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IMPLEMENTATION OF AN ACTIVITY-BASED COSTING SYSTEM IN AN AMENITIES MANUFACTURER – MODEL'S CONSTRUCTION, USEFULNESS, AND PROFITABILITY ANALYSIS

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Abstract

The following Work Project entails the development and implementation of an Activity-Based Costing system within a Portuguese firm in the amenities' manufacturing and commercialization industry. The model was divided into two parts, one regarding product costing and the other considering order processing costs. Its main objective is to ensure the company's accurate costing and provide an easy and adaptable tool that allows for a faster and more reliable bidding process. The analysis has revealed remarkable results regarding products, lines, and clients' profitability. Furthermore, the sustainability of the firm's online store was evaluated.

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Keywords

Activity-Based Costing; Bidding; Costing Systems; Profitability; Traditional Costing.

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1. Introduction

Founded in 1988, company LM[1] is one of the national leaders in the industry of manufacturing and commercialization of amenities, such as shower gel and soap. Counting on the trust of more than 5000 national and international clients, LM ranks amongst the leading national amenities suppliers, serving from hotel and motel chains to restaurants and airlines. The firm also works with some resellers. In 2001, it partnered with T, a national company that has become responsible for the design and production of all products' wrapping and labelling. LM fully produces in-house its solid and liquid soaps, shower gels, shampoos, and wipes. When it comes to body lotions and conditioners, those are outsourced, and LM is only responsible for their packaging and distribution. The same happens to other amenities such as caps and shaving kits. Financially wise, LM has proved to be stable, counting on Net Margins rounding 10% as well as healthy Activity and Liquidity ratios (Appendix 11.2.). With more than 2.6M€ of regular annual sales, the firm has a Shareholder value higher than 2M€. However, with the Covid-19 pandemic and the consecutive suspension of the whole hotel industry, the firm was severely impacted, as its most significant clients were forced to shut down. Nevertheless, in 2020, despite having suffered a cut of around 28% in sales, LM could sustain its financial position by shifting

[1] For confidentiality purposes, when referring to the company under analysis, a fictitious name was used. The same logic was applied to its competitors and partners.

the focus of its production to alcohol gel and disinfectant wipes. Due to the high demand for such kinds of products and their respective market shortage, LM was able to practice high prices and take advantage of high margins. Adding to that, it has also launched its online store, broadening its business to a B2C model. As such, the company seized all opportunities, enabling it not to shut down its production. As a consequence, the firm was able to even raise its EBITDA and Net Margin, culminating in a 2020 Net Income increase of almost 9%. However, in 2021, the market for disinfectant products was balanced, and tourism was still highly constrained. As a result, LM had one of its worst financial years, dropping its Net Income by almost 97%. Finally, in 2022, with the lifting of most Covid-19 restrictions and the increasing Portuguese tourism, the firm has been able to reach pre-pandemic sales levels and even surpass them in some months.

When evaluating the firm's General Environment, it should be reinforced that the world's economy is still recovering from the massive impact of the pandemic. Moreover, even though tourism is finally going back to its average value, in 2022, a new challenge has arrived. The war between Russia and Ukraine is having an outsized impact on the global supply chain as it has been stopping the flow of goods and causing dramatic fuel cost increases and product shortages. Consequently, one can observe the rising of commodity prices worldwide. As a result, firms in this industry are facing the challenge of increasing raw materials prices as well as supply shortages, forcing them to increase their product prices and renegotiate deliveries' lead times and stock needs. The rise of environmental concerns has also been highly impacting the amenities industry. Strong regulations on both cosmetics and packaging composition have been introduced, forcing firms to change formulas and labels, as well as to tighten their quality control measures.

Analysing the industry using Porter's Five Forces framework (Porter 1979), one can classify it as having low intensity of competition and moderate attractiveness (Appendix 11.3.). Buyers

have low bargaining power, as there are mainly two firms competing in the market, and the industry presents some switching costs due to contracts and product personalization. Furthermore, the industry also faces low threat of new entrants as it requires high initial Capital Expenditure and Research & Development investments, and there is not much room to diversify. Suppliers present a moderate degree of power. On the one hand, there is an extensive range of suppliers from which to choose. On the other hand, suppliers are not highly dependent on their relationship with this specific industry's clients. There are also high switching costs with some of the suppliers, as personalized packaging requires moulds to be made, which are costly and time-consuming to produce. The intensity of rivalry can be considered low, with the two leading industry players taking advantage of their strong brand loyalty and slow industry growth. The threat of substitute products can be regarded as moderate, as buyers rather purchase all their amenities from the same supplier, which only specialized companies in this industry can offer. However, full-size products manufactured by players in other sectors can substitute amenities and present lower prices while having similar performance. Such can already be seen, for instance, with the well-known cosmetics brand *Rituals* supplying some big hotel chains.

Focusing on LM's competitive environment, a renowned French amenities group can be identified as its biggest direct competitor, encompassing 30 brands, and covering more than 70 countries. In 2018, the firm became a more significant threat, when its representative in Portugal inaugurated a new factory unit in Viana do Castelo to better accommodate the Spanish and Portuguese markets. LM counts with other director competitors, whose names were not revealed due to confidentiality reasons. Nonetheless, these are not significant for LM as they only cover a small percentage of the market. Some indirect competitors should also be considered, such as *Rituals*, *Longlife* and *Nortempresa* Perfume & Cosmetics Manufacturer.

Following an internal analysis and grounding our thoughts in a SWOT framework (Humphrey 1960) it was possible to identify LM's main strengths (Appendix 11.4.). Naturally, its strong

partnership and close location to firm T gives LM a crucial competitive advantage, allowing it to be autonomous and extremely fast in developing and producing its products' wrapping and labelling. With more than 30 years of experience, LM is also considered a solid and reputable brand with a loyal customer base. A key distinguishable factor is their unique and complete machinery set, which makes them capable of packaging their whole vast portfolio of products. Moreover, LM counts with a specialized labour force made of 14 factory employees, all capable of performing any step of each production line.

Nevertheless, as mentioned before, LM is still recovering from the financial consequences of the Covid-19 pandemic. Consequently, the firm has become even more apprehensive to invest in what could be a crucial strength: the fully in-house production of two of its most important products, conditioners, and body lotions. This is one of LM's medium/long-run strategic objectives. Another weakness worth mentioning concerns the company's particular business model and its required high-safety stocks. As a result, LM suffers from occasional losses of ingredients that are out of expiration date.

In what concerns opportunities, since the pandemic, industry firms have been forced to increase their online presence. LM was no exception, having created its online store. This source of revenue has been growing significantly, with a sales increase of around 130% over the last year. If the company strategically invests in it, it might continue to be a growing opportunity. Exportation is also one of the most promising plans in the short run.

A crucial factor of LM's industry is its high dependence on tourism. If, on the one hand, tourism has been indeed booming and surpassing pre-pandemic levels, on the other hand, such reliance still constitutes a significant threat. Additionally, the industry's high exposure to seasonality and constant regulation changes are other concerns to consider. It should also not be ignored that LM's most significant competitor has opened its first factory in Portugal, which can bring considerable threats in the future. Finally, the whole industry has been and will naturally

continue to be impacted by inflation's great consequences.

2. Literature Review

2.1. Introduction to Costing Systems

To make clever decisions concerning the marketing and manufacturing of their products, decision-makers must accurately know the cost of their products. Other managerial decisions such as product design, budgeting, bidding[2], and personnel hiring will also be influenced by product costs and profitability (Cooper and Kaplan 1987; Daru 2016).

When computing product costs, a cost accumulation system is required to assign costs to cost objects. A cost object refers to the product, service, project, client, or any item for which costs are being separately measured (Kumar and Mahto 2013b). These costs can be divided into direct, those that can be precisely traced to a cost object, and indirect or overhead costs (Drury 2018). Direct costs are associated with the cost object's consumption of resources, i.e. the elements consumed in or necessary to the performing activities inherent to the cost object's existence (Kumar and Mahto 2013b; Themido et al. 2000). When it is not possible to directly measure the quantity of resources consumed by a cost object, costs must be assigned using surrogate rather than direct measures, hence following a cost allocation (Drury 2018). The basis for allocating costs to cost objects is called cost driver or allocation base. When this driver is a significant cost determinant, a cause-and-effect allocation or driver tracing is followed. When such does not happen, the term arbitrary allocation is used, which tends to result in an incorrect allocation of indirect costs. Furthermore, two systems of cost allocation exist: direct or variable costing systems, which assign only direct costs to cost objects; And absorption costing systems, which assign both direct and indirect costs. Among the absorption costing systems, one can find Traditional Costing (TC) and Activity-Based Costing (ABC) Systems (Drury 2018).

[2] Since the term bidding has multiple meanings in the Finance field, when reading this Work Project, one should consider the following definition: The bidding is the act of sending a bid proposal. (i.e., "A bid proposal is a document that companies use to outline the products or services, pricing and time frame they can offer clients for completing a specific project" (Indeed Editorial Team 2020) |)

2.2. Traditional Costing Systems

Until the 1900s, when information processing systems were expensive and time-consuming, most companies used simplistic costing methods created to purely answer financial accounting requirements (Drury 2018).

TC systems tend to allocate indirect costs based on easily identifiable drivers, such as direct labour hours (DLH), machine hours (MH) or the number of units produced. In other words, based on broad averages that usually do not reflect causality (Kumar and Mahto 2013b; Cokins and Lawson 2006). This way, the method assumes that the respective volume consumed is the underlying driver behind manufacturing overheads (Daru 2016b). The use of these allocation methods makes the results vary depending on the allocation basis (Cokins and Lawson 2006). Contributing to an arbitrary cost allocation, all overheads tend to be allocated using the same cost driver. Besides, the traditional allocation method fails to allocate the non-manufacturing overheads associated with the cost object's production, such as General and Administrative Expenses (Daru 2016b). Critics say this method under-costs complex and low-production volume products while it over-costs simple products produced in big batches (Hughes and Paulson Gjerde 2003). Further insights on the advantages and limitations of the model will be discussed in section 2.4..

2.2.1. Plant-wide / Blanket Overhead Rates

The most simplistic TC method, the plant-wide or blanket overhead rate, attributes indirect costs to cost objects using a single overhead rate (SOR) for the entire company. (Drury 2018). In this model, total overheads are accumulated in one single cost pool (i.e., "a location to which overhead costs are initially assigned") (Drury 2018), which is then assigned to products through a single rate, based on DLH, MH, or another similar driver. This rate is then multiplied by the quantity of driver used in the production of each product. Once the resulting amount is added to the direct cost of every produced unit, one arrives at the total product cost (Trigg, Holland,

and Kundey 1997).

Naturally, some departments consume more indirect costs than others. As such, products that spend more time in those departments should account for more overheads than the ones that spend less time there. By having different rates for different departments, one could capture these differences. However, a SOR does not, due to its averaging nature. Therefore, a SOR will probably result in an inaccurate allocation of overheads, and it should only be used if all products consume departmental overheads approximately in the same proportions (Drury 2018). Happily, firms have been shifting away from this costing method (Drury 2018). In a study with several UK organizations (Al-Omiri and Drury 2007), it was reported that a plant-wide rate was only used by four per cent of the surveyed firms.

2.2.2. Departmental rates and the Two-Stage Allocation Method

When a firm has a diverse range of products that spend different proportions of time in each department, departmental rates should be used whilst following the two-stage allocation method. Accordingly, the first stage is to allocate the indirect costs to cost centres, which usually are departments but can also be smaller and more specific segments, as it will be further developed in section 2.3.. The second stage assigns the cost centres' accumulated costs to the cost objects using cost drivers (Drury 2018). A TC system tends to use a small diversity of cost drivers and assumes these significantly influence the level of overhead expenditure. The Two-stage Allocation Method is used in both TC and ABC systems. However, in the latter, a higher number and diversity of cost centres and drivers is considered (Drury 2018).

2.3. Activity-Based Costing Method

2.3.1. The emergence of Activity-Based Costing

In the late 1980s, the intensification of many industries' competitive environments forced firms to improve the accuracy of their costing systems (Turney 2010), allowing them to reduce the oversimplified and arbitrary costing allocations resulting from more TC methods (Cokins and

Lawson 2006). Such has increased demand for more relevant, consistent, and understandable management accounting techniques, namely the ABC systems (Mahal and Akram Hossain 2015). Another key factor driving the spread of ABC models was the significant rise in indirect costs resulting from the increasing factory automation felt in that period (Cokins and Lawson 2006). One aspect that should also not be disregarded concerns the increasing complexity of the firm's business models (Cokins and Lawson 2006). The higher heterogeneity in the portfolio of products/services, as well as clients, distribution, and sales channels, has further increased the need for a system that properly assigned the increasingly significant overhead costs (Cokins and Lawson 2006). By assigning their costs according to cause-effect allocations, indirect costs could consciously be considered when reaching crucial decisions (Cokins and Lawson 2006). As such, and although relatively new, ABC has become widely accepted by firms from different industries, including the public sector and medical institutions (Kumar and Mahto 2013b).

2.3.2. What is Activity-Based Costing?

According to Aronoff et al. (1998), there are two purposes behind the implementation of an ABC system:

1. To avoid cost perversion.
2. To identify and reduce activities that are not adding value to a process.

ABC is a method that assigns overheads to the different activities (i.e., single or gathering of tasks) (Kumar and Mahto 2013c) of a process flow, based on their actual consumption and considering their cause-effect associations (Cokins and Lawson 2006). After accumulating such costs by activities, one can reach the total costs in each activity cost centre (Drury 2018). Then, considering each cost object's consumption of each activity, the final product/service cost is reached. A key feature of this method is that it can be applied to a wide range of firm areas, not just the manufacturing one (Kumar and Mahto 2013b). In other words, it considers that the efforts related to marketing, sales, and products/services delivery create a demand for

organizational activities (and the other way around) that should not be disregarded (Cooper and Kaplan 1992). As such, thanks to its completeness and high levels of accuracy, it permits managers to have a much more detailed and accurate view of their firm's cost structure and behaviours. Furthermore, it allows to analyse different areas of business, profitability according to their different products/services, the impact of different customers, among others. (Gunasekaran, Marri, and Yusuf 1999). So, one can say that an ABC system is a powerful tool for both financial and non-financial decisions (Cokins and Lawson 2006).

2.3.3. How does Activity-Based Costing work?

Deepening the methodology related to the development of an ABC model, it can be said that the first, and one of the most important steps, is Data Gathering. During that phase, all required information should be collected, from identifying the different firm's activities and acknowledging the process's crucial information to acknowledging the different drivers and consumption patterns. During this step, meetings with different level managers are necessary. It might also be helpful to visit the firm's manufacturing area to conduct some observational research and informal interviews with the workforce (Cokins and Lawson 2006). According to Cookin and Lawson (2006), the data required to build an ABC system can be grouped according to three different sources:

1. People: Asking the ones constantly in contact with the firm's activity might be a helpful way to retrieve information about the process flow behaviour, the respective consumptions and the organization's structure.
2. General Ledger: Some cost data might be immediately obtained from this record-keeping system.
3. Organization's Information Technology Systems: These might provide important information regarding past production history.

After having all data compiled, the two-stage allocation method should be followed

(Gunasekaran, Marri, and Yusuf 1999), which according to Drury (2018), unfolds in four steps:

1. Recognition of the critical activities happening within the organization.
2. Allocation of the overhead costs to the different activities' cost centres.
3. Identification of the different activities' drivers.
4. Consideration of each cost object different activities' consumption and respective allocation of each activity's total cost.

After following these four steps, one will have an accurate picture of each cost object's value.

2.3.4. The Implementation of an Activity-Based Costing System

Successful implementations of ABC systems imply behavioural change within the whole organization (Cokins and Lawson 2006). Firstly, not only the top management but also the rest of the organization's team should be engaged in the process (Mahal and Akram Hossain 2015; Cokins and Lawson 2006). Here, communication is key, and the advantages of such exchange should be clearly transmitted (Cokins and Lawson 2006). Some experts also agree that a team of workers from different areas should be nominated to oversee the implementation (Mahal and Akram Hossain 2015). Specifically, accounting members should not be considered in this nomination (Mahal and Akram Hossain 2015). Adding to that, according to Cooper and Kaplan (1991), six critical decisions should be made before designing an ABC model:

1. Whether the new model should be combined with the currently used one or treated as independent.
2. Whether a formal decision on a model design should be taken before the actual implementation.
3. The person/s who will be in charge of building the final model.
4. The level of precision that should be used.
5. Whether the costs to consider should be based on historical values or future ones.
6. What should be the level of complexity of the first model.

One should be particularly concerned when deciding on issue four, as the precision level will depend on the trade-off between the system's cost and its extent of detail, exactness, and rigidity (Cokins and Lawson 2006). Exact and accurate models may demand levels of effort that end up not being worth it. Citing Keynes, sometimes, "it is better to be approximately right than precisely wrong".

In 1999, Gunasekaran, Marri and Yusuf developed another crucial model to understand whether ABC can be applied to specific organizations in the manufacturing and service areas (Appendix 11.5.). According to it, four aspects should be taken into account:

1. The circumstances motivating the implementation of the model.
2. The aspects hindering the model from being implemented.
3. A cost-benefit analysis evaluating whether the gains from this implementation surpass its costs.
4. The potential negative consequences (both financial and non-financial) of the model's implementation.

With these decisions and considerations in mind, a weighted decision can be followed.

As important as the implementation strategy of a system is its sustainability in the long run. For that, it must be ensured that the whole organization's team is conscious of the value and the purpose of the model. (Cokins and Lawson 2006). Furthermore, the model's data should be periodically reviewed to ensure validity (Drury 2018).

2.3.5. The impact of Activity-Based Costing on Strategic Cost Management

As said before, an ABC system helps companies allocate their costs to cost objects more consciously and precisely. But other than that, ABC might also be beneficial in its crucial strategic decisions (Drury 2018), from Pricing/Product Mix ones (Cooper and Kaplan 1992) to process re-engineering (Cooper and Kaplan 1988). A study conducted by Innes, Mitchel and Sinclear (2000) has shown that ABC systems have been more helpful in cost management-

related decisions than in the ones related to the initial purpose of the model, product costing. When it comes to Pricing decisions, for instance, ABC is a useful tool to understand which products are being over or under-costed and hence might need to have their prices readjusted. Likewise, some Product Mix considerations might be retrieved from the model conclusions. This way, firms might more accurately understand the cost impact of their customers' decisions on the volumes and heterogeneity of products ordered. Such considerations may then be pondered when pricing the respective orders (Cooper and Kaplan 1992).ABC systems might also be highly useful in Customer Profitability Reporting (Cokins and Lawson 2006). Not focusing solely on products' manufacturing costs allows firms to have a complete view of their customer's value. Based on such insights, Profit and Losses Statements might be built for individual customers. As such, one can say that the profitability of two customers ordering the same product mix might be significantly different depending uniquely on their consumer behaviour. In other words, the level of effort a customer demands from an organisation, i.e., customer service and delivery requirements highly impact its profitability (Cokins and Lawson 2006). Such reasoning was summarized by Cokins (2001) in a two-axis matrix that confronts the "Product Mix Margin'', which evaluates the net margin by customer based solely on their product consumption, with the "Cost-to-Serve'' a client during its whole customer journey (Appendix 11.6.). Ideally, all firms should focus on strategically having their customers positioned at the upper left corner, maximizing their profitability (Cokins and Lawson 2006).

Another field in which ABC insights might support important decisions regards the company's process flow of activities (Cooper and Kaplan 1988). By having a clearer view of the costs in each activity of their processes, companies might feel the need to standardise their production process or redesign it in ways that reduce lead and set-up times. Furthermore, managers might also become motivated to change their factory and headquarters' layouts to reduce materials' handling costs and increase productivity (Cooper and Kaplan 1988).

All in all, implementing an ABC system provides decision-makers with crucial data to have more informed decisions about a firm's manufacturing and support costs and activities (Cooper and Kaplan 1988).

2.4. Comparing both Models: Advantages and Limitations

An ABC System can generate a completely different picture of product costing than the one generated by traditional systems. The main reason behind it concerns ABC's more sophisticated approach when it comes to the assignment of overhead costs (Cooper and Kaplan 1988). Nevertheless, the choice of costing systems may and should differ according to each firm's operations. For instance, ABC systems might be too complex for companies manufacturing and selling only one product, as all overheads will be incurred to support the production of that one product. In turn, firms with multiple or differentiated products should use a more sophisticated system to precisely account for their resource consumption (Hughes and Paulson Gjerde 2003). Since ABC systems were created as an attempt to update the TC ones, by increasing their complexity and accuracy, the advantages of one ended up being a response to the limitations of the other. However, as the choice of a firm's costing system can significantly impact its results, the advantages, and limitations of each of the models will be further enumerated.

2.4.1. Advantages of Activity-Based Costing / Limitations of Traditional Costing

- ABC recognizes the interdependence between cost drivers and activities and uses cause and effect allocations, contrarily to TC's arbitrary ones (Drury 2018).
- ABC considers non-manufacturing costs associated with production, enabling more accurate results and more efficient decision-making about pricing, marketing, and product design (Daru 2016b; Mahal and Akram Hossain 2015).
- ABC improves operational performance by allocating indirect costs based on each activity's actual resource consumption, while TC does not divide the firm into activities (Mahal and Akram Hossain 2015).

- ABC allows decision-makers to visualize where are the most significant costs and what is behind them, preventing the use of misleading cost information (Mahal and Akram Hossain 2015; Lockamy and Smith 2000).
- ABC allows a better view of production processes, encouraging companies to redesign products and processes by redeploying resources from a non-value to a value-added activity (Reyhanoğlu, n.d.; Mahal and Akram Hossain 2015).
- ABC allows the analysis of different product lines' profitability, increasing organizational efficiency (Mahal and Akram Hossain 2015).
- ABC systems make it easier for firms to quickly adapt to changes in demand, production processes and prices, contrarily to TC ones (Askanary 2007).

2.4.2. Limitations of Activity-Based Costing / Advantages of Traditional Costing

- TC aligns with the Generally Accepted Accounting Principles as it provides a value for the cost of goods sold, whereas ABC does not since it also considers non-manufacturing costs (Daru 2016b).
- Due to its higher complexity, an ABC system is more costly to maintain than a TC one (Askanary 2007).
- TC is widely understood, whereas ABC is still unknown by a wide range of people and, consequently, firms (Askanary 2007).
- Implementing an ABC system is much more time-consuming than a TC one (Mahal and Akram Hossain 2015).
- ABC, contrarily to TC, requires regular updates (Mahal and Akram Hossain 2015).
- Building an ABC requires building management's thinking, as overheads are not only about costs but also about processes (Reyhanoğlu, n.d.).
- ABC commonly faces employee resistance as it requires significant organizational change (Reyhanoğlu, n.d.).

2.5. Activity-Based Costing and Supply Chain Management

As mentioned in the previous section, TC systems are not constructed to connect non-value-added activities and their respective costs with the causes behind them (low raw material quality or delivery inefficiencies, for example). However, to improve both supplier and client performance, management accounting systems should measure activities as a whole, considering their causes and consequences. As such, one can conclude that TC systems are not intended to support strategic value chain management (Thomas and Mackey 2006). Furthermore, a survey conducted by *UPS Supply Chain Solutions, Alpharetta, Ga.*, described that 61% of the responding CFOs believed that supply chain management was fundamental to their success. However, from these, 62% considered that due to the fragmented supply chain control and the inability to measure supply chain costs (a consequence of the use of traditional systems) only minor improvements were possible (Thomas and Mackey 2006).

Furthermore, as aforementioned, in TC systems, product costing methods were designed for external value reporting purposes, mainly resulting in misleading cost information and, consequently, lousy decision-making (Lockamy and Smith 2000). Thus, one can clearly state that the TC systems are not the correct framework to analyse Supply Chain productivity (Lockamy and Smith 2000). In turn, ABC systems not only provide accurate, detailed, and up-to-date information on activities and processes but also report them in an easily understandable manner for decision-makers. Therefore, by shifting to an ABC system, companies will access more relevant, crucial information to better manage supply chain activities (Thomas and Mackey 2006; Kumar and Mahto 2013b).

2.5.1. Relating Literature findings with LM firm's case

LM belongs to the manufacturing industry and plays the role of an intermediate on its value chain. Moreover, in today's intense global competition, supply chain management is a crucial tool for managers to improve a firm's productivity, profitability, and performance (Kumar and

Mahto 2013b). As such, it would be beneficial for LM to have an ABC system allowing them to improve the accuracy of their analysis and, consequently, decision-making. Despite still being disregarded by most SMEs, research has shown that ABC can indeed play an essential role in improving their competitiveness (Gunasekaran, Marri, and Grieve 1999). This idea was further emphasized by Bayaksogly & Kaplanogy's (2008) study that concluded that many industries are implementing a variety of techniques, such as Just-in-Time and Total Quality Management, to grow their supply chain value, with ABC being one of the most recognized models (Kumar and Mahto 2013b). Moreover, in 2006, a survey was conducted among the top 500 companies (excluding financial services) and the top 50 financial services companies of the *2001 Business & Finance listings of Irish Companies* to study the perceived success of costing systems. Here, it was possible to conclude that the relative proportions of the adoption of ABC were 18% for manufacturing companies, 3.3% for financial services firms and 6.5% for non-manufacturing enterprises (Pierce and Brown 2006). These numbers show that the advantages of an ABC system within the manufacturing sector have not been unnoticed. Along with all the previously mentioned data, several case studies on the implementation of ABC systems in manufacturing companies around the world have been documented, showing that this costing system has been increasing in popularity in the last few years (Kumar and Mahto 2013a; Rohani, Azman, and Zakaria 2015; Almeida and Cunha 2017).

3. Research Question

After the significant consequences of more than two years of fight against the Covid-19 outbreak, the world's economy is now being highly impacted by the Russia-Ukraine conflict, which has been having unsettling outcomes on the energy, oil, wheat, and other commodities prices. According to the IMF, from a growth of 6.1% in 2021, the global economy is now expected to grow by 3.2% in 2022. Moreover, all countries are suffering from excessive levels of inflation (with Portugal reaching a 10.1% CPI annual rate in October 2022 (Instituto

Nacional de Estatística 2022a)) and economic instability is felt in almost all industries. As an example, Portuguese Industrial Production Prices Index year-on-year change rate was 16.2% in October 2022 (Instituto Nacional de Estatística 2022b), culminating in firms' being highly challenged with constantly changing costs as well as extraordinarily volatile and time-consuming bidding processes.

Naturally, the problem mentioned above is amplified when companies still use TC Systems that arbitrarily allocate costs and do not account for most of their overhead expenses. This was the main reason that motivated LM to reach out for our team's help, as the CEO felt the firm's costing system was not accurate enough to provide them with the necessary tools to bear the following challenging times. As a result, the scope of this Work Project is to build LM a new, easily adaptable costing system that will allow it not only to have a more detailed and accurate view of its costs but also to retrieve crucial information about its profitability by product, product lines and customer types. Consequently, this will also culminate in a more conscious (and hopefully, faster) bidding process, with which the firm can wittingly decide on quantity discounts, order minimums and customer-specific strategies. As such, an ABC model for LM's product portfolio will be built focused on answering the following main questions:

RQ1: What is the impact of the implementation of an easily adaptable ABC system on LM's product and order costing?

RQ2: How can LM offer more reliable and faster bids bearing in mind their different types of clients and respective ordering behaviours?

4. Research Method

4.1. Phase 1: Diagnosis

In March 2022, LM's CEO contacted the team seeking a solution to the previously described problem. In fact, the firm had already worked with our team on a course project. As such, the opportunity of doing a Consulting Lab Project as our Work Project emerged.

At the beginning of April, we reunited with Professor Marta Almeida, a professor that had taught us both the Management Accounting and Strategic Costing courses, to understand the viability of the project and possible solutions to LM's concerns. After some weeks of brainstorming, it was understood that a model could be constructed to answer the firm's requests while substantially improving the efficiency of its daily operations.

On the 19th of April, we had our first meeting with LM, where the team's ideas were exposed to the firm, which showed interest and openness to their implementation. Therefore, an informal decision was made regarding our Work Project scope and the firm we would be working with.

On the 5th of September, the Work Project plan and calendar were defined during the kick-off meeting with Professor Marta. Moreover, the first official meeting with the firm was prepared, which would happen on the 6th of September. Back then, we visited the factory and observed the production processes as well as how the company's operations are designed and organized. Moreover, a more in-depth discussion was followed regarding the topics to be addressed in the Work Project, and some necessary data was collected.

After analysing and organizing all the information sent, another meeting was conducted with LM on the 23rd of September with the purpose of an in-depth explanation of their current costing model. Back then, it was immediately understood that the allocation of overheads was done traditionally, so the team grasped to briefly introduce the ABC system.

4.2. Phase 2: Activity-Based Costing Model Development

While studying the current costing model of LM, it was noted that the firms' vast range of products produced a significant amount of costs, from which some were arbitrarily allocated, and others were not even contemplated. Moreover, different ways of handling and delivering orders, as well as some customer types with distinct consumption patterns, were identified. Naturally, these require different effort levels and resource costs from the company. Therefore, the profitability of two customers ordering the same product mix might be significantly

different based on their consumer behaviour (Cokins and Lawson 2006). As such, they should not be costed equally. Hence, it was decided that the proposed costing system would be divided into two parts: product and order processing costing.

Therefore, along with a lot of research and trial and error, a draft raw version of the model was constructed. This initial system was first presented to Professor Marta, and after incorporating her feedback, the model's presentation to LM was prepared.

On the 14th of October, the draft model version was presented to the firm, which showed enthusiasm and desire to help with its development.

Until the end of November, the team was fully dedicated to the model development, which was the main scope of this Work Project and will be explained in detail in section 5. During this time, there was a lot of communication, mainly with the firm's CEO and production director, as well as some visits to the headquarters to clarify doubts, conduct interviews and ensure the model's viability. The main data collected during this process can be found in Appendix 11.18..

4.3. Phase 3: Analysis and Recommendations

After the model creation, a series of analyses were designed. A comparison of the two model's cost differences as well as their causes and consequences was made, considering the distinct cost types and activities. Profitability per product type, format and lines was calculated, allowing to drive pricing and bidding recommendations. Plus, examples of the model's interactivity were created, displaying how easily it can be used to incorporate cost or process changes. During the meetings with the firm, a concern regarding the viability of the online store was noticed. As such, a study was conducted to assess its potential success and evaluate the impact of hiring an extra employee dedicated to it.

4.4. Phase 4: Model Implementation in the company

The last and one of the most critical steps of this Work Project was the model's implementation in the company. Our team wanted to guarantee that the model would be correctly explained to

both the production director and the CEO, ensuring that both could use and adapt it. This way, the elimination of one of the company's old costing model problems would be safeguarded: its dependence on the production director. To achieve this, a workshop was constructed where it was explained, in detail, how one could take the most advantage of the model. It is important to highlight that to avoid any possible conflicts or discomfort all numbers related to specific employee expenses were hidden and protected in the delivered model so that these could only be seen or modified by the CEO. Moreover, the whole model was translated into Portuguese, the firm's official language.

Finally, the Work Project's main analyses and recommendations were presented to the company and time was given to answer possible questions or hesitations. Fortunately, the final feedback was positive, and LM received the new model with enthusiasm and gratitude. Particularly, they were delighted not only with the increasing cost accuracy of the model but also with its interactive, change-friendly features.

5. Model's Construction

5.1. General Processes View

LM offers its clients a total of 14 standard product lines, differing in terms of perfumes as well as formats offered. The company is also specialized in personalized product lines, but due to its intrinsic complexity, for the sake of this Work Project, only standard lines will be studied.

Regarding its portfolio of products, LM fully produces in-house its liquid and solid soaps, shamps, and shower gels. In other words, the firm not only produces these intermediate goods

but also packages them. Moreover, LM is also responsible for the entire production and wrapping of both their refreshing and disinfectant wipes. However, when it comes to conditioners and body lotions, the company externally buys the respective liquids and is only responsible for their packaging. Besides these, LM also offers a range of products categorized as "others", which comprises complementary goods from bath sponges to shaving and dental kits. For these, the firm mainly acts similarly to a reseller.

Talking specifically about soaps, these are offered in different weights (12gr, 15gr, 20gr, 40gr) and formats: squared (SQ), rounded (RD) and rectangular (RT). Regarding their packaging, flow pack (FP), paper (P), and pleat wrapper (PW) options are available (Appendix 11.7.).

Moving on to liquids, there are also plenty of options depending on their dosages and packaging designs. Shower gels, shampoos and body lotions are offered in all kinds of formats: sachets (10ml), tubes (30ml), dispensers (300ml), refills (5L) and miniatures. Conditioners, however, do not have a refill option, except in Line A[3]. Regarding liquid soaps, refills and dispensers are the only available alternatives. One should notice that the miniatures' format comprises a wide range of dosages (20ml, 30ml, 35ml and 50ml) as well as designs (regular, amber-coloured, squared versions, among others) that vary according to the different product lines and are clearly identified according to an internal naming (i.e. O59, O82, among others). Furthermore, some have exclusive tops (i.e. golden tops) and specific requirements (i.e. being further packed in a cardboard box). Finally, refreshing wipes come in two formats: small and big, whilst disinfectant ones are only available in the small format (Appendix 11.7.).

All interior products[4] are produced in automatic machines (MachineRunSoap, MachineRunLiquids and MachineRunWipes). In the case of dispensers and some specific miniatures (M270, M155 and M30AMB for shower gels and shampoos and adding to those, M188, M059 and M205 for body lotions and conditioners), these are then packed using a semi-

[3]For confidentiality purposes, the names of the lines were replaced by alphabetic letters.
[4] Interior product refers to the plain soaps and liquids (i.e., before being packaged).

automatic machine, which implies slower packaging rates. The remaining miniatures, soaps and wipes are packed automatically. Refills are always filled in and labelled simultaneously in a manual machine. As such, it can be noticed that LM is equipped with a set of machinery that allows them to be self-sufficient in packing its vast portfolio of products. The process flow charts of the distinct production processes are summarised in Appendix 11.8.

5.2. The Proposed Model

5.2.1. Product Costing

5.2.1.1. Manufacturing Overheads (Excel_PartOne_Tab2_2.1)

Following an ABC allocation, there was the need to create 18 different activity centres to allocate LM's manufacturing OH (Appendix 11.9.).

5.2.1.1.1. Variable Manufacturing Overheads

In this category of costs, only one expense was identified: electricity. Since LM has a five-year contract with the energy provider that fixes the electricity price to 0.25€/KW, this allocation was straightforward. The KW hourly consumption for each machine was considered, and once multiplied by the fixed-rate, each machine's euro cost per hour of production was reached. Then, to allocate the cost from the activity centres to the products, the hours needed to produce 1000 units of each type of product were the considered cost driver.

5.2.1.1.2. Fixed Manufacturing Overheads

When it comes to these indirect expenses, more costs were considered. Firstly, to ensure its products' quality, the firm has a contract with an external Quality Control laboratory that results in a considerable monthly fee. In practical terms, LM arbitrarily chooses products from different batches, which are then sent for analysis. It should be noticed that only the fully in-house produced goods are apt to be selected. To allocate this cost, the total monthly fee was assigned to the Quality Control activity centre. Another relevant cost concerns depreciations. Firstly, it should be highlighted that limitations were levied in this allocation due to restrictions imposed

by the firm's accountant, who was not available to share the detailed depreciation records. At this stage, both the building and the basic equipment's depreciation costs were accounted for, considering their initial cost and respective useful lives. Regarding basic equipment's depreciation, it is important to notice that from the 15 machines considered, three have already been replaced whereas the rest are still in their useful life. As such, the cost of the replaced machines was only considered once, avoiding cost duplication. This way, the resulting basic equipment's monthly depreciation was evenly[5] distributed among all equipment and allocated to the correspondent activity centres, depending on their amount of equipment. In the case of the building depreciation, the monthly correspondent cost was allocated according to each activity centre's occupation area (in m^2). The considered division of the building can be found in Appendix 11.10.. Finally, mandatory monthly insurance, comprising contents', civil liability and building insurance, also needs to be allocated. As the bigger insurance proportion corresponds to the building, the considered cost driver was the area occupied in the factory (in m^2) by the activity centres.

Once these first-stage allocations were concluded, total cost drivers were calculated based on each activity's average monthly production. This data was computed considering the production history from the first ten months of 2022, which was given by the firm. Then, different costs were allocated to the distinct product types and formats based on their individual average monthly produced quantity. This way, one arrives at the monthly fixed overhead cost per product type and format. This cost is needed per 1000 units of each product to maintain consistency with the remaining model calculations. As such, the monthly fixed overhead costs were divided by the average monthly produced units (in thousands). The referred allocation's complexity increased in the case of the liquids' machine running and storage. In the other activities case, the amount of OH incurred was the same regardless of the product format, as

[5] Limitation imposed by the firm's accountant who did not disclose the depreciation records by machine

most referred to machines that only produced products with similar dosages. However, the liquids machine manufactures considerably different quantities of liquid, depending on each format's dosage. As such, the amount of depreciation that is, for example, allocated to the production of a 5L refill cannot be the same as the one allocated to a 10ml sachet. Therefore, these activity centres' total costs were first assigned to products based on the monthly millilitres produced (considering their actual dosages). Then, after arriving at the monthly fixed overhead cost per product type and format, these were divided by the monthly produced units, to have the cost per 1000 units. It should be highlighted that the Quality Control's total costs were only distributed towards the products that might be selected for the control test.

5.2.2. Product Costing Results (Excel_PartOne_Tab3)

After all the allocations mentioned above, it was possible to reach the Product Costing Results sheet, which showcases for each product of each product line the total costs per 1000 units produced. There, the split between DM, DL, and OH's costs can be clearly understood.

5.2.3. Order Processing Costing (Excel_PartOne_Tab4)

To recall, in this second part of the model, the aim was to account for the different costs resulting from the different consumption patterns. Here, three distinct aspects were considered:

- Order Receivement: to consider the effort differences of receiving, registering, and bidding orders received via e-mail, telephone, or online store.
- Products' Pick–Up (and Order Preparation): to account for the difference in time spent preparing an order solely composed of goods from the same product line, hence relatively close to each other, versus from distinct lines.
- Order Distribution (Preparation and Delivery): To consider the time spent issuing transportation guides and extra needed documentation (required by CTT) and delivering the order (Distrib_Intern).

As a result, three different activity centres were created (Appendix 11.11.). In this part of the

costing system, which was also constructed with an ABC method in mind, the cost object will correspond to the different options within each activity centre. In other words, there will be, for instance, OrderReceivement_Web and OrderReceivement_E-mail, to distinguish between these two separate ways of receiving orders.

5.2.3.1. Direct Costs (Excel_PartOne_Tab4_4.2)

In the Order Processing Cost calculations, different direct costs were considered for each cost object. Starting with the Order Receivement, for the orders related to the online store, the E-commerce Fee paid for the website management needs to be accounted as a direct cost. In the established contract, the monthly charge also includes costs incurred with Social Media management (i.e., Instagram Content Creation and Advertisement), which were carefully removed from the considered cost, as marketing expenses are not being reflected in this model. As such, only the costs purely related to the online store (i.e., website hosting, domain, and online store management) were considered. Moving on to the Distribution options, in the case of the internal distribution, three distinct direct costs were contemplated: the vehicle's monthly depreciation and insurance, as well as the historical value of monthly fuel expenses. It is important to mention that internal distributions are made, on average, three times a week and are offered to the most recurrent and contractual clients. As such, the entirety of the costs incurred with it must be covered by the firm. In the case of the delivery through CTT, the correspondent delivery fee will usually be directly paid by the customer, as such, it was only considered in the Final Order Bid Tab.

5.2.3.2. Overheads (Excel_PartOne_Tab4_4.1)

When it comes to OH, in this part of the model, these ended up being entirely related to employee expenses. In this case, the labour cost of the three workers that are not part of the manufacturing department, and hence not yet contemplated, was considered: the CEO, the Administrative Officer, and the Transportation Agent. Here, all employee-related expenses

were contemplated, as in the first part of the model. The expenses' allocation reflects the respective time each worker dedicates to the respective centres. Whilst the Administrative Officer considers that 54% of her working time is indeed occupied with order receivement-related procedures, the CEO only believes that 30% of hers is spent in these processes. 6% of the Administrative Officer's time is also spent issuing transportation guides and extra documentation (required by CTT). The Transportation Agent considers that 30% of his working time is spent picking up products and preparing the final order, whilst 70% is spent taking care of the internal order distribution. With these percentages in mind, it was possible to achieve the respective activity centre's total costs. Then, to allocate these to the cost objects, a survey was followed to retrieve information about the effort units needed for each different order pattern. Putting it another way, these workers were asked, in terms of effort required, the difference between receiving an order via telephone versus e-mail or preparing a final order with goods only from one product line versus separate ones, among others. Then, the average monthly orders of each order specification were used to compute each worker's average monthly effort with each order type. Finally, the average monthly effort with each order type and specification was used as a cost driver, enabling us to reach the total monthly OH of each order type.

5.2.3.3. Order Processing Costing Results (Excel_PartOne_Tab4_4.3)

Summing all the mentioned costs, it was possible to reach the total costs incurred by each order specification (OrderRec_Tele, Distrib_Client, among others). By using, again, the average monthly orders of each type, one can get the *per-order* cost associated with each ordering behaviour, allowing to understand the different costs incurred to serve distinct types of clients.

5.2.4. Final Order Bid (Excel_PartOne_Tab5)

Finally, the result from all the allocations mentioned above was summarized in the last model's sheet. There, one can interactively select the specifications of an order in terms of its receivement, preparation and distribution and automatically get the order processing cost. In

the case of CTT deliveries, the respective fee can also be found on this sheet. To reduce complexity and ensure the model's viability, the previously used Excel sheet was incorporated to easily calculate the amount paid for the different deliveries (highly dependent on the volumes and weights of the orders) (Excel_PartOne_Tab6). Currently, LM uses this sheet independently from its costing model, which complicates, even more, the bidding process. Finally, the total product cost is easily reached by writing down the respective ordered quantities. Thereafter, one can quickly select the desired profit margin for each specific product or in total terms, and the model automatically gives what should be the products and order bidding price. A crucial point here is the consideration of the Infarmed Tax, a fee (1%) that LM pays yearly, depending on its sales volume. By accounting for this cost when computing the total order price, the firm ensures that such expense will be covered.

6. Results and Analysis

6.1. Profitability Analysis

6.1.1. Profitability per Product Type and Format (Excel_PartTwo_Tab2.1.)

One can easily conclude that most products' profit margins have decreased with the proposed costing model. Moreover, it is crucial to note that the significant under costing of some products has led some to end up with negative margins. It is the case for all soaps in the format PW RD20 (except for Line P, C and A) as well as the P SQ20 format in Lines A and D. Moreover, all Refills from Line B were affected, as their current price is too low compared with this format's usual price in other lines. Finally, all conditioners and body lotions in the tube format (apart from Line C) have also seen their profit margins become negative.

When analysing the old costing model, negative profit margins were surprisingly identified. These correspond to nearly all body lotions and conditioners in the miniatures format and Line C's shower gel and shampoo in format 188. All of them were inaccurately over-costed, and as such, their margins have naturally increased in the proposed costing model. Some have seen

their margins turn positive, as with the previously over-costed products from Line D and C. The remaining product's profit margins, however, persisted negative, which indicates a necessary future re-formulation of their pricing.

It is interesting to analyse that the new model's most common product's profit margin interval continues to be]20%-30%]. However, the second most common range has decreased from margins > 30% to the]0%-10%] interval (Appendix 11.12.). Even though the highest-margin product continues to be the fig refreshing small wipe from Line G, the lowest one became the soap SQ20 P from Line A. The previous analysis excludes products from the "others" category as these would make the results biased due to their usual high margins.

During the profitability analysis, the price per litre and kilogram for each product was also computed. Such was used to analyse whether, from the customer perspective, it was worth investing in larger formats of the products. There are indeed some liquids in which dispensers (300ml) are more expensive (per litre-speaking) than the 30ml option. At the same time, some liquids in the 10ml sachets end up being cheaper (per litre-speaking) than the correspondent 30ml miniature format. As such, the pricing approach of these products should be rethought so that the price per litre decreases as its liquids' dosage increases.

6.1.2. Profitability per Product Line (Excel_PartTwo_Tab2.2.)

Logically, each Product Line's profitability depends highly on its products' prices. As such, it is important to say that LM's most premium product lines are Line C and E. On the opposite price spectrum, are Lines A and B. The analysis of the impact of the new costing model on each line's profitability has shown that apart from Lines P and C, all product lines suffered a decrease in their average profit margin (APM) when compared to OM's values (Appendix 11.13.). Consequently, the most profitable line has proceeded from Line B to Line P. Likewise, Line O and C used to be the less profitable lines (APM=18%) and were replaced by Line A and E (APM=12%), a result that is by the previously done analyses. Moreover, it is interesting to note

that LM's best-seller, Line A, has an APM of 12%, whilst Line G, which sells significantly less, achieves an APM of 22%. It might be concluded that their reduced prices in Line A end up being compensated by its sales volume. Nonetheless, it was not possible to identify a pattern behind margins depending on product lines or types. The different product lines' pricing also does not seem to follow any straightforward strategy.

6.1.3. Profitability per Client Type (Excel_PartTwo_Tab2.3.)

To enrich LM's Profitability Analysis, nine different personas were created, reflecting nine typical types of customers and their ordering behaviour (Appendix 11.14.). Moreover, each typical order mix was also considered. Data were retrieved from interviews with the firm's CEO and the Administrative Officer. With this information in mind, it was possible to calculate each customer type's typical order profit margin both for the old and the proposed costing model. This way, it was possible to understand the impact of the different product and order processing costs on each client's profitability.

When analysing the results, it can be concluded that with the OM, the most profitable orders came from the website clients, with an order margin of 71.57%. Specifically, these represent online customers buying low product volume (*persona* 7.1). However, its margin has decreased by around 42%, mostly due to the previously unconsidered cost of receiving an order through the online store. As such, with the PM costs, the customers with the highest order margins are City Hotels ordering multiple lines via e-mail and receiving them via CTT (*persona* 2.2.2.). The less profitable orders continue to be the ones coming from resellers, and their order profit margin has further decreased to 9.81%. However, when conducting these analyses, the order frequency of each customer type cannot be ignored. Once taking that into account, resellers (*persona* 8) end up yielding the highest yearly profit, and environmental-friendly hotels become the less profitable customer type. Naturally, the order's profit margins are also highly dependent on the chosen product mix. Hence, a considerable part of the margins' changes was caused by

the changes in product costs' allocations. The remaining part of these differences regards the order processing costs. As graphic 11.15. suggests, the behaviour that results in the highest order processing cost involves the firm's internal distribution. Then, orders coming from the website or made through the telephone are also significantly costly. Finally, it can be concluded that orders received via e-mail and distributed through CTT have the lowest order processing costs. It is also interesting to mention that the order processing costs related to the Product's Pick-Up end up not being particularly significant when dealing with high-volume orders.

6.2. Model's Usefulness

As already explained, one of LM's main worries during the last few years has been the constant price changes. As such, when constructing the proposed costing model, one of the main goals was to create an interactive model that was easy to adapt to cost changes. The assumptions tab was created to accommodate possible changes in OH and DL costs (Figures 1 and 2).

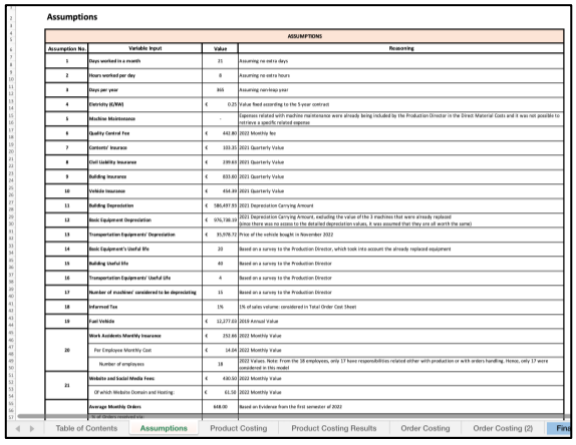


Figure 1- Assumptions Tab_Proposed ABC Model

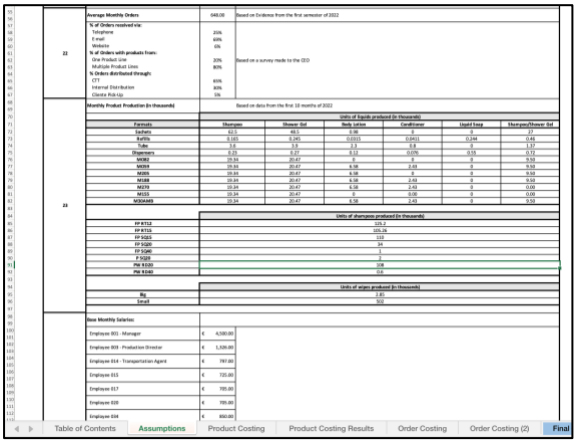
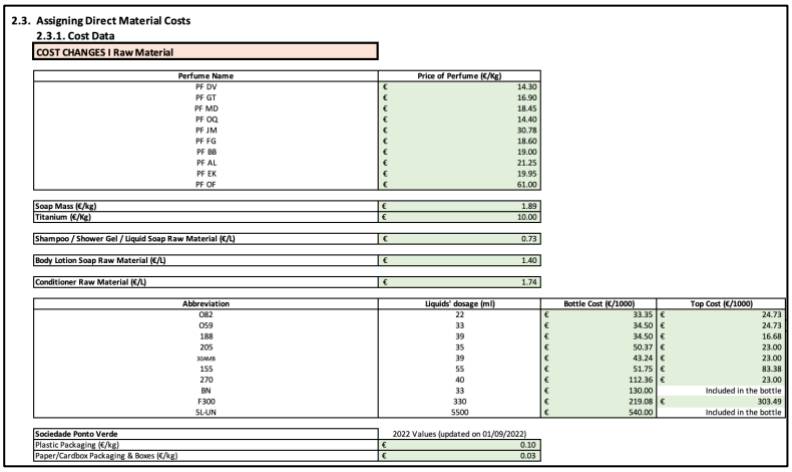


Figure 2- Assumptions Tab_Proposed ABC Model

Here, all the resource costs, cost drivers amount, and employee expenses were included and linked to the other model tabs. This way, if any of the values need to be updated, it just needs to be changed in the correspondent cells. The assumptions regarding the production and order type mix can also be found there. Thus, when the average number of monthly orders or produced products change, one can easily update the model and derive the new overhead rates. Concerning DM prices, all cost changes should be applied in the Product Costing tab. For the

liquid, soap mass, perfume, bottles and tops and *Sociedade Ponto Verde* tax costs, a segment denominated "Price Changes" was created (Figure 3). There, all the costs mentioned above are displayed and linked to the interior product or packaging material calculations. (Figure 4)



2.3. Assigning Direct Material Costs

2.3.1. Cost Data

COST CHANGES I Raw Material

Perfume Name	Price of Perfume (€/Kg)
PF DV	€ 14.30
PF GT	€ 16.90
PF MD	€ 18.45
PF OQ	€ 14.40
PF JM	€ 30.78
PF FG	€ 18.60
PF BB	€ 19.00
PF AL	€ 21.25
PF EK	€ 19.95
PF OF	€ 61.00

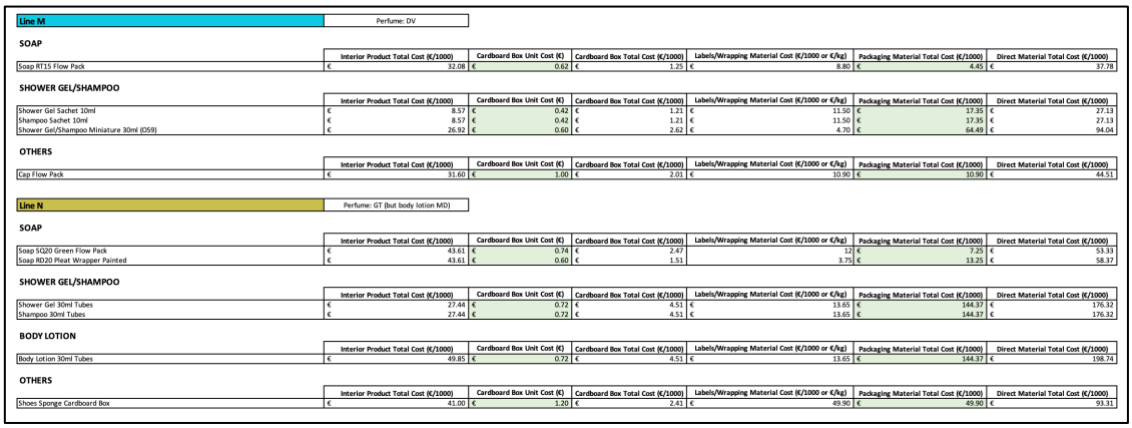
Soap Mass (€/kg)	€ 1.89
Titanium (€/Kg)	€ 10.00
Shampoo / Shower Gel / Liquid Soap Raw Material (€/L)	€ 0.73
Body Lotion Soap Raw Material (€/L)	€ 1.40
Conditioner Raw Material (€/L)	€ 1.74

Abbreviation	Liquids' dosage (ml)	Bottle Cost (€/1000)	Top Cost (€/1000)
O82	22	€ 33.35	€ 24.73
O59	33	€ 34.50	€ 24.73
188	39	€ 34.50	€ 16.68
205	35	€ 50.37	€ 23.00
30MB	39	€ 43.24	€ 23.00
155	55	€ 51.75	€ 83.38
270	40	€ 112.36	€ 23.00
BN	33	€ 130.00	Included in the bottle
F300	330	€ 219.08	€ 303.49
5L-UN	5500	€ 540.00	Included in the bottle

Sociedade Ponto Verde	2022 Values (updated on 01/09/2022)
Plastic Packaging (€/kg)	€ 0.10
Paper/Cardbox Packaging & Boxes (€/kg)	€ 0.03

Figure 3-Cost Changes section _Proposed ABC Model

Cardboard box and labels/wrapping material costs are specific for each product and need to be independently updated (Figure 4).



Line M — Perfume: DV

SOAP

	Interior Product Total Cost (€/1000)	Cardboard Box Unit Cost (€)	Cardboard Box Total Cost (€/1000)	Labels/Wrapping Material Cost (€/1000 or €/kg)	Packaging Material Total Cost (€/1000)	Direct Material Total Cost (€/1000)
Soap RT15 Flow Pack	€ 32.08	€ 0.62	€ 1.25	€ 8.80	€ 4.45	€ 37.78

SHOWER GEL/SHAMPOO

	Interior Product Total Cost (€/1000)	Cardboard Box Unit Cost (€)	Cardboard Box Total Cost (€/1000)	Labels/Wrapping Material Cost (€/1000 or €/kg)	Packaging Material Total Cost (€/1000)	Direct Material Total Cost (€/1000)
Shower Gel Sachet 10ml	€ 8.57	€ 0.42	€ 1.21	€ 11.50	€ 17.35	€ 27.13
Shampoo Sachet 10ml	€ 8.57	€ 0.42	€ 1.21	€ 11.50	€ 17.35	€ 27.13
Shower Gel/Shampoo Miniature 30ml (O59)	€ 26.92	€ 0.60	€ 2.62	€ 4.70	€ 64.49	€ 94.04

OTHERS

	Interior Product Total Cost (€/1000)	Cardboard Box Unit Cost (€)	Cardboard Box Total Cost (€/1000)	Labels/Wrapping Material Cost (€/1000 or €/kg)	Packaging Material Total Cost (€/1000)	Direct Material Total Cost (€/1000)
Cap Flow Pack	€ 31.60	€ 1.00	€ 2.01	€ 10.90	€ 10.90	€ 44.51

Line N — Perfume: GT (but body lotion MD)

SOAP

	Interior Product Total Cost (€/1000)	Cardboard Box Unit Cost (€)	Cardboard Box Total Cost (€/1000)	Labels/Wrapping Material Cost (€/1000 or €/kg)	Packaging Material Total Cost (€/1000)	Direct Material Total Cost (€/1000)
Soap SQ20 Green Flow Pack	€ 43.61	€ 0.74	€ 2.47	12	€ 7.25	€ 53.33
Soap RD20 Pleat Wrapper Painted	€ 43.61	€ 0.60	€ 1.51	3.75	€ 13.25	€ 58.37

SHOWER GEL/SHAMPOO

	Interior Product Total Cost (€/1000)	Cardboard Box Unit Cost (€)	Cardboard Box Total Cost (€/1000)	Labels/Wrapping Material Cost (€/1000 or €/kg)	Packaging Material Total Cost (€/1000)	Direct Material Total Cost (€/1000)
Shower Gel 30ml Tubes	€ 27.44	€ 0.72	€ 4.51	€ 13.65	€ 144.37	€ 176.32
Shampoo 30ml Tubes	€ 27.44	€ 0.72	€ 4.51	€ 13.65	€ 144.37	€ 176.32

BODY LOTION

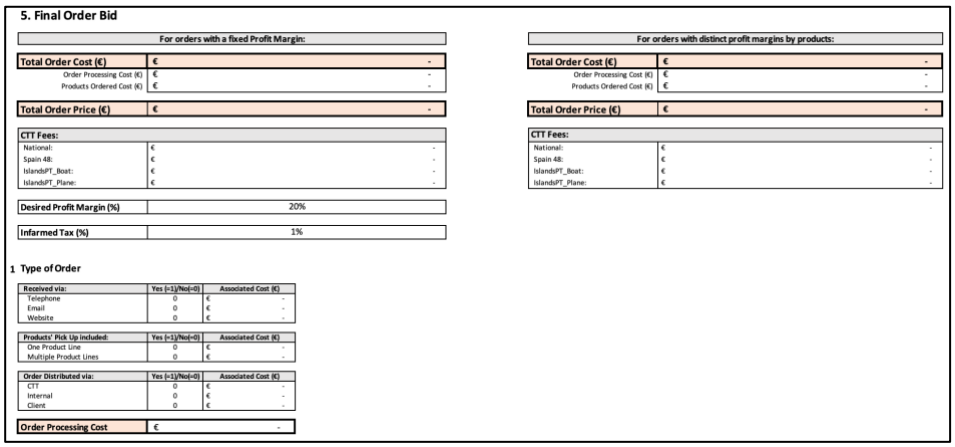
	Interior Product Total Cost (€/1000)	Cardboard Box Unit Cost (€)	Cardboard Box Total Cost (€/1000)	Labels/Wrapping Material Cost (€/1000 or €/kg)	Packaging Material Total Cost (€/1000)	Direct Material Total Cost (€/1000)
Body Lotion 30ml Tubes	€ 49.85	€ 0.72	€ 4.51	€ 13.65	€ 144.37	€ 198.74

OTHERS

	Interior Product Total Cost (€/1000)	Cardboard Box Unit Cost (€)	Cardboard Box Total Cost (€/1000)	Labels/Wrapping Material Cost (€/1000 or €/kg)	Packaging Material Total Cost (€/1000)	Direct Material Total Cost (€/1000)
Shoes Sponge Cardboard Box	€ 41.00	€ 1.20	€ 2.41	49.90	€ 49.90	€ 93.31

Figure 4- Cardboard box + labels/wrapping material cost changes_ Proposed ABC Model

Another concern for LM was its bidding process, which was not automatized and, therefore, was too time-consuming and lacked some accuracy. For this purpose, the tab "Final Order Bid" was created (Figures 5 and 6).



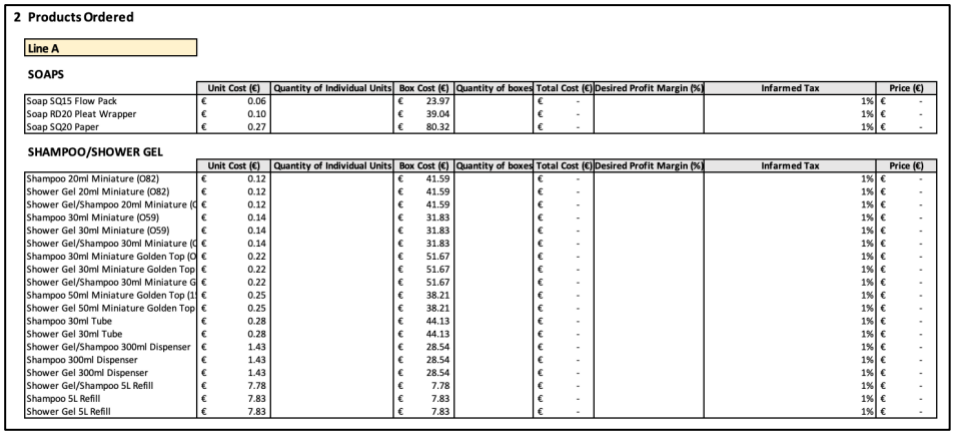
5. Final Order Bid

For orders with a fixed Profit Margin:		For orders with distinct profit margins by products:	
Total Order Cost (€)	€ -	Total Order Cost (€)	€ -
Order Processing Cost (€)	€ -	Order Processing Cost (€)	€ -
Products Ordered Cost (€)	€ -	Products Ordered Cost (€)	€ -
Total Order Price (€)	€ -	Total Order Price (€)	€ -
CTT Fees:		CTT Fees:	
National:	€ -	National:	€ -
Spain 48:	€ -	Spain 48:	€ -
IslandsPT_Boat:	€ -	IslandsPT_Boat:	€ -
IslandsPT_Plane:	€ -	IslandsPT_Plane:	€ -
Desired Profit Margin (%)	20%		
Infarmed Tax (%)	1%		

1 Type of Order

Received via:	Yes (=1)/No(=0)	Associated Cost (€)
Telephone	0	€ -
Email	0	€ -
Website	0	€ -
Products' Pick Up included:	**Yes (=1)/No(=0)**	**Associated Cost (€)**
One Product Line	0	€ -
Multiple Product Lines	0	€ -
Order Distributed via:	**Yes (=1)/No(=0)**	**Associated Cost (€)**
CTT	0	€ -
Internal	0	€ -
Client	0	€ -
Order Processing Cost	€ -	

Figure 5- Final Order Bid Tab_Proposed ABC Model



2 Products Ordered

Line A

SOAPS

	Unit Cost (€)	Quantity of Individual Units	Box Cost (€)	Quantity of boxes	Total Cost (€)	Desired Profit Margin (%)	Infarmed Tax	Price (€)
Soap SQ15 Flow Pack	€ 0.06		€ 23.97		€ -		1%	€ -
Soap RD20 Pleat Wrapper	€ 0.10		€ 39.04		€ -		1%	€ -
Soap SQ20 Paper	€ 0.27		€ 80.32		€ -		1%	€ -

SHAMPOO/SHOWER GEL

	Unit Cost (€)	Quantity of Individual Units	Box Cost (€)	Quantity of boxes	Total Cost (€)	Desired Profit Margin (%)	Infarmed Tax	Price (€)
Shampoo 20ml Miniature (O82)	€ 0.12		€ 41.59		€ -		1%	€ -
Shower Gel 20ml Miniature (O82)	€ 0.12		€ 41.59		€ -		1%	€ -
Shower Gel/Shampoo 20ml Miniature (O	€ 0.12		€ 41.59		€ -		1%	€ -
Shampoo 30ml Miniature (O59)	€ 0.14		€ 31.83		€ -		1%	€ -
Shower Gel 30ml Miniature (O59)	€ 0.14		€ 31.83		€ -		1%	€ -
Shower Gel/Shampoo 30ml Miniature (O	€ 0.14		€ 31.83		€ -		1%	€ -
Shampoo 30ml Miniature Golden Top (O	€ 0.22		€ 51.67		€ -		1%	€ -
Shower Gel 30ml Miniature Golden Top	€ 0.22		€ 51.67		€ -		1%	€ -
Shower Gel/Shampoo 30ml Miniature G	€ 0.22		€ 51.67		€ -		1%	€ -
Shampoo 50ml Miniature Golden Top (1	€ 0.25		€ 38.21		€ -		1%	€ -
Shower Gel 50ml Miniature Golden Top	€ 0.25		€ 38.21		€ -		1%	€ -
Shampoo 30ml Tube	€ 0.28		€ 44.13		€ -		1%	€ -
Shower Gel 30ml Tube	€ 0.28		€ 44.13		€ -		1%	€ -
Shower Gel/Shampoo 300ml Dispenser	€ 1.43		€ 28.54		€ -		1%	€ -
Shampoo 300ml Dispenser	€ 1.43		€ 28.54		€ -		1%	€ -
Shower Gel 300ml Dispenser	€ 1.43		€ 28.54		€ -		1%	€ -
Shower Gel/Shampoo 5L Refill	€ 7.78		€ 7.78		€ -		1%	€ -
Shampoo 5L Refill	€ 7.83		€ 7.83		€ -		1%	€ -
Shower Gel 5L Refill	€ 7.83		€ 7.83		€ -		1%	€ -

Figure 6- Final Order Bid _Tab_Proposed ABC Model

With this new tool, once an order arrives, the first step will be to calculate the order behaviour-related cost, typing "1" in each order specification. Then, the requested quantities (in units or boxes) must be inserted in the products ordered list to account for the respective product costs. Finally, one can either choose a total order's specific margin or different margins for each product. With this, the final price, considering the 1% lost to the Infarmed tax, will be automatically given, both in total order terms and for each product. Afterwards, if the chosen distribution method is CTT, the "CTT_General" tab should be used to insert the distribution specifications and get the extra cost the customer must pay

6.3. Online Store Analysis (Excel_PartTwo_Tab4.)

During one of the meetings with LM, the CEO showed some concern about the viability of their online store. In 2022, the online sales revenue increased by around 103%, proving that there is

online demand to be served. However, the firm's total capacity is reaching its limit, with the employees recurrently working overtime. As such, to further invest in the website, an extra administrative employee would need to be hired, an expenditure that LM still considers risky. Adding to that, if the firm indeed decides to bet on its online presence, a higher marketing investment would have to be made to ensure a higher website reach. An in-depth study of their online store viability and possible marketing campaign strategies would have room to be the scope of a Work Project. Nevertheless, even though this project's scope is the construction and implementation of the new costing system, a brief individual analysis of the future of LM's online store was considered valuable. For that, the first step was to research how much the firm should be investing in marketing and what would be the correspondent expected return on revenues. It was concluded that, according to some studies, B2B firms tend to, and should, invest between 2% and 5% of their total sales revenues in marketing (Horvath 2022). It should be noted that currently, LM's advertising strategy only comprises digital marketing. Moreover, it was found that the average industry standard points towards an online marketing ROI of 5 (Glover 2022). When comparing these values with LM's current situation, it was concluded that the average online marketing investment corresponds only to 0.23% of its previous year's total revenues, a value far from the suggestive interval. Since a jump from 0.23% to 2% in just one year was considered too ambitious, the following analysis will consider that in 2023, LM will invest 1% of 2022 total revenues in Online Marketing (30169.88€).

Having all the above in mind, three scenarios were created to understand the impact of such an investment. Each scenario reflects a different possible return: an optimistic scenario, pointing towards an ROI of 7; an average one, assuming an ROI of 5; and a pessimistic one, that assumes an ROI of 2.49. Firstly, for accuracy purposes, total sales revenues were divided into the two possible sales channels: offline and online. Such division was only possible from 2020 onwards, as it was the year in which the online store was created. After this, it was possible to compute

the average growth rates of both offline and online total sales revenues. With that, it was possible to forecast what would be, per se, LM's online and offline sales revenues in 2023. In other words, these correspond to the 2023 forecasted revenues if the firm continues to invest the same proportions in online marketing. The additional total sales revenues arising from the higher online marketing investment were calculated, assuming each scenario's ROI. It cannot be disregarded that this investment will naturally also indirectly impact the offline channel, as some new customers will come across LM and eventually contact them to further place an offline order. To account for that, 20% of the additional total sales revenues were reflected as offline sales revenue increase, and only 80% were assumed to impact the online sales revenues. Ultimately, it was possible to forecast 2023 total sales revenues as well as the respective portions that correspond to the online and offline channels.

With these values, it was finally possible to analyse whether this higher investment in online marketing would end up being profitable. For that, one needs to reach the average monthly total order costs, which already account for both the products and the order processing costs. The considered product's margin (52%) corresponds to the average profit margins of the products currently available at the online store. To account for the cost of hiring the new employee, it was assumed that his/her salary would be the same as the current Administrative Officer's. Considering all of this, it was possible to have the forecasted 2023 monthly online sales profit for all three scenarios. The monthly online marketing investment was subtracted from the correspondent value. After doing so, 2023 monthly online store profits of 3117.88€, 1718.13€ and -41.95€ were reached for the optimistic, average, and pessimistic scenarios, respectively.

7. Limitations

When constructing and analysing the proposed costing model, some limitations emerged. Firstly, it should be noted that little literature on the implementation of ABC systems can be found. This constitutes a limitation as there was no concrete guidance or examples on how to

construct a new costing system from scratch.

Moving to the model itself, and starting with DM, it should be mentioned that detailed quantities and prices of the liquids and soaps' components were not disclosed to us. According to the Production Director, the liquid soaps, shampoos, and shower gels had different components in different amounts but ended up yielding the same cost per litre. For the soaps and outsourced liquids, he also considered it not worth specifying each component's cost. As such, in the proposed model, these costs were preserved. Furthermore, machine maintenance was already included in the raw material costs. Even though a split of these values was asked, the production director considered it difficult to do and asked to maintain it together. Naturally, one should be aware that these might jeopardize the validity of the DM costs. Still in the DM calculation, as stated before, some values were arbitrarily added to some products. Some had a reliable justification and thus were considered in the correct place. To reduce complexity, those that were line/product-specific were maintained as DM. Others had no proper justification and, as such, were disregarded.

It should also be noted that the daily (and consequently, monthly) firms' production is extremely variable, as it depends both on the products that need to be re-stocked and on the orders received. As such, the followed strategy for allocating the fixed OH costs, which considers the average monthly production over the last ten months as the firm's monthly product mix, might reduce the model's accuracy. Nonetheless, by regularly updating the units produced, the firm will be able to reduce this model's flaw. Moreover, for some costs, only the 2021 annual values were available, and consequently, those were the ones considered. Specifically for the fuel cost, the 2019 yearly value was used, as the CEO recognizes this as the best estimate for the 2022 cost. As such, the firm was advised to update these to the most recent values at the beginning of the next financial year. Regarding the basic equipment depreciation, the accountant could not deliver the detailed depreciation per machine, only the total value.

Therefore, the model assumes that all machines depreciate at the same rate, even though we are aware that this is not the reality. Moreover, building insurance and depreciation were allocated based on square meters. As LM did not have a proper building plant with the detailed equipment's location, its positioning was drawn in the firm's regular building plant, and the respective scale was used to get the area occupied by each machine (Appendix 11.10.).

Regarding the products in the "others" category, it was considered that the necessary effort to deepen our analysis of these products' category and the value they would add to the model would end up not being worth it (Cokins and Lawson 2006).

As explained before, the order processing cost part of the model relied on data retrieved from staff interviews. As such, one should be aware that despite conducting interviews with the working staff (namely, the Production Director, the CEO, the Administrative Officer, and the Transportation Agent) is one of the most accurate ways of retrieving data, there is always the risk of having biased answers that might compromise some data's reliability. Also, on the order processing costing part, the average number of monthly orders had to be used to compute the monthly effort units for each order behaviour. As can happen with the fixed OH allocation, the per-order cost assumes a fixed number of orders, which might lead to either doubling or miscounting OH.

Regarding the subsequent model analysis, some limitations can also be recognised. Starting with the profitability per customer type, the developed personas and their correspondent order mixes are only the best estimates one can have. Naturally, LM has a highly variable portfolio of clients that consume different volumes and mixes of products. Moreover, for comparison purposes, specific product lines had to be chosen, which might not reflect each client's choice. Furthermore, the online store profitability analysis was based on the research paper's results on the usual amount of revenues invested by B2B firms in marketing and the commonly expected online marketing campaigns' ROI. Even though different scenarios were created to reduce

possible inaccuracies, one should still consider that each company and industry behaves differently. As such, the driven results might not totally represent LM's reality.

8. Recommendations

After developing the proposed costing model and conducting the previous analyses, some recommendations were collected to give to the firm.

First and most important, our team is highly confident that the firm should indeed shift its costing model to the proposed one. Even though the adaptation might initially be time-consuming, we truly believe this Work Project is an opportunity for LM to simultaneously increase its costing accuracy and have a faster bidding process. It is also important to emphasize that this tool will reduce the considerable amount of time spent adapting the model to the constant price changes. Nevertheless, we would like to highlight the importance of the model's regular updates. LM should ensure a frequent update of the model's variable inputs. Moreover, as mentioned in section 7, the current incorporation of the machine maintenance expenses in the raw materials' cost compromises this data reliability. As such, we would like to recommend the segregation of these costs and the accurate allocation of machine maintenance. It should be noted that the team has shown its willingness to help the firm in such a task.

The proposed order processing costing has enabled a clearer view of the impact of each client's buying behaviour. Notably, it was understood that orders made through the telephone are too time-consuming, which is significantly reflected in its correspondent order processing cost. As such, the firm should invest in shifting its clients' ordering method to e-mail. Moreover, the correspondent order-type cost cannot be ignored when deciding which clients to offer the internal delivery to. The firm should attempt to group these deliveries based on the client's location to maximize cost-effectiveness. Strategically, it could also limit the delivery offer exclusively to contractual clients in an attempt to increase customer retention.

From the profitability analysis, some key pricing recommendations can also be retrieved. First,

the firm should ensure that the product's price per litre/kg decreases as its dosage increases. As seen before, this is not a reality in some lines, such as Line A which has dispensers being costlier than 30ml miniatures, per litter speaking. Besides, some action is required to deal with the model's impact on all product's profit margins, apart from the "Others'' category. Naturally, there is an urgent need to increase the prices of the 31 products that currently show negative profit margins (Appendix 11.16.). Moreover, if LM wants to maintain its usual product margins in the]20%-30%] range, the price increase should be applied to more products. Since it was not possible to identify a specific margin strategy (neither per product type nor format), we would like to suggest that the firm chooses a consistent approach and applies it. A range of margins should be chosen for each product line, depending on its financial purpose. A smaller margin interval should be used if the firm wants a specific line to be its cash cow, meaning it wants to sell higher quantities by setting lower prices. Contrarily, if the company wants to strategically position a line in a more premium standard, higher prices should be settled, even if that implies lower quantities sold. In that case, the margin range should be higher. Following the same reasoning, higher margin ranges could also be applied to unique lines and products.

The results of the conducted online store profitability study also led to some suggestions. Considering the current financial situation of the firm, with revenues already surpassing the pre-pandemic year (2019), we believe that 2023 would be a good time to invest in the online store. The forecast shows great values for the firm, with the average scenario yielding a monthly profit for the online store of 1718.13€. Even with the pessimistic scenario, which seems unlikely, as it would imply an ROI smaller than what the company currently has, the monthly loss (41.95€) would not be a big concern as it will expectably be recovered after some months. As such, and even though a more detailed analysis could be performed, we believe that LM should increase its marketing investment and confidently hire the required employee.

9. Conclusion

As previously explained, the scope of this Work Project was the construction of an easily adaptable ABC system that would answer the proposed Research Questions. Wrapping up, the new model allowed us to identify the firm's inaccurate costing that ignored or incorrectly allocated a substantial portion of its costs and, consequently, led products to be over or under-costed. As a result, profitability was being affected, with some products yielding negative margins. During the model's construction, the team was particularly concerned with guaranteeing its easy adaptation to cost changes. As such, with the proposed solution, LM will have a clearer view of its costing structure, and it will be able to easily and correctly cost and, hence, price its products. The further incorporation of the order processing costs also allowed the association of different costs to different ordering behaviours. Adding all of this with the integration of a bidding tool resulted in a complete costing model that will allow LM to have a faster and more reliable pricing and bidding process. Finally, we believe that the firm's next steps should pass through the implementation of the previously given recommendations.

The results of this Work Project also contribute to Academic Literature, as few studies showcasing the results of ABC models' development and implementation in SMEs were found. In fact, this limitation has already been perceived in other dissertations. Gunasekaran, Marri and Yusuf (1999), for instance, have stated that despite the significant research on ABC's theoretical implementations, there are few articles illustrating real case experiences.

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11. Appendix

11.1. Abbreviations' List

Abbreviation	Meaning
ABC	Activity-Based Costing
APM	Average Profit Margin
B2B	Business-to-business
B2C	Business-to-consumer
CEO	Chief Executive Officer
CFO	Chief Financial Offer
CPI	Consumer Price Index
CTT	Correios, Telégrafos e Telefones
DL	Direct Labour
DLH	Direct Labour Hours
DM	Direct Material
EBITDA	Earnings before Interest, Taxes, Depreciation and Amortization
FP	Flow Pack
IMF	International Monetary Fund
KW	Kilowatt
M O59	Miniature Format Type O59
M 205	Miniature Format Type 205
M 188	Miniature Format Type 188
M 270	Miniature Format Type 270
M 155	Miniature Format Type 155
M 30AMB	Miniature Format Type 30AMB

M O82	Miniature Format Type O82
MH	Machine Hours
OH	Overheads
OM	Old Model
P	Paper
PM	Proposed Model
PW	Pleat Wrapper
RD	Rounded
ROI	Return On Investment
RT	Rectangular
SME	Small and Medium-sized Enterprises
SOR	Single Overhead Rate
SQ	Squared
SWOT	Strengths, weaknesses, opportunities, and threats
TC	Traditional Costing
u/h	Units per Hour
UC	Under-costing
VAT	Value-added Tax

11.2. LM's financial information

11.2.1. LM's Income Statement

	2021	2020	2019
Sales	€ 1,704,303.00	€ 2,055,986.73	€ 2,842,304.74
Subsidies	€ 4,655.00	€ 13,850.01	€ -
As a % of Sales	0.27%	0.67%	0.00%
Change on inventory production	€ (66,005.55)	€ 142,981.56	€ (76,261.39)
As a % of Sales	4%	7%	3%
COGS	€ 808,098.64	€ 1,003,419.23	€ 1,418,995.51
As a % of Sales	47.4%	48.8%	49.9%
Change in COGS	-24.2%	-41.4%	-6.7%
Supplies and External Services	€ 331,047.95	€ 312,634.88	€ 469,895.41
As a % of Sales	19.4%	15.2%	16.5%
Labour Costs	€ 403,958.79	€ 417,971.62	€ 404,381.93
As a % of Sales	23.7%	20.3%	14.2%
Change in Labour Costs	-3.4%	3.4%	2.7%
Other Income	€ 51,314.22	€ 46,024.31	€ 46,460.55
As a % of Sales	3.0%	2.2%	1.6%
Other Expenses	€ 27,432.32	€ 23,222.31	€ 45,916.88
As a % of Sales	1.6%	1.1%	1.6%
EBITDA	€ 123,728.97	€ 501,594.57	€ 473,314.17
Depreciation and Amortization	€ 112,236.72	€ 140,520.51	€ 142,033.96
Operational Result	€ 11,492.25	€ 361,074.06	€ 331,280.21
Interest Received	€ -	€ -	€ -
Interest Paid	€ -	€ 396.03	€ 3,093.16
EBT	€ 11,492.25	€ 360,678.03	€ 328,187.05
Taxes	€ 1,432.98	€ 75,742.39	€ 66,600.00
Net Income	€ 10,059.27	€ 284,935.64	€ 261,587.05

11.2.2. LM's Balance Sheet

	2021	2020	2019
Total Assets	€ 2,720,818.25	€ 2,613,830.73	€ 2,682,522.86
Current Assets	€ 1,772,637.13	€ 1,573,531.45	€ 1,495,957.00
Non-current Assets	€ 948,181.12	€ 1,040,299.28	€ 1,186,565.86
Total Equity	€ 2,236,210.12	€ 2,337,814.27	€ 2,052,878.63
Total Liabilities	€ 484,608.13	€ 276,016.46	€ 629,644.23
Current Liabilities	€ 474,591.79	€ 276,016.46	€ 554,644.23
Non-current Liabilities	€ 10,016.34	€ 00.00	€ 75,000.00
Equity + Liabilities	€ 2,720,818.25	€ 2,613,830.73	€ 2,682,522.86

11.2.3. LM's financial ratios

	2021	2020	2019
NWC	€ 1,298,045.34	€ 1,297,514.99	€ 941,312.77
Solvency Ratio	4.61	8.47	3.26
Financial Autonomy Ratio	0.82	0.89	0.77
EBITDA Margin	7.26%	24.40%	16.65%
Net Margin	0.59%	13.86%	9.20%
ROA	0.00	0.14	0.12
Change EBITDA	-75.33%	5.97%	3.93%
Change operational result	-96.82%	8.99%	-14.74%
Change Net Income	-96.47%	8.93%	-13.71%
Change in Sales	-17.11%	-27.66%	3.89%

11.3. **Porter's Five Forces framework** (Porter 1979)

Threat of new entrants - Low
- High capital requirements
- Economies of scale
- Moderate product differentiation
- High R&D
- 2 big players with strong brand names

Bargaining power of suppliers - Moderate
- High number of substitutes
- Industry firms are not crucial to suppliers' survival
- Suppliers' goods are critical for the industry
- Low threat of forward integration as there are different suppliers for different parts of amenities
- High switching costs due to molds

Rivalry among existing competitors - Moderate
- Only two significant players
- Slow industry growth
- Moderate space for differentiation
- Marketplace cannot sustain a big amount of successful companies
- High exit barriers

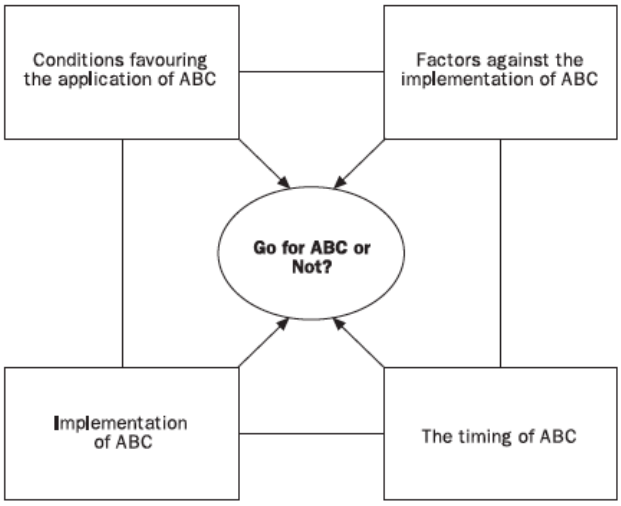
Bargaining power of buyers - Low
- Low number of alternatives for buyers
- Switching costs due to contracts and/or personalized products molds
- No threat of backward integration
- Product sales account for significant part of seller's annual revenues

Threat of substitutes - Moderate
- Full size options can substitute amenities in some products: similar performance and lower prices
- Usually, buyers prefer to purchase all amenities from the same place which only specialized companies can offer
- Switching costs due to molds

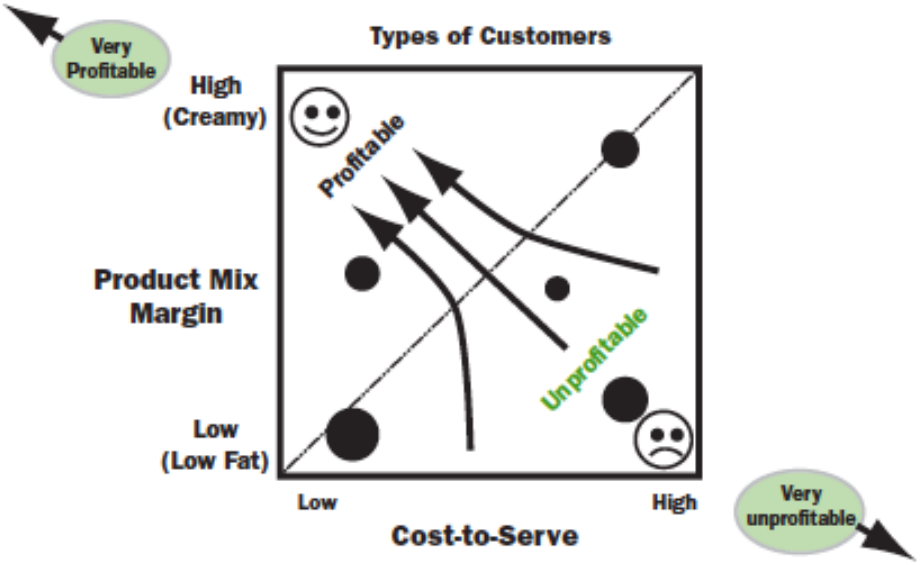
11.4. SWOT framework (Humphrey 1960)

Strengths: • Some of their machines have unique, rare, and value-adding technology, such as the tube's machine • Partnership with firm T • Strong brand name and reputation. • Loyal customer base • Diverse portfolio of products. • Only Portuguese factory with the whole needed machinery to fully produce all formats of soaps, shower gels and shampoos • The whole manufacturing staff is taught to operate all the different machines of the different processes	**Weaknesses:** • Still recovering from the huge financial impact of the Covid-19 pandemic • Lack of resources and capital to stop outsourcing and invest in the in-house production of conditioners and body lotions • Their business model implies high safety stocks
Opportunities: • Tourism has been following an increasing trend • Increasing focus on their online business • Growing exportation levels	**Threats:** • High dependence on tourism • High exposure to seasonality • Increasing presence of their most direct competitor in Portugal • Industry regulations are high and constantly changing • Inflation

11.5. A conceptual model for the decision to implement ABC (Gunasekaran, Marri, and Yusuf 1999)



11.6. Product Mix Margin vs Cost-to-Serve Matrix (Cokins 2001)



11.7. Products available formats and respective production and packaging machines

Product Type:	Available Formats:	Production Machine:	Packaging Machine:
Soap	RT12 Flow Pack	Machine Running Soaps	Packaging Soaps Flow Pack 1
	RT15 Flow Pack		Packaging Soaps Flow Pack 1
	SQ15 Flow Pack		Packaging Soaps Flow Pack 2
	SQ20 Flow Pack		Packaging Soaps Flow Pack 2
	SQ40 Flow Pack		Packaging Soaps Flow Pack 2
	SQ20 Paper		Packaging Soaps Paper
	RD20 Pleat Wrapper		Packaging Soaps Pleat Wrapper
	RD40 Pleat Wrapper		Packaging Soaps Pleat Wrapper

Product Type:	Available Formats:	Production Machine:	Packaging Machine:
Shower Gel	Sachets	Machine Running Liquids	Packaging Liquids Sachets
	Refills		Packaging Liquids Refills (Manual)
	Tubes		Packaging Liquids Tube
	Dispensers		Packaging Liquids Semi-Automatic
	M O82		Packaging Liquids Automatic
	M O59		
	M 205		
	M 188		
	M 270		Packaging Liquids Semi-Automatic
	M 155		
	M 30AMB		

Product Type:	Available Formats:	Production Machine:	Packaging Machine:
Shampoo	Sachets	Machine Running Liquids	Packaging Liquids Sachets
	Refills		Packaging Liquids Refills (Manual)
	Tubes		Packaging Liquids Tube
	Dispensers		Packaging Liquids Semi-Automatic
	M O82		Packaging Liquids Automatic
	M O59		
	M 205		
	M 188		
	M 270		Packaging Liquids Semi-Automatic
	M 155		
	M 30AMB		

Product Type:	Available Formats:	Production Machine:	Packaging Machine:
Shower Gel/Shampoo	Sachets	Machine Running Liquids	Packaging Liquids Sachets
	Refills		Packaging Liquids Refills (Manual)
	Tubes		Packaging Liquids Tube
	Dispensers		Packaging Liquids Semi-Automatic
	M O82		Packaging Liquids Automatic
	M O59		
	M 205		
	M188		
	M 30AMB		Packaging Liquids Semi-Automatic

Product Type:	Available Formats:	Production Machine:	Packaging Machine:
Body Lotion	Sachets	Production Outsourced	Packaging Liquids Sachets
	Refills		Packaging Liquids Refills (Manual)
	Tubes		Packaging Liquids Tube
	Dispensers		Packaging Liquids Semi-Automatic
	M O59		
	M 188		
	M 270		
	M 30AMB		
	M 205		

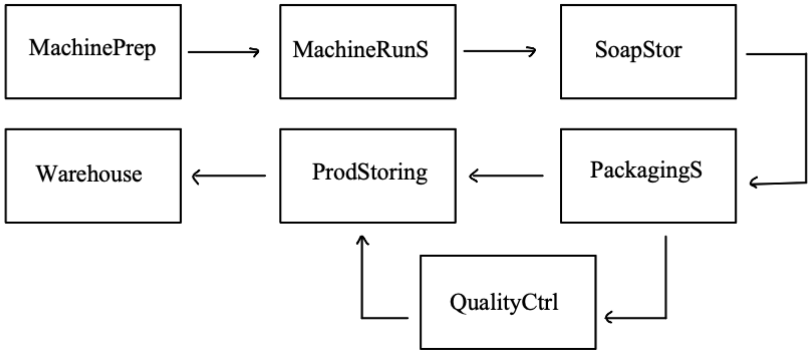
Product Type:	Available Formats:	Production Machine:	Packaging Machine:
Conditioner	Refills	Production Outsourced	Packaging Liquids Refills (Manual)
	Tubes		Packaging Liquids Tube
	Dispensers		Packaging Liquids Semi-Automatic
	M O59		
	M 270		
	M 30AMB		
	M 188		

Product Type:	Available Formats:	Production Machine:	Packaging Machine:
Liquid Soap	Refills	Machine Running Liquids	Packaging Liquids Refills (Manual)
	Dispensers		Packaging Liquids Semi-Automatic

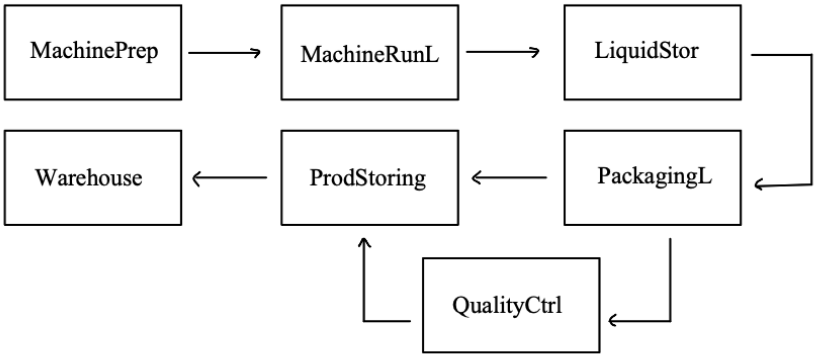
Product Type:	Available Formats:	Production Machine:	Packaging Machine:
Wipes	Small	Machine Running Wipes	Packaging Wipes
	Big		

11.8. Process Flow Charts

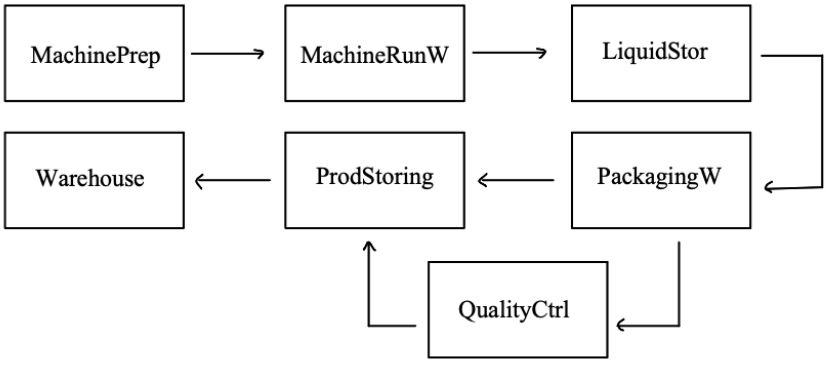
11.8.1. Soaps Production



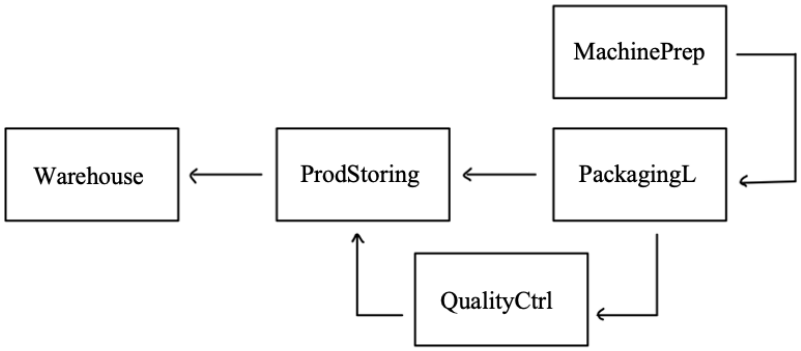
11.8.2. Shower gel, Shampoo, Liquid Soap, Shower gel/Shampoo Production



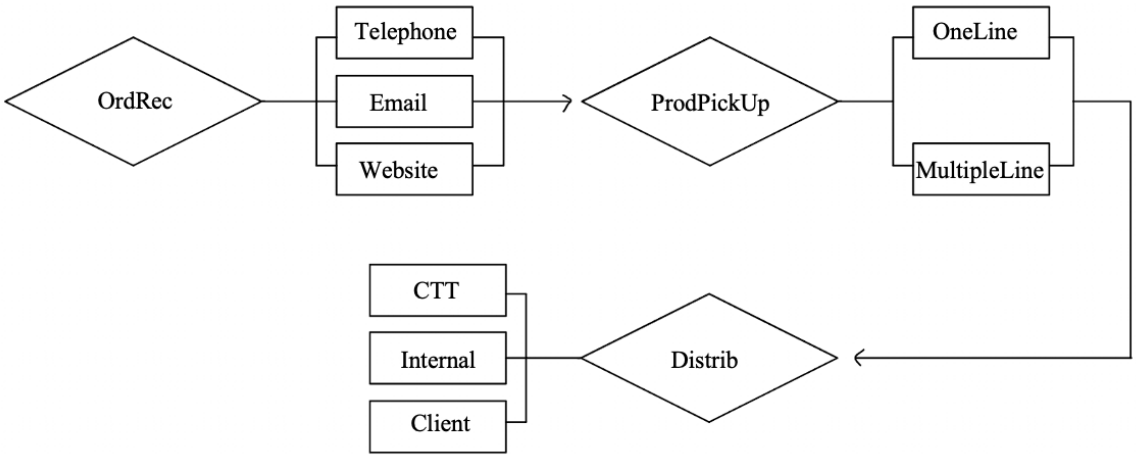
11.8.3. Wipes Production



11.8.4. Body Lotion and Conditioner Production



11.8.5. Order Processing



11.9. Product Costing Activity Centres' description

Activity Centre Name:	Abbreviation:	Purpose:
Machines' Preparation	MachinePrep	To accumulate the cost of checking DM requirements, transport them to the machines and set the machines up.
Machine Running Soap	MachineRunS	To accumulate the cost of having the soap's assembly machine running.
Machine Running Wipes	MachineRunW	To accumulate the cost of having the wipes' mixer machine running.
Machine Running Liquids	MachineRunL	To accumulate the cost of having the liquids' assembly machine running.
Liquid Storage	LiqStor	To accumulate the cost of having the liquids stored before packaging.
Soap Storage	SoapStor	To accumulate the cost of having the soaps breathing before packaging.

Packaging Soap Flowpack	PackagingSFlow	To accumulate the cost of packaging and labeling soaps in the Flow Pack format.
Packaging Soap Paper	PackagingSPaper	To accumulate the cost of packaging and labeling soaps in the Paper format.
Packaging Soap Pleat Wrapper	PackagingSPleatW	To accumulate the cost of packaging and labeling soaps in the Pleat Wrapper format.
Packaging Wipes	PackagingWipes	To accumulate the cost of packaging wipes.
Packaging Liquids Sachets	PackagingLSachets	To accumulate the cost of packaging liquids in the Sachets format.
Packaging Liquids Refills	PackagingLRefills	To accumulate the cost of packaging and labeling liquids in the Refills format.
Packaging Liquids Tube	PackagingLTube	To accumulate the cost of packaging and labeling liquids in the Tubes format.
Packaging Liquids Semi-Automatic	PackagingLSemiAut	To accumulate the cost of packaging and labeling liquids using the semi-automatic packaging machines (can be used for dispensers and/or specific miniatures).
Packaging Liquids Automatic	PackagingLAut	To accumulate the cost of packaging and labeling liquids using the automatic packaging machines (can be used for miniatures).
Product Storing	ProdStoring	To accumulate the cost of transporting the products from production to packaging machines, and from packaging machines to the warehouse.
Quality Control	QualityCtrl	To accumulate the cost of having an external certified lab checking and controlling the quality of the in-house produced goods
Warehouse	Warehouse	To accumulate the cost of having an area dedicated to warehouse.

11.10. LM's factory plant

11.10.1. Activity Centre's positioning in the factory

11.10.2. Resulting area occupied in the factory, in m^2, per Activity Centre

Activity Centre:	Area occupied (in m^2):	As a % of Total Area:
Machine Running Soaps	40.45	6.22%
Machine Running Wipes	4.21	0.65%
Machine Running Liquids	37.92	5.83%
Soap Storage	32.02	4.93%
Liquid Storage (both machines considered)	42.14	6.48%
Packaging Soaps Flow Pack 1	12.36	1.9%
Packaging Soaps Flow Pack 2	12.36	1.9%
Packaging Soaps Paper	7.58	1.17%
Packaging Soaps Pleat Wrapper	5.90	0.91%
Packaging Wipes	4.49	0.69%
Packaging Liquids Sachets	4.49	0.69%
Packaging Liquids Refills	9.83	1.51%
Packaging Liquids Tubes	15.45	2.38%
Packaging Liquids Semi-Automatic	15.45	2.38%
Packaging Liquids Automatic	28.65	4.41%
Warehouse	376.69	57.95%
Total Area occupied (in m^2)	649.99	

11.11. Order Processing Costing Activity Centres' description

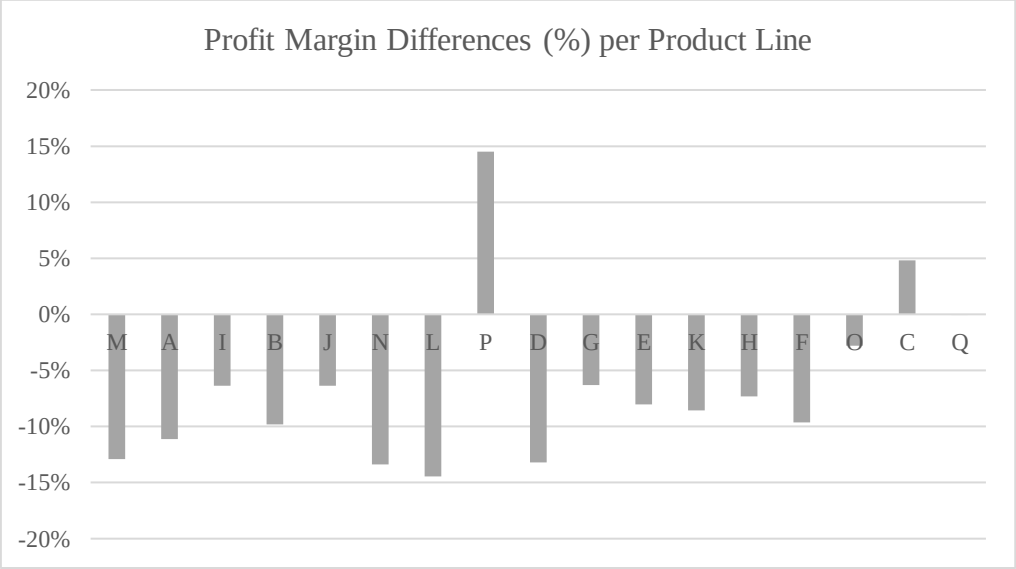
Activity Centre Name:	Abbreviation:	Purpose:
Order Receivement	OrdRec	To consider the effort differences of receiving, registering and sending the bids of an order received via e-mail (OrdRec_Email), telephone (OrderRec_Tele) or online store (OrderRec_Web).
Products' Pick-Up (and order Preparation)	ProdPickUp	To account for the difference in time spent preparing an order solely composed of goods from the same product line (ProdPickUp_OneLine), hence relatively close to each other, versus from distinct lines (ProdPickUp_MultipleLines)
Order Distribution (Preparation and Delivery)	Distrib	To consider the time spent issuing transportation guides and extra needed documentation (required by CTT) and delivering the order (Distrib_Intern).

11.12. Product's profit margin interval distributions

	Old Model	Proposed Model
Profit Margins (%) Interval:	**Number of products:**	**Number of products:**
X ≤ 0%	20	31
0% < **X** ≤ 10%	3	44
10% < **X** ≤ 20%	18	22
20% <**X**≤ 30%	95	81
X > 30%	104	62

(Excluding the "others" category)		
	Old Model	**Proposed Model**
Profit Margins (%) Interval:	**Number of products:**	**Number of products:**
X ≤ 0%	20	31
0% < **X** ≤ 10%	3	44
10% < **X** ≤ 20%	18	22
20% < **X** ≤ 30%	93	79
X > 30%	85	43

11.13. Profit Margin Differences (%) per Product Line

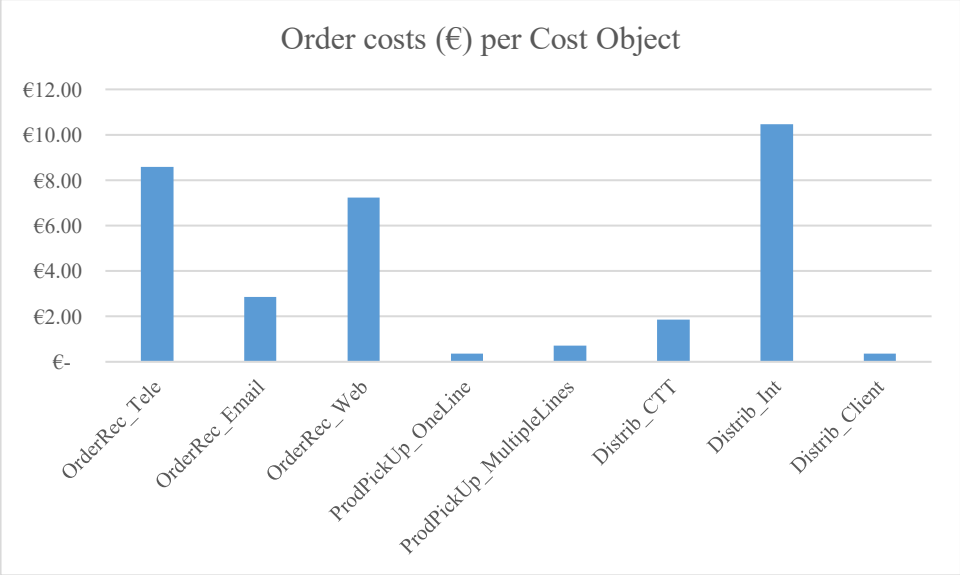


11.14. Personas' description

Client Type:	Ordering behavior:	Order frequency:
1. 4-5 Star Hotel	1.1. Order received via e-mail, with multiple product lines and distributed by the firm	Semesterly
	1.2. Order received via e-mail, with multiple product lines and distributed via CTT	
2. City Hotel	2.1.1. Order received via e-mail, with one product line and distributed by the firm	Quarterly
	2.1.2. Order received via e-mail, with multiple product lines and distributed by the firm	
	2.2.1. Order received via e-mail, with one product line and distributed via CTT	
	2.2.2 Order received via e-mail, with multiple product lines and distributed via CTT	
3. Environmental-Friendly Hotel	3.1. Order received via e-mail, with one product line and distributed by the firm	Semesterly
	3.2. Order received via e-mail, with one product line and distributed via CTT	
4. Motels	4.1. Order received via e-mail, with multiple product lines and distributed by the firm	Semesterly
	4.2. Order received via e-mail, with one product line and distributed via CTT	
5.Airbnb/Hostels/Local Accommodation	5.1. Order received via telephone, with multiple product lines and distributed by the firm	Semesterly
	5.2. Order received via telephone, with multiple product lines and with the client picking it up	
6.Restaurants / Airlines	6.1. Order received via e-mail, with multiple product lines and distributed via CTT	Semesterly
	6.2. Order received via telephone, with multiple product lines and distributed via CTT	
7.Website	7.1. Order received via website, with one product line and distributed via CTT	Punctual
	7.2. Order received via	

	website, with multiple product lines and distributed via CTT	
8.Resellers	8.1. Order received via telephone, with multiple product lines and with the client picking it up	Quarterly
9. Private Hospitals and Clinics	9.1. Order received via telephone, with multiple product lines and with the client picking it up	Quarterly

11.15. Order costs (€) per Cost Object



11.16. Products presenting negative Profit Margins in the proposed model

Product Line:	Product Names:	Profit Margins:
A	Soap SQ20 Paper	-103%
A	Body Lotion 30ml Tube	-25%
A	Conditioner 30ml Tube	-23%
A	Conditioner 30ml Miniature (O59)	-14%
A	Body Lotion 30ml Miniature (O59)	-14%
A	Conditioner 30ml Miniature Golden Top (O59)	-12%
A	Body Lotion 30ml Miniature Golden Top (O59)	-11%
B	Liquid Soap 5L Refill	-7%
B	Body Lotion 30ml (205)	-6%
B	Shampoo 5L Refill	-3%
B	Shower Gel 5L Refill	-3%
B	Shower Gel/Shampoo 5L Refill	-3%
B	Soap RD20 Pleat Wrapper	-0.39%
D	Soap SQ20 Paper	-94%
D	Soap RD20 Pleat Wrapper WHite	-2%
E	Soap PW RD20	-3%
E	Body Lotion 30ml Miniature (O59)	-2%
E	Conditioner 30ml Miniature (O59)	-1%
F	Body Lotion 30ml Tube	-13%
F	Conditioner 30ml Tube	-12%
F	Body Lotion 30ml Miniature (O59)	-10%
F	Conditioner 30ml Miniature (O59)	-9%
F	Soap RD20 Pleat Wrapper	-4%
G	Body Lotion Miniature 30ml (O59)	-7%
H	Body Lotion Miniature 30ml (188)	-10%
K	Body Lotion Miniature 30ml (188)	-7%
K	Soap RD20 Pleat Wrapper	-0.09%
N	Soap RD20 Pleat Wrapper	-7%
N	Body Lotion 30ml Tube	-1%
O	Body Lotion 30ml Miniature (188)	-9%
O	Soap RD20 Pleat Wrapper	-7%

11.17. Data collected to construct the model

11.17.1. Machines hourly consumption (KW/h)

Machine Considered:	Machines' Power per Hour :
Machine Running Liquids	8.2 KWh
Machine Running Soaps	12.5 KWh
Machine Running Wipes	3 KWh
Packaging Soap Flow Pack	4 KWh
Packaging Soap Paper	6.5 KWh
Packaging Soap Pleat Wrapper	2.5 KWh
Packaging Liquids Automatic	7.5 KWh
Packaging Liquids Semi-Automatic	6 KWh
Packaging Liquids Tubes	13.5 KWh
Packaging Liquids Sachets	4.7 KWh
Packaging Wipes	4.7 KWh

11.17.2. Machines considered per Activity Centre

Activity Centers:	Machines considered per Activity Center:
Machine Running Liquids	1
Machine Running Soaps	1
Machine Running Wipes	1
Packaging Soap Flow Pack	2
Packaging Soap Paper	1
Packaging Soap Pleat Wrapper	1
Packaging Liquids Automatic	1
Packaging Liquids Semi-Automatic	2
Packaging Liquids Tubes	1
Packaging Liquids Sachets	1
Packaging Wipes	1
Liquid Storage	2

11.17.3. Soaps manufactured and packed per hour

Soap Format:	Units manufactured per hour:
RT12	6500
RT15	6500
SQ15	6500
SQ20	6000
SQ40	4000
RD20	5000
RD40	3000

Soap Type:	Units packed per hour:
FP RT12	5000
FP RT15	5000
FP SQ15	4000
FP SQ20	4000
FP SQ40	3000
PW RD20	1500
PW RD40	1300
P SQ20	1000

11.17.4. Liquids manufactured and packed per hour

Liquid Category:	Liquid dosage and type:	Litres manufactured per hour:
Shower Gel/Shampoo/Liquid Soap	All formats	150
Body Lotion/Conditioner	All formats	There is no manufacturing of these, they are outsourced

Liquid Category:	Liquid dosage and type:	Units packed per hour:
Shower Gel & Shampoo	20 ml – MO82	3000
	30 ml – MO59	3000
	30 ml – M188	2700
	30 ml – M205	3000
	30 ml – M30AMB	250
	50 ml – M155	250
	35 ml – M270	250
	30 ml – Tube	1000
	300 ml – Dispenser	100
	5000 ml – Refill	50
	10 ml - Sachet	2500
Body Lotion	10 ml – Sachet	2500
	5000 ml – Refill	25
	30 ml – Tube	250
	300 ml – Dispenser	100
	30 ml – MO59	250
	30 ml – M188	250
	35 ml – M270	250
	30 ml – M30AMB	250
	30 ml – M205	250
Conditioner	5000 ml – Refill	25
	30 ml – Tube	250
	300 ml – Dispensers	100
	30 ml – MO59	250
	35 ml – M270	250
	30 ml – M30AMB	250
	30 ml – M188	250
Liquid Soap	5000 ml – Refill	50
	300 ml - Dispenser	100
Shower Gel/Shampoo	10 ml – Sachet	2500
	5000 ml – Refill	50
	30 ml – Tube	1000
	300 ml – Dispenser	100
	20 ml – MO82	3000
	30 ml – MO59	3000
	30 ml – M205	3000
	30 ml – M188	2700
	30 ml – M30AMB	250

11.17.5. Wipes manufactured and packed per hour

Wipes' Format:	Wipes mixed per hour:
Small	5000
Big	1428

Wipes' Format:	Wipes packed per hour:
Small	5000
Big	2500

11.17.6. Number of employees required in each product's manufacturing, per product type and format

Manufactured product:	Number of employees required:
Soaps: RD20 & RD40	2
Soaps: RT12, RT15, SQ15, SQ20 & SQ40	1
Liquids (all formats produced in-house)	1
Wipes (all formats)	1

11.17.7. Number of employees required in each product's packaging, per product type and format

Packed product (format):	Number of employees required:
Soaps: Pleat Wrapper	1
Soaps: Paper	3
Soaps: Flow Pack	2
Sachets	1
Miniatures (with packaging rate > 1000 units/hour)	4
Miniatures (with packaging rate ≤ 1000 units/hour)	1
Tubes	2
Dispensers	1
Refills	1
Wipes (all formats)	1

11.17.8. The time needed to set up machines and store products, in minutes per hour, per Activity Centre

Activity Centre:	Time needed to Set-up Machine (minutes/hour):	Time needed to store products (minutes/hour):
Machine Running Soaps	10	5
Machine Running Liquids	10	10
Machine Running Wipes	5	5
Packaging Soaps Flow Pack	10	5
Packaging Soaps Pleat Wrapper	10	5
Packaging Soap Paper	10	5
Packaging Liquids Automatic	5	5
Packaging Liquids Semi-Automatic	20	10
Packaging Liquids Tubes	10	5
Packaging Liquids Sachets	10	5
Packaging Liquids Refills	10	5
Packaging Wipes	7	5

11.17.9. Plastic/Paper consumption for products' packaging, in grams, per product type and format

Product's Type and Format:	Plastic/Paper consumption per unit produced (g):
Soap Flow Pack RT12	0.5
Soap Flow Pack RT15	0.5
Soap Flow Pack SQ15	0.5
Soap Flow Pack SQ20	0.5
Soap Flow Pack SQ40	0.5
Soap Pleat Wrapper RD20	0.5
Soap Pleat Wrapper RD40	0.5
Soap Paper SQ20	1.3
Liquids Miniature O82	5.5
Liquids Miniature O59	5.5
Liquids Miniature 188	6
Liquids Miniature 205	5.5
Liquids Miniature 30AMB	5.5
Liquids Miniature 155	8
Liquids Miniature 270	6
Liquids Tube	7
Liquids Dispenser	30
Liquids Refill	160
Liquids Sachet	1
Wipe Small	1.2
Wipe Big	1.8

11.17.10. Paper consumption for products' cardboard boxes, in grams, per product formats

Products' Format:	Paper consumed per cardboard box used (g):
All soaps and liquids (except sachets' format)	300
Sachets, wipes and "others" category	250

11.17.11. Price list example

Price lists similar to the one below were disclosed for all the existing lines. The online store prices were taken off the website.

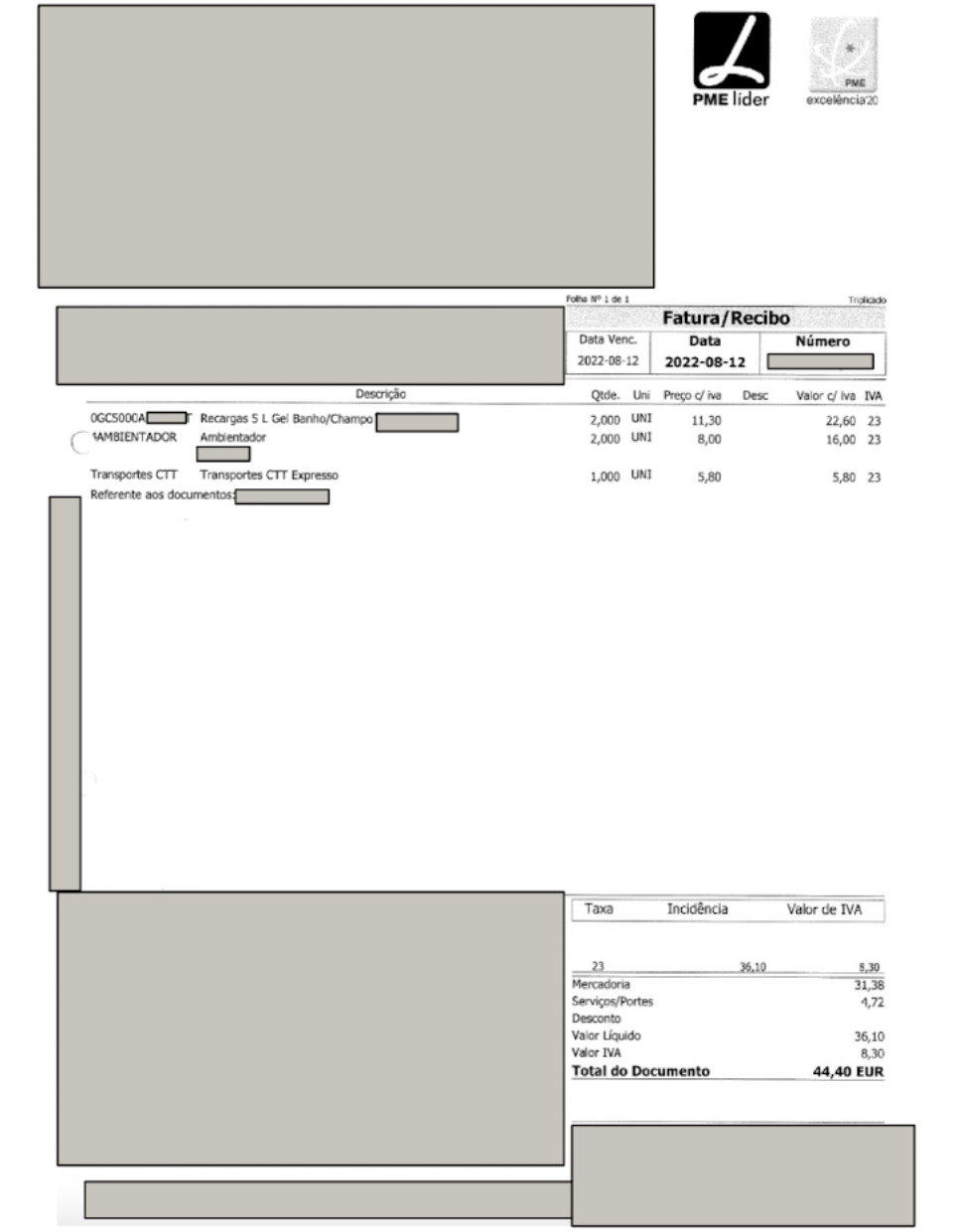
REFª	PRDUTOS / GRAMAGENS / EMBALAGENS	QUANTIDADE CAIXA	PREÇO CAIXA	PREÇO UNITÁRIO
0S20PLLAV	SABONETE 20 GRS (REDONDO) EMBALAGEM PLISSADA BRANCA	400	41,00	0,102 €
0S20PLLAV-FL	SABONETE 20 GRS (REDONDO) EMBALAGEM PLISSADA FLORAL	400	49,00	0,123 €
0S20PAPELLAV	SABONETE 20 GRS (QUADRADO) EMBALADO RÓTULO DE PAPEL	300	42,50	0,142 €
0S20CARTLAV	SABONETE 20 GRS (QUADRADO) EMBALADO CAIXA DE CARTOLINA	250	56,50	0,226 €
0CH30LAV	CHAMPÔ EM FRASCO 30 ML	220	54,00	0,245 €
0GB30LAV	GEL DE BANHO EM FRASCO 30 ML	220	54,00	0,245 €
0BL30LAV	BODY LOTION EM FRASCO 30 ML	220	66,00	0,300 €
0CO30LAV	CONDICIONADOR EM FRASCO 30 ML	220	71,00	0,322 €
0GC50LAV	GEL DE BANHO / CHAMPÔ EM FRASCO 50 ML	160	48,00	0,300 €
0SL300LAV	DOSEADOR 300 ML DE SABONETE LÍQUIDO	20	42,00	2,100 €
0SL5000LAV	RECARGA 5 LITROS DE SABONETE LÍQUIDO	1	----	8,800 €
0CH300LAV	DOSEADOR 300 ML DE CHAMPÔ	20	42,00	2,100 €
0CH5000LAV	RECARGA 5 LITROS DE CHAMPÔ	1	----	8,800 €
0GB300LAV	DOSEADOR 300 ML DE GEL DE BANHO	20	42,00	2,100 €
0GB5000LAV	RECARGA 5 LITROS DE GEL DE BANHO	1	----	8,800 €
0BL300LAV	DOSEADOR 300 ML DE BODY LOTION	20	53,00	2,650 €
0BL5000LAV	RECARGA 5 LITROS DE BODY LOTION	1	----	16,800 €
4SUPORTEPLAS	SUPORTE EM ABS DE PAREDE - BRANCO OU PRETO	1	----	2,800 €
4SUPORTECROMADO	SUPORTE EM ABS DE PAREDE - CROMADO	1	----	11,900 €
0KHLAV	KIT DE HIGIENE COM 3 COTONETES, 3 DISCOS FACIAIS, 1 LIMA E 1 TOUCA EM CAIXA DE CARTOLINA	420	193,00	0,456 €

11.17.12. Units produced in the first 10 months of 2022, per Product's Format and Type

Products' Format and Type:	Units produced in the first 10 months of 2022:
Soaps	
Soap Flow Pack RT12	1.252.000
Soap Flow Pack RT15	1.052.600
Soap Flow Pack SQ15	1.100.000
Soap Flow Pack SQ20	340.000
Soap Flow Pack SQ40	10.000
Soap Paper SQ20	20.000
Soap Pleat Wrapper RD20	1.080.000
Soap Pleat Wrapper RD40	6.000
Shower Gel	
Sachets	485.000
Refills	2.450
Tubes	39.000
Dispensers	2.700
Miniatures	1.433.000
Shampoo	
Sachets	625.000
Refills	1.650
Tubes	36.000
Dispensers	2.300
Miniatures	1.354.000
Body Lotion	
Sachets	9.800
Refills	315
Tubes	23.000
Dispensers	1.200
Miniatures	329.000
Conditioners	
Refills	411
Tubes	8.000
Dispensers	760
Miniatures	97.000
Liquid Soaps	
Refills	2.440
Dispensers	5.500
Shower Gel/Shampoo	
Sachets	270.000
Refills	4.600
Tubes	13.700
Dispensers	7.200
Miniatures	475.000
Wipes	
Big	28.500
Small	5.020.000

11.17.13. Online Store Revenues

To reach the online store's monthly and yearly revenues, every single invoice (similar to the one below) had to be summed.



PME líder

PME excelência'20

Folha Nº 1 de 1 — Triplicado

Fatura/Recibo

Data Venc.	Data	Número
2022-08-12	**2022-08-12**	[redacted]

Descrição		Qtde.	Uni	Preço c/ iva	Desc	Valor c/ iva	IVA
0GC5000A[redacted]	Recargas 5 L Gel Banho/Champo [redacted]	2,000	UNI	11,30		22,60	23
1AMBIENTADOR	Ambientador [redacted]	2,000	UNI	8,00		16,00	23
Transportes CTT	Transportes CTT Expresso	1,000	UNI	5,80		5,80	23

Referente aos documentos: [redacted]

Taxa	Incidência	Valor de IVA
23	36,10	8,30

Mercadoria	31,38
Serviços/Portes	4,72
Desconto	
Valor Líquido	36,10
Valor IVA	8,30
Total do Documento	**44,40 EUR**

11.17.14. Total Monthly and Yearly Sales Revenues

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Janeiro	79.935,94 €	97.324,44 €	70.660,07 €	108.966,17 €	109.334,34 €	115.519,54 €	155.192,21 €	180.591,98 €	150.561,39 €	183.124,36 €	65.354,86 €	92.579,88 €
Fevereiro	89.088,19 €	73.848,98 €	82.005,36 €	76.871,17 €	76.918,44 €	98.634,37 €	124.568,53 €	150.556,67 €	183.652,17 €	160.154,87 €	25.306,02 €	150.235,83 €
Março	125.995,40 €	113.690,33 €	163.742,20 €	133.629,40 €	177.540,83 €	178.296,54 €	231.880,99 €	208.475,83 €	210.825,72 €	192.480,60 €	65.114,12 €	238.582,41 €
Abril	126.834,73 €	103.860,30 €	143.999,30 €	156.497,67 €	144.611,68 €	167.250,94 €	193.566,21 €	209.450,36 €	238.303,43 €	185.361,52 €	67.462,49 €	245.242,42 €
Maio	174.359,31 €	145.904,78 €	150.684,34 €	180.531,06 €	168.753,23 €	232.325,67 €	296.113,74 €	325.220,32 €	328.975,77 €	269.323,57 €	137.585,90 €	329.356,31 €
Junho	185.561,92 €	162.953,49 €	152.943,47 €	178.356,61 €	220.153,47 €	252.299,00 €	261.817,67 €	305.721,59 €	275.769,00 €	238.413,15 €	180.909,02 €	287.483,88 €
Julho	178.254,77 €	175.311,44 €	221.864,49 €	292.599,21 €	282.299,63 €	261.577,29 €	332.874,19 €	350.083,64 €	362.186,89 €	274.417,15 €	256.396,15 €	426.588,82 €
Agosto	128.344,32 €	118.906,05 €	113.854,59 €	131.219,79 €	144.754,50 €	166.443,67 €	169.749,08 €	201.516,73 €	202.034,98 €	120.786,52 €	151.567,40 €	213.463,80 €
Setembro	181.929,97 €	138.132,43 €	172.471,97 €	166.189,43 €	180.010,98 €	242.979,20 €	258.921,19 €	258.309,88 €	286.517,18 €	170.248,87 €	240.030,57 €	392.194,35 €
Outubro	160.235,65 €	159.900,64 €	205.191,12 €	187.293,38 €	223.339,07 €	185.327,97 €	279.063,52 €	237.939,28 €	262.019,80 €	137.957,85 €	190.109,84 €	252.736,90 €
Novembro	104.940,80 €	97.510,80 €	105.990,08 €	139.405,73 €	150.103,71 €	152.902,17 €	177.055,53 €	121.295,54 €	189.847,85 €	73.469,82 €	220.048,32 €	235.761,76 €
Dezembro	123.427,11 €	71.344,34 €	88.264,16 €	86.197,11 €	99.121,75 €	115.775,98 €	161.612,83 €	170.345,03 €	148.718,18 €	50.634,25 €	113.437,40 €	
Total	1.658.908,11 €	1.458.688,02 €	1.671.671,15 €	1.857.756,73 €	1.976.921,63 €	2.169.331,74 €	2.642.415,69 €	2.719.506,85 €	2.839.412,36 €	2.056.372,53 €	1.713.322,09 €	2.864.226,36 €

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Janeiro	21,75%	-27,40%	54,21%	0,34%	5,66%	34,34%	16,37%	-16,63%	21,63%	-64,31%	41,66%
Fevereiro	-17,11%	11,04%	-6,26%	0,06%	28,23%	26,29%	20,86%	21,98%	-12,79%	-84,20%	493,68%
Março	-9,77%	44,02%	-18,39%	32,86%	0,43%	30,05%	-10,09%	1,13%	-8,70%	-66,17%	266,41%
Abril	-18,11%	38,65%	8,68%	-7,59%	15,68%	15,73%	8,21%	13,78%	-22,22%	-63,60%	263,52%
Maio	-16,32%	3,28%	19,81%	-6,52%	37,67%	27,46%	9,83%	1,15%	-18,13%	-48,91%	139,38%
Junho	-12,18%	-6,14%	16,62%	23,43%	14,60%	3,77%	16,77%	-9,80%	-13,55%	-24,12%	58,91%
Julho	-1,65%	26,55%	31,88%	-3,52%	-7,34%	27,28%	5,17%	3,46%	-24,23%	-6,57%	66,38%
Agosto	-7,35%	-4,25%	15,25%	10,30%	15,00%	1,99%	18,71%	0,26%	-40,22%	25,48%	40,84%
Setembro	-12,11%	24,86%	-3,64%	8,32%	34,98%	6,56%	-0,24%	10,92%	-40,58%	40,99%	63,39%
Outubro	-0,21%	28,32%	-8,72%	19,25%	-17,02%	50,58%	-14,74%	10,12%	-47,35%	37,80%	32,94%
Novembro	-7,08%	8,70%	31,53%	7,67%	1,86%	15,80%	-31,49%	56,52%	-61,30%	199,51%	7,14%
Dezembro	-42,20%	23,72%	-2,34%	14,99%	16,80%	39,59%	5,40%	-12,70%	-65,95%	124,03%	-100,00%
Total	-12,07%	14,60%	9,94%	7,57%	9,73%	21,81%	2,92%	4,41%	-27,58%	-16,68%	

Disclaimer: The remaining necessary data for the model's construction was directly incorporated in the proposed model excel fi