INSTITUTO
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Department of Marketing, Operations and General Management

In-Company Project: Developing a model that optimizes the number of flyers produced and measure its efficiency.

Type of dissertation: In- Company Project

Inês Monteiro

Master in management

Supervisors:

Professor Rui Vinhas da Silva, Associate Professor, ISCTE Business School, Department of Marketing, Operations and General Management

Professor Catarina Marques, Assistant Professor, ISCTE Business School, Department of Quantitative Methods for Management and Economics

November 2021

BUSINESS SCHOOL

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ABSTRACT

Flyers are essential for EDP's business and customers. In the presential distribution channels, the customers find the flyers very useful because everything about the campaign or product is explained in detail, the client and the seller can write notes there, and it is possible to take it home if they need time to think about the purchase decision.

This project emerges from the company's need to optimize its resources in order to reduce costs and, especially, to fight the waste made by the overproduction of flyers.

The objective of the project is to create a mechanism, based on the characteristics of the different distribution channels (Stores and Agents), that allows to optimize the number of flyers produced and distributed for each point of sale, by campaign. The mechanism created is referred to as the Merchandising Model.

The merchandising model was implemented in one campaign that took place from February to April 2021. Its results are compared with the results from a previous campaign where the merchandising model was not applied.

The main conclusion from this project is that the merchandising model allowed EDP to reduce the production of flyers, which translates into a reduction of costs and waste produced, while having a positive impact on the sales volume.

Key Words: Merchandising, Flyers, Point of sale, Campaign, Sales Performance

JEL Classification: M1 Business Administration, M3 Marketing and Advertising

RESUMO

Os flyers são essenciais para o negócio da EDP e para os seus clientes. Para os clientes dos canais presencias, os folhetos são bastante úteis, pois contém toda a informação necessária sobre a campanha e/ou produto. É possível também que cliente, ou o vendedor, tirem notas nesse folheto, que o cliente poderá levar para casa caso necessite de mais tempo para ponderar a sua decisão de compra.

Este projeto surge da necessidade da EDP otimizar os seus recursos, de forma a reduzir custos e, principalmente, combater o desperdício gerado pelo excesso de produção de folhetos.

O objetivo do projeto é criação de um mecanismo, baseado nas características dos diferentes canais de distribuição (Lojas e Agentes), que permita otimizar o número de folhetos produzidos e distribuídos por cada ponto de venda, para cada campanha. O mecanismo criado é denominado de Modelo de Merchandising. Os resultados da implementação do modelo são comparados com os resultados de uma campanha anterior, onde o Modelo de Merchandising não foi aplicado.

O Modelo de Merchandising foi implementado numa campanha, que ocorreu de fevereiro a abril de 2021.

A principal conclusão deste projeto é que o Modelo de Merchandising permitiu à EDP reduzir a sua produção de folhetos, o que se traduz numa redução de custos e de desperdício produzido, tendo ainda um impacto positivo no volume de vendas.

Key Words: Merchandising, Folhetos, Ponto de Venda, Campanha, Sales Performance

Classificação JEL: M1 Business Administration, M3 Marketing and Advertising

Index

Chapter I – Introduction 15

1.1. Company Background 15

1.1.1. Distribution Channels 16

1.1.2. Products 17

1.2. Operational GAP 18

1.3. Research Aim 18

Chapter II – Literature Review 19

2.1. Distribution Channels 19

2.2. Role of Merchandising at the Point of Sale 20

2.3. Importance of Store Flyers 21

2.4. Effectiveness of Campaign Flyers in Store Performance 22

2.5. Main Empirical Studies 25

Chapter III – Methodology 26

3.1. Research Paradigm and Objectives 26

3.2. Research Questions 27

3.3. Research Design 27

3.4. Methods used in data selection 28

3.5. Methods used in data analyses 28

3.5.1. Conceptual Models used for analyzing the efficiency of the merchandising model 28

3.5.2. Research Hypothesis 29

3.5.3. Linear Regression 29

Chapter IV - Presentation and Analysis of the Information 32

4.1. Data selection for the Merchandising Model 32

4.2. Data Analysis for the Merchandising Model 34
4.2.1. General Algorithm 34
4.2.2. Algorithm for Solar Campaigns 37
4.2.3. Merchandising Model on Excel 38
Chapter V - Implementation 42
5.1. Implementation of the Merchandising Model 42
5.2. Testing the Hypothesis 45
5.2.1. Campaign 1 46
5.2.1.1. Relationship between Number of Flyers and Sales Volume 46
5.2.1.2. Relationship between Number of Flyers and Information Requests 46
5.2.1.3. Relationship between Number of Information Requests and Sales Volume 47
5.2.1.4. Relationship between Number of Flyers, Number of Information Requests and Sales Volume 47
5.2.2. Campaign 2 47
5.2.2.1. Relationship between Number of Flyers and Sales Volume 48
5.2.2.2. Relationship between Number of flyers and Information Requests 48
5.2.2.3. Relationship between Number of Information Requests and Volume of Sales 49
5.2.2.4. Relationship between Number of Flyers, Number of Information Requests and Sales Volume 49
5.2.3. Hypothesis Analysis 49
Chapter VI - Conclusion 53
6.1. Results 53
6.2. Limitations 54
6.3. Theoretical Contribution, Managerial and Social Implications 55
6.4. Future Research 55

Chapter VII- References **56**

Chapter VIII - Annexes **58**

Annex 1. Additional calculations when comparing the number of flyers in campaign 1 and 2 58

Annex 2. Assumptions and Results of the relationship between the Number of Flyers and the Sales Volume for campaign 1 58

59

Annex 3. Assumptions and Results of the relationship between the Number of Flyers and the Number of Information Requests for campaign 1 59

Annex 4. Assumptions and Results of the relationship between the Number of Information Requests and Sales Volume for campaign 1 60

Annex 5. Assumptions and Results of the relationship between the Impact of the Number of Flyers and Sales Volume for campaign 2 61

Annex 6. Assumptions and Results of the relationship between the Number of Flyers and the Number of Information Requests for campaign 2 63

Annex 7. Assumptions and Results of the relationship between the Number of Information Requests and Sales Volume for campaign 2 64

Annex 8. Assumptions and Results of the relationship between the Number of Flyers, Information Requests and Sales Volume for campaign 2 65

Index of Figures and Tables

Figure 2.1- Model that relates flyers to store performance 22

Figure 2.2- Model A: Adapted model that relates flyers to store performance 23

Figure 2.3- Model B: Adapted model that relates flyers to information requests and to store performance 24

Figure 3.1- Model A: Adapted model that relates flyers to store performance 28

Figure 3.2- Model B: Adapted model that relates flyers to information requests and to store performance 29
Figure 3.3- Mediation effect by Baron & Kenny (1986)..... 31
Figure 4.1- Cover of the Merchadinsing Model on Excel..... 39
Figure 4.2- Technical Datasheet of the Merchandising Model on Excel 40
Figure 4.3- Sheet of distribution channel Stores in the Merchandising Model on Excel..... 40
Figure 5.1- Assumption filled in the technical datasheet of the Merchandising Model, for campaign1..... 42
Figure 5.2- Summary shown in the technical datasheet, of the number of flyers calculated with Merchandising Model, for campaign1. 43
Figure 5.3- Mediation effect in campaign 1 51
Figure 5.4- Mediation effect in campaign 2 52
Figure 8.1- Homoscedasticity of the residuals 58
Figure 8.2- Linearity of the coefficients 59
Figure 8.3- Homoscedasticity of the residuals 58
Figure 8.4- Linearity of the coefficients 598
Figure 8.5- Homoscedasticity of the residuals.....59
Figure 8.6- Linearity of the coefficients.....59
Figure 8.7- Homoscedasticity of the residuals.....60
Figure 8.8- Linearity of the coefficients.....60
Figure 8.9- Homoscedasticity of the residuals.....61
Figure 8.10- Linearity of the coefficients.....62
Figure 8.11- Homoscedasticity of the residuals.....63
Figure 8.12- Linearity of the coefficients.....63
Figure 8.13- Homoscedasticity of the residuals 66
Figure 8.14- Homoscedasticity of the residuals 66

Table 2.1- Summary of the main empirical studies..... 25
Table 5.1- Summary of the number of flyers distributed in campaign 2..... 43
Table 5.2- Comparative summary table of the number and costs of flyers in campaign 1 and campaign 244
Table 5.3- Correlation between the variables..... 45

Table 5.4- Summary of the linear regressions created to teste the hypothesis, for campaign 1 46
Table 5.5- Summary of the linear regressions created to test the hypothesis, for campaign 2..... 48
Table 5.6- Summary of the effects studied in linear regressions created for campaign 1 and 2 50
Table 8.1- Summary of the model.....56
Table 8.2- Validity test of the model.....56
Table 8.3- Summary of the model.....57
Table 8.4- Validity test of the model.....57
Table 8.5- Summary of the model.....58
Table 8.6- Validity test of the model.....59
Table 8.7- Summary of the model.....60
Table 8.8- Validity test of the model.....60
Table 8.9- Summary of the model 61
Table 8.10- Validity test of the model 61
Table 8.11- Summary of the model.....62
Table 8.12- Validity test of the model.....62
Table 8.13- Summary of the model.....63
Table 8.14- Validity test of the model.....64

Chapter I – Introduction

This Master Thesis has the format of an in-company project since it was developed and implemented while doing an internship in the Portuguese company EDP.

The objective of this master thesis is to create a mechanism, that allows to optimize the number of flyers produced and distributed for each EDP's point of sale, by campaign, and then analyze its impact on sales and costs to the company.

1.1. Company Background

EDP- Eletricidade de Portugal was created in 1976 and resulted from the merge and nationalization of thirteen companies in the Portuguese electricity sector. Its public character meant that its main objective was to provide access to electricity to the majority of Portugal.

In 1997, the first privatization process of the EDP group took place, followed by the group's internationalization process.

Over the years, EDP has been consolidating its relevant presence in the world energy panorama, with a presence in 22 countries, on four continents.

The EDP group is positioned in the energy sector, being present in all the electricity value chain: production, commercialization, and distribution of electricity, as well as commercialization and distribution of gas.

EDP is the fourth largest producer of wind energy globally and 74% of the energy produced is renewable. They supply electricity and gas to more than 9 million customers in the world.

The group has been part of Euronext Lisbon since 1997, and EDP Brasil and EDP Renováveis are also listed on the stock exchange. It is a member of the Dow Jones Sustainability Index, which evaluates the sustainability performance of companies and their adaptation to market trends.

As already mentioned, EDP Group consists in a group of companies that carry out their activity in the energy sector, in different geographies and market segments.

During the development of this project, EDP went through an internal reorganization process that included the extinction of EDP Soluções Comerciais, the company responsible for managing the customer service and contact channels of the various companies in the group.

The project began by being developed precisely at EDP Soluções Comerciais in the Department *"Direção de Canais Presenciais"* and when it was completed the department was already part of EDP Comercial.

1.1.1. Distribution Channels

At EDP *Soluções Comerciais, (*now at EDP *Comercial),* there are three types of distribution channels: The presential (Stores, Agents, RAD and D2D), telephonic (inbound and outbound) and digital channels (website and app).

The presential channels are divided into four different groups: Stores, Agents, RAD (Distribution agents' network) and D2D (Door to door), considering that all of them work differently.

The Stores make sales, charges, and customer service. Those are located mainly in Lisboa, Porto and other capitals of district.

The "Agents" are still divided in three different categories: Exclusive agents, Sales and Customer service agents and Representation agents. The "exclusive agents", as the name says, work exclusively for EDP and replace the stores in cities with high traffic. The "sales and service agents" are agents that have other businesses and complementarily, make sales, charges and customer service for EDP. They usually have one balcony inside the space and one STOPPER outside of the store. The "representation agents" work in the same way as the sales and service agents, the only difference is that they cannot finish the sale process because they do not have access to the EDP's commercial system. They print the contract, the customer signs it and they send it to EDP's back-office, so that the contract is created in the system.

The D2D channel works in the same way as other businesses, the sellers go to the potential new client's house and try to sell them EDP's products.

Finally, the RAD channel is the most recent and complex one. It works with agents as well, but these are not managed by EDP directly. Instead, there are a group of eight managers that manage all the RAD agents in the country, and the RAD agents can choose which manager they want to work for, based on the different commissions offered. EDP only manages those eight managers instead of all the agents.

1.1.2. Products

There are ten types of products that are advertised at EDP Points of Sale: Electricity, Gas, Solar, "Conta Certa", "Débito Direto", EDP health, "Fatura Eletrónica", "Fatura Segura", "Funciona" and Packs Living.

Some products are self-explanatory, such as Electricity and Gas, since EDP is a company in the energy sector. However, other products are not as common to sell in this sector and need more explanation.

EDP now has many approaches and options regarding solar energy, but the product "Solar" that is sold in the presential channels are the solar panels.

"Fatura Segura" is an insurance distributed by EDP that guarantees the energy bill payment in difficult times.

"Conta Certa", "Débito Direto", and "Fatura Eletrónica" are attributes related to the energy product, usually to electricity, that have no cost to the customer.

"Conta Certa" is a billing modality that allows paying a fixed amount every month, avoiding significant variations in the monthly value of the energy bill. This value is suggested based on the average consumption values of the customer and has limits according to the power contracted.

"Débito Direto" is the direct debit of the energy bill in the customer's bank account.

"Fatura Eletrónica" is the option to receive the energy bill via email instead of receiving it in paper via mail.

The "Funciona" is a service that gives the customer access to a network of qualified technicians who provide technical assistance and guarantee the security of their home.

The "EDP Saúde" or "EDP Mais" plan is a set of medical assistance services that allow customers to perform medical services in a network of private healthcare providers at lower prices.

Packs Living are the star product of EDP Comercial and are a set of additional services to the energy supply, such as the discount on the energy bill, the supply of 100% green energy, technical assistance, the "EDP Saúde" service, and exclusive benefits on other partners.

There are three different types of packs, the Easy, Smart and Full. The Pack Full is the most complete pack, with a bigger offer for the client and, consequently, a higher price. On the other hand, the Pack easy is the pack with the lowest price and lower offer.

1.2. Operational GAP

The idea for building a new mechanism to calculate the number of flyers to distribute to each point of sale for EDP, came from the need to optimize resources and their growing concern for the environment.

The method that is currently being used to calculate the flyers is not very complex or individualized. It has in consideration some variables (such as the store's traffic) for two of the channels, but for the other two, it is given an equal fixed number for every point of sale.

It is also based on the knowledge and sensibility of one person that has been doing it for many years. That creates a lot of dependency on one person, and the empirical knowledge is much more complicated to pass to other people than an algorithm.

This method causes waste in some points of sale because when the campaign is over the excess of flyers are not useful anymore. At the same time, there can be shortage of flyers in other points of sale, forcing the company to produce a number of backup flyers that may, or may not, be used.

Right now, having all of this in consideration, the current method is not efficient enough for EDP's needs.

1.3. Research Aim

The aim of the research is to develop a model that optimizes the number of flyers distributed per each point of sale in the four different presential channels, for each campaign, and evaluate its efficiency by analyzing the sales performance.

The objective of this model is to minimize the costs for the company and, more important, to guarantee that the company becomes more sustainable.

Chapter II – Literature Review

2.1. Distribution Channels

The concept of distribution channel has been defined by many authors over the past years. Some definitions are:

Kotler et al. (2006) (as cited in Dujak et al., 2011) defined distribution or marketing channel as systems of mutually dependent organizations included in the process of making goods or services available for use or consumption.

Ostrow (2009, p.59) (as cited in Dujak et al., 2011), defined distribution channel as "the route along which goods and services travel from producer/manufacturer through marketing intermediaries (such as wholesalers, distributors, and retailers) to the final user. Channels of distribution provide downstream value by bringing finished products to end users. This flow may involve the physical movement of the product or simply the transfer of title to it.

When companies have more than one distribution channel, the term "Hybrid Marketing Channel is used" (Moran & Moriarty,1990). Hybrid marketing channels allow us to understand that having only one distribution channel is not enough. Having multiple channels is the way to find new groups of customers, offer new possibilities to the existing customers, and influence special groups of customers (Dujak et al., 2011).

Kotler et al. (2006) (as cited in Dujak et al., 2011) defends that multichannel architecture optimizes channel coverage, adjustability, and control while minimizing costs and conflicts. Therefore, various channels for different sized clients should be developed.

The importance of IT in a distribution channel is growing and it is crucial to understand its role in it. Progress in manufacturing technology, logistics and distribution reconfiguration has allowed manufacturers to provide their customers with customized products and solutions (Purchase & Volery, 2020).

Over the past years, many marketing innovations show how activities within the distribution channel are increasingly focusing on consumer interaction and adapting to their needs (Purchase & Volery, 2020).

2.2. Role of Merchandising at the Point of Sale

Visual merchandising is the art of displaying things in an attractive way so that it could attract the attention of the customer and persuade them to buy the product (Krishnakumar, 2014). Merchandising themes are planned many months in advance in conjunction with the seasons, store promotion and new campaigns.

The store's future depends on what the consumer sees and experiences there. Visual merchandising plays a crucial role in creating the difference. It can also be referred to as a 'silent salesman', for the science and art of suggestive selling only by the display and presentation. The merchandising focal points are placed strategically in the store and communicate the features and benefits of what it is trying to sell. (Krishnakumar, 2014)

In 2009, a study conducted by Maier, highlights the importance of visual marketing in the business strategy of a company by explaining how the visual scheme leads someone to make decisions based on the look of a store. It is mentioned that companies with a good visual marketing plan are more easily able to establish a brand image with its target. (Pillai et al., 2011)

An appropriate visual merchandising can lead to a series of actions from consumers, including affecting spending behavior (Chebat & Michon, 2003). There are features of the store that should be accentuated in order to create the appeal to the costumers, including the store layout and promotional activities. (Pillai et al., 2011)

A study made by Bustos in 2004 about the importance of store presentation, concludes that simple, creative, and innovative displays are more attractive to customers. To be able to do this, the company needs to have good merchandising presentation skills. (Pillai et al., 2011)

Visual merchandising uses fundamental design principles when working with many materials and colors. A successful visual display having in consideration: themes, colors, mannequins, forms, fixtures, hangings, poles or stands, platforms, paintings and wall-decoration, fabrics, tablecloths and banners, tables and furniture, lighting effect, accessories and props and music (Krishnakumar, 2014)

Traditional marketing, also considered "outbound marketing", includes anything except digital means. The many facets of traditional marketing include, TV commercials, billboards, print ads on newspapers and magazines, flyers, direct paper mail, radio, etc. Outbound marketing is usually a one-way conversation and it means buying attention from the costumer. (Todor, 2016)

People are still very used to traditional marketing, since it is present on many activities they do daily, such as reading the newspaper, watching TV or reading billboards. (Todor, 2016)

Research on the attention paid to printed merchandising, such as flyers, points to the importance of the physical stimuli created by the colors, size, and the value that it adds by containing important information, such as price (Gijsbrechts et al., 2003).

Flyers wildly used across several sectors, (such as grocery, electronics, drugstore, and furniture) and constitute a substantial part of a retailer's budget in many countries (Ziliani & Leva, 2015)

2.3. Importance of Store Flyers

Store flyers are still an important communication channel for many brands, even with the growth of electronic channels. (Simon & Andrews, 2015). They help to communicate the variety of products that the company offers (Mimouni Chaabane, et.al, 2010).

Studies that were conducted previously show that there is a frequent and positive interaction with store flyers that indicate that some customers may become emotionally attached to this type of communication (Simon,2016).

With this in mind, it is not surprising that companies still invest significant resources in this type of communication and that it represents a significant percentage of the company's communication budget (Mimouni Chaabane, et.al 2010). The flyer cost unit is almost insignificant but considering the total number of copies distributed in a year, that perspective changes and it becomes a considerable cost for the company. (Luceri et al., 2020)

The waste caused by the excessive production of flyers is a concern that was already raised in public debate and needs to be taken into consideration by companies (Simon, 2016)

Therefore, there is the need for companies to optimize their flyer distribution, to both reduce the waste produced and their costs, that are caused by the overproduction.

There are not many research or case studies regarding the distribution of store flyers, so it is difficult to analyze and compare to what is done in other companies.

Current trends in marketing support that the flyers distribution planning should be based on the store format, the market area and on the characteristics of the demand. (Luceri et al., 2020)

Sometimes companies also rely on methods such as past experience or analogies. (Luceri et al, 2020)

2.4. Effectiveness of Campaign Flyers in Store Performance

Researchers have studied the impact of featured and advertised promotions and campaigns on store traffic and sales. Most researchers have concluded that those have a positive relationship and cause an increase in store traffic and sales. Some of these authors also have taken in consideration an important factor for the traffic in stores, the location, which can be an explanatory factor for differences in in effectiveness between stores. (Gijsbrechts et al., 2003).

Gijsbrechts, Campo and Goossen (2003) developed a study, applied to the food industry, where they analyzed the impact of the promotions and campaign flyers on store performance.

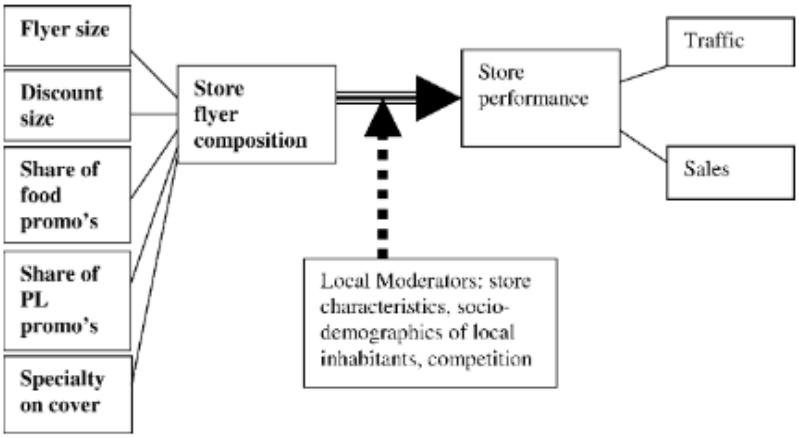

Figure 2.1- Model that relates flyers to store performance

The authors developed the model shown in fig. 2.1. There are characteristics of the flyers that are taken into consideration, as well as external factors, such as the location of the store and its own characteristics. The authors defend that flyers can affect the propensity to drawn costumer to the store and to have them to spend there.

Campaigns and promotions usually draw more customers into the stores, which can lead to an increase in sales. If the costumer would have visited the store anyways, the impact of the campaign flyer is ambiguous. The negative side of the campaigns is that it can "cannibalize" the regular sales, which will negatively impact the sales value. On the other hand, the campaigns can stimulate the sales of other products and hence increase sales (Gijsbrechts et al., 2003).

As indicated in the introduction, this project aims to build a mechanism to distribute campaign flyers and study its efficiency. Based on that and on the model shown in fig.2.1, the model used in

this study was adapted into the one shown in fig. 2.2, the model A. The main difference between the two models is that in the model A, the variable traffic of the store is not relevant. The flyers are only be present inside the point of sale, so the impact on the variable traffic is difficult to measure. Model A relates the store flyers to store performance that is measured through the sales.

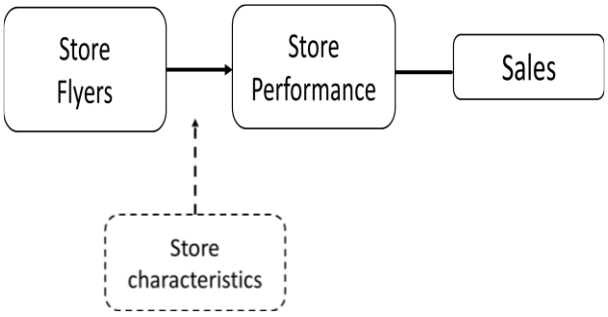

Figure 2.2- Model A: Adapted model that relates flyers to store performance

Leach et al. (2021) developed a study that explores how salespeople adapt their sales tactics according to different types of customers: customers that seek information by themselves, informed customers with information inaccuracies and informed customers making sub-optimal decisions.

The study concludes that salespeople are more able to demonstrate their knowledge and sales skills when interacting with information seeking customers, than with more informed customers. (Leach et al., 2021)

Therefore, it is relevant and interesting for this project to understand how the store flyers can affect the client's information requests at the stores, and consequently, affect the store performance by reverting them into sales. In other words, if the information requests can work as a moderator between the store flyers and the sales volume.

Based on this study made by Leach et al. (2021) and the study made by Gijsbrechts et al. (2003), another model that studies the effectiveness of the store flyers was created. Model B is an adapted model that relates store flyers to information requests and to store performance, which is measured through sales.

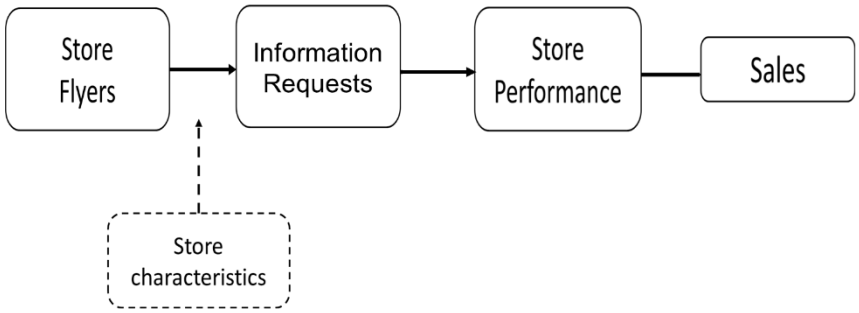

Figure 2.3- Model B: Adapted model that relates flyers to information requests and to store performance

2.5. Main Empirical Studies

Table 2.1- Summary of the main empirical studies

Authors	Year	Title	Subject Studied	Main Findings
Zdenko Segetlija, Josip Mesaric and Davor Dujak	2011	Importance of distribution channels- Marketing Channels- for nattional economy.	Distribution channels Multi-channel retailing	Importance of the development of distribution channels supported by IT.
Krishnakumar	2014	The role of visual merchandising in apparel purchase decision.	Visual Merchandising Retail Business	Visual merchandising plays a significant role in the purchase decision of the consumers.
Pillai, Azmiya Iqbal, Habiba Umer, Aisha Maqbool and Namrata Sunil	2011	Design, effectiveness and role of visual merchandising in creating customer appeal.	Visual Merchandising In-store Display	Most people are attracted to buy products based on store's ambience and visual display.
Els Gijsbrechts, Katia Campo and Tom Goosen	2003	The impact of store flyers on store traffic and store sales: a geo-marketing approach.	Retailer promotions Store flyers	Flyers affect significantly the traffic and sales in the stores.

Chapter III – Methodology

The methodology describes how the research and development of the project was conducted, explaining the methods and strategies used to answer the research questions.

This project had two different phases, so it is important to separate the project's methodology in two. The first phase is the creation and implementation of the mechanism, and the second phase refers to the mechanism efficiency assessment.

3.1. Research Paradigm and Objectives

This project was developed and implemented in two of EDP's four different presential distribution channels in Portugal. This thesis project was developed with the purpose to help EDP to face their challenge to reduce their flyers production, and consequently lower their costs and become more sustainable.

The objective of this thesis is the development and implementation of a mechanism that calculates the optimal number of flyers needed for each point of sale, labeled by the merchandising model. The model goal is the reduction of costs and waste caused by the over production of flyers.

To build this model for the different distribution channels, it is necessary to select the appropriate variables to include in the mechanism, through the study of the literature review and the analysis of EDP's information.

After applying the merchandising model in one campaign, it is important to compare its results (number of flyers produced and costs) to the results of a campaign where the merchandising model was not applied. This allows to understand if the main objective of the project was achieved, which is to bring costs as waste reduction to EDP, by reducing the number of flyers produced. Therefore, the campaign where the merchandising model was applied is going to be referred as campaign 1 and the campaign where the model was not applied as campaign 2, from now on.

Then, the model's efficiency was assessed in two different ways: through the relationship between the number of flyers and the sales volumes and through the relationship of the number of flyers, the information requests, and the sales volume.

3.2. Research Questions

From the objectives described above, the research questions to be explored in this research are the following:

1. Which variables should be selected to build the merchandising model mechanism?
2. Can the same model be applied for the different points of sale?
3. By applying the model, was there a reduction in the flyers distributes and in costs to EDP?
4. Is there a relationship between the number of flyers and the sales volume?
5. Is there a relationship between the number of flyers, the number of information requests and the number of sales?

3.3. Research Design

This study focuses on a quantitative research, since all the data collected and analyzed isnumerical data.

In the first phase of the project, the mechanism is built using the variables that fit better for each distribution channel. The values obtained through the implementation of the model in one campaign were compared with the values of a previous campaign. This comparison allowed to understand if the model brought costs and waste reduction to EDP.

The research design of the second phase of this project is based on the adapted models that were presented in the literature review (Model A and Model B), based on studies from Gijsbrechts et al. (2003) and Leach et al. (2021).

Model A relates the flyers effectiveness with store performance, measured through sales. Model B relates flyers effectiveness to information requests and to store performance, measured,once again, through sales. These two models allow to understand the efficiency of the merchandising model.

Model A and Model B were applied in the two campaign, through the use of regression analyses. In one campaign the merchandising model was applied and the other campaign the model was not applied. The results obtained allowed to conclude the efficiency of the merchandising model.

3.4. Methods used in data selection

The data collected for this project was only secondary data, since it is data that was already collected previously.

The data collected was used to build the merchandising model mechanism with the most appropriate variables. These variables were selected based on the marketing trends mentioned in the literature review and based on past experience in the definition of flyers at EDP. The data needed for the variables used in the merchandising model was mostly collected through reports already made on PowerBI, a business analytics service from Microsoft which goal is to provide interactive visualizations and business intelligence capabilities for end users to create their own reports and dashboards. Some of the data needed was also collected previously by the person in charge for the definition of the number of flyers in the past. There is also data that is collected through the campaign manager.

3.5. Methods used in data analyses

3.5.1. Conceptual Models used for analyzing the efficiency of the merchandising model

The efficiency of the merchandising model was analyzed through the two conceptual models defined in the literature review (Model A and Model B). The models were defined based on the study from Gijsbrechts et al. (2003), that relates store flyers with store performance, translating into sales, and the study from Leach et al. (2021) that relates information seeking clients to the salespeople performance.

Model A relates the store flyers to store performance.

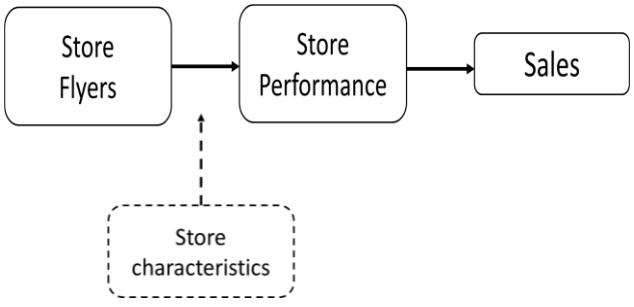

Figure 3.1- Model A: Adapted model that relates flyers to store performance

Model B consider a new indicator, the “Information Requests”. It relates the store flyers to the information requests made by costumers that revert into sales. This model aims to test if the information requests can work as a moderator between the store flyers and the store performance.

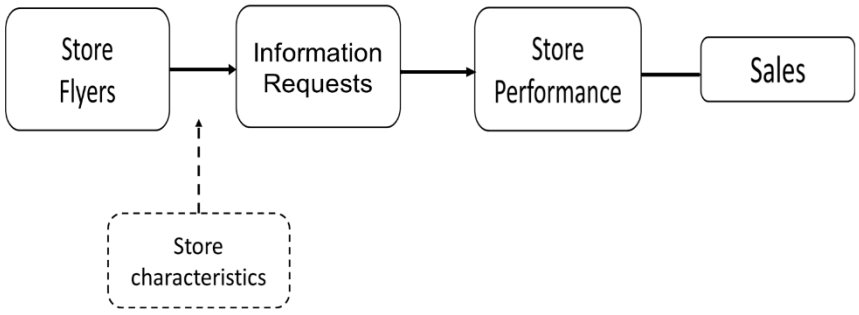

Figure 3.2- Model B: Adapted model that relates flyers to information requests and to store performance

As mentioned previously, these two conceptual models were applied in two campaigns, campaign 1 and campaign 2.

These two conceptual models were tested using different linear regressions. By analyzing the results obtained in the different linear regressions, it is possible to make conclusions about the efficiency of the merchandising model.

3.5.2. Research Hypothesis

Based on the conceptual models A and B, the hypothesis to be tested in this project, to analyze the efficiency of the merchandising model, were created:

H1: The number of flyers has an impact on the sales volume

H2: The number of flyers impact the number information requests

H3: The number of information requests impact the sales volume

H4: The number of information requests is a mediator of the relationship between the number of flyers and the sales volume

3.5.3. Linear Regression

The hypothesis formulated through the conceptual Models A and B were tested using four different linear analyses.

Regression analysis is a statistical analysis used for studying the relationships between variables and can be applied in many different fields of study.

The linear regression model is represented by the following formula:

$$Y = \beta_0 + \beta_1 X_1 + ... + \beta_k X_k + \varepsilon \quad (3.1)$$

The X_i represents the independent variable and Y the dependent variable. The Xi is called the predictor or regressor variable and Y is the response variable. β_i are unknow constants, usually called regression coefficients and ε is a random error component. (Montgomery,2021). When the formula includes only one predictor variable is a simple linear regression. when it includes more than one predictor variables it is a multiple linear regression model. In this project three simple linear regressions were be applied and only one multiple linear regression.

It is important to mention that regression models by itself does not imply a cause effect relationship between the variables. Instead, there must be a basis of theoretical studies that suggests the relationship and the regression models can confirm the relationship (Montgomery,2021).

Before applying the regressions, the correlation between the variables must be studied. For that, the analysis of the Pearson correlation coefficient was applied to the variables, allowing to understand the intensity and direction of the correlation, where-1 indicates a strong negative linear correlation and 1 a strong positive linear correlation.

To apply linear regressions, there are some assumptions that need to be verified (Hair et al., 2019):

1. The regression is linear in the coefficients and has a residual component
2. The expected value of the residuals is zero
3. The independent variables are not correlated with the residuals
4. Absence of correlation between the residuals
5. Homoscedasticity of the residuals
6. Normality of the residuals

The most relevant assumptions for the project were analyzed.

In this project, the population where the linear regressions were applied are the points of sale of the distribution channels Agents and Stores, which are 193.

The values of the dependent and independent variables were standardized, to make them more comparable since the magnitude of the values in the variables is different.

To test the hypotheses, this project contemplates four different models of linear regression:

$$\text{Sales Volume} = \beta_{01} + \beta_{11} * \text{Nº of Flyers} + \varepsilon_1 \quad (3.2)$$

$$\text{Nº of Information Requests} = \beta_{02} + \beta_{12} * \text{Nº of Flyers} + \varepsilon_2 \quad (3.3)$$

$$\text{Sales Volume} = \beta_{03} + \beta_{13} * \text{Nº of Information Requests} + \varepsilon_3 \quad (3.4)$$

$$\text{Sales Volume} = \beta_{04} + \beta_{14} * \text{Nº of Flyers} + \beta_{15} * \text{Nº Information Requests} + \varepsilon_4 \quad (3.5)$$

Is it essential to mention that since the four hypotheses were tested for campaign 1 and 2, each linear regression was be implemented twice.

To test H4, a mediation analysis needs to be done to a system with three variables. The system contains an independent variable (X), a dependent variable (Y) and a mediator (M).

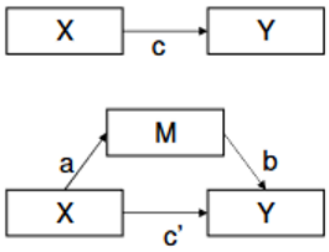

Figure 3.3- Mediation effect by Baron & Kenny (1986)

To evaluate the effect of the mediation, the causal steps strategy method, proposed by Baron & Kenny (1986) was used. The firsts steps are to test the relationship between the variables, it is necessary to demonstrate that X affects Y, X affects M and M affects Y. This was demonstrated through the significance of the linear regression's coefficients. Then, to demonstrate that M mediates the relationship between X and Y, its effect needs to be calculated.

The mediation effect is quantified by the reduction of the effect of X in Y (or c- c'). The effect can be calculated through a*b (the indirect effect). The total effect is given by c'=c + ab, if a*b is not significant, then c'=c and M is not a mediator.

Chapter IV - Presentation and Analysis of the Information

4.1. Data selection for the Merchandising Model

The merchandising model was built to overcome EDP's limitations in the definition of flyers for the distribution channels and was built incorporating insights from the existing literature and from past experience.

The first step for developing the model was choosing the relevant variables to use, based on the characteristics of the channels, the products and the current marketing trends presented in the literature review.

It was decided that to begin with, the model was only being developed for the channels Stores and Agents.

As mentioned in the literature review, according to Luceri et al. (2020), current trends in marketing support that the flyers distribution planning should be based on the store format, the market area, and the characteristics of the demand. Companies can also rely on past experience to support the decision.

The variables chosen must reflect those current trends in marketing, and after analyzing the different possibilities of variables that EDP has and that could be used, the following variables were chosen: Previous Month Product Sales; Previous Month Solar Simulations (only for Solar Campaigns), Number of Service Counters, Number of flyers that fit in each flyer holder and Number of the backup flyers.

The variables "Previous Month Product Sales" and "Previous Month Solar Simulations (only for Solar Campaigns)" indicates the characteristics of the demand in each point of sale, for the product advertised in the flyers. Choosing data from the previous month available is a way to have the most up-to-date values and in line with reality.

The variable "Number of Service Counters" indicate the format of the store, since bigger stores have more service counters.

The “Number of flyers that fit in each flyer holder” is always ten. Each service counter has one flyer holder, so this number is important to define the flyer’s distribution.

The “Number of backup flyers” was defined with the help of the knowledge, gained from past experience, from the person responsible for the definition of the number of flyers distributed until now.

There are also variables for every campaign that are previously defined by the campaign manager that must be taken into consideration in the mechanism and affect other variables: the “Number of months of the Campaign” and “Type of product”

In more detail, this every variable that was used to build the mechanism, what it represents specifically in EDP’s points of sale and how the information is collected:

Last Month Product Sales: The number of sales made in the previous month, of the product advertised in the flyer, is collected through a dashboard in PowerBi that contemplates all the sales.

Last Month Solar Simulations: The number of solar simulations in each point of sale, is the number of times clients simulated the best option for them in terms of solar panels. Those simulations can revert into Solar sales, or not but, give a perception of the customers’ interest in the solar product. This value is collected through a dashboard on PowerBi.

Type of Product: The type of product is the same for every point of sale, for each campaign. This variable affects the other variables that depend on the type of product. This information is obtained through the campaign/product managers.

*Number of months of the campaign**:*** The number of months of the campaign’s duration is the same for every point of sale, for each campaign. There are campaigns that last only one month and others that last all year, but the amount of time that the merchandising stays in store is always equal for every point of sale. That number of months is decided by the campaign managers and shared with everyone.

Number of Service Counters: The number of service counters (or balconies), is variable for each point of sale. This information was collected previously by the person responsible for the definition of the number of flyers.

Number of flyers that fit in each flyer holder: The number of flyers that fit into a flyer holder is the same at every point of sale, it is 10 flyers. Each Service Counter has a flyers holder. This information was collected previously by the person responsible for the definition of the number of flyers.

Backup Flyers: It was set a specific number of back up flyers for every point of sale, for each month, with the help of the knowledge of the person responsible for the definition of the flyers for each point of sale until now. The amount of backup flyers is always the same for the points of sale of the same channel but differs from channel to channel. For the Stores and Exclusive Agents, the number of backup flyers for each campaign month is of 100, for the Sales and Service Agents the number is 50 and for the Representation Agents there are no backup flyers.

With the definition of the variables, research question number 1 is answered.

4.2. Data Analysis for the Merchandising Model

After choosing the variables that are relevant to use in the model, the second step is to build the algorithm for the different points of sale and products to optimize the distribution of flyers

An algorithm is a formula or set of steps built for solving a particular problem. This algorithm was built through an excel formula, using the variables defined.

As it was already mentioned, in this initial phase of the development of the model and implementation, it is only going to be made for the channels Stores and Agents.

The logic for the model is the same for the four types of distribution channels, although each channel has its own specifications. There is also an adaptation of the model in case of the calculation of the number of flyers for a campaign of the product solar.

The development of this algorithm (the general one and the solar one) was done by analyzing the variables and testing to see what worked best for each distribution channel. It was concluded that the same algorithm can be applied to Stores and to Exclusive Agents, however, Customer Service Agents and Representation Agents need some adaptations in the model. This answers the research question number 2.

4.2.1. General Algorithm

The basis of the algorithm for the model of distribution of flyers, in each point of sale (expect for solar campaigns) is the following:

$$=\boldsymbol{MRound}^{1}\big((\boldsymbol{No\ of\ Service\ Counters} * \boldsymbol{No\ of\ flyers\ in\ each\ service\ counter}\ (\mathbf{10}) * \boldsymbol{No\ months\ of\ the\ campaign}) + (\boldsymbol{Last\ Months\ product\ sales} * \boldsymbol{No\ months\ of\ the\ campaign}) + (\boldsymbol{Backup\ Flyers} * \boldsymbol{No\ Months\ of\ the\ campaign}); \boldsymbol{x}\big) \quad (4.1)$$

[1] MRound: Excel formula that returns the value rounded to the desired multiple

The first part of the algorithm calculates the number of flyers for the service counters for each point of sale. It multiplies the number of service counters by the number of flyers in each service counter, which is always 10, by the number of months of the campaign. Multiplying by the number of months gives the minimum value for the rotation of the flyers in the service counters, that can always be compensated with the rest of the flyers calculated in the rest of the model.

The second part of the algorithm calculates the number of flyers for each month of the campaign, based on the product sales from last month, assuming that the product sales in the following months of the campaign will stay constant. In that way, it is guaranteed that at least the number of clients that buy the product will have a flyer available.

The third and the last part of the model, calculates the backup flyers for each point of sale, for all the months of the campaign, and it's the part that varies the most for the different channels. The number of the flyers calculated for the service counters and based on the previous month sale, may not always reflect the reality of the consumption of the flyers, so there is a need to have backup flyers to avoid having its shortage. The number of backup flyers its different for each distribution channel but is the same for the different points of sale of the same distribution channel, in this initial phase. After implementing the model and receiving feedback from the points of sale, the number can be adapted in the future, and the model can become even more personalized and, consequently, optimized.

In the end, the value has to be rounded to the hundred or to 50 (in case of a point of sale that does not reach near 100), due to the minimum amounts defined by EDP for the distribution of the flyers.

The adaptation of the model for the different channels, are the following:

Stores and Exclusive Agents:

Since the channel Stores and Exclusive Agents have very similar characteristics, regarding the store layout and the demand, it was defined that the model applied to both these channels is the same.

$$=\boldsymbol{MRound}\big((\boldsymbol{No\ of\ Service\ Counters} * \mathbf{10} * \boldsymbol{No\ months\ of\ the\ campaign}) + (\boldsymbol{Last\ Months\ product\ sales} * \boldsymbol{No\ months\ of\ the\ campaign}) + (\mathbf{100} * \boldsymbol{No\ Months\ of\ the\ campaign}); \mathbf{100}\big) \quad (4.2)$$

This model is equal to the model presented before as the base model. What differs is that the number of backup flyers for both channels was defined as 100 flyers, for each point of sale, for each month of the campaign.

The number was defined as 100 based on the knowledge from past experience from the person that was responsible for the definition of the number of flyers to be distributed. The number of backup flyers is bigger than from the other two remaining channels, since the Stores and Exclusive Agents have a more significant demand than the others.

The final value is be rounded up to the nearest hundred.

Sales and Service Agents:

$$=\boldsymbol{MRound}\big((\boldsymbol{No\ of\ Service\ Counters} * \mathbf{10} * \boldsymbol{No\ months\ of\ the\ campaign}) + (\boldsymbol{Last\ Months\ product\ sales} * \boldsymbol{No\ months\ of\ the\ campaign}) + (\mathbf{50} * \boldsymbol{No\ Months\ of\ the\ campaign}); \mathbf{100}\big) \quad (4.3)$$

What the algorithm for the Sales and Customer Service Agents differs from the Stores and the Exclusive Agents algorithm, is the number of backup flyers per month of the campaign. The value is only 50 per month, since this type of distribution channel has a lower demand and the characteristics of the store since it is not exclusive for selling EDP's products. It usually has 2 or 3 service counters (or Stoppers in this case) at each point of sale, compared with de Stores and Exclusive Agents, the representation of EDP smaller.

Representation Agents:

$$=\boldsymbol{MRound}\big((\mathbf{1} * \mathbf{10} * \boldsymbol{No\ months\ of\ the\ campaign}) + (\boldsymbol{Last\ Months\ product\ sales} * \boldsymbol{No\ months\ of\ the\ campaign}); \mathbf{50}\big) \quad (4.4)$$

From the four different distribution channels, the Representation Agents have the lowest demand, and the characteristics of the stores are very different, since the store only has one Stopper, or service counter, representing EDP.

Therefore, in the first part of the algorithm, since there is only one service counter, the multiplication is the 10 flyers for that fit into one flyer holder by the number of months of the campaign.

The second part of the algorithm is the same as is the other channels. The main difference from the other channels is that there are no backup flyers. The previous experience from distributing flyers says that there is no need to have backup flyers.

Due to the low demand in this type of distribution channel, the final number of the flyers distributed to the points of sale is rounded to 50, since it is usually far from 100. The minimum number of flyers defined by EDP to be distributed is 50, so usually for this channel that is the logic without needing that much calculation.

However, the use of the algorithm allows to see if there is any point of sale that is standing out in terms of sales and needs more than 50 flyers.

4.2.2. Algorithm for Solar Campaigns

As already mentioned, the solar product is the exception when applying the model. The only difference in the algorithm is that instead of considering last month's solar sales, it is considered last month's available solar simulations made in each point of sale.

The product solar is the only product with simulations, since it is personalized and adapted to the client's needs. It is a product with a process of installation and requires bigger investment, it usually needs more time to convert into sale. With that in consideration, it is important that every costumer that goes into the store and does a simulation has a flyer available.

The basis of the algorithm for the model of distribution of flyers in each point of sale, in case of a solar campaign, is the following:

$$=\boldsymbol{MRound}\big((\boldsymbol{No\ of\ Service\ Counters} * \boldsymbol{No\ of\ flyers\ in\ each\ service\ counter}\ (\mathbf{10}) * \boldsymbol{No\ months\ of\ the\ campaign}) + (\boldsymbol{Last\ Months\ Solar\ Simulations} * \boldsymbol{No\ months\ of\ the\ campaign}) + (\boldsymbol{Backup\ Flyers} * \boldsymbol{No\ Months\ of\ the\ campaign}); \boldsymbol{x}\big) \quad (4.5)$$

The algorithm has the same characteristics and assumptions mentioned before in the general algorithm, for de different distribution channels. The only difference is that instead of considering the sales, it considers the simulations.

The algorithm applied for the different distribution channels are the following:

Stores and Exclusive Agents:

$$=\boldsymbol{MRound}\big((\boldsymbol{No\ of\ Service\ Counters} * \mathbf{10} * \boldsymbol{No\ months\ of\ the\ campaign}) + (\boldsymbol{Last\ Months\ Solar\ Simulations} * \boldsymbol{No\ months\ of\ the\ campaign}) + (\mathbf{100} * \boldsymbol{No\ Months\ of\ the\ campaign}); \mathbf{100}\big) \quad (4.6)$$

Sales and Service Agents:

$$=\boldsymbol{MRound}\big((\boldsymbol{No\ of\ Service\ Counters} * \mathbf{10} * \boldsymbol{No\ months\ of\ the\ campaign}) + (\boldsymbol{Last\ Month's\ Solar\ Simulations} * \boldsymbol{No\ months\ of\ the\ campaign}) + (\mathbf{50} * \boldsymbol{No\ Months\ of\ the\ campaign}); \mathbf{100}\big) \quad (4.7)$$

Representation Agents:

$$= \boldsymbol{MRound}\big((\mathbf{1} * \mathbf{10} * \boldsymbol{No\ months\ of\ the\ campaign}) + (\boldsymbol{Last\ Months\ product\ sales} * \boldsymbol{No\ months\ of\ the\ campaign}); \mathbf{50}\big) \quad (4.8)$$

The Representation Agents are not able to make solar simulations, so the formula applied for the solar product is the same as for the other products, considering last month's solar sales instead of the solar simulations.

4.2.3. Merchandising Model on Excel

After defining the variables and building the algorithm that allows the calculation of the number of flyers needed for each point of sale, for every campaign, it is necessary to build the excel that feeds this algorithm.

For each campaign, a copy of this excel is created and updated with the data needed for the specific campaign. This excel is shared with other departments that use it as a report, to manage the campaign planning, request the production of flyers defined in it and send them to each point of sale.

The first sheet of this excel is a general cover that is used for reports made in excel. This cover has the title of the report, "Merchandising Model" and the date of the creation of the report, for that specific campaign

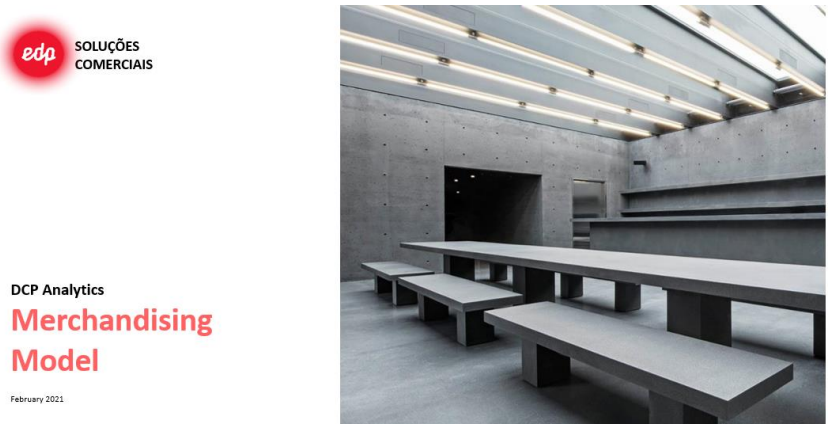

Figure 4.1- Cover of the Merchadinsing Model on Excel

The second sheet is the "Technical Datasheet". This sheet aims to describe the campaign and allows the update of the algorithm by defining the assumptions.

By only viewing this sheet, anyone should be able to understand the aim of the campaign and see a summary of the final results produced in the report.

This sheet is divided into three important parts:

1. *Scope and objectives of the campaign*- It is important to describe the type of campaign, the product advertised and the duration of the campaign.
2. *Assumptions* – The definition of the two assumptions: "The number of months of the campaign" and the "Type of product". It is also defined the date of previous month of the campaign (or the last month available), that helps to gather the information for the algorithm. By defining or changing the assumption, the variables of the algorithm are updated in an automatic way.
3. *Summary* – In the summary is possible to see the total number of flyers that needs to be produced for thar specific campaign, and how the number is distributed by the different distribution channels.

1.Scope and Objectives of the Campaign

Type of campaign, Product, Duration,...

2. Assumptions

Duration of the campaign (months)		
Product		
Month of the Campaign		
Previous Month Available		
Dates of the Previous Month available		

3. Summary

Distribution Channel	Number of Flyers
Stores	
Exclusive Agents	
Sales and Service Agents	
Representation Agents	
Total	

Figure 4.2- Technical Datasheet of the Merchandising Model on Excel

Then, there is a sheet for each distributions channel: “02_Stores”, “03_ExclusiveAgents”; “04_SalesandServiceAgents” and “05_RepresentationAgents”.

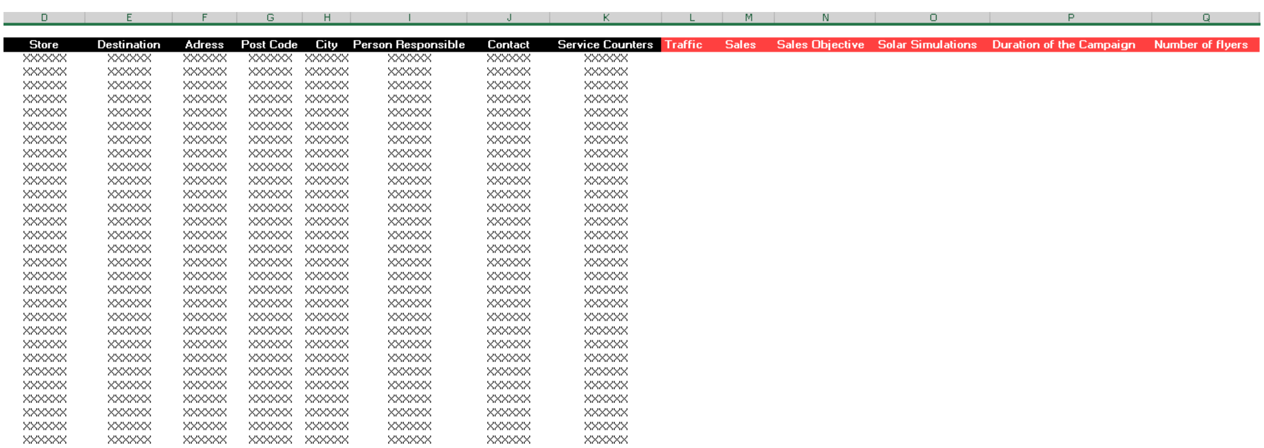

Figure 4.3- Sheet of distribution channel Stores in the Merchandising Model on Excel

Each distribution channel’s sheet includes all of its points of sale. Figure 4.3 shows the sheet of the channel Stores. The columns D to J, are filled with information of each point of sale: the name of the store (commercial name and CRM name), the address, and the name and a telephonic number of the person responsible for each point of sale. This information is essential for the department responsible for sending the produced flyers for each point of sale

Column K shows the number of service counters of each point of sale. This number differs for each point of sale but does not change from campaign to campaign, so it is a fixed value. All of this information is filled, but it cannot be shown for privacy terms.

Columns L and N show the “Store’s Traffic” and the “Sales objectives”, respectively. These variables are not used for the algorithm calculation purpose, are only included in the excel as an indication of the performance of the point of sale in the previous month.

Columns M and O show the variables used for in the logarithm, the “Last Months Number of sales” and “Last Months Number of Simulations” (in case the product is Solar).

These four columns, with the variables “Store’s Traffic”, “Sales objectives”, “Last Months Number of sales” and “Last Months Number of Simulations” are going to read the information to input hidden sheets, where the information of the sales, simulation, objectives, and traffic are filled previously and updated when needed.

By defining or changing the product and date of the campaign in the sheet “Technical Datasheet”, the information that those columns (L, N, M, O) reads in the input sheets and changes according to that.

Therefore, it is important to correctly define the assumption in the Technical Datasheet and keep the input sheets updated. These sheets are updated using information collected through the different reports on PoweBI, and always stay hidden in the excel of the Merchandising Model.

Column P shows the duration of the campaign. This assumption was already identified on the sheet “Technical Datasheet”, and the cells on column P reads the number directly on that sheet.

The column Q shows the number of flyers defined for each point of sale, using the formula of algorithm that was defined in this project.

Chapter V - Implementation

5.1. Implementation of the Merchandising Model

The implementation of the merchandising model consisted in applying the merchandising model mechanism that was built in excel, in one campaign. The campaign was applied in a campaign for the product "EDP Saúde" or sometimes referred to as "EDP Mais", the health insurance product.

This campaign lasted 3 months, from February to April 2021 and advertised a price change in health insurance product. The type of flyers produced were diptych flyers, flyers that have only one-fold.

The request for the number of flyers was made in December 2020, so the model was applied during that month.

2. Assumptions

Duration of the campaign (months)	3	
Product	EDP Mais	
Month of the Campaign	Fevereiro	
Previous Month Available	Novembro	
Dates of the Previous Month available	01-11-20	30-11-20

Figure 5.1- Assumption filled in the technical datasheet of the Merchandising Model, for campaign1.

With this information, it was possible to fill in the model the assumptions of the campaign in the technical datasheet. The assumptions are filled in Portuguese, since all the data is in Portuguese.

Since the request for the number of flyers was made in December, the previous month that was used was the month of November, since it is the month with the most recent information that could be used.

After the assumptions were filled in and the input sheets updated with the most recent information, the number of flyers calculated in total and for each distribution channel can be observed in the summary table.

3. Summary

Distribution Channel	Number of Flyers
Stores	38,100
Exclusive Agents	8,800
Sales and Service Agents	17,400
Representation Agents	2,700
Total	**67,000**

Figure 5.2- Summary shown in the technical datasheet, of the number of flyers calculated with Merchandising Model, for campaign1.

The total of flyers produced were 67,000 flyers: 38,100 flyers for the Stores, 8,800 flyers for the Exclusive Agents, 17,400 flyers for the Sales and Service Agents and 2,700 flyers for the Representation Agents.

The amount of money spent for the production and distribution of this flyers was 668€, just for the channels Stores and Agents.

To understand if the results are positive, it is essential to compare them with a past campaign, where the model was not applied.

The campaign used for comparative terms, was also an "EDP Saúde" campaign. The production of flyers for this campaign was more considered of a flyer renewal. The store flyers advertising the "EDP Saúde" product needed to be updated to include a new customer service phone number. These flyers remained in store for 4 months, from June to September.

For this campaign were produced 103,200 flyers, for the 4 months, only for the distribution channels Stores and Agents. The flyers were distributed in the following way:

Table 5.1- Summary of the number of flyers distributed in campaign 2

Distribution Channel	Number of Flyers
Stores	30,100
Agents	73,100
Total	**103,200**

The value of the production and distribution of the flyers was 2.789€, just for the channels Stores and Agents.

Through the comparative summary on table 5.2, it is possible to compare different aspects of the two campaigns and make some conclusions.

Table 5.2- Comparative summary table of the number and costs of flyers in campaign 1 and campaign 2

	Campaign 1	Campaign 2	Δ% (Campaign 1 - Campaign 2)
1. Nº of flyers produced	67,000	103,200	-35%
1.1. Nº of flyers produced for Stores	38,100	30,100	27%
1.2. Nº of flyers produced for Agents	28,900	73,100	-60%
2. Nº Flyers produced per month	22,333	25,800	-13%
3. Amount Spent in Total	668 €	2,789 €	-76%
4. Amount Spent per month	223 €	697 €	-68%
5. Flyer's Unit Cost	0.010 €	0.027 €	-63%

By observing table 5.2 it is possible to make many analyses. First, it is possible to see that from the campaign 1 to the campaign 2, the production of flyers was reduced by 35%. Having in consideration that the production of flyers for the campaign 1 was for 3 months and the campaign 2 was for 4 months, the number of flyers was divided by the number of months (3 and 4, respectively). Comparing the number of flyers produced per month, there was still a reduction in the production of flyers of 13%, from the campaign 1 to the campaign 2.

When analyzing the number of flyers per distribution channel, there was a significant reduction of 60% in the channel Agents.

Surprisingly, in the Stores the opposite happened. The optimal number defined by merchandising model for campaign 1, ended up being a superior number than the number that was defined for the campaign 2.

It is possible to conclude that the number of flyers produced for the channel Agents was highly inadequate for its needs and was causing a considerable increase in costs and unnecessary waste. In the channel Stores, the flyers production was adjusted to its needs and ended up increasing.

Through some calculations, in annex 1, it is possible to verify, that if the method for defining the number of flyers used for campaign 2, was applied in campaign 1, more 10,400 flyers would have been produced, for the 3 months of the campaign.

As for the monetary cost of flyers, it is also possible to verify a cost reduction of 68% per month, from campaign 2 to campaign1. This cost variation was caused by the reduction of the number of flyers produced, but also due to the change in the unit cost of each flyers.

The campaign manager was questioned about the reason for the flyer's unit cost reduction, however, there was no logical explanation for this change. This cost changes for every campaign and has many factors that influence it.

It is possible to conclude that there was a reduction in the number of flyers produced and in costs to EDP, answering research question number 3. The main objective of the project was successfully achieved.

Now it is necessary to test the efficiency of the model, by analyzing the impact of the number of flyers and information requests on the sales volume.

5.2. Testing the Hypothesis

To understand the efficiency of the merchandising model it is essential to test the hypothesis elaborated previously. Therefore, the research questions 4 and 5 will be answered.

Before doing the linear regressions, the correlation between the variables needs to be analyzed, using Pearson's r correlation coefficient.

Table 5.3- Correlation between the variables

	Nº Flyers	*Information requests*	*Sales Volume*
Nº Flyers	1		
Information requests	0.22	1	
Sales Volume	0.91	0.24	1

By analyzing Table 5.3, it is possible to conclude that there is a positive linear correlation between the variables and different from zero. It is possible to understand that the correlation between the number of sales and the number of flyers is much stronger than the other correlations.

Regarding the regression assumptions, the homoscedasticity of the residuals and the linearity coefficients were verified and can be observed in the different figures of the annexes 2, 3, 4, 5, 6, 7 and 8.

The absence of residual correlation was also verified by the Durbin-Watson test. The null hypothesis of this tests says that there is no correlation among the residuals, and the values range from 0 to 4. A value around the number 2 says that there is no autocorrelation in the residuals. The values closer to 0 indicate a positive autocorrelation and valuers close to 4 indicate a negative

autocorrelation. It is possible to see in the 2, 3, 4, 5, 6, 7 and 8 that the assumption was verified for the values of the merchandising model.

It is also important to mention, that in all the linear regressions applied, the value of the constant was insignificant as standardized values were used.

5.2.1. Campaign 1

Table 5.4- Summary of the linear regressions created to test the hypothesis, for campaign 1

Linear regression	Dependent Variable	R Square	Adjusted R Square	Independent Variables	Coefficients	Standard Error	t Stat	P-value
1	Sales Volume	0.826	0.825	Intercept	0.000	0.030	0.00	1
				Nº Flyers	0.909	0.030	30.12	0.000
2	Nº Information Requests	0.048	0.043	Intercept	0.000	0.071	0.00	1
				Nº Flyers	0.220	0.071	3.12	0.002
3	Sales Volume	0.058	0.053	Intercept	0.000	0.070	0.00	1.000
				Nº Information Requests	0.242	0.070	3.44	0.001
4	Sales Volume	0.828	0.826	Intercept	0.000	0.030	0.00	1
				Nº Flyers	0.899	0.031	29.15	0.000
				Information requests	0.044	0.031	1.42	0.156

5.2.1.1. Relationship between Number of Flyers and Sales Volume

To understand the relationship between the number of flyers and the volume of sales, by analyzing how much the number of flyers affect the volume of sales, the first simple linear regression model was created. The formula obtained from the linear regression is on annex 2.

The impact of the number of flyers in campaign 1 is very important for the volume of sales, since the variability of the volume of sales is explained by the variability of the number of flyers in 83%.

The validity of the model indicates that the number of flyers helps to explain the volume of sales and its impact is positive and significant ($\beta 11 =+ 0.909$ and p-value <0.01).

5.2.1.2. Relationship between Number of Flyers and Information Requests

To understand the relationship between the number of information requests and the number of flyers, by analyzing how much the number of flyers affect the number of information requests, the second simple linear regression model was created. The formula obtained from the linear regression is on annex 3.

The number of flyers is not very important, but still impacts the number of information requests, since the variability of the number of information requests is only explained by the variability of the number of flyers in 4,8%.

The validity of the model indicates that the number of flyers helps to explain the number of information requests and its impact is positive and but very low (β12 =+ 0.220 and p-value <0.01).

5.2.1.3. Relationship between Number of Information Requests and Sales Volume

To understand the relationship between the number of information requests and the volume of sales, by analyzing how much the number of information requests affect volume, the last simple linear regression model for campaign 1 was created. The formula obtained from the linear regression is on annex 4.

The impact of the number of information requests is not very important for the sales volume, since the variability of sales volume is only explained by the variability of the number of information requests in 5.8%.

The validity of the model indicates that the number of flyers helps to explain the number of information requests and its impact is positive and but very low (β13 =+ 0.242 and p-value <0.01).

5.2.1.4. Relationship between Number of Flyers, Number of Information Requests and Sales Volume

To understand if the number of information requests are a mediator of the relationship between the number of flyers and the volume of sales, the system of four regression models were analyzed.

The mediation role of the number information requests on the sales volume is not significant (p-value=0.156 > 0.01).

It is possible to conclude that the effect of the number of information flyers is not a mediator between the number of flyers and the volume of sales, in campaign 1. However, the number of flyers have a very important impact on the sales volume, as already noted.

5.2.2. Campaign 2

To understand better the results obtained from the linear regressions created for campaign 1, it is important to create the same for campaign 2 (where the merchandising model was not applied) and compare the results.

Table 5.5 presents the results of the four regression analysis for campaign 2.

Table 5.5- Summary of the linear regressions created to test the hypothesis, for campaign 2

Linear regressions	Dependent Variable	R Square	Adjusted R Square	Independent Variables	Coefficients	Standard Error	t Stat	P-value
1	Sales Volume	0.313	0.309	Intercept	0.000	0.060	0.000	1
				Nº Flyers	0.559	0.060	9.322	0.000
2	Nº Information Requests	0.050	0.045	Intercept	0.000	0.071	0.000	1
				Nº Flyers	0.224	0.071	3.176	0.002
3	Sales Volume	0.175	0.171	Intercept	0.000	0.066	0.000	1
				Nº Information Requests	0.419	0.066	6.376	0.000
4	Sales Volume	0.403	0.397	Intercept	0.000	0.056	0.000	1
				Nº Flyers	0.490	0.057	8.522	0.000
				Information requests	0.309	0.057	5.378	0.000

5.2.2.1. Relationship between Number of Flyers and Sales Volume

To understand the relationship between the number of flyers and the volume of sales in campaign 2, a simple linear regression model was created. The formula obtained from the linear regression is on annex 5.

It is possible to verify that the number of flyers impact the volume of sales, but not as much comparing with campaign 1, since the variability of the volume of sales is explained by the variability of the number of flyers in 31%.

The number of flyers positively influences the sales volume ($\beta 21 = + 0.559$ and p-value <0.01).

5.2.2.2. Relationship between Number of flyers and Information Requests

To understand the relationship between the number of information requests and the number of flyers, the second simple linear regression model was created for campaign 2. The formula obtained from the linear regression is on annex 6.

The impact of the number of flyers is also not very important for the number of information requests, since the variability of the number of information requests is only explained by the variability of the number of flyers in 5%. The impact is very similar to what was obtained for campaign 1.

The validity of the model indicates that the number of flyers helps to explain the number of information requests and its impact is positive and, but low ($\beta 22 = + 0.224$ and p-value <0.01).

5.2.2.3. Relationship between Number of Information Requests and Volume of Sales

Finally, to understand the relationship between the number of information requests and the volume of sales in campaign 2, the last simple linear regression model was created. The formula obtained from the linear regression is on annex 7.

The impact of the number of information requests is also not very important for the sales volume, since the variability of sales volume is only explained by the variability of the number of information requests in 17%. However, the impact is bigger in campaign 2 than in campaign 1.

The number of flyers positively influences the number of information requests ($\beta 23 = + 0.419$ and p-value < 0.01).

5.2.2.4. Relationship between Number of Flyers, Number of Information Requests and Sales Volume

To understand if the number of information requests is a mediator of the relationship between the number of flyers and the volume of sales in campaign 2, a system of several linear regression models was analyzed.

For campaign 2, the number of information requests is not a mediator of the relationship between the number of flyers and the volume of sales.

5.2.3. Hypothesis Analysis

Through the table 5.6, it is possible to observe all the effects tested in the different linear regressions, which helps to verify, or not, the hypothesis defined in this project.

Table 5.6- Summary of the effects studied in linear regressions created for campaign 1 and 2

Hypothesis	Effect in Regression Models	Campaign 1	Campaign 2
H1	Flyers → Sales Volume (Simple Regression)	Hypothesis Verified	Hypothesis Verified
H2	Flyers → Information Requests (Simple Regression)	Hypothesis Verified	Hypothesis Verified
H3	Information Requests → Sales Volume(Simple Regression)	Hypothesis Verified	Hypothesis Verified
H1	Flyers → Sales Volume (Multiple Regression)	Hypothesis verified	Hypothesis verified
H3	Information Requests → Sales Volume(Multiple Regression)	Hypothesis not verified	Hypothesis Verified
H4	Mediation	Hypothesis not verified	Hypothesis not verified

H1 is verified through the first simple linear regression and the multiple linear regression, for the two campaigns. For campaign 1, in both linear regressions, the variability in sales volume is largely explained by the variability in the number of flyers. For campaign 2 the same happens but it is possible to observe that the number of flyers has a much greater impact on campaign 1, than in campaign 2, which means that the quantities of flyers defined by the merchandising model are more adequate to the sales volume of each point of sale.

H2 was also verified for campaign 1 and 2. It was tested through the second simple linear regression and is verified for campaign 1 and 2. It is possible to affirm that the number of flyers impacts the number of requests for information, even if it is in a weak way in the two campaigns.

H3 was verified for campaign 1 and 2. It was also tested through two linear regressions, the third simple linear regression and the multiple linear regression. When H3 it is analyzed through simple linear regression, it is possible to verify for campaign 1 the number of information requests impacts the sales volume in a weak way. For campaign 2, the number of information requests influences the sales volume in stronger way, still not being considered very relevant.

Through the multiple linear regression, it is possible to verify that when analyzing the impact of the number of flyers and the number of information requests on the sales volume, the relationship

between information requests and sales volume is not significant, in the case of campaign 1. It is possible to validate H3 using the simple linear regression. It is true that the number of information requests have an impact, on the sales volume of campaign 1, when analyzed alone. For campaign 2 this relationship is verified in both regressions, and H3 is validated.

H4 is rejected for both campaigns, as above mentioned. To validate this hypothesis, a mediation analysis was carried out, through the Causal Steps Strategy Method defined by Baron and Kenny (1986), using the values of the coefficients obtained in several linear regressions.

The application of this model for campaign 1 and 2 can be seen through figures 5.3 and 5.4, respectively. The Number of Flyers is the independent variable (X), the Sales Volume is the dependent variable (Y) and the mediating variable is the Number of Information Requests (M).

For campaign 1, the method allows to conclude that the number of information requests is not a mediating variable, since the effect of the mediation of the Number of Information requests (a*b= 0.010) is not significant on the total effect (c'+a*b= 0.909).

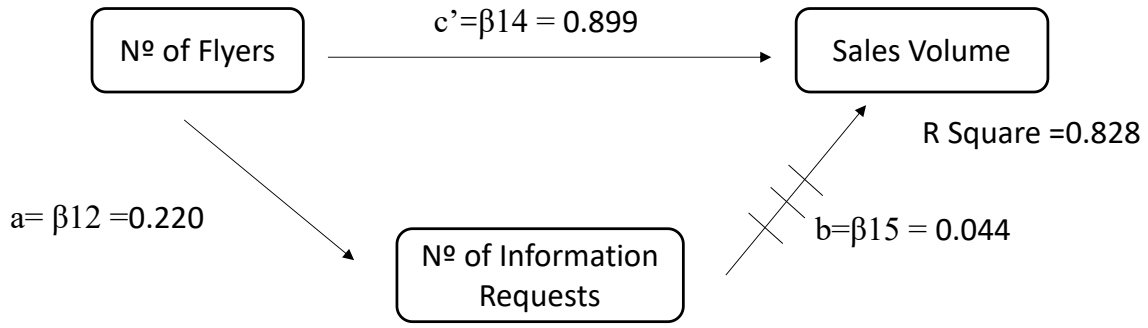

Figure 5.3- Mediation effect in campaign 1

For campaign 2, the values in figure 5.4 bellow were collected. The method allows to conclude that the number of information requests is not a mediating variable, since the effect of mediation of the Number of Information Requests (a*b= 0.069) is not significant on the total effect (c'+a*b=0.559).

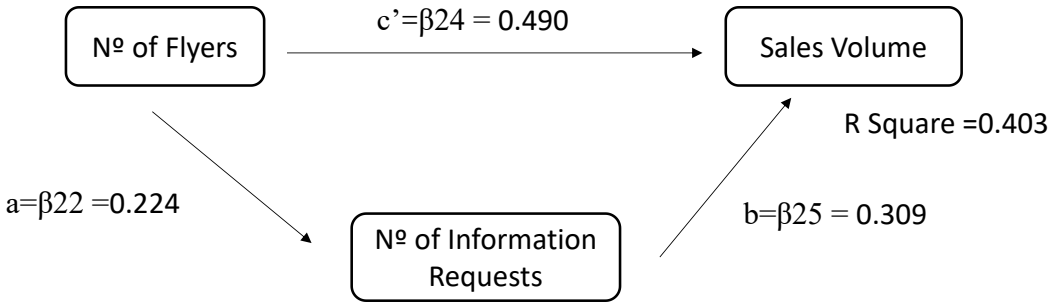

Figure 5.4- Mediation effect in campaign 2

Chapter VI - Conclusion

6.1. Results

The main objective of this project was to create a mechanism (the merchandising model) that calculates the optimal number of flyers needed for EDP's points of sale, by campaign, in order to reduce costs and waste caused by the overproduction of flyers.

The Merchandising Model was built in Excel by defining an algorithm with the most appropriate variables. As mentioned, these variables were defined through the support of the existing literature on the subject and through the transmission of past experience in the definition of flyers at EDP.

The main objective of this project was achieved, since the merchandising model allowed a reduction of flyers produced per month of 13% and a reduction in costs per month of 68%, in the campaign where it was applied (campaign 1), compared to the campaign where the model was not applied (campaign 2).

It is important to highlight that even with this reduction in the number of flyers distributed, no point of sale requested more flyers or transmitted the feedback that the flyers were insufficient.

After the main objective of the project was achieved, the efficiency of the model was studied through the hypothesis created from the conceptual models A and B. These models were adapted from the study of Gijsbrechts et al. (2003) that relates store flyers to sales performance, and the study of Leach et al. (2021) that suggests that information requests can affect the sales volume, both mentioned in the literature review. To test the hypothesis, four different linear regression were created, based on Model A and B, for each campaign. It was important to test the hypothesis in campaign 1 and in campaign 2, to interpret better the results.

H1 was created through the conceptual model A, that incorporates the study of Gijsbrechts et al. (2003) and was verified for both campaigns that the number of flyers affects the sales volume. It was also concluded that the number of flyers has a much greater impact on the sales volume in campaign 1, than in campaign 2. This indicates that the quantities of flyers defined by the merchandising model are more adequate to the point of sale needs and have great positive effect the sales volume.

The other three hypothesis were defined based on the conceptual model B. This conceptual model incorporates both the study of Gijsbrechts et al. (2003), and the study of Leach et al. (2021).

What is concluded in this project, through the test of H3, is that the number of information requests affect positively the sales volume, but not in a significant way. This impact is bigger on campaign 2 than on campaign 1.

Model B suggests that the number of information requests is a mediator of the relationship between the number of flyers and the sales volume. However, results allow to conclude that the number of information requests do not work as a mediator of this relationship, for both campaigns.

Although the conceptual Model B was not proven in this project, this analysis was interesting to do, and since there is not much literature to study the impact of the information requests, it would be interesting to apply this model to other type of business and study its results.

The Merchandising Model developed in this project allowed EDP to reduce its costs and waste produced, by reducing the number of flyers distributed in the presential channels, while impacting the sales volume in a positive and significant way.

6.2. Limitations

The study's main limitation was the fact that during the development of this project, EDP went through an internal reorganization. This reorganization had many impacts on the company, including the fact that the role of the definition of the number of flyers was no longer in the scope of the team where this project was implemented. This responsibility was handed over to an external company, making it impossible to continue this project, which was only applied to one campaign. The objective was to continue using the Merchandising Model, giving the great results analyzed in this project, of the one campaign where it was implemented and, in addition to expand it to the other two presential distribution channels: D2D and RAD.

Furthermore, it is important to mention as a limitation, the fact that both the campaign where the model was applied (campaign 1) and the campaign where the model was not applied (campaign 2) took place during the COVID-19 pandemic. However, during the months where campaign 1 took place, from February to April, there were more restrictions in Portugal. This can influence campaign 1 results, both in sales volume and in the number of information requests and may explain the fact that the information requests had less impact in the sales volume in campaign 1.

However, contrary to what might be expected due to the pandemic restrictions, the impact of number flyers in the sales volume was superior in campaign 1, then in campaign 2. This proves,

once again, that through the Merchandising Model, the number of flyers was adapted to the needs of each point of sale.

6.3. Theoretical Contribution, Managerial and Social Implications

The development of this project brought benefits both to the company and to society. Developing a model that optimizes the number of flyers distributed for EDP's presential channels, was a great achievement for the company, since it allowed the company to reduce costs and to minimize its "footprint". Society also benefits from that, because it is a way to avoid producing waste by reducing the number of flyers produced. The decrease in paper consumption helps to minimize the use of earth resources.

6.4. Future Research

This project also adds a new concept for the literature with the development of the conceptual Model B, by suggesting that the information requests can work as a mediator of the relationship between the number of flyers and store performance. In this project the mediation effect was not verified, however the model can be applied and tested for other type of businesses.

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Chapter VIII - Annexes

Annex 1. Additional calculations when comparing the number of flyers in campaign 1 and 2

Number of flyers for campaign 1 using the methods of campaign 2 =25,800*3= 77,400 flyers

Number of flyers for campaign 1 using the Merchandising Model (Real value) = 67.000 flyers

Number flyers not produced (Method of campaign 2- Merchandising Model) = 77.400- 67.000 = 10.400 flyers

Annex 2. Assumptions and Results of the relationship between the Number of Flyers and the Sales Volume for campaign 1

Table 8.1- Summary of the model

Regression Statistics	
Multiple R	0.908912
R Square	0.826122
Adjusted R Square	0.825211
Standard Error	0.419165
Observations	193
Durbin-Watson	1.480719

Table 8.2- Validity test of the model

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	159.441	159.441	907.469	0.000
Residual	191	33.559	0.176		
Total	192	193.000			

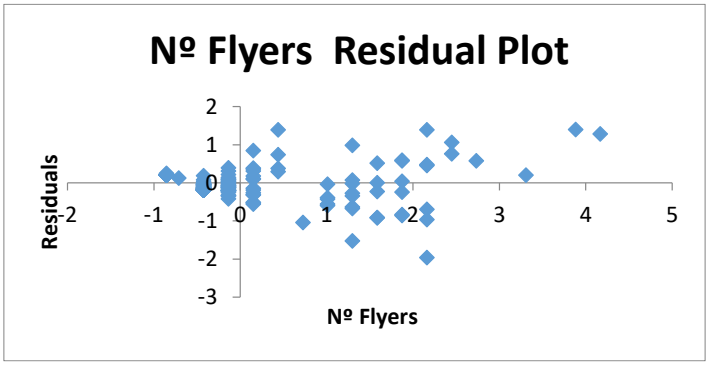

Figure 8.1- Homoscedasticity of the residuals

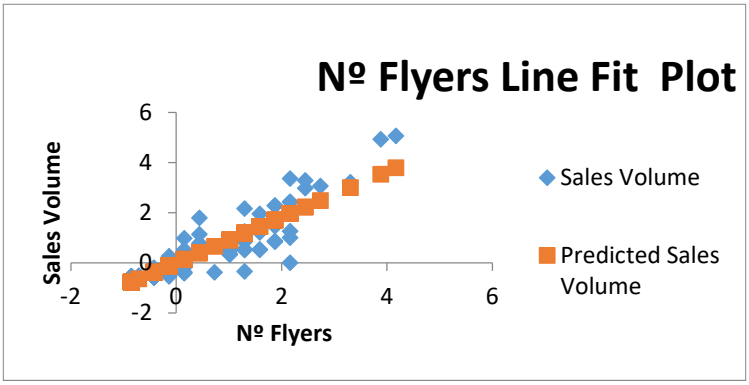

Figure 8.2- Linearity of the coefficients

$$\text{Sales Volume} = 0.000 + 0.909 * \text{Nº of Flyers} \quad (7.1)$$

Annex 3. Assumptions and Results of the relationship between the Number of Flyers and the Number of Information Requests for campaign 1

Table 8.3- Summary of the model

Regression Statistics	
Multiple R	0.219918
R Square	0.048364
Adjusted R Square	0.043382
Standard Error	0.980612
Observations	193
Durbin-Watson	1.797159

Table 8.4- Validity test of the model

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	9.334	9.334	9.707	0.002
Residual	191	183.666	0.962		
Total	192	193.000			

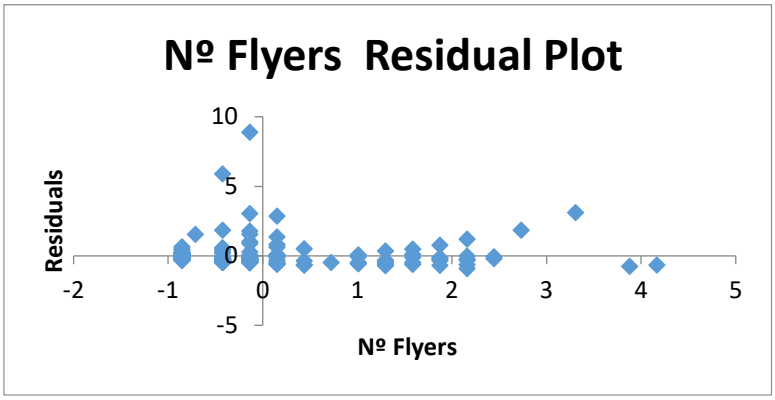

Figure 8.3- Homoscedasticity of the residuals

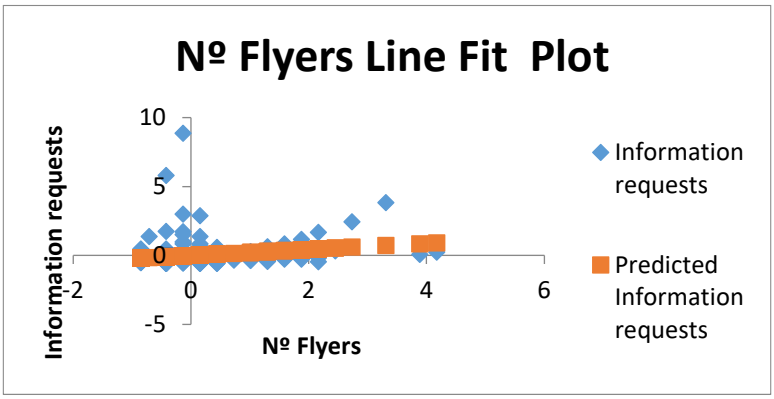

Figure 8.4- Linearity of the coefficients

Nº of Information Requests = 0+0.22*Nº of Flyers (7.2)

Annex 4. Assumptions and Results of the relationship between the Number of Information Requests and Sales Volume for campaign 1

Table 8.5- Summary of the model

Regression Statistics	
Multiple R	0.241708
R Square	0.058423
Adjusted R Square	0.053493
Standard Error	0.975416
Observations	193
Durbin-Watson	0.861437

Table 8.6- Validity test of the model

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	11.276	11.276	11.851	0.001
Residual	191	181.724	0.951		
Total	192	193.000			

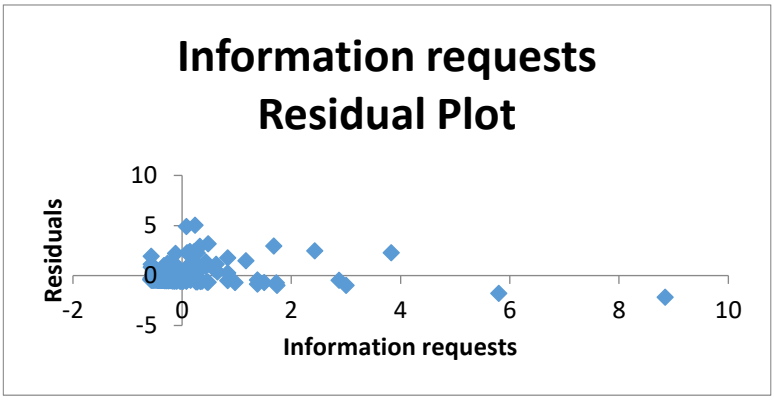

Figure 8.5- Homoscedasticity of the residuals

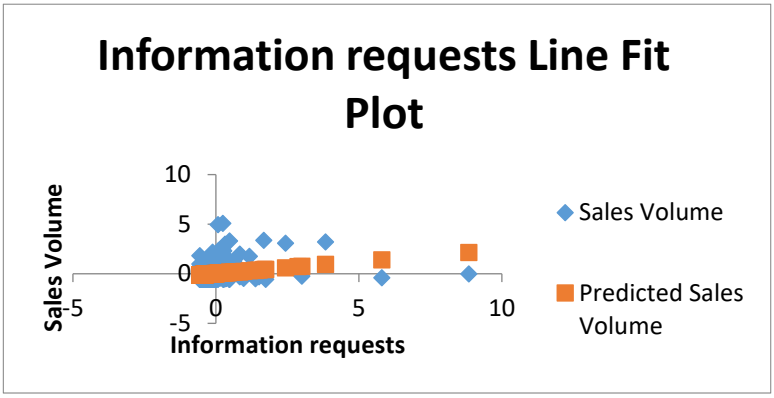

Figure 8.6- Linearity of the coefficients

Sales Volume = 0+0.242*Nº of Information Requests (7.3)

Annex 5. Assumptions and Results of the relationship between the Impact of the Number of Flyers and Sales Volume for campaign 2

Table 8.7- Summary of the model

Regression Statistics	
Multiple R	0.909923
R Square	0.82796
Adjusted R Square	0.826149
Standard Error	0.418039
Observations	193
Durbin-Watson	1.49526

Table 8.8- Validity test of the model

ANOVA					
	df	*SS*	*MS*	*F*	*gnificance*
Regression	2	159.796	79.898	457.196	0.000
Residual	190	33.204	0.175		
Total	192	193.000			

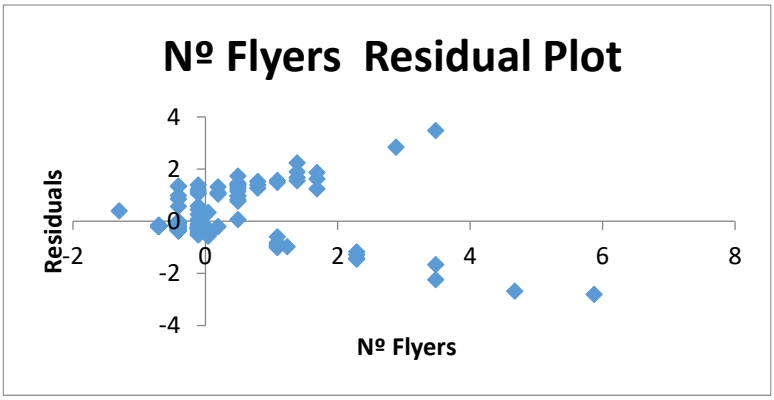

Figure 8.7- Homoscedasticity of the residuals

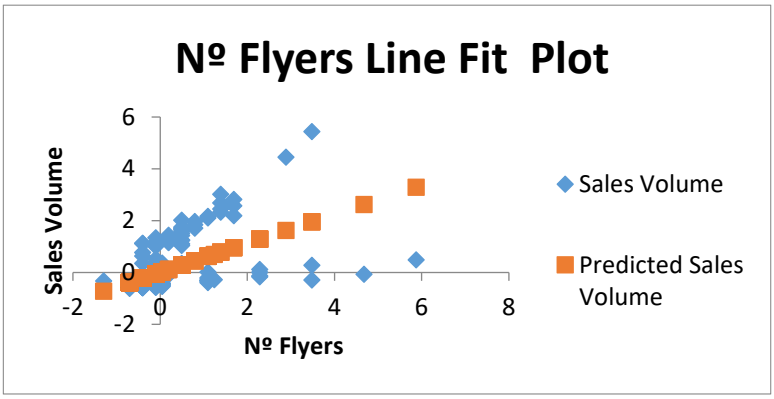

Figure 8.8- Linearity of the coefficients

Sales Volume = 0.000+0.559*Nº of Flyers (7.4)

Annex 6. Assumptions and Results of the relationship between the Number of Flyers and the Number of Information Requests for campaign 2

Table 8.9- Summary of the model

Regression Statistics	
Multiple R	0.559194
R Square	0.312698
Adjusted R Square	0.3091
Standard Error	0.833366
Observations	193
Durbin-Watson	0.570762

Table 8.10- Validity test of the model

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	60.351	60.351	86.898	0.000
Residual	191	132.649	0.694		
Total	192	193.000			

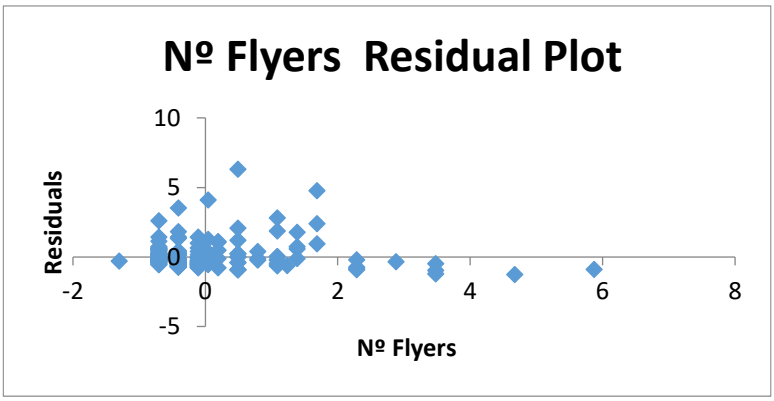

Figure 8.9- Homoscedasticity of the residuals

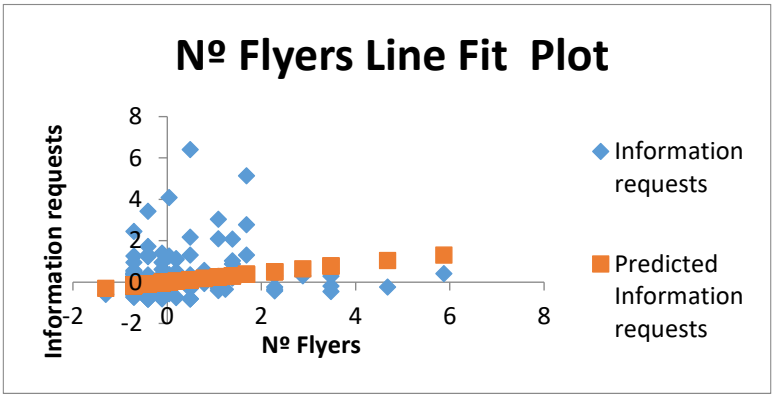

Figure 8.10- Linearity of the coefficients

Nº of Information Requests = 0+0.224*Nº of Flyers (7.5)

Annex 7. Assumptions and Results of the relationship between the Number of Information Requests and Sales Volume for campaign 2

Table 8.11- Summary of the model

Regression Statistics	
Multiple R	0.4189
R Square	0.175477
Adjusted R Square	0.17116
Standard Error	0.912774
Observations	193
Durbin-Watson	0.967929

Table 8.12- Validity test of the model

ANOVA					
	df	*SS*	*MS*	*F*	*gnificance*
Regression	1	33.867	33.867	40.649	0.000
Residual	191	159.133	0.833		
Total	192	193.000			

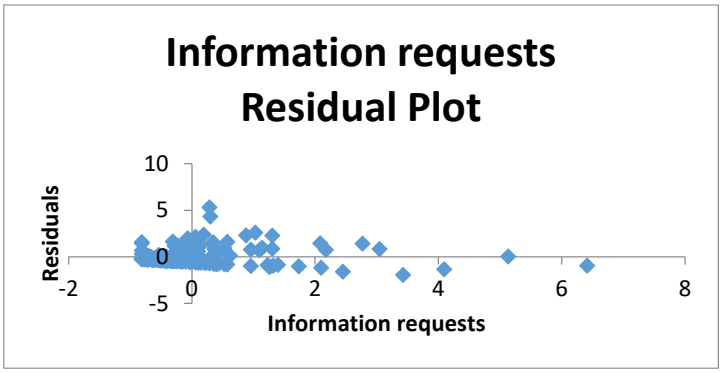

Figure 8.11- Homoscedasticity of the residuals

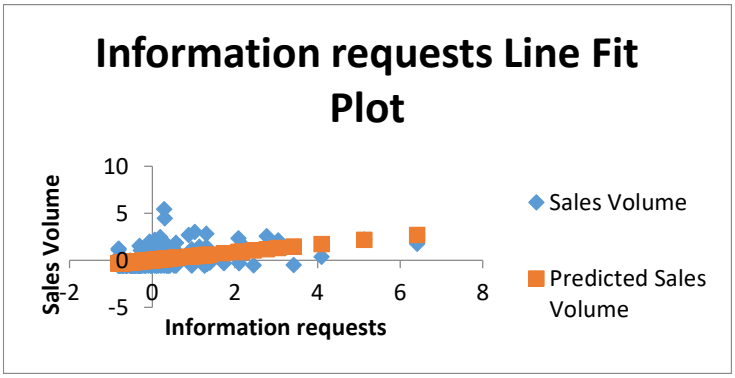

Figure 8.12- Linearity of the coefficients

Sales Volume = 0+0.419*Nº of Information Requests (7.6)

Annex 8. Assumptions and Results of the relationship between the Number of Flyers, Information Requests and Sales Volume for campaign 2

Table 8.13- Summary of the model

Regression Statistics	
Multiple R	0.635206
R Square	0.403486
Adjusted R Square	0.397207
Standard Error	0.778417
Observations	193
Durbin-Watson	0.759487

Table 8.14- Validity test of the model

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	77.873	38.936	64.259	0.000
Residual	190	115.127	0.606		
Total	192	193.000			

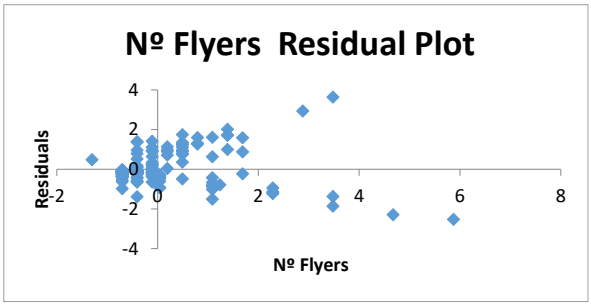

Figure 8.13- Homoscedasticity of the residuals

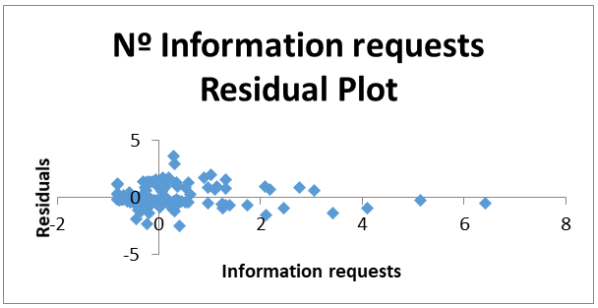

Figure 8.14- Homoscedasticity of the residuals

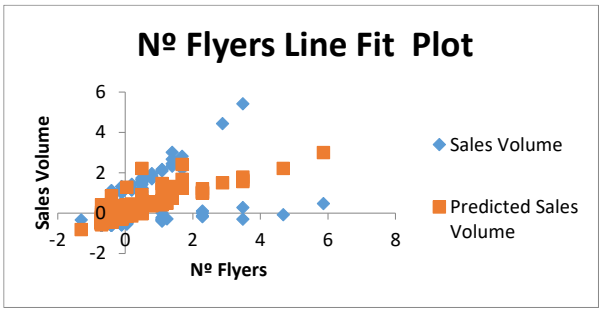

Figure 8.15- Linearity of the coefficients

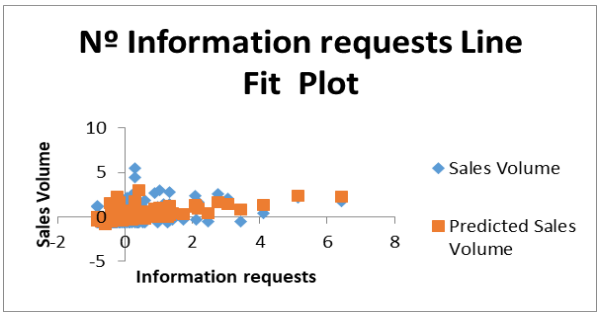

Figure 8.16- Linearity of the coefficients

$$\text{Sales Volume} = 0+0.490*\text{Nº of Flyers}+0.309*\text{Nº of Information Requests} \quad (7.7)$$