of each CDP should be done: economy, convenience, service level and availability.

The unattended delivery to the home is an unusual CDP mode that respects the use of reception boxes. However, as reported by McKinnon and Tallam (2003), this mode can bring security problems because it envolves leaving the order outside of the home. The authors concluded that, despite of the high level of convenience and the low investment needed, the lack of proof of delivery (POD) and the opportunity for theft on successive deliveries may interrupt the implementation of such boxes.

Anyway, Portuguese reality is not familiar with this kind of boxes, having only the traditional mailboxes, but normally e-tailers and carriers refuse to drop packages inside such small openings and risk to damage the product.

Another example of an attended CDP is picking orders in store. Nonetheless, this option represents a complex task for e-retailers in what respects to synchronizing both channels – online and offline – in terms of logistics. For instance, in the case of fashion retailers, it becomes especially difficult because clothes may be in the fitting rooms, leaving employees and customers in front of empty shelves despite the IT system that there are some more articles available (Wollenburg et al. 2017).

Finally, there are crowdsourcing platforms too, where any user can register his/her home as a CDP during specific time windows and receive a commission for each parcel received. An example of such model is ParknParcel, a company from Singapore.

All in all, the gap of the CDPs is that it does not avoid additional traffic and external costs because in most part of deliveries using a CDP the customer travels by car to pickup the parcel (Arnold et al. 2017). The study done in the article tried to understand how the distance that the receiver has to travel to achieve the CDP influences the use of a car to pick-up parcels. The results have shown that if such distance is no more than 200m the buyer uses the car in 10% of the cases. If it is between 200 and 500 m the percentace reaches 30%, for 500 to 1000m it increases to 50%, and for distances of more than 1000m, customers will use their car in 70% of the situations.

Finally, an innovative CDP that is not yet popularized is the e-shoppers' car trunk. Volvo has developed a system for certain car models that generates an electronic key allowing the carrier to open the e-shoppers' car trunk to deliver the order (Volvo Car Group 2014).

2.6 Benchmarking

The research of this work has also included a benchmark in the CEP industry. The companies searched were categorized according to their business model, for this, besides Rangel's sources, it was used a classification from McKinsey&Company that differentiated companies depending on their value chain coverage - fulfilment, order front end for products, elastic & IT-enabled delivery platform and last mile delivery (Netzer et al. 2017).

With this being said, this section will illustrate some relevant companies found with the following business models: carriers, in-house fulfillers, integrated supply aggregators, CDP network and pure tech plays.

2.6.1 Carriers

In this report, "Carriers" are third-party logistic providers that also offer delivery services. These players run warehouses in which they perform activities such as storage & sorting and from where parcels depart to final consumers.

Under the Portuguese context, the most relevant integrators playing the domestic B2C segment are Chronopost & Seur, CTTExpresso and Nacex.

Chronopost and Seur both belong to the DPDgroup Portugal. The first one was considered the best express transportation company in Portugal for the second consecutive year. Probably the main flag of their B2C segment is the pickup network offered, with 600 points spread all over the country (Chronopost Portugal 2018a). These two companies achieved 66M€ together in the last year (Chronopost Portugal 2018b).

CTTExpresso is the national post service of Portugal in what concerns to the B2C services, representing more than 15% of total company sales, and the company believes this percentage will increase to 50% in two or three years (Monteiro 2016).

Nacex is a Spanish company with a strong image in Portugal for e-commerce businesses, according to some interviews done with e-retailers. Nacex performs the next day delivery with 98% of success rate and charges a very competitive price. For instance, the company provides deliveries for Prozis, one giant of e-commerce in Portugal.

Among international solutions it can be mentioned a very interesting service provided by SignPost, called ezeCommerce, that stocks and ships online orders from its clients. This service is a cloud-based e-commerce fulfilment solution for SMEs (Hooi 2015).

2.6.2 Integrated Supply Aggregatores

As of today's reality, this business model fits perfectly in the food delivery industry. In fact, there is a high competition in the instant delivery of prepared food delivery. These players work as a marketplace of restaurants, where consumers can choose a meal from innumerable restaurants through a mobile app, developed by the company, which has also the responsibility of managing the delivery fleet.

One of the most popular and successful example in this market is UberEats, launched in 2015, with more than 8M users in the USA alone, and operates in more than 200 cities among 30 countries (Filloon 2017). Delivery Hero can also be mentioned as a strong player, operating in more than 40 markets with more than 14.000 employees. This startup was founded in 2011 and in the first quarter of 2018 has achieved the milestone of one million orders per day.

However, since then, a lot more startups have been launched. There are already very famous operators around the globe performing the same task, such as Deliveroo (UK), DoorDash (USA), Foodora & Foodpanda (Worldwide), JustEat (UK), Postmates (USA) and Takeaway.com (NL).

There is a group of other companies delivering not only prepared food, but also any other thing the e-shopper ask. Glovo and Jinapp are two examples, providing exactly the same service as the above-mentioned companies, although, the marketplace also includes fashion retailers, pharmacies, supermarkets and many more.

Finally, more than an integrated supply aggregator, there is a small group of enterprises providing prepared food but with a difference: they actually prepare the food. These are called In-house fulfillers because they are omnipresent throughout the value chain and one example can be Munchery (USA).

2.6.3 Collect and Delivery Points Network

Companies that provide a CDP network to the e-retailers as a business model can be clustered into three types - parcel lockers, scattered little stores and crowdsourced CDP – all of them innovative and with low expression since home deliveries are still the preferred location to receive packages as it was shown in previous sections.

Regarding parcel lockers networks, there is a pilot project in Portugal using this method from CTT Expresso (2017), but only in Lisbon and with estimated duration of one year. When asked about the service, the company said it is available for any e-buyer that in the moment of the checkout indicates the parcel lockers as a collect and delivery point and that in the moment of the delivery the recipient will receive a message by e-mail and mobilephone, informing the code to open the locker. The most important feature referred by the company was the availability of the service, 24h per day and 7 days per week, allowing people to

manage their own time. Another example of this type of business in Portugal is PUDO and one international can be the service of PopStation provided by SingaporePost.

Respecting the remaining business models of CDP network, two companies seem to provide a disruptive and successful service: Parcelly and ParknParcel. Both gather a set of CDPs where the driver can leave packages without worrying if the recipient is at home or not.

Nonetheless, companies perform such activities with different methods. Parcelly offer non-chain little stores the possibility to collect and deliver packages to the recipients, and ParknParcel works with independent people to do the same being a crowdsourced platform. With this, they can provide to e-retailers a wide range of locations spread all over the cities in which they operate, getting really closer to the final consumer.

2.6.4 Pure Delivery Players

In a similar way to the integrated supply aggregators, Pure Delivery Players provide last mile delivery and IT-enabled delivery platform but they do not afford an order front end for products. The value proposition of these enterprises is the fast delivery but not necessarily instant. Generally, pure delivery players are based on a crowdsourced team of drivers to transport packages, alike Uber model, providing great technology like APIs that integrate their dashboards with e-retailers ones. Some companies using this business model are Amazon with AmazonFlex service, Deliv (USA), Doorman (USA), Quiqup (UK), NoTime (CH), PassMyParcel (UK), Paack (ES) and Parcify (BE).

There is a subgroup in this category that focus on reverse logistics, so the value proposition of these companies is not to deliver goods from e-retailer to e-shopper but the other way around. Two examples are ReturnPal service from An Post (IE) and ShopRunBack (FR).

Just as importantly, it is worth mentioning that two relevant providers of on-demand delivery have decided to shut down. The first one was Shyp, one startup founded in 2013 that despite its investments of 50M$ in 2015, and valuated in 250M$ in the same year, ended up as a casualty of its own model. Likewise, Uber Rush, a service from Uber launched in 2015, will end its operations in June of 2018.

With this being said, although on-demand shipping startups are rising more frequently, it is proven that there is no space for all of them, and the explanations for that can be further developed in future works.

2.6.5 Pure Tech Plays

This subchapter will describe the most outstanding features developed by technology companies that provide digital programmes to support the last mile delivery and e-commerce operations, connecting the e-retailer, the e-shopper and the carrier in one place all together. Undeniably, these high-tech solutions are becoming increasingly indispensable day after day, assuming a preponderant weight in the performance of the involved activities. More than that, it is not inappropriate to say that without any information system it is impossible for a company to be competitive in a market where businesses only survive with the use of technology.

Most part of pure technology players in the logistics industry studied in this report are based on cloud computing, meaning the software can be accessed over the internet and used to assemble a solution on-demand, this is, at the same time the order is placed. It is the so-called Software as a Service (SaaS).

Although every solution has its own combination of specific features, it is possible to identify that almost every one tends to be an e-commerce delivery management software, which is able to gather every intervenient of the value chain at the same place. This integration

between the e-retailer, carrier and e-shopper is naturally the main reason that put this kind of solutions among the most populars because in the e-retailer perspective is much easier to control the business with one single software application.

For instance, Onfleet provides a panoply of services through its software, from connecting e-retailers with drivers and drivers to e-shoppers, to optimizing routes and generating comprehensive reports through data analytics. Metapack connects more than 400 carriers and 4000 services around the globe and, among many other services, manages returns via an online interface.

Regardless of that, there are many companies focusing on niche markets. For example, Routific offers a reliable route optimization solution which mission is to help businesses becoming greener and saving them time and up to 40% on fuel. Scandit turns any smartphone into a barcode scanner, integrating camera-based barcode scanning into companies existing browser-based applications without integration effort. Shippo helps e-retailers essentially on shipping processes, providing a hassle-free solution that creates and prints labels in just a few moments. Another example can be Airmap that spotlights the management of drones and wants to make this new delivery mode as part of people's everyday life.

In light of this, all the services provided by the fourteen technology operators can be generally categorized as shown in the Table 5.

Table 5: Technology features for e-commerce industries

Category	Features
General management	• Consolidate operations into one dashboard; • Accurate Estimated-time-of-arrival (ETA) • Real time alerts • Dynamic Search • Best carrier suggestion for specific deliveries • Manage returns • Manage shipping costs
Drivers App	• Proof of delivery (POD) • E-shopper information • Order details • Review timings, mileages
E-shopper interaction	• Notifications by SMS or e-mail • Track and Trace • Communication with the driver, or call centre • Rating service
Data Analytics & Business Intelligence	• Monitor performance • Identify bottlenecks • Download compregensive reports • Identify risk of non-delivery • Identify delivery trends
Others	• Route optimization • Map control: define service zones, dispatching across cities • Chat between online store and dispatcher • Task linking • Value added services: carry heavy items, installations • Geo Marketing

2.7 Business Model

A business model can be defined as "the rationale of how an organization creates, delivers, and captures value" (Osterwalder and Pigneur 2010). More importantly, these authors showed in their book how any company intends to make money through nine building blocks, defined as Business Model Canvas. It instantly gives a shared language that allows anyone to describe, discuss and manipulate businesses ideas.

Drucker (1994) developed his own definition of business model where he emphasizes the importance of adapting it over time, otherwise a company can become obsolete and may bankrupt. Instead of "business model", the author calls it "the company's theory of the business" and defines it as "the assumptions on which the organization has been built and is being run no longer fit reality" or "the assumptions about what a company gets paid for".

Margretta (2002) agrees with Peter Drucker and mentions that "a good business model answers Peter Drucker's age-old questions, 'Who is the customer? And what does the customer value?'". The author compares the process of a business model creation with writing a new story and mentions that, as "all new stories are variations on old ones, as all new business models are variations on the generic value chain underlying all businesses". Shortly, it seems that Drucker and Margretta concern more about the assumptions behind the business model than with the money that this framework intents to generate.

Johnson, Christensen, and Kagermann (2008) found that a new business model is not always required, but when a company wants to leverage a new technology or when it targets an entirely new group of customers the business model is required.

Girotra and Netessine (2014) determine a business model as "a set of key decisions that collectively determine how a business earns its revenue". Above the definition, the authors provide a business model framework that will help managers to put their businesses to another level of reliability. This framework takes into account many important factors like company's offers, costs, risks and revenue.

Casadesus-Masanell and Ricart (2011) draw attention to the fact that many companies test their business models in isolation, without considering competition, and cite that reason as a big failure driver. In what regards business model definition, the authors refer many authors that have been mentioned before in this subchapter, and they added that in order to create a business model, a company has to make policy choices, asset and governance choices.

3 Current B2C Model of Rangel

Since this project's scope is on e-commerce deliveries and Rangel network is focused on B2B services, it becomes challenging to gather last mile delivery information about the actual B2C services of the company because they are practically null. The truth is that, as it was mentioned before, B2C and B2B deliveries are integrated in the same network, with B2C representing only between 1-10% of the total service.

Before showing the inputs of the current service provided, a global perspective of Rangel service regarding transportation of goods to its clients is presented, as well as the actual assets used to complement the company operations.

3.1 Ongoing Service Provision of Rangel

The company in which this project is inserted, RDL, mainly offers services in the logistics area such as the management of Rangel's eleven warehouses throughout Portugal, which includes, for example, pick & packing and labelling, or services such as reverse logistics, outsourcing and insourcing logistics. However, as it has been said previously, the proposed challenge is essentially a transport problem, since it concerns the development of an alternative transport network for B2C deliveries, mainly coming from e-commerce. Currently RDL only offers transport to the Pharma & Healthcare service, managing a fleet of 100 vehicles all of them acquired by Rangel and with temperature control.

Actually, a synergy was needed with another company of the group, REX II, which is responsible for the Express & Parcels business unit. Opposite to RDL, REX II uses an outsourced fleet. Currently, its transport network has a comprehensive national coverage and a broad portfolio of services for B2B deliveries, such as delivering next day until 7:00 p.m., called "Rangel Express 19". In addition to this, Rangel currently offers an online portal, where customers can check online the status of deliveries, details of shipments, access to the digital POD, possibility to activate notification via SMS and email, or the possibility of exporting data to excel or word.

As the B2C service is not part of the REX II culture, no network is availabe that offers a fast and efficient service to B2C consumers. Despite this, the company provides home deliveries due to a large client - Correos from Spain -, which uses Rangel to make domestic deliveries in Portugal. Most of these deliveries come from telemarketing rather than from e-commerce, which means that the target audience is quite different from the one this project aims to address. However, since deliveries are made to consumers' homes, it is interesting to look at this operation.

Since the geographic points of interest for this project are the urban centres of Porto and Lisbon, Rangel was asked for a query containing all the submissions of the Correos to Porto and Lisbon in the months of March and April 2018. The main objective of the consultation of the query was to understand the characteristics of the products that were sent, as well as their volume and concentration according to postal codes. From the observation of the query, it was

verified that during the two months mentioned, 19.927 shipments were to Lisbon and 15.279 to Porto, with an average of 1,09 packages per shipment to Lisbon and 1,13 to Porto. These numbers account for 452 shipments per day to Lisbon and 347 to Porto, which is very significant. The average weight of shipments was 3.45kg.

Finally, it was found that for Lisbon, almost 90% of orders are sent to 70 different postal codes, out of 449 that receive orders from Correos. In what concerns to the Porto district, 56 postal codes out of 304 receive almost 90% of orders. This observation is important because it allows establishing a sealing of the zones of each city that there is more traffic on B2C orders.

3.2 Assets Description

Firstly, the main physical asset of this operation is the van. For the route of the city of Porto, the van used for the service on a daily basis is a 2009 Fiat Ducato diesel (Figure 2). The maximum capacity of this van is around 200 and 300 B2B parcels and, as estimated by Rangel, if only filled with e-commerce orders the van would probably bear out 400 packages, reaching up to 3kg maximum each one.

Figure 2: Sprinter van of B2C deliveries of Rangel

Another important asset is the Transport Management System (TMS) of Rangel, called GCOM, which was developed in-house and covers the whole group operations.

For transport operations, GCOM provides all information on any shipment that Rangel makes, such as who the shipper is, the place of collection, and the consignee. For the routes, GCOM generates the respective manifests, which are the documents that accompany the driver in the van and serve as a consultation point of information about each shipment. However, the same information on the manifest is also on the driver's PDA, another crucial device for this activity. Each route is associated with a cost, which is the amount that Rangel pays the suppliers to provide the vans and the drivers, and a delivery fee, which is the amount that Rangel charges customers to make the deliveries (these are also arranged in the GCOM).

The above-mentioned PDA is synchronized with GCOM and is governed by it, so there are a few people in the company offices that are able to make changes if necessary. At this time, the company is considering to replace these devices by smartphones since each costs more than 1200 €. Two of GCOM's outputs are the track and trace of orders as well as the billing that is issued through this system.

Also included in GCOM is the company's CRM that is used by the company's commercial & sales team. The CRM provides the information for each single customer, as well as all the history of the shipments they have made through Rangel so far. Finally, if there is a failure in a delivery due to errors in the information available, it is the responsibility of the customer support service to correct that in order to make sure the next day cargo is ready for retry.

In conclusion, the most important assets of the B2C & B2B delivery operations are four: the van (and the driver), GCOM & PDA and the warehouses that were referred in the previous subchapter.

3.3 Description of Porto's Route Delivery Service

The current B2C model of Rangel was studied through interviews with managers of the company as well as with the driver of the city of Porto route. More than that, it was possible to observe closely the driver's work during two full workdays. Thus, all the information described below is a result of those experiments.

The schedule of a typical delivery day starts between 8:30AM and 9:00AM. However, the driver has to arrive earlier at Rangel premises because he is responsible to load the parcels into the van and organizing them in a way that it will be easier to unload according to the route. Since the driver plans the route, without any computer assistance, he knows which parcels to deliver in first place and the ones left to the end. This is only possible because it is a repeatable work during the week, always with the same route, the same clients, so the driver has all the knowledge needed to load the van before leaving Rangel in the morning.

Similarly, after the delivery period, when the driver returns to Rangel around 7:00PM, he has to unload the parcels collected during the day. Moreover, he has to confirm the parcels delivered among the office workers and provide them the money corresponding to "cash on delivery" orders. When he collects cargo which destination is Spain, he must arrive before 6:45PM to Rangel, because the respective van departs at 7:00PM from Rangel.

For each delivery during the tour, the driver gets close to the store or recipient's home, parks, fetches the parcel from the van and delivers it at the customer′s door. Before returning to the van, the driver collects the proof of delivery that is done on the Personal Digital Assistant (PDA).

It is important to refer that in the city of Porto it is usually impossible to park correctly, as there is no space to perform it and the driver has to interrupt regular traffic flow while maneuvering for parking. In the case of a B2C delivery, if the customer or any neighbours are not at home, the respective parcel is maintained in the van and at the end of the day is returned to the warehouse. A new attempt will be done the next day.

Not least importantly, both departure and arrival occur in the warehouse of Rangel, in Alfena, which is 17km far away from the city centre of Porto. This has an impact on the performance of deliveries since the driver might spend between 30 and 45min to run that distance.

As it was already referred earlier in this chapter, during the execution of this project there was the opportunity of spending two days with the driver of Porto, who was able to openly describe his job, and talk about what he was performing better and what were the main issues faced by him everyday. Topics such as new technologys emerging on the CEP industry as well as e-commerce in general were discussed. Hereafter, these experiences will be detailed described.

3.3.1 Day One – 14th of March

First of all, during this day, there were too many parcels to be delivered, therefore, a bunch of parcels were left at Rangel's warehouse because they did not fit inside the van. Consequently, another driver was asked to deliver these parcels. Also because of this, the departure occurred later than usual because it took too long to load the van.

As it was mentioned before, during this day, the weather conditions disturbed the performance of the driver, who was unable to deliver all the parcels also because of the traffic congestion. Indeed, this can explain the expressive time spent on the road ("T road") of 4h44min. The worse consequence of the bad weather was seven missed deliveries.

In what concerns to the incidents of the day, there were three: two of them were B2C deliveries and the other one related to B2B. Beginning by describing the B2C incidents, the first situation occurred when the driver ignored a French note written in the manifest, and therefore, he drove to the indicated localization and when he arrived there was not any recipient waiting for the order. Meanwhile, when he consulted the meaning of the note in the translator, he understood that the recipient was asking to contact her first before moving to the destination written in the manifest, because she would probably not be there, but in another place not far away. By a mischance, the address to which the driver led was situated in a narrow-inclined street, and with all the rain, he could not move during many minutes, what has resulted in a total of 26min idle time.

The second occasion also occurred because the driver did not contact the recipient before driving to the destination, which had a respective travel time of 7min. In this case, the e-shopper was not at home, and his wife who was there did not have the necessary amount to pay this "cash on delivery" order. The remaining incident occurred due to the driver who completely forgot to deliver an envelope having passed at the client's doorstep.

To conclude, B2C packages were not only a few but also their deliveries had a low service level, because there was only one delivered without any setback. Relatively to the others, one took too long and the other delivery was not performed.

3.3.2 Day Two – 24th of April

During "day one", the driver referred many times that the weather strongly influenced the performance of the work in that day. In order to counteract this situation, this day was chosen because of the good weather.

The number of missed deliveries is the ultimate key performance indicator of this job. Therefore, if there are no parcels left at the end of the day there will not be any client complaining for the delay, which is definitely a positive point for Rangel image. By looking to Table 4, it is clear that "day two" was better performed than "day one" once there was only one missed delivery against seven from the "day one".

The only missed delivery of this day happened because the number of the door was wrong in the manifest. Hence, the driver parked the car far away from the recipient's door and it would be a costly effort to return there, namely it would delay the next deliveries and jeopardize the remained route.

Relatively to the setbacks of this day, it happened twice that the client had already paid the order but this was not specified in the manifest meanings it was considered a "cash on delivery" order. As a result, the driver had to call Rangel to confirm such payment, which caused an unnecessary waste of time of 12min in each situation. Besides that, the shopping deliveries took 19min as well. Consequently, the time spent per stop was higher on this day

than in the first one. Finally, there was one B2C delivery where the recipient was not at home, but his spouse was there to receive the parcel.

3.3.3 Summary of the Information Obtained and Driver Mindset

All the data gathered during the two days spent with the driver is shown in Table 6. “Day one” occurred at the second week of March and the weather was very rainy. Moreover, according to the driver he had more parcels to deliver in this day than usual. On the other hand, “day two” happened during the last week of April, with less parcels to be delivered and a sunny weather.

As a result, the number of missed deliveries is very significant in the first day when compared with the second day. By “missed deliveries” it is understood the number of parcels that remained in the van at the end of the day because there was not time to deliver them. Also, the time spent between the last delivery and the way back to Rangel’s warehouse is not counted as the time spending on the road (“T road”) since it does not contribute to the delivery of any package although it limits the available time to hand over the parcels.

Table 6: Porto's route metrics

	Day one	**Day two**
Start – End (duration)	8:57 AM – 6:50 PM (9h53min)	8:46 AM – 6:05 PM (9h19min)
Lunch time	1:18 PM – 2:25 PM (1h7min)	1:12 PM – 14:12 PM (1h)
Stops	58	51
~Km	200	200
Km/Stop	2,76	3,14
Total T road	4h44min	4h03min
Total T delivery	3h28min	4h01min
Time/Stop	8,48min	9,49min
Missed deliveries	7	1
B2C deliveries (failed ones)	3 (1)	1 (0)

With this being said, “T road” indicates the time inside the van that includes driving and parking. On the other hand, “T delivery” describes the time the driver spends out of the vehicle when delivering the parcels.

Although “T delivery” might seem short, that is not always the case. In fact, the act of delivering a good is fast, the driver delivers it and receives the signature of the client on his PDA. However, there are cases in which it is not possible to perform the task quickly. For example, when it comes to shopping centre deliveries, the time wasted until the driver arrives at the store is very significant. Another situation causing the same problem occurs when the cargo has to be placed on store’s basement and the driver is responsible to carry all of the parcels there.

The number of stops referred on the table means the number of times the driver parked the van and left it to deliver some orders. This is not the same as the total number of parcels delivered, or the total number of clientes attended. Naturally, these represent a higher number once it is frequent to deliver more than one parcel to the same client as well as delivering parcels to more than one client at once. The maximum number of parcels delivered to the same client was 16, for instance.

Probably the data in Table 6 that most denounces the lack of e-commerce deliveries are the kilometers per stop and time per stop, which values are too high, meaning that the density of

the route is too low. As it was described in the literature review, the density is the most direct influence factor in what concerns to the operational cost of the route, this is, the less kilometres travelled and time wasted per stop the lower the route density is, and consequently lower costs as well. In Rangel's case, this is not the scenario.

In order to understand the driver's mindset regarding his job, a few questions were asked during the day spent with him. Among all the topics approached, three main conclusions are highlighted:

- The driver prefers to perform B2B deliveries instead of B2C, because dealing with stores or offices is easier and faster. Moreover, he already knows most part of the people usually waiting every week for parcels;
- The driver is not satisfied with his work conditions mainly because he is the only one performing Porto route so he considers he has to much work load;
- The driver does not see using his smartphone as a PDA with good eyes, neither he is prepared to use, for example, a dynamic GPS to guide him and avoid traffic jam and accidents for example.

In Appendix B, it is possible to observe a common delivery to the store by Rangel's driver and a prohibited but necessary parking during the deliveries.

To complete this point, despite an inappropriate transport system for the e-commerce demand, it can be observed that the problem of this network goes beyond the integration of B2B and B2C. The problem is also present in the mindset and attitudes of drivers themselves. There is no doubt in concluding that the required behaviour when performing B2C deliveries is very different from the way it is done by the B2B ones and not every driver is willing to adapt to both realities. The contrasts between the two services are described below.

The B2B deliveries represent a routine activity in which the driver establishes contact with the employees of the companies in a weekly basis, meaning that there is a higher level of confidence and comprehension between both. Relatively to B2C deliveries, the driver does not know who is waiting for the package in the next stop, so the appearance becomes much more important as well as the care needed when talking to the recipient and giving the package.

Finally, yet important, contrary to what happens in the B2B deliveries, the local of the B2C ones are not known a priori. If Rangel would have dozens of e-commerce deliveries every day, it would be impossible for the driver to plan the best route without any technology support. This is a concern to bear in mind once Rangel drivers are normally older people (above 50 years old) not willing to adapt to different realities and using informatics applications.

3.4 Current situation outcomes

After the observation of the current state of Rangel B2C operations, it was possible to cluster the main issues of the model as well as the main consequences caused by the limitations of it. Both are listed next.

Main issues of current model:

- Lack of flexibility to adapt the route accordingly to new requests during the day.
- Lack of communication between the driver and the recipient;
- B2B deliveries are a priority over B2C ones;
- The driver's mindset is old fashioned, as he is not willing to adapt to new technologies and to offer a custom service for the recipient;
- Inexistence of route optimization software;
- Inexistence of a pickup point network.

Main consequences caused by the limitations of the current model:

- Loss of client's trust;
- Loss of potential revenue coming from B2C and B2B segments, owing to the fact that a considerable number of customers prefer to work with an unique logistic operator and they will choose the one that offers the most balanced service between the two segments.
- An increase of operational costs;
- Low service level.

To conclude this chapter, a comparative board was elaborated (Table 7) between the current integrated model of Rangel and the model intended to develop. It was also studied its feasibility during this project, one fully dedicated to the B2C shipments coming from e-commerce orders.

Table 7: Current vs. Desired B2C delivery model of Rangel

		B2B	**B2C now**	**B2C wanted**
Model overview	**Definition**	Small, médium and big parcel delivery, delivered to stores	Typically, small parcel delivery up to 3kg, delivered to door	Typically, small parcel delivery up to 3kg, delivered to door **or to a pickup point**
	Currently use cases	Clients B2B	E-commerce	E-commerce
	Timing	Next day	Next day	**Same Day**
	Leading providers	CTT Expresso, Chronopost*	CTT Expresso, Chronopost, Nacex	CTT Expresso Chronopost, Nacex
	Geographic coverage	Nationwide	Nationwide	**Urban centres of Porto and Lisbon**
Economics	**Operating assets**	Hubs, Truck, sprinter van	Hubs, Sprinter van	**UMCCs**, sprinter van, **car**, **motorcycle, IT**
	Labor model	1 driver	1 driver (the same driver of B2B)	1 **dedicated B2C driver**
	Labor / asset ownership	Contracted	Contracted	Contracted ("Uber model")
	Route density	60 stops / day	3-6 stops / day	**10-50 stops / day**

*Small sized parcels

4 Proposed Solution: Same day Delivery

After reviewing the literature about the state of e-commerce in the world as well as in Portugal, and after perfectly understanding Rangel B2C operations, it was concluded that same day deliveries are an extremely important opportunity. On the one hand, the research done demonstrated that the demand for this service is increasing year by year and, in what concerns benchmarking, it was determined that the Portuguese market still does not offer a quality same day delivery service. Thus, this solution seems to be the perfect investment for Rangel in the near future, in order to become market leader in such service and obtain more e-commerce clients.

With this being said, this chapter is divided in three parts. The introductory part has the aim to prove that the Portuguese market is willing to pay for a premium service of same day deliveries (4.1 and 4.2). The second part is concerned with the presentation of the proposed operational model that would perform the same day service (4.3). Lastly, a financial analysis is made with the objective of showing the project feasibility (4.4).

4.1 The Opportunity of Same day Delivery in Portugal

In an attempt to find out how receptive the national market regarding the same day delivery is, two interviews were done with online stores. After that, the market size of e-commerce deliveries was estimated.

4.1.1 Market Insights

In the first part of this section data collected from one survey is shown. All the 216 answers were gathered into graphics and tables with the aim of better understanding what does the majority of people think about the Same-Day service. This leads to the obtainment of the main outcomes from each question, which are listed next.

The survey was sent to students from the Faculty of Engineering of the University of Porto (FEUP). Table 8 shows general statistics from the survey. As a result of the University environment, where most respondents are millennials, what is considered a good target since they are the public that has grown in the digital era. Figure 1, Figure 2, Table 9 and Table 10 illustrate the answers of the questions asked during the survey.

Table 8: Statistics from survey of FEUP

Total answers	216
Gender	50% Men / 50% Women
Age	85% [18,34] / 15% [35,55]

Right after, three reactions are given from three different online stores when their representants were asked about how relevant deliveries are for them and how the Portuguese market is evolving when providing such services.

Question 1: How often do you buy online?

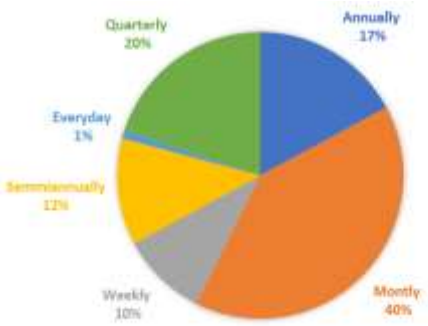


Figure 3: FEUP survey - answers Question 1

Question 2: What of the following delivery options would make you more likely to purchase from an online store?

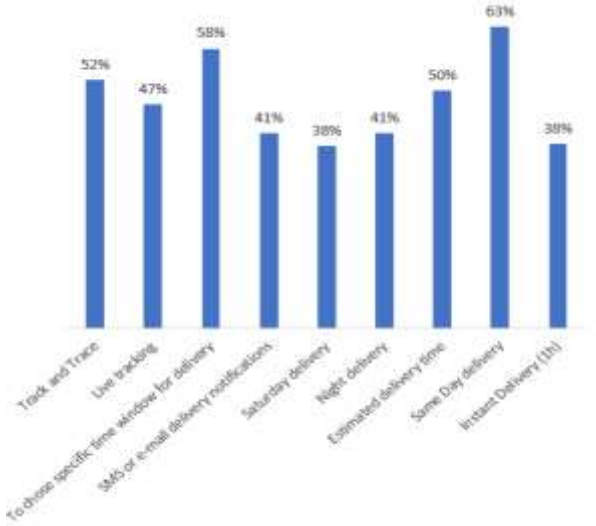


Figure 4: FEUP survey - answers Question 2

Question 3: Imagine that you want to make an online purchase worth 50 €. What value are you willing to pay other than the value of the product for a delivery on the of its purchase, for a normal and urgent (Mother's Day) situation?

Table 9: FEUP survey - answers Question 3

	Normal Situation	**Urgent Situation**
Average value	2,97€	5,34€
% of purchase's value	~6%	~10,5%

Question 4: What value are you willing to pay other than the value of the product for a delivery on the same day of its purchase if the price of the product is 50€ and 200€:

Table 10: FEUP survey - answers Question 4

	Product of 50€	**Product of 200€**
Average value	3,14€	7,01€
% of purchase's value	~6%	~3,5%

From each set of answers, it was possible to resume relevant insights from the public, which are ordered below, by question:

1. People frequently buy online with almost half of respondents buying every month (40%);
2. People recognize deliveries as an important feature or service. As it is possible to observe, it was the most chosen option among the all available with a percentage of 63%;
3. The more urgent is the situation people are in, the more important is a fast delivery. This is reflected in the amount of money they are willing to pay according to the necessity they have, which is almost double for an urgent situation.
4. The amount charged per delivery is linked with the purchase's value. The more expensive the purchase, the higher the amount people are willing to pay for the same day delivery. However, the relationship between the price to be paid for the purchase and the amount willing to pay for delivery is not a direct proportionality.

In fact, it was once again revealed that people recognize same day deliveries as an important service. To conclude this point, the following information was obtained from three Portuguese online stores – Life in a Bag, Prof and Prozis, which were asked about the importance of same day deliveries in the national market.

The first is the less relevant because despite being a company that started out the aim as an online B2C e-retailer, nowadays they sell mostly for other brick-and-mortar retailers that re-sell their products, and now only 18% of their shipments are B2C. For the remaining, it is important to mention that Prof is originally a traditional footwear retailer that becames an omni-channel retailer, and currently has more than a thousand shipments per month, while Prozis is a pure online player that sells sports nutrition and functional foods, with thousands of shipments per day, all over the world.

- *"It is indeed an interesting proposal, and we see that it is the future since other carriers already begin to comment on this service, however, for our business is not relevant at this time"* Life in a Bag CEO
- *"Deliveries are surely very relevant for this business. Our clients call us right after of buying online, asking when will the shoe be delivered, so we strongly believe they will have no problems sharing the '' fee with us"* PROF Ecommerce Manager
- *"It is a key point. We are already working with same day deliveries and we think it is the future, it has already a great impact nowadays. This service is among our main goals for Portugal, in the mid-term we want to deliver 100% of our orders during the same day of its purchases. After that, we will do the same with Spain."* Prozis Representant

4.1.2 Market Size

In order to understand the relevance of this service, the total Portuguese available market size was calculated. Considering the example explained afterwards, the average price charged by Rangel to its clients is 4.32€.

It is known that there are 3.1M of e-shoppers in Portugal and that each one buys 9.3 orders per year average. From the survey done in FEUP, it is estimated that for a normal situation, 34% of people is willing to pay more than 4€ for the service. Hence, it is assumed that 1.054.000 e-shoppers will ask for this service for the price of 4.32€.

The potential market size can be calculated as follows:

$$Same\ Day\ Market\ Size = Potential\ SameDay\ orders \times Average\ fee\ charged$$

The potential orders are firstly determined multiplying the average number of annual orders per e-shopper by the number of e-shoppers. The resultant value is 9.802.200 orders, which multiplied by 4.3€ provides the market size, with the value of 42.345.504€.

In its turn, the total e-commerce market size was also estimated:

$$E-commerce\ Market\ Size = N\ e-shoppers \times \text{N orders / year} \times Delivery\ fee$$

In this case, the delivery fee used was 2.6€. Although this fee is very low and below average, it is known that one of Rangel's competitor offers such price. In order to get non-so-optimistic market size, it was decided to keep such fee.

Final results can be observed in Table 11:

Table 11: E-commerce's deliveries market size

Market	Size
E-commerce deliveries	74.958.000€
deliveries	42.345.504€

Finally, with this calculation it was possible to conclude that the same day deliveries market represents 56% of the total e-commerce deliveries market

4.2 Same Day Delivery Model

It is impossible to exactly define the best model for same day deliveries in Portugal without testing it in reality. Thus, what is presented next is a suggestion from which new upgrades would be based on. In fact, these improvements can only come from interaction with the market.

4.2.1 Business Model

The business model used in this subchapter was the one suggested by Osterwalder, a framework already mentioned in the previous literature review. The developed model represents a two-sided market once there are two different client's segments, where both depends on each other to exist: e-retailers and e-shoppers. As such, the most important measure in the short run was to establish a model where e-retailers could offer same day deliveries to the e-shoppers. However, as it was found in the literature review, there is another business model emerging in some of the main e-commerce economies.

Such model is connecting carriers with e-shoppers by creating a marketplace of e-retailers at the same place. This is very interesting because e-shoppers can have unlimited deliveries by paying a monthly fee and e-retailers may be exposed to hundred or maybe thousands of potential consumers. In the end, carriers will have loyal brands associated, which in exchange will have loyal e-shoppers.

Therefore, Figure 5 illustrates Rangel business model where the main client segment represents the e-retailer, but it does not eliminate the possibility of the "marketplace" model, and that is why the information related with that one is represented in smaller letters. Henceforward, each division of the business model canvas will be better described.

Value Proposition: with the value proposition, the model intents to offer a faster delivery than the market has nowadays and consequently decrease the discomfort that e-shoppers feel when they want to buy something online. Moreover, the goal is to provide better features during the delivery experience. Shortly, the ultimate value proposition of this model is the same day delivery. However, other complementary services such as night and weekend deliveries or a delivery management portal where the consumers can track and trace their packages are also mentioned.

Customer Segments: customer segment works hand in hand with the value propostition. The e-retailers are the main target; however, their customers preferences will influence their own preferences. As such, e-shoppers are also a target to take into consideration. Moreover, if in a mid-term Rangel manage to get a marketplace of e-retailers, it can be a great strategy to obtain more e-shoppers by offering, for example, unlimited same day deliveries with a monthly fee. For that reason, there are two different customer segments, so there are also two different revenue streams.

Channels: it will work through physical distribution channels like direct sales force and a commercial team. Another hypothesis is through digital tools but this method is more adequate to achieve final consumers directly.

Customer Relationships: as it is a new service, the primary goal will be to get clients so customer touchpoints will be achieved essentially through customer support, live chats on the portal and others. After that, the model can develop some "keep & grow" strategies and it may implement loyalty programmes, free giveaways, and similar kind of promotions.

Revenue Model: firstly, and mainly, the money comes from delivery fees charged to the e-retailers, with the total value being proportional to the usage of the service. Afterwards, in the marketplace model, a subscription can give continuous access to final consumers for example.

Key Partners: courier companies are the epicentre of all partnerships of this model because of their willing to use their flexibility and omnipresence around the city to implement its operations. They will be Rangel's suppliers in the same day service.

Key Resources: in this case, the model will keep on working with the same assets as today, but a study on how an urban micro consolidation centre can affect the operations in terms of speed and costs is necessary.

Key Activities: there are three main activities in what concerns to operations: pick-up, line-haul and delivery. Besides, sales and customer service are very important to obtain more clients. Marketing can be fundamental in the marketplace model.

Costs Structure: workforce that will be responsible for administration issues, suppliers that will perform pick-up and delivery activities, and consolidation that is still a question mark. Marketing expenses will have more expression in the marketplace model.

Figure 5: Business Model

4.2.2 Operational Model

The diagram in Figure 6 represents the overview of the developed model for deliveries whose main goal is making it possible for the e-shopper to receive the order on the same day it was placed. The timings exposed in the same figure are suggestions and they may suffer changes afterwards. Therefore, in order to provide such service, the operation has to cross-different steps.

Before going through each step individually, it is important to refer that the model will only work with the partnership of two courier companies. The first one is the same that performs B2B deliveries for Rangel nowadays, which will perform the pick-up phase and line-haul as well. The second has to perform the last mile phase so it has to provide a more flexible service and it has to be available beyond the standard work hours.

Bearing this in mind, there was the necessity to contact companies that work with Uber or Uber Eats and ask them if they have any interest in performing transport of goods instead of passengers or food, as these companies have vehicles spread all over the city and available workforce at any time.

Thus, two courier companies were interviewed: BFR that is beginning its operations now and the other one is the biggest Uber partner in Portugal, BluWalk. Table 12 shows the information collected during the interviews.

Table 12: Information obtained from courier companies

	BFR	**BluWalk**
Fleet size	5 cars	200 cars and 25 motorbikes
Geographic coverage	Porto	Porto, Lisbon, Braga, Algarve
Interest	Only in idle periods	Yes, and with a dedicated vehicle
Storage capability	Yes	It is not the objective but it can be done for a pilot
Main concerns	Legal issues, licences, operations assets needed	Volume needed, value of the service

After getting the approval of the courier companies, the developed model could finally progress. Therefore, hereafter the draft of the model is described gradually (see Figure 6 to fully understand).

Processing: it refers to the moment consumers are placing orders on the e-retailers websites and it ends at 13h, meaning no orders that are executed after that time will be collected in the . This phase also includes the physical processing of the orders to send that the retailers have to perform.

Pickup: when the e-retailer has all the orders approved, Rangel will collect them through an outsourced van and driver.

Line-Haul: the cargo that is collected in Porto and needs to be delivered in Lisbon or vice-versa, will perform the line-haul by van. If it is not the case, this step can be ignored.

Last Mile: the innovation lies in this step. It refers to the last transportation phase when the final consumer finally receives his/her order, and the second courier companies perform it by motorbike or car.

Now that each phase was explained one by one, it is time to clarify some important details of this model. First, between the pickup and the line-haul phases there is a smaller task called consolidation. This consolidation can be made using the courier company infrastructure, or it can be responsibility of Rangel, although, in order to simplify the diagram only one place was considered.

Consolidation has the aim to separate and organize all the collected cargo according to their district and with their zip code afterwards, so it makes possible to define which packages will travel the line-haul and to define each route.

Lastly, the communication established between Rangel, e-retailer and courier companies could be done through a software such as Onfleet or Routific, although for the pilot project it will not be necessary.

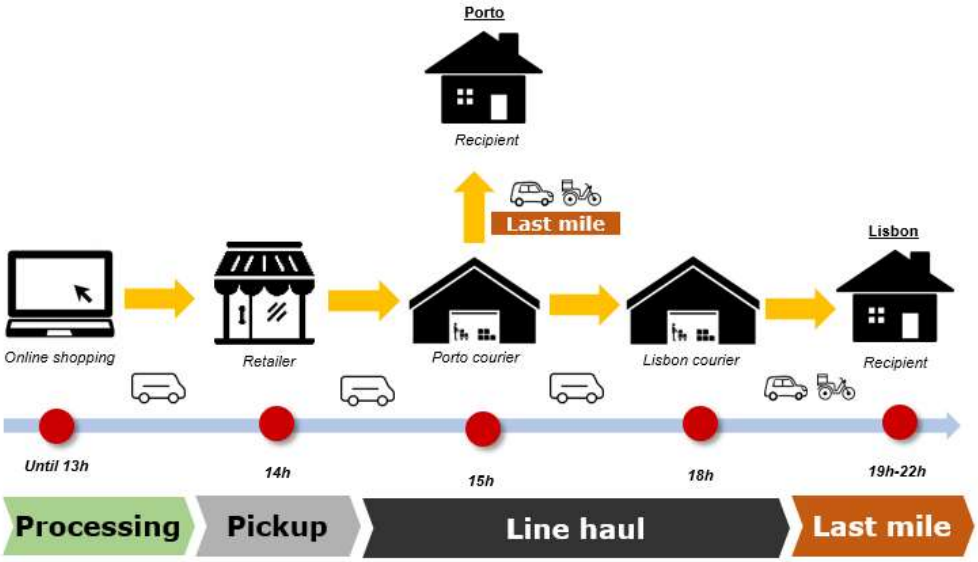


Figure 6: Operational model of new B2C deliveries

4.3 Risk Analysis

In order to evaluate the risks of the current project, a Porter's Five Forces analysis was conducted, followed by a SWOT analysis. While the first analysis gives a micro-tool view of the external environment, the second is a macro analysis that gets a more deeply understanding of the company in order to analyse its internal potential.

4.3.1 Five Porter's Forces Annalysis

This analysis touches in five competitive forces that shape all industries, thus, it can be used for any segment of the economy in order to observe how profitable and attractive the segment can be. Next it will be shortly described each force for the specific case of the B2C deliveries, more specifically the service of Same-Day. Table 13 summarizes all the five forces description.

Competition in the industry: measures the number of competitors in the same industry, and the number of similar products and services offered throughout the market. In this case, although there is no service like the one being developed, there are many transportation and logistic companies providing services for e-commerce deliveries, so the competition is very high once they can copy and follow Rangel's steps. In order to minimize competitor's chances, it is advised for Rangel to be the first mover and build a strong branding. This may result in customer loyalty and economies of scale that are difficult to achieve.

Potential of new entrants into the industry: measures the time and money needed to become a player in the market. In this case, the investment is significant and because there are already big well-known players in the market, the barriers of entry are very strong, what makes the threat of new entrants low.

Power of suppliers: measures how unique is the service provided by the suppliers. In this case their power is medium-low because there are a lot of courier companies from which Rangel may choose. Moreover, they do not get in touch with the e-retailers so they cannot operate without Rangel.

Power of customers: determine the cost of loosing a customer to the competition. At this case, this force is difficult to measure because it is a new market so there is no knowledge regarding the reaction of the customers to this service. What is known is that this industry is constantly fighting for the best price, so Same Day service will be a very price-sensitive as well.

Threat of substitutes: verify if there is available any service that can provide the same output as the current one. For example, next day delivery is a substitute of delivery in case the speed of delivery is not that important for the e-shopper.

Table 13: Five Porter's Forces summary

Porter's Force	Level of the threat	Short description
Competitive Rivalry	High	Current operators can try to copy the model
New Entrants	Low	Significant investment and know-how required
Supplier Power	Low-Medium	Their service is not difficult to find in the market
Customer Power	Relative	Difficult to have an accurate measure
Substitutes	Medium	If time is not a problem, Next Day is a strong substitute

4.3.2 SWOT Analysis

The second analysis in this chapter is called SWOT analysis that touches in internal and external factors of the company. At this point, the strengthts and weaknesses of Rangel that can affect the new business of deliveries were first analysed. Next, external factors from the company were figured out like market tendencies that may affect service. The final SWOT is shown in Table 14.

Table 14: SWOT Analysis

STRENGTHS (+)	**WEAKNESSES (-)**
Strong reputation; Cost advantage through know how; Customer portfolio.	Poor quality of B2C services now; Technology innovation.
OPPORTUNITIES (+)	**THREATS (-)**
Developing market; A market that is led by a weak competitor; It is a new service in Portugal.	Price war; Competitors; New regulations; Partners dependency.

From the data above exposed, it was concluded that, for this service, Rangel should follow two strategies in order to achieve a winning business model. The first would be an aggressive strategy, using the company's strengths to seize the market opportunities and thus lead the market through developing the new service of same day deliveries. Finally, another strategy would be a diversification where the company would use its strengths to minimize the existent threats. This could be done through innovation and loyal customers.

4.4 Financial Analysis

It can be considered that the theoretical study presented so far showed a high degree of optimism regarding the Same-Day service, whose possible non-financial benefits boosted by this new business unit are:

- Better performance of B2C deliveries;
- Increase of cost efficiency in B2C deliveries;
- Decrease of delays and failed B2C deliveries;
- High potential of attracting new customers;
- Stand out in the national e-commerce market;
- More aggregated value to the company name.

Nonetheless, in this chapter a financial analysis is presented, with the aim of concluding what is the potential value created by this project to the company. This analysis was conducted in a time horizon of three years, divided into six semesters, meaning the analysis was based in six different periods. In order to obtain the most accurate value, the cash flows were calculated and updated to the first period.

During the following sections, all the assumptions made are demonstrated. Thus, the financial benefits, costs and other variables can be defined and better explained. These factors were essential for the subsequent calculation of the cash flows.

4.4.1 Financial Benefits

The financial benefits (sales) come from the service provided by delivery. Rangel will charge a fee to the online stores for each package they send through its services, which value will depend on the number of shipments per month they have, presented in Table 15.

Table 15: E-retailer segmentation by size

Size of the e-retailer	Shipments/month	Charged fee/order
Large	5.000	4€
Medium	1.000	4,3€
Small	200	5€
Punctual	20	5,5€

This segmentation of the size of the e-retailer is important for commercial reasons. Assuming that in the future, the level of hardship in convincing those clients to opt for Rangel services is independent of their sizes, it will be naturally more intelligent to approach more frequently and more insistently the stores with higher shipment volumes.

Moreover, the number of shipments per month per e-retailer size was defined based on four main references, described next.

"Large" e-retailer: it was estimated that 5% of Prozis shipments have Portugal as their destination. Furthermore, during the interview, the company's representant said the company has 10.000 shipments per day, so, there are 15.000 shipments per month to Portugal. Because Prozis is an exception in the Portuguese market in terms of dimension, the "Large" size in this study is considered to be an online store three times smaller than Prozis, wich means with 5.000 shipments per month;

"Medium" e-retailer: during the interview, the e-commerce Manager of PROF also informed that their online store has approximately 1.300 shipments per month in average. So, for safety reasons, in this study it was considered a number of 1.000 shipments per month;

"Small" e-retailer: the small sized online store was based on the company Life in a Bag that has 188 shipments per month. In this case, this value was rounded up to 200;

"Punctual" e-retailer: the punctual e-retailers are the least important once they represent "Do it yourself" retailers, with very few shipments per month. The number 20 was an estimation in this case.

Relatively to the fees charged per shipment by Rangel to their clients, these values were based on the data obtained in the survey conveyed by FEUP students. In this market study, in a normal situation (not urgent), 6% of therespondents said they would pay 4€ more for the delivery, 21% would pay 5€ for the same service, 6% would pay between 6€ and 10€ and 1% would pay between 11€ and 15€. In total, 34% of respondents said they would pay 4€ or more in order to get their order delivered in the same day of their purchase.

With this being said, the financial benefits are calculated based on the sum of the sales coming from the different type of companies and from the two cities studied – Porto and Lisbon.

Thus, for each e-retailer size the financial benefits are calculated according to the following formula, where "X" is the size of each store:

$$Financial\ benefits = number\ of\ clients\ \mathrm{X} \times number\ of\ shipments\ \times fee$$

Finally, the total financial benefit is calculated for a period of one month. Afterwards, it is assumed a growth rate of 10% per year (CTT 2017), meaning 0.83% per month, in what concerns to the number of shipments per client. The number of clients remains static in this analysis.

4.4.2 Costs

In this model costs may be classified as variable or fixed costs. As for the first ones, they are divided within the three main activities of the operation - pickup, consolidation, line haul and delivery. The remaining ones are structural costs and consolidation costs.

Pick-up costs: in the developed model, the van is used as the only delivery mode to perform the pick-ups. According to company sources, the cost per stop of this activity using the van is around 2,5€. The number of stops is the number of times the driver parks the van in order to pick-up orders, and its calculation was the main point to obtain the pick-up costs. It is assumed that while the number of shipments per day is lower or equal to the van capacity, which according to Rangel's sources is approximately 400 parcels, the number of stops is the same as the number of clients. This assumes the worst-case scenario once there will be days in which not every single client will have shipments to send, mainly the small and punctual ones.

If the number of parcels increases to more than 400, another van will be used so the number of stops will continue equal to the number of clients. For instance, if there are 500 parcels to collect in a specific day, two vans will be used, each one picking 250 parcels. Although it is not expected that during the first months of operations the number of parcels per day requiring pick-up exceeds 400.

Consolidation costs: the consolidation can be performed using Rangel's warehouse or using an urban micro consolidation centre (UMCC). The cost driver is the rent of each building, depending on the location of the building and on the area needed.

During the first months of the operation it is not expected any additional costs such as wages or technology. In such context, the model chose the cheapest option for each city and combined these to obtain the final consolidation cost. All the values of the variables presented are an estimation. However, they are based in references given by Rangel.

Line Haul costs: the cost per line haul was also an information obtained from Rangel, which value is 260€. During the financial analysis, it is calculated the number of line hauls needed according to the number of shipments to deliver. In order to obtain such number, there is one assumption to be done relatively to the proportion of packages that will go through the line haul. The percentage considered of 50% is an estimation given by Rangel. In order to assure a minimum service level to the future clients, the model defines that there is at least one line-haul available per day, per direction – Porto Lisbon and Lisbon Porto.

Delivery costs: the delivery costs are the most significant among all the costs. The main reason for this is that a fee is charged for every package delivered. This assumption excludes the cases in which the driver can deliver more than one order at the same stop. However, it is beneficial for the analysis once it will always assume the worst-case scenario. Differently from the pick-up phase, during deliveries two vehicles can be used: vans and motorbikes, even though the cost per stop for each one is not the same. In the case of the vans, it will remain €2,5 per stop, while regarding to the motorbikes the cost was given by a courier company when asked about a budget to perform the same day deliveries. Considering this, the company provided a delivery fee of € 1.57 per order delivered, and an additional fee of € 0.72 per km and per motorbike.

To conclude this point, the remaining question was the proportion of packages delivered by van or by motorbike. The values tested in the model were 30% van vs. 70% motorbike in Lisbon and 60% motorbike vs. 40% van in Porto.

Structure costs: These are costs resulting from activities that are not part of the execution but are also fundamental to achieve success. These can be part of the sales force, R&D, quality control, marketing and others. All of these are clustered into "structure costs" and the value is an estimation given by Rangel that suggested €5.000 per month.

4.4.3 Possible Scenario

In this section the inputs added to the model for testing will be given. Firstly, the number of each e-retailer size for each city was defined (Table 16).

Table 16: Number of clients considered per size

Size	Big	Medium	Small	Punctual
N Clients	1	2	5	10

With these clients, Rangel would achieve the revenues and costs represented in Table 17, per semester. As already mentioned, the financial analysis was done for a period of three years. Therefore, in the following tables, the periods from 1 to 6 represent the semesters of the analysis.

Table 17: Revenues and Costs

Period	**1**	**2**	**3**	**4**	**5**	**6**
Revenues	416 400 €	437 220 €	459 081 €	482 035 €	506 137€	531 444 €
Pick-up Costs	11 880 €	11 880 €	11 880 €	11 880 €	11 880 €	11 880 €
Consolidation Costs	403 €	403 €	403 €	403 €	403 €	403 €
Line-Haul Costs	68 640 €	68 640 €	80 080 €	80 080 €	80 080 €	91 520€
Delivery Costs	234 635 €	246 367 €	258 685 €	271 619 €	285 200 €	299 460 €

The gross margin is obtained by subtracting the costs above mentioned to the revenues. Right after, structure costs are calculated as it was already explained before as well as depreciations. The depreciation rates were estimated, 33.3% for intangible fixed assets and 12.5% for

tangible fixed assets. Thus, it was possible to obtain the value of the EBIT for each period. The last step before achieving the economic cash flow was to calculate taxes, this rate was 21,5% (source: Rangel), in order to obtain the NET Income, show in Table 18.

Table 18: Gross Margin, EBIT and NET Income

Period	1	2	3	4	5	6
Gross Margin	101 245 €	110 333 €	96 556 €	106 576 €	117 097 €	116 704 €
EBIT	71 245 €	80 333 €	66 556 €	76 576 €	87 097 €	86 704€
NET Income	55 927 €	63 062 €	61 572 €	69 438 €	77 697 €	77 388 €

After the previous calculations, the economic cash flow is reached by subtracting the values of the depreciations to the values of the NET Income. The following step consists on the calculation of the final cash flows of the project taking into account values of the cash flows of the investment. Posteriorly, the cash flows of the project will be updated to the period 0.

The investment considered in the period 0 are divided into tangible fixed costs and intangible fixed costs. The first ones come from real state and IT equipment, and the last ones from a software license. For the remaining periods, it was necessary to bear in mind the investment in working capital, or the time spent to receive from the clients and to pay to the suppliers, which is 30 days.

Subsequently, the cash flows of the project can be calculated by subtracting the cash flows of investment to the economic cash flows (see Appendix C). These results are expressed in Table 19.

Table 19: Cash Flows

Period	0	1	2	3	4	5	6
Economic CF	0	57 990 €	65 124 €	63 635 €	71 500 €	79 759 €	79 451 €
CF of Investment	13 000 €	16 807 €	1 515 €	- 316€	1 670 €	1 753 €	- 66 €
CF of the project	13 000 €	41 183 €	63 610 €	63 951€	69 830 €	78 006 €	101 505€

The main objective of the calculations was to obtain the value of the Net Present Value (NPV), which corresponds to the real amount of money generated to Rangel. Thus, at this point, the semi-annual effective rate was calculated, considering a cost of capital of 4%, value given by Rangel. With the value of 1.98%, this rate was used to update all the cash flows of the project to the period 0. The NPV is the sum of each updated CF of the project and the results of this last step of the financial analysis is shown on Table 20.

Table 20: Updated Cash Flows

Period	1	2	3	4	5	6
Updated CF	40 383 €	61 164 €	60 298 €	64 563 €	70 722 €	90 239 €

Finally, the NPV (see Appendix D) of the Delivery Service of Rangel in three years is 374.369€, which demonstrates that there is feasibility in this new business area and the company should keep forward with this initiative.

4.4.4 Feasibility Conclusion

It is clear that the scenario described is based on several assumptions, and that the model created also assumes some facts that may be deviated from reality. However, an attempt was made to design a calculation that was as realistic as possible, also taking into account actual data from both Rangel and the courier companies that were interviewed.

Therefore, it is believed that the results obtained can be used to make investment decisions. Nevertheless, it should not be forgotten that even if the numbers are deviated, the investment cost is extremely low because Rangel is already a holder of almost all the resources necessary to start this operation.

To conclude, it is strongly advised to have at least a pilot test of deliveries in the same day because in case the process fails, as in this situation – the cost is almost insignificant. On the contrary, if the process succeeds, it can open doors to a completely new market to be explored in Portugal, in which Rangel will be ahead of the competition since the beginning.

5 Conclusions and Future Research

The last chapter of this report is organized into four distinct parts. In the first place, the main conclusions of the work are discussed. Next, the contributions that this study has brought to Rangel and to the Portuguese market of the delivery are mentioned. Thirdly, a few points are suggested for future research in order to complement what has already been done. Finally, the final conclusion of this report is done.

Discussion of the inferences that can be drawn from the research

E-commerce is not the future anymore, and the first ones to understand that finding will be able to build a strong branding as well as customer loyalty and get cost advantages as a result of the economies of scale.

Indeed, research has revealed that online stores are the place where people tend to buy more and more. For instance, the estimated Portuguese market for 2017 is 4.7 billion euros (Abraham, Lone, and Couenberg 2017) and 8.9 billion euros in 2025 (ACEPI and IDC 2017). Moreover, 33% of the Portuguese population buy online and still have great growth potential since the European average is 55% (CTT 2017). Nevertheless, Portugal is considered a developing country when compared to USA or UK, which also means there is a considerable potential development in the next years, making Portugal a start-up country in the e-commerce industry.

The same day delivery service has the potential to absolutely change the way people shop because it integrates two often exclusive realities: it offers the convenience of online retail and at the same time allows the immediacy of traditional stores. In fact, the e-commerce trendsetter Amazon has lead the delivery service since the introduction of Amazon Prime in 2005 and launched free same day delivery for Prime members in 2015 (Netzer et al. 2017), and a free two-hour shipping in 2017, called Prime now. These moves are certainly a reliable prediction of the future of the last mile.

In light of the delay of the Portuguese e-commerce market, for instance, it does not offer many networks of Collect and Delivery Points (CDP), neither the last mile industry uses Urban Micro Consolidation Centres (UMCC) in its value chain in order to provide faster deliveries.

Internationalization and mobility are highly connected with e-commerce industry. Amazon, eBay and Alibaba are the main responsibles for the CBEC around the world. As a matter of fact, China is the country where Portuguese e-shoppers buy more frequently as a result of Alibaba website sales (ACEPI and IDC 2017). Research also concluded that smartphones are getting importance regarding e-commerce orders, among other reasons, due to the rise of millennials.

The level of innovation and technology associated with the operations may determine the success degree of a company in this industry. There is a multiplicity of tech solutions in the market to support e-commerce websites and logistics operators (some of them were shown in the benchmark section). Concerning the innovative services, 3D printing was mentioned

because although it was first invented in the late 80s (Flynt 2017), it has now the power to completely revolutionize the delivery.

Contributions that the research has made

Firstly, this project has identified the main issues of the current B2C delivery model of Rangel and posteriorly the consequences caused by the limitations of such model. This was only possible because there was a close observation of the operations, allowed by cthe close observation of the driver of Porto's route during two workdays. Therefore, the problems verified were:

- Lack of flexibility to adapt the route accordingly to new requests during the day;
- Lack of communication between the driver and the recipient;
- B2B deliveries are a priority over B2C ones;
- The driver's mindset is old fashioned, as he is not willing to adapt to new technologies and to offer a custom service for the recipient;
- Inexistence of route optimization software;
- Inexistence of a pickup point network.

These gaps are setting back the company to grow its services on B2C segments because they are resulting in some negative consequences:

- Loss of client's trust;
- Loss of potential revenue coming from B2C and B2B segments;
- An increase of operational costs;
- Low service level.

The relevance of same day deliveries was proven through a survey of 216 respondents. This market study yielded important outcomes for the analysis showing that the Portuguese e-shoppers buy frequently online and recognize the service as an important feature. In addition, it has proven that same day deliveries have become as important as urgent regarding to a variety of situations and that the amount charged per delivery is linked with the purchase's value.

From the risks analysis, it was concluded that the main threat of Rangel in case the company decides to invest in this new service would be the existence of competitors who would certainly try to copy the Same-Day model. So, it is advised to implement an aggressive strategy that uses Rangel's strengths to seize the market opportunities and at the same time a diversification strategy where the company would use its strengths to minimize the existent threats.

Finally, the study summarized six non-financial benefits of the Same Day model:

- Better performance of B2C deliveries;
- Increase of cost efficiency in B2C deliveries;
- Decrease of delays and failed B2C deliveries;
- High potential of attracting new customers;
- Stand out in the national e-commerce market;
- More aggregated value to the company name.

The financial analysis developed in this project resulted in the first analytical support of a possible delivery service for Rangel. As such, it was something very useful since the company recognizes that e-commerce will not stop growing in the coming years, and therefore the numbers presented in this part of the report will most likely be the basis for the implementation of the new service.

It is important to point out that the model developed took into account several requirements of the company, and several assumptions obtained through interviews with the courier companies. Even so, the result was a Net Present Value of €374.027 over three years of running the service, a number that deserves thought as Rangel can be at the door of a great business opportunity. From this analysis, it was also concluded that the main cost is delivery, which in the example defined represents more than 55% of the value of total revenues.

Suggestions for future research

In what concerns to the delivery process, if Rangel manages to establish a Pickup and Drop off (PUDO) network, the number of stops needed will decrease, as well as the transportation costs. Although according to the company's sources it might be a possibility in the future, further analysis is needed in order to measure the cost savings of such an add-on.

In order for the company to have more confidence in this new service, it would be beneficial to contact more e-retailers. Their classification was made based on three online stores, which despite being considered good examples, do not represent the Portuguese market in its entirety. Thus, with more interviews, it would be possible to have a better sense of the average number of submissions per e-retailer, which would give a more accurate revenue estimate.

In what concerns other financial considerations, the importance of value creation within the scope of the investment decision based on the concept of its opportunity and the variables that influence the respective choices are exposed in the presented analysis. However, forecasting the financial flows associated with the project and determining the financial requirements necessary to maintain its sustained development required a longer period. Considering a minimum period of ten years would allow to design gross margin behaviours and to conclude about the project's competitive advantages in the medium to long-term horizon, as well as defining the appropriateness of the positioning of the target audience.

The cash flow approach made possible to show the differences of the Net Profit for the period, but it was limited to the operating cash flows from the project perspective. An investor approach would allow a better differentiation between the two perspectives and their complementary. Another point that could be developed with better access to the necessary information would be the analysis of the cost of capital, and methodology to estimate the discount rate of the flows associated with the project activity.

The only investment decision criterion used was the Net Present Value. Taking into account other criteria (Average Rate of Return, Yield Ratio, Internal Rate of Return, Investment Recovery Period, Internal Integrated Yield Ratio, Annual Equivalent Benefit, and Annual Equivalent Cost) would enrich the analysis, and a criterion that weighted all the results found would be a relevant challenge.

The analysis of risk and uncertainty was introduced indirectly by highlighting the strategic variables with greater weight in the determination of the results, in order to identify the critical points of the project, but the use of the decision tree technique, evidencing them, would enrich the decision maker's analysis. In addition, a *tableau de bord* of the variables with greater responsibility on the operations of the model would focus on controlling the profitability and solvency of the project throughout its economic life.

Final observation

In the end, among the expected results defined at the beginning of the company's internship, the creation of a pilot project was the only one objective not achieved, although it was considered viable. In fact, this objective was seen from the outset as a "bonus", since it was already known that the time was too short to proceed to a real test. Even so, the biggest counter-time for this to happen was the lack of availability of the company's commercial team to arrange meetings with e-retailers that might be available to test the developed model.

Therefore, as all other expected results have been achieved, a sense of mission accomplished is conveyed, and of a promising future for Rangel's e-commerce.

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APPENDIX A: Organizational chart of Rangel & Distribuição Logística

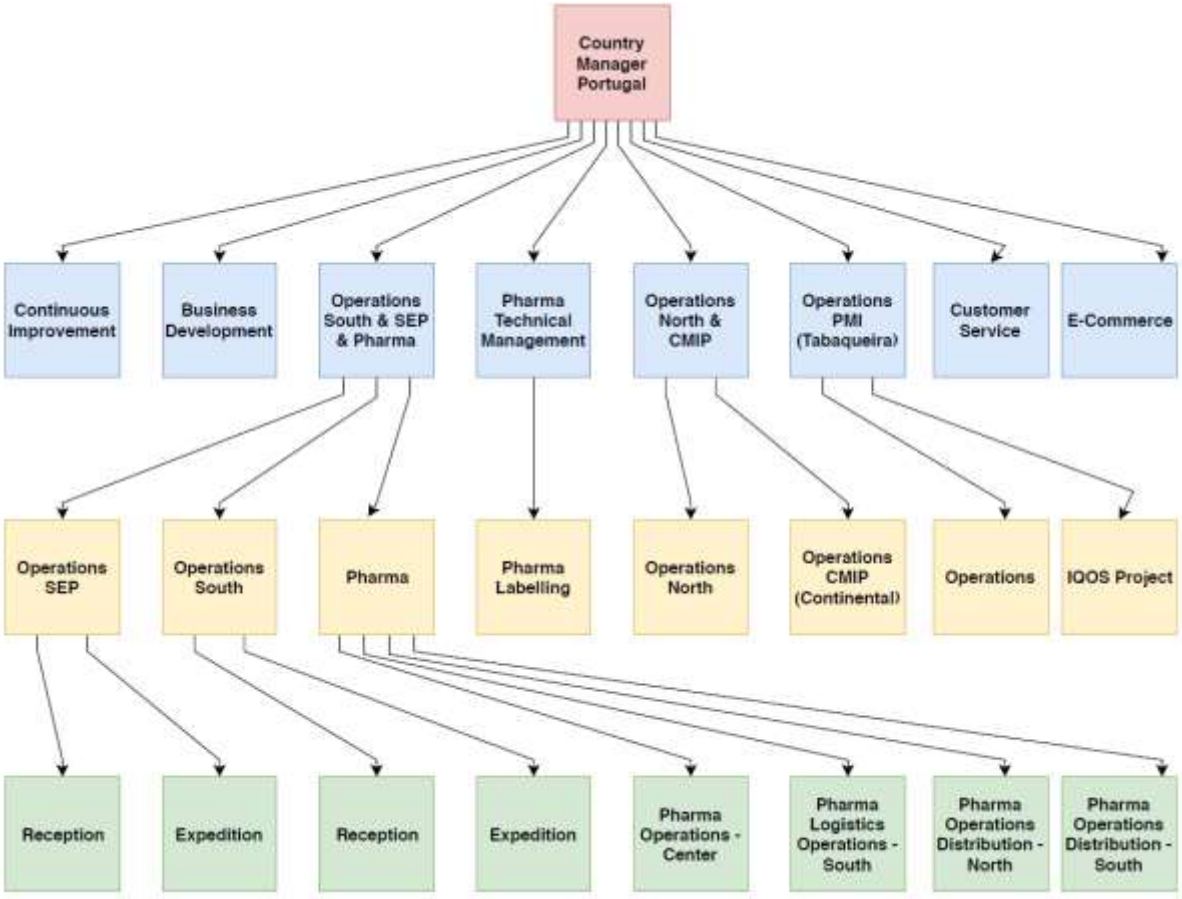

Figure 7: Organizational chart of *Rangel & Distribuição Logística*

APPENDIX B: B2B delivery (left) and prohibited parking (right)

Figure 8: B2B delivery (left) and prohibited parking (right)

APPENDIX C: Economic Cash Flow and Cash Flow of Investment

	0	Y1	Y1	Y2	Y2	Y3	Y3
	Sem0	S1	S2	S3	S4	S5	S6
Revenues		416 400 €	437 220 €	459 081 €	482 035 €	506 137 €	531 444 €
Costs		315 155 €	326 887 €	362 525 €	375 459 €	389 040 €	414 740 €
Pick-up Costs		11 880 €	11 880 €	11 880 €	11 880 €	11 880 €	11 880 €
Line-Haul Costs		68 640 €	68 640 €	80 080 €	80 080 €	80 080 €	91 520 €
Delivery Costs		234 655 €	246 367 €	258 685 €	271 619 €	285 200 €	299 460 €
Consolidation Costs		403 €	403 €	403 €	403 €	403 €	403 €
Gross Margin		101 245 €	110 333 €	96 556 €	106 576 €	117 097 €	116 704 €
Structure Costs		30 000 €	30 000 €	30 000 €	30 000 €	30 000 €	30 000 €
Amortizations & Depreciations (*)		2 062 €	2 062 €	2 062 €	2 062 €	2 062 €	2 062 €
Furniture		63 €	63 €	63 €	63 €	63 €	63 €
Informatic equipment		333 €	333 €	333 €	333 €	333 €	333 €
Software		1 667 €	1 667 €	1 667 €	1 667 €	1 667 €	1 667 €
EBIT		71 245 €	80 333 €	66 556 €	76 576 €	87 097 €	86 704 €
Taxes		15 318 €	18 477 €	15 308 €	17 612 €	20 032 €	19 942 €
NET INCOME		55 927 €	63 062 €	61 572 €	69 438 €	77 697 €	77 388 €
Economic Cash Flow	0	57 990 €	65 124 €	63 635 €	71 500 €	79 759 €	79 451 €
Cash flows of investment	13 000 €	16 807 €	1 515 €	- 316 €	1 670 €	1 753 €	- 66 €
Investment in tangible fixed costs	3 000 €						
Furniture	1000	- with rate 12,5% by year or 6,25% by sem (decret law 2/90) : 8 years from Amortizations & Depreciations					
Informatic equipment	2000	- with rate 33,3% by year or 16,65% by sem (decret law 2/90) : 3 years from Amortizations & Depreciations					
Investment in intangible fixed costs	10 000 €						
Software	10000	- with rate 33,3% by year or 16,65% by sem (decret law 2/90) : 3 years from Amortizations & Depreciations					
Investment in Working Capital							
clients receivables (30 days)		69 400 €	72 870 €	76 514 €	80 339 €	84 356 €	88 574 €
suppliers payables (30 days)		52 593 €	54 548 €	58 508 €	60 664 €	62 927 €	67 210 €
Working capital necessity		16 807 €	18 322 €	18 006 €	19 676 €	21 429 €	21 364 €
Investment in Working Capital (only variations)		16 807 €	1 515 €	- 316 €	1 670 €	1 753 €	- 66 €
Residual values of the working capital							21 364 €
Residual values of the fixed investment							625 €

Figure 9: Calculation of revenues, costs, net income, economic cash flow and cash flow of investment

APPENDIX D: Net Present Value

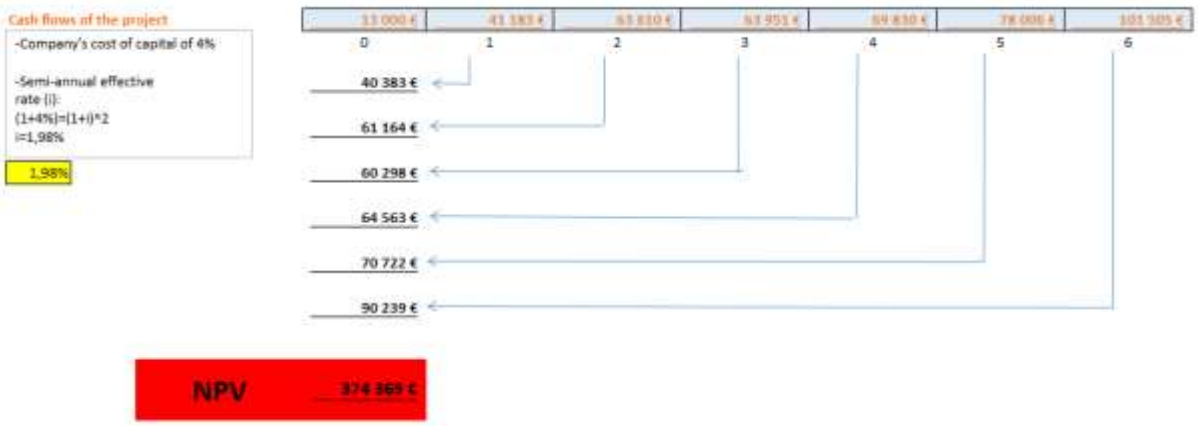

Figure 10: Calculation of the cash flow of the project and the net present value