Lisbon School of Economics & Management
Universidade de Lisboa

MASTER

Management and Industrial Strategy

MASTER´S FINAL WORK

Dissertation

The Influence of Inventory Management on Supplier Portfolios – A Case Study in the Social Sector

Afonso Arez Dias de Cintra Seromenho

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Supervision

José Novais Santos

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Abstract

This dissertation seeks to identify the influence that inventory management has on supplier portfolios, considering procurement strategies, supplier selection processes, and buyer-supplier relationships. With this aim, a case study was developed within a social sector context using an institutional entity, namely Santa Casa da Misericórdia de Albufeira. A seven-step framework is proposed, comprising phases for both the implementation of innovative inventory management strategies and the optimisation of purchase processes and the current supplier portfolio, emphasising the need for efficiency gains and cost savings.

The identification of consumption rates and the consequent implementation of inventory optimisation strategies that leverage higher control and expenditure efficiency is heavily influential on a company's supplier portfolio. Centralisation and standardisation are commonly implemented inventory management strategies that generate a restructuring of the consumption framework, which must be accompanied by an adjustment of the supplier base. Other inventory-related ideologies, such as regularity in purchase orders and reduced unnecessary interactions with suppliers, can improve buyer-supplier relationships. Furthermore, insights generated by effective inventory management processes influence supplier criteria that consequently dictate future restructures in supplier portfolios.

Keywords: inventory; procurement; supplier selection; buyer-supplier relationships; supplier portfolio; cost management

Resumo

Esta dissertação procura identificar a influência que a gestão de inventário exerce sobre os portefólios de fornecedores, considerando estratégias de compras, processos de seleção de fornecedores e relações comprador-fornecedor. Com esse objetivo, foi desenvolvido um estudo de caso no contexto do setor social utilizando uma entidade institucional, nomeadamente a Santa Casa da Misericórdia de Albufeira. É proposto um modelo de sete fases, que compreende etapas tanto para a implementação de estratégias inovadoras de gestão de inventário como para a otimização dos processos de compra e do portefólio de fornecedores atual, enfatizando a necessidade de ganhos de eficiência e redução de custos.

A identificação das taxas de consumo e a consequente implementação de estratégias de otimização de inventário, que potenciem um maior controlo e eficiência nos gastos, exercem uma influência significativa sobre o portefólio de fornecedores de uma empresa. A centralização e a estandardização são estratégias de gestão de inventário frequentemente implementadas que originam uma reestruturação do modelo de consumo, a qual deve ser acompanhada por um ajustamento da base de fornecedores. Outras abordagens relacionadas com o inventário, como a regularidade nas encomendas e a redução de interações desnecessárias com fornecedores, podem melhorar as relações entre comprador e fornecedor. Além disso, os dados obtidos através de processos eficazes de gestão de inventário influenciam os critérios de seleção de fornecedores que, por sua vez, determinam futuras reestruturações nos portefólios de fornecedores.

Palavras-chave: inventário; compras; seleção de fornecedores; relações comprador-fornecedor; portefólio de fornecedores; gestão de custos

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Glossary

FIFO – first in, first out

IPSS – private social solidarity institution

OASF – Olhos de Água Social Facility

SCMA – Santa Casa da Misericórdia de Albufeira

SR – Social Response

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1. Introduction

A large body of literature regarding inventory management focuses on framing the topic in an environmental, engineering, and energy context (Munyaka and Yadavalli, 2022), completely overlooking the significance it plays in social sector enterprises. Furthermore, when research studies are performed regarding buyer-supplier relationships, researchers tend to focus on analysing singular relationships, downplaying the importance of the interdependencies between the supplier portfolio in its entirety (Olsen and Ellram, 1997; Wagner and Johnson, 2004). Hence, this study intends to target not only the lack of research on both individual concepts but also to delve into the association between the two topics, a field of literature that requires significant attention due to the lack of developed studies.

Inventory has strategic importance in overall performance, as it can represent a significant portion of a company's total expenses (Munyaka and Yadavalli, 2022). Portfolio approaches to supplier analysis, in the supply chain and purchasing management context, leverage the efficient allocation of scarce resources (Dubois and Pedersen, 2002), which can also directly impact a company's performance (Wagner and Johnson, 2004). Therefore, understanding the in-depth relationship between the two concepts can generate insights into how managers should implement inventory management strategies to optimise the restructuring of the current supplier portfolio to improve overall performance, especially through cost savings.

Acknowledging that the identification of an association between inventory management and supplier portfolio is the primary objective of this final master's work, a case study was developed using an institutional entity belonging to the social sector, namely Santa Casa da Misericórdia de Albufeira. A seven-step framework is proposed, comprising phases for both the implementation of innovative inventory management strategies and the optimisation of purchase processes and the current supplier portfolio. The latter adjustments were only possible due to the insights generated in the early phases of the framework, through the discovery of consumption rates and the implementation of certain inventory ideologies, especially centralisation and standardisation.

In the following chapters, the relevant literature will be presented, comprising five key topics of the dissertation: inventory management, procurement practices, supplier selection, buyer-supplier relationships, and supplier portfolio management. Posteriorly,

the case study description outlines the implemented framework, subdivided into a seven-step process, within the defined environmental context. Finally, the discussion chapter presents a comparative analysis between the relevant literature and the case study, followed by the conclusion of the final master's work.

2. Relevant Literature

2.1.Inventory Management

Onkundi and Bichanga (2016) classify inventory management as the control of the regular movement of items from allocated storage warehouses. The number and location selection of such warehouses tasked with maintaining in-house inventory, as well as the levels of existing inventory, are aspects embedded in inventory deployment decisions (Shapiro and Wagner, 2009). Munyaka and Yadavalli (2022) categorise overseeing and establishing inventory levels at the lowest cost while maintaining, or improving whenever possible, the provided customer service levels as a primary objective of inventory management. Inegbedion *et al.* (2019) argue that offering higher customer service levels at a minimum cost enables a company to enhance the management of existing inventory levels by facilitating informed decisions related to inventory management. The authors define inventory level as the rate at which items flow in and out of established storage-keeping units.

Inventory management has suffered much scrutiny in the past decades. Factors influencing inventory management decisions and goods storage levels have always been the focus of developing inventory models. Demand, product and warehouse tangible characteristics, as well as cost structure assumptions, differentiate existing inventory management models (Inegbedion *et al.*, 2019). Inventory models primarily depend on demand characteristics and can be categorised into deterministic and stochastic demand models (Munyaka and Yadavalli, 2022; Inegbedion *et al.*, 2019). Inegbedion *et al.* (2019) categorise stochastic demand models with uncertainty in demand and re-stock periods. According to Munyaka and Yadavalli (2022), demand uncertainty can lead to high inventory levels, increased holding costs, and lower customer satisfaction. The authors suggest that deterministic inventory demand models are developed based on specific variables and can be subdivided into independent and dependent deterministic demand models. Single-period and multi-period inventory models can be classified as

independent demand, deterministic models. The former accounts for perishable goods that, when not consumed within a specified period, lose most or all of their value and must be discarded from inventory (Munyaka and Yadavalli, 2022).

According to Inegbedion *et al.* (2019), the latter considers items, mainly stock leftovers, that, when not consumed, can be stored and used later if needed. Munyaka and Yadavalli (2022) subdivided multi-period, independent demand, deterministic inventory models into fixed-order quantity systems and fixed-time period models. The authors suggest that the former system is based on equal-order quantities at non-equal ordering periods, given that the purchase order is placed at the quantity re-order point, which has no predefined time. Inegbedion *et al.* (2019) propose two inventory models, Economic Order Quantity Models and Reorder Point Models, which are based on the same premises as the fixed order quantity systems presented by Munyaka and Yadavalli (2022). Fixed-time-period models involve placing different quantity orders whenever the predefined inventory review period occurs (Munyaka and Yadavalli, 2022). Material Requirements Planning (MRP) is the most commonly used inventory model, characterised by demand uncertainty (Jonsson and Mattsson, 2008).

Inventory management can occur across multiple warehouses within a company or various locations within a single facility (Onkundi and Bichanga, 2016). Milewski (2020) suggests that choosing between a centralised or decentralised storage and distribution strategy is at the epicentre of the battle between storage, transport, handling costs and lost sales. Lower revenues connected with inventory aspects can arise due to lower stock availability. The author concluded in his proposed research that a centralised strategy could lead to higher levels of consumer satisfaction, resulting from higher stock availability.

Milewski and Wiśniewski (2022) revisited the previous work of Milewski (2020), advocating that centralisation strategies may not be optimal if the held items are of high unitary value. The authors suggest that such situations, considering a company's total inventory, especially the safety stock percentage, which decreases when the number of established warehouses diminishes, can lead to higher inventory maintenance costs, consequently lower stock availability, and generate lost sales. Despite centralisation strategies reducing fixed costs by lowering the number of physical facilities and allowing for greater control, Pedersen *et al.* (2011) suggest that medium and small companies may not fully grasp the advantages of centralisation due to limited in-house resources,

especially skilled labour. Milewski and Wiśniewski (2022) highlighted that in the case of supply-chain internal environmental disruptions, decentralisation of held inventory can lower risks and costs.

2.2.Procurement Practices

According to Novack and Simco (1991), procurement encompasses all actions necessary to obtain goods and services that align with identified consumer requirements. Jama and Mohamud (2022) strongly advocate procurement practices that, when implemented effectively, positively correlate with companies' overall performance. Furthermore, the authors concluded that effective procurement practices lead to the acquisition of high-quality products and services, the development of key partnerships with suppliers, and the attainment of competitive advantages. The primary objective of procurement practices is to implement and manage the various bilateral channels between supply chain members, enabling supplier-buyer exchanges (Novack and Simco, 1991).

In the public sector, the development of buyer-supplier relationships is strongly and positively correlated with procurement performance (Changalima *et al.*, 2022). However, Landale *et al.* (2017) suggest that government-based procurement is typically time-consuming due to the meticulous regulations that aim to ensure transparency and fairness. Transparency in government procurement aims to fairly and equitably adjudicate contracts, thereby minimising corruption (Raymond, 2008). Nevertheless, opportunism and unethical behaviour are common aspects of today's world. Hawkins *et al.* (2011) suggest that managers of non-profit companies tend to have more opportunistic behaviour and wilful ignorance when compared to the leadership of for-profit companies.

Procurement processes and strategies have recently garnered attention from researchers due to their importance to a supply chain's functionality. Novack and Simco (1991) propose four procurement activity groups: (1) planning, (2) implementation, (3) control, and (4) environmental activities, which are subdivided into eleven specific procurement activities that maximise value for the supply chain. Planning is comprised of eight procurement activities that represent the timeline till selecting a specific supplier (identify new or reevaluate existing needs, establish consumer requirements, decide on whether to produce in-house or outsource, identify the required type of purchase, develop a supplier availability-based market analysis, define a poll of all existing suppliers capable of satisfying the need, filter the supplier poll, and evaluate the remaining suppliers).

According to Gambo and Musonda (2021), planning involves identifying the prerequisites for enhancing the quality of the procurement process. The implementation group includes the selection of the supplier and the trial run conducted by the supplier to meet consumer requirements, which also entails developing the buyer-supplier relationship. Control activities are limited to the post-trial supplier performance evaluation and ensuring that the buyer's needs are fully satisfied. Environmental procurement practices represent the analysis of both internal and external factors that may influence the procurement process.

2.3.Supplier Selection

Taherdoost and Brard (2019) conceptualise supplier selection as the process by which firms identify, evaluate, and contract with suppliers. Supplier selection plays a fundamental role in a firm's strategic decision-making process when the intended buyer-supplier relationship is based on mutual performance improvements and is long-term in nature (Thiruchelvam and Tookey, 2011). Hosseininasab and Ahmadi (2015), as great advocates of supplier selection being a long-term strategic decision, suggest that selecting a supplier should not consider only present characteristics and factors. Analysis of past occurrences and trend-based predictions can strongly indicate whether a supplier can optimise a firm's supply chain. Despite thorough examination, supplier selection will always carry risks, which positively correlate with the intended returns extracted from the supplier relationships (Mokhtar *et al.*, 2019).

According to Cheraghi *et al.* (2011), a practical supplier evaluation and selection process is of great relevance as the number of potential suppliers and the number of selection criteria increase. Handfield *et al.* (2009) advocate that supplier evaluation and selection processes require a significant managerial commitment and substantial resource allocation. The author suggested a seven-step process, ranging from (1) identifying the need for supplier selection by predicting future purchasing needs, (2) establishing the purchaser-relevant sourcing requirements, (3) developing the purchasing strategy, (4) identifying the potential suppliers, (5) diminishing the number of potential suppliers into a small list of higher value candidates, (6) establishing the supplier selection method for the suppliers that surpassed the previous step, (7) selecting the intended suppliers.

De Boer *et al.* (2001) considered the diversity and complexity of procurement situations to be essential factors in supplier selection processes. Surpassing the simplicity

of Kraljic's (1983) purchasing situations categorisation matrix, the author offered a supplier selection framework that assists in developing a successful supplier selection process while confronting it with different purchasing situations. De Boer *et al.* (2001) considered various purchasing situations along the horizontal axis, including new task situations, leverage and routine items, and strategic/bottleneck items. The vertical axis represents the four-step supplier selection process used by the author, namely (1) identifying the purchaser's intended goals with supplier selection, (2) establishing the selection criteria, (3) a primary filtration of promising suppliers, and (4) selecting the actual desired suppliers.

Supplier selection criteria studies can be traced back to the twentieth century, when they were conceptualised as vendor selection. This subject has been a primary focus among many researchers over the years and has undergone substantial development as the needs and markets change. Dickson (1966) constructed a list of twenty-three selection criteria, that served as foundation for many posterior researches, based on the aggregation of criteria highlighted on a self-developed questionnaire regarding the analysis of three independent factors, existing rating systems, retained performance information regarding already used suppliers, and circumstances that could lead to overriding a low quotation. The author assigned a rating to each attribute based on the frequency of its mention in the conducted survey. The ability of the supplier to meet, in a consistent manner, the buyer's quality requirements was categorised as extremely important, followed closely by the supplier's ability to fulfil delivery timelines. Despite the tendency to use net price at the time as a single criterion for selecting suppliers, the factor ranked sixth on Dickson's (1966) list, given its low score in terms of the frequency of factors that could override a low bid and the supplier's retained information.

Both Cheraghi *et al.* (2011) and Thiruchelvam and Tookey (2011), by reviewing twenty-first-century subject-related articles, extended the initially developed criteria list by Dickson (1966), introducing new criteria that account for the satisfaction of recent buyer and market needs. The authors highlighted reliability, flexibility, long-term relationships, product development, and integrity as vital supplier characteristics. A shift from traditional criteria has occurred over the last few decades, as suppliers have begun to be viewed as key members of the supply chain and instrumental to a firm's overall performance.

2.4.Buyer-Supplier Relationships

Gullett *et al.* (2009) conceptualise buyer-supplier relationships as exchange-based business partnerships with reciprocal trust as the cornerstone of the relationship**.** The bilateral behaviour between buyers and suppliers, as well as subsequent attributes that underpin the type of buyer-supplier relationship developed, represents a significant influential force in supplier management (Wagner and Johnson, 2004). Such typologies have received immense attention from researchers, as their underlying importance in managing supplier portfolios and exchange-based relationships becomes apparent (Tangpong *et al.*, 2008). Companies have multiple singular relationships with suppliers based on the number of outsourced products and activities. The strength and thriving of such relationships depend on their closeness to core competencies and the application of resources by either party. Ford (1980) is a strong advocate of developing relatively close relationships with suppliers, rather than maintaining an overly diversified supplier portfolio, when the outcome of such relationships yields significant financial benefits.

Tangpong *et al.* (2008) suggested that buyer-supplier relationships are based on two key attributes: relational and power dependence. Tangpong *et al.* (2015) later concluded that relationships based on power-dependence approaches are vastly outnumbered by relational-based relationships, where collaboration and trust play a key role in today's current globalised market. Using relational and power-dependence approaches as guidelines, Tangpong *et al.* (2008) proposed four buyer-supplier relationship typologies: market relationships, power relationships, autonomous-link relationships, and constrained-link relationships. Market and power relationships have a higher power-dependence aspect, as both types revolve around individualistic and opportunistic behaviour, diminishing the possibilities for long-term performance improvement. Autonomous-link and constrained-link relationships are based on relational exchanges where collaboration and mutual empowerment serve as pillars to continuous overall business success. Tangpong *et al.* (2015) proposed a three-variable analysis in the categorisation of eight buyer-supplier relationships: (1) voluntary collaboration, (2) buyer-led collaboration, (3) bilateral partnership, (4) supplier-led collaboration, (5) supplier-dominant relationships, (6) win-lose partnerships, (7) buyer-dominant relationships, and (8) discrete relationships. The authors used relationism, buyer dependence, and supplier dependence as the pillars of the suggested three-dimensional categorisation matrix. Typologies (1), (2), (3), and (4) have high relationism levels, while

typologies (5), (6), (7), and (8) are at the other end of the spectrum. The buyer-supplier relationships (3), (4), (5), and (6) are all categorised with high levels of buyer dependence, and the typologies (2), (3), (6), and (7) have high levels of supplier dependence.

Similar to supplier selection, the development of buyer-supplier relationships can be a thorough process that significantly influences a company's performance. Ford (1980) proposes a five-step process of buyer-supplier relationship development, ranging from (1) the pre-relationship stage, (2) the early stage, (3) the development stage, (4) the long-term stage, and (5) the final stage. To characterise the process stages, the authors used a multi-variable approach, based on factors such as experience from past and existing relationships, uncertainty regarding new potential costs, and the perceived distance between buyer and supplier.

While buyer-supplier relationships have undergone extensive scrutiny in the past decades, the concepts of power and interdependence have been closely associated as common influencing factors (Cox, 2004). The concepts of power and interdependence between buyer and supplier are strongly interconnected. Caniëls and Gelderman (2005) conceptualised relative power from one party in the relationship towards the other as a consequence of interdependence asymmetry. Asymmetric interdependence represents a partnership where either the buyer or supplier is overly dependent on the other, which can lead to opportunistic behaviour by the empowered entity (Jambulingam *et al.*, 2011; Kobayashi, 2023). In contrast, Caniëls and Gelderman (2005) defined total power as an outcome of interdependence symmetry, representing a trust-based and cooperative relationship between buyer and supplier. Jambulingam *et al.* (2011) conceptualise symmetric interdependence as an equal-dependence partnership.

2.5.Supplier Portfolio Management

In general, portfolio approaches analyse an investment's expected return while accounting for internal and external environmental risks (Markowitz, 1952). Liao and Hong (2007) argue that portfolio theories can be applied in a wide range of situations and management areas. There is no mandatory connection between the portfolio concept and any other subject for the former to be correctly applied. In supply chain and purchasing management, the development of portfolio analysis is frequently employed to support decision-making regarding the allocation of a company's scarce resources (Dubois and Pedersen, 2002). Wagner and Johnson (2004) emphasise the importance of using portfolio

approaches, given the significant implications that suppliers have on a company's performance.

Olsen and Ellram (1997) have constructed a portfolio model as a supporting tool for managing supplier relationships. The authors felt the need to develop such a model due to the lack of prior research studies that fully account for the interdependencies and their varying levels of strength between different entities. Interdependence-based relationships represent a significant leveraging tool for buyers to improve the supply structure and optimise product development phases, according to Kobayashi (2023). While Olsen and Ellram (1997) focused on developing a portfolio approach from a purchasing relationship perspective, Wagner and Johnson (2004) intended to deepen the concept of supplier portfolio by investigating its influence on a company's value creation. Surpassing the simple correlation between supplier relationships, portfolio approaches, and purchasing situations, Wagner and Johnson (2004) advocate for the importance of the sustainable and continuous development of strategic supplier portfolios.

A portfolio model is proposed by Olsen and Ellram (1997) to understand supplier relationships and the consequent development of action plans. The authors developed a three-step approach to achieve the mentioned research objectives. The first step is based on understanding the firm's current purchases and the posterior categorisation of such purchases, allowing the identification of the firm's specific optimal supplier relationship for each type of purchase. The second step aims to analyse the company's current supplier relationships and categorise these relationships accordingly. The third step involves constructing action plans to enhance the firm's current management of its supplier portfolio. To categorise the firm's current purchasing situations, Olsen and Ellram (1997) suggest two dimensions, namely the difficulty of managing purchasing situations and the strategic importance of the purchase. Nellore and Söderquist (2000) argue in favour of a positive correlation between the two dimensions, more specifically, the more difficult it is to manage the purchasing situation, the greater is its strategic importance for the firm. Purchasing situations on the Olsen and Ellram (1997) matrix can be categorised into four types: bottleneck, strategic, non-critical, and leverage. The primary goal in leverage purchasing situations is to develop long-term and mutually respectful supplier relationships. Given the low significance of the non-critical group regarding both dimensions, its main objective is to reduce administrative costs. Regarding the strategic and bottleneck categories, both aim to provide a greater sense of involvement to the

supplier in the product development stages, allowing for the reduction of operational and poor performance costs.

As the ideal types of supplier relationships for different purchasing situations are identified, Olsen and Ellram (1997) propose a second matrix. To understand how a company manages its current supplier relationships, the authors suggest utilising two dimensions to categorise such relationships: the strength of the buyer-supplier relationship and the supplier attractiveness. Tóth *et al.* (2020) recommend optimising attractiveness for any supplier that desires to acquire new customers or enhance existing relationships, due to the positive correlation between attractiveness and relationship-specific investments.

In step three, Olsen and Ellram (1997) develop strategies to transform the firm's current supplier portfolio, categorised in step two, into the ideal relationships identified in step one. Three action plan groups are suggested, depending on the allocation in the second matrix. For relationships where the supplier has high attractiveness, the authors suggest that a firm should allocate a larger amount of both financial and human resources to convey to the supplier the desire to improve the relationship. An analysis should be conducted to determine whether a company should change suppliers in cases where suppliers have low levels of attractiveness. The third group serves as a strategy to obtain the required capital for the plans of the previous groups based on the reduction of the allocated resources into the relationships that have the lowest potential.

The expansion of portfolio models in the supplier relationships spectrum has gained relevance as firms focus on their core competencies by outsourcing non-essential activities (Vonderembse and Tracey, 1999). Suppliers have a significant impact on product development and are influential to a firm's overall success. Wagner and Johnson (2004) conceptualised strategic supplier portfolio management as managing a network of supplier relationships, acknowledging that each supplier serves a specific purpose and benefits a firm singularly, allowing the achievement of a non-ideal but optimised supplier base. To sustain the previous ideologies, the authors developed a three-step process for configuring and managing strategic supplier portfolios. The first step is intended to create portfolio planning activities. Wagner and Johnson (2004) focus on identifying the firm's specific target supplier base and developing strategies for managing each future supplier relationship. The second step of the process aims to execute the developed plan and implement the strategic supplier portfolio, which comprises three sub-activities:

optimising the firm's current supplier base, developing new suppliers, and integrating existing suppliers. The final step focuses on monitoring and controlling the implemented supplier portfolio. According to Ittner *et al.* (1999), a lack of monitoring strategies in the supply chain is strongly linked to low product quality and weaker long-term relationships.

2.6.*Conceptual Framework*

Regarding the efforts to associate the impact that inventory management strategies have on a company's supplier portfolio, a comprehensive analysis of the relevant literature was conducted on five crucial topics: inventory management, procurement practices, supplier selection, buyer-supplier relationships, and supplier portfolio management. Inventory management, oversight of individual buyer-supplier relationships, and supplier portfolio management are integral to a company's day-to-day operations. While these functions occur continuously and require constant managerial resources, buyer-supplier relationships and portfolio management, in particular, are highly influenced by the adoption of new procurement strategies and the selection of new suppliers. These evolving practices not only reshape existing buyer-supplier relationships but also impact how companies define supply structures. Figure 1 provides a brief summary of the theories and frameworks presented by various authors for each of the five outlined topics.

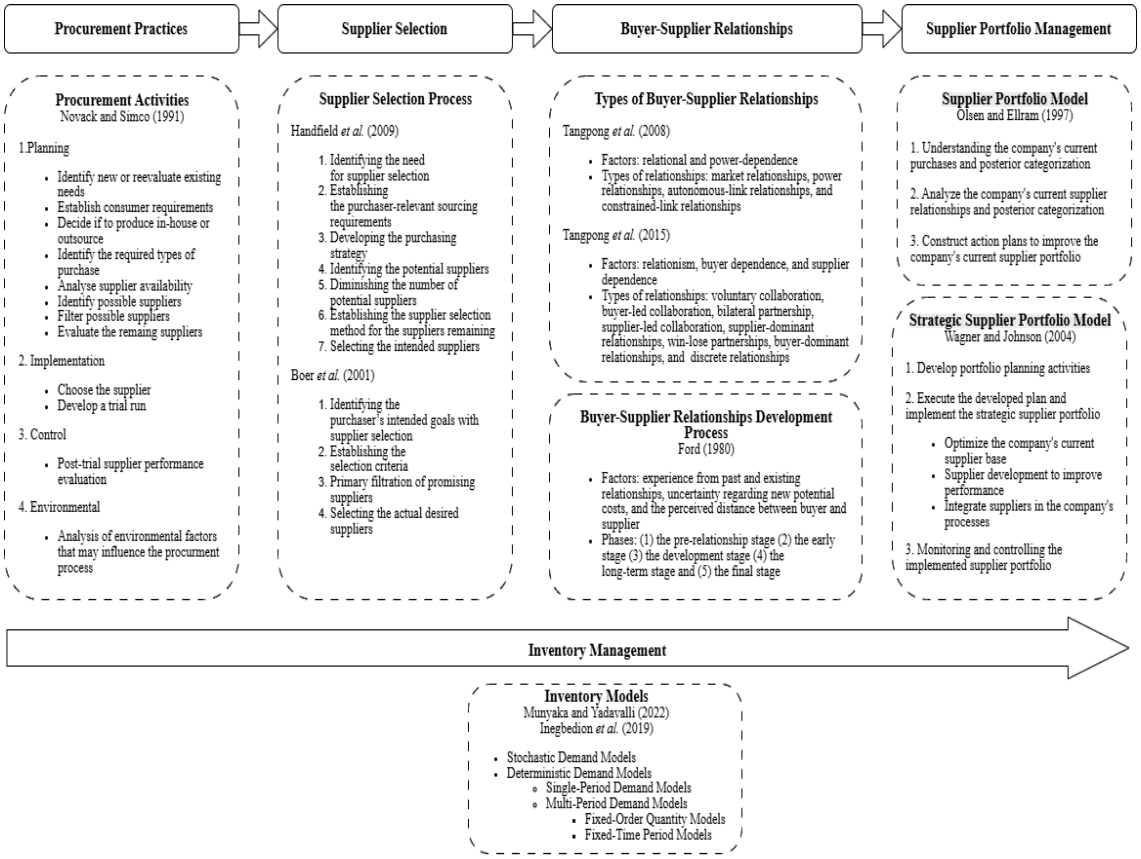

FIGURE 1 - RELEVANT LITERATURE FRAMEWORK

3. Methodology

Considering the primary objective of the dissertation, which is to analyse how inventory management affects supplier portfolios, the choice of using a case study as the methodological approach appeared natural. This approach leveraged the generation of insights from an in-depth analysis of a contemporary and complex relation within a real-life application of the social sector. In practice, the use of a case study enabled a more comprehensive investigation, spanning from the observation of existing inventory management strategies to the impact that adjustments in such strategies have on supplier portfolio management and the development of optimisation proposals, as well as their effectiveness.

The "how" research question may not be a decisive criterion for selecting a research design, as it relates to multiple research designs. According to Saunders *et al.* (2023), the research design outlines the thought process that grounds the answer to the research question, which can take various forms: exploratory, descriptive, explanatory, evaluative, or combined. Moreover, when the description of a situation or environment is

viewed as a contextual step in explaining the relationship between two elements, the research design can be categorised as a descriptive-explanatory study (Saunders et al., 2023). Aligned with the latter research design, this dissertation, drawing on relevant literature as a reference, aims to explain how inventory management practices and subsequent adjustments can influence supplier portfolios. Prior to presenting the association between the two concepts, a description of the institution's current inventory management scenario is provided to serve as a baseline for the outlined implemented strategies.

The investigation is based on a qualitative analysis, focusing on understanding and interpreting the outcomes generated in the supplier portfolio by transforming the inventory management system. At the same time, some quantitative elements are used to support the analysis, the core of the case study lies in conceptualising from contextualized and purposeful data, rather than using probabilistic and statistical methods.

The data collection process is primarily based on participant observation, as the researcher was previously immersed in the institution's contextual setting. Such involvement facilitated the sharedness of information and collection of primary data from key stakeholders through a series of documentary requests and in-field observation, which accounted for three to four months of the total time spent developing the study. Structured secondary data was also gathered from systematically updated analysis tools and continuous interactions, improving the completeness and quality of the investigation.

The analysis of the collected data followed a qualitative and interpretative approach, strengthened by the researcher's participation in the investigated process. Hence, participant observation, supported by documentary evidence and structured secondary data analysis, allowed the generation of significant insights that created the required conditions to associate the concepts of inventory management and supplier portfolio.

4. Case Study

4.1. Introduction

Santa Casa da Misericórdia de Albufeira, hereinafter referred to as SCMA, is classified as a private social solidarity institution (IPSS) and is headquartered in the city

of Albufeira. The institution was founded in 1499 and was a pioneer in its field for many years, being one of the first to be established. As its mission, the SCMA has placed upon itself the responsibility of serving others, who are in a situation of social vulnerability or other possible difficulties. In response to the social needs of the Algarve, and more specifically, the community of Albufeira, the institution has designed, developed, and constructed numerous facilities and structures that serve as social responses to address those same needs. The SCMA has focused its efforts on seven main areas of activity: childhood and youth, family and community, senior, mental health, disability and incapacity, training and employability, and projects. Each of these action fields is comprised of multiple social responses with unique and specific goals.

The work agenda was centred on improving the institution's existing inventory management system, which would require adapting to every social response due to the various specific needs and functional requirements. To provide a comprehensive and fact-based case study, the design, development, and implementation of the inventory management system at the Olhos de Água Social Facility, hereafter referred to as OASF, will be discussed in detail in this dissertation. Since inventory adjustments have great effects on purchase and supply chain decisions, it will also be approached the impacts that this management system had on the purchase process and consequently in the supplier portfolio and supplier relationships, both from a micro (specific to the OASF) and macro point of view (the institution as a whole). The choice of using the OASF as the epicentre of this case study was because it was the first structure within the institution to undergo changes regarding these topics. Additionally, the inventory management system's stages, design, development, and implementation are complete, and it is now in the compliance and improvement phase. Regarding the consequent adjustments in the purchase process and supplier portfolio, significant improvements were achieved, and therefore, it will be possible to thoroughly analyse the outcomes of the newly developed system.

Before diving into the management system itself, it is essential to provide some context for the OASF and its components. The facility, which was first opened a year ago and has only six months of full-capacity functioning experience, consists of four social responses: a daycare (social response, or S.R., number 1), a home support service (social response, or S.R., number 2), a day center (social response, or S.R., number 3), and a residential structure for elderly people (social response, or S.R., number 4). The SCMA has another social response, specifically another daycare (social response, or S.R.,

number 5), located less than one kilometre away from this facility. Therefore, regarding the inventory management system and the purchase process, we approached the subject, as there were five social responses in the OASF. The structure features an in-house kitchen and laundry that serve both the facility and S.R. 5, providing some operational independence from the rest of the institution.

SCMA, despite all its years of experience, had no functioning inventory management system, which was seen as a great opportunity for developing new ideologies and revolutionary strategies for the institution. One of the most significant disadvantages of the non-existent management system was the constant stock ruptures, as the concept of safety stock was unknown and unused. The purchase process was based on an ideology of buying only when necessary and quantities that seemed necessary. Inventory deviations, misalignments between purchase orders and the actual goods received, inefficient consumption levels, and excessive costs and waste were also significant consequences, as there were no established inbound and outbound goods control processes.

Observing and identifying the facility's main weaknesses enabled the design, development, and implementation of an inventory management system that effectively addressed them. Improvements in the purchasing process and subsequent adjustments to the supplier portfolio occurred only after the management system was fully implemented and consumption rates were regularised. The primary objective of the newly implemented inventory management system was to shift the previous purchasing philosophy of making purchases solely when necessary by creating a system that automates the purchasing process. Nevertheless, this was only achievable through the definition of consumption rates, centralisation of the facility's inventory, and control of all goods entering and exiting that centralised warehouse. The implementation was divided into seven phases, ranging from discovering the individual consumption rates of each social response and the OASF's consumption aggregate, identifying storage warehouses, developing an inbound and outbound goods control process, and designing the restocking process, to improving both the facility's and the institution's current purchasing processes and supplier portfolio.

4.2. First Phase: Discover the actual consumption rates for each of the social responses

The decision to first determine the consumption rates for each of the five social responses rather than the facility was made because each of them represents an independent analytic centre with its own financial and accounting tools, influenced by different procedures, social security rules, functional requirements, user targets, and consumption needs.

Given that the facility has been open for less than a year, there was no data from previous years to serve as guidance. Therefore, as the first step of this phase, and prior to discovering the actual consumption rates, it was necessary to identify all varieties of products consumed in the facility. This task was complicated by the absence of a central warehouse designated for the storage of consumable goods, resulting in the dispersion of natural storage across multiple rooms. The identification of all product varieties consumed by each social response was achieved not only through extensive meetings with the colleagues responsible for operational management, but also through regular visits to old storage rooms. Nevertheless, due to significant fluctuations in patient numbers, and despite the creation of multiple initial lists of the varieties of consumed products, ongoing adjustments are required to meet the ever-changing needs of each social response. A key insight gleaned from this variety assessment, which would later heavily influence decisions regarding the purchasing process, was the lack of product standardisation. This suggests that identical needs, despite being addressed in different social contexts, were fulfilled with distinct products. Standardisation of products across multiple departments, here referred to as social responses, not only enhances shared resources but also increases negotiation power with suppliers.

The second step of the first phase was to identify, after knowing what each social response consumes in terms of quality, what they consume in terms of quantity. The difficulty level of performing this task was emphasised again by the lack of historical consumption data, and therefore, an estimation was made based on the inputs provided by colleagues in charge of each social response for the levels of consumption of every variety of product consumed. Considering that the estimations could be inaccurate, a centralised inventory warehouse for each social response was temporarily established to verify them, where the respective weekly consumption level of every product was supplied. At the end of the established timeline, an inventory of the centralised

warehouses was conducted and compared with the quantities at the beginning. Given that establishing consumption levels based solely on one experimental week cannot be considered sufficiently accurate, this process was conducted over four weeks, allowing for the acknowledgement of possible consumption fluctuations. Once the experimentation period was concluded, a weekly average consumption level for every product per social response was calculated.

Nevertheless, as the lists of varieties consumed by each social response suffer constant adjustments, the same is expected for the good's consumption levels. Therefore, constant inventories are maintained, and calculations are made to proactively identify and execute any necessary adjustments, both regarding the quality and supplied quantity of each product.

4.3. Second Phase: Discover the actual consumption rate for the whole OASF

Once the consumption rates for each social response were established, the OASF's consumption rate could be calculated by aggregating all the singular rates. It was necessary to convert all the different consumption timeframes into monthly periods to equalise the institution's purchase regularity. The high levels of complexity and the extensive nature of the facility's consumption list, when compared to a singular social response list, initially represented a significant management challenge. However, the completion of this macro list leveraged the development of tools that would allow the automation of the purchase process. Moreover, supported the comparison of consumption patterns between the multiple social responses outside the OASF, providing significant insights for possible cost and waste reduction measures.

4.4. Third Phase: Identify the rooms allocated solely for storage

As previously mentioned, the OASF had no designated warehouse for storing consumed goods, and therefore, allocating one was seen as a priority to centralise all the products that would later be used to satisfy the needs of the social responses.

When initially presented to managers and operatives, the centralisation strategy was not welcomed gladly because, despite acknowledging that waste and cost levels were high, they were accustomed to a certain level of independence that would decrease if inventory management suddenly required a multi-party effort to succeed. To diminish the

sense of loss of independence and to increase openness to innovation, it was necessary to demonstrate the great opportunities that this strategy could generate, such as the sharedness of products and savings that could leverage the investment in new equipment. The latest inventory management system was designed by having the concepts of responsibility and accountability as its main pillars. These two concepts were foreign to the social facility regarding inventory management because the storage rooms were at every employee's disposal for withdrawing any product that seemed necessary.

Table I illustrates all the warehouses and storage units created to serve the employees and users of the respective social responses. There is a hierarchy level from left to right and a non-interconnectivity between rows, which means that a storage unit is supplied exclusively by the storage unit or warehouse immediately to its left.

TABLE I

HIERARCHY LEVEL OF WAREHOUSES AND STORAGE UNITS

1st Line	2nd Line	3rd Line
Centralised Inventory Warehouse	S.R. 1 Storage Unit	
	S.R. 2 Unit	
	S.R. 3 Storage Unit	
	S.R. 4 Storage Unit 1	S.R. 4 Storage Unit 2
	S.R. 5 Unit	

4.5. Fourth Phase: Developing an inbound and outbound goods control process

The inbound and outbound goods control process emerged as a necessary strategy to achieve three main objectives: verify and continuously adjust the previously established consumption rates, hold employees accountable for the improper transfer and use of goods, and accurately and precisely allocate the exact costs of each product consumed by each social response. Both the control processes allowed for the movement of not only purchased goods from suppliers but also, based on the ideologies of saving and sharing, donations and transfers from other social responses. This could occur if a stock rupture occurred and another social response had a surplus of the needed product.

In ideal circumstances, an automated program, which the institution already has at its disposal, would be used to control the movements. However, given the current

employed accounting method, the use of such a program was not feasible. Since changes to accounting methods cannot occur until the end of the fiscal year, the inbound and outbound control processes had to be launched based on Excel-developed maps, which required manual completion.

Regarding the inbound control process, before reaching the map-filling stage, a product verification process was implemented, which occurs at the moment the merchandise is received from suppliers and therefore has not technically entered the facility. This verification process is comprised of two stages. The first relates to the comparison between the purchase order and delivery note presented by either the supplier itself or a transporter, which identifies any disparities between the purchase order and what the supplier claims to have shipped. The second stage of the process involves the physical verification of the received merchandise, allowing for the detection of any discrepancies between the delivery note and the actual items sent. Whenever products of inappropriate quality conditions were sent by the supplier, the allowed employees who received the merchandise should follow an established premise of not accepting the shipment.

An Excel map for the inbound control process was developed to create a historical record of all products that enter the OASF. Therefore, every time a product enters the facility, the “Inbound Control Map” must be filled. The filling of the map is restricted to employees who have access to the centralised inventory warehouse. This choice was made in an effort to establish responsibility and accountability. The “Inbound Control Map” consists of eight columns: date, quantity, purchasing unit, internal product reference, product description, entrance warehouse, delivery note number, and signature. The purchasing unit column was included to account for the consumption conversion factor. Given the ability to purchase products in various forms, it is essential to register not only the quantity of what was purchased but also the form in which it was purchased, such as boxes, packs, or units, as each form has a different price.

The outbound control process begins in the centralised inventory warehouse, which supplies all storage units and common areas of the facility. The primary purpose of this control process is to monitor all product exits from the centralised inventory warehouse, including the quantity and variety of products that are outbound, the entity that will consume them, and the individual who executed the movement.

The above-mentioned process is based on filling out the "Outbound Control Map". The ideology that highlighted its need was based on a change to the facility's purchase process. Instead of creating a purchase order for each social response and supplier, a single purchase order is made for the entire facility per supplier, and the total quantity of purchased goods will be stored in the centralised inventory warehouse. This change not only generated consumption cost reductions given the higher inventory control but also immense administrative savings. Therefore, to ensure a precise allocation of the product's cost, this tool requires that whenever a certain amount of goods is withdrawn from the centralised inventory warehouse, a registration log is kept of who consumes the goods. The "Outbound Control Map" is solely allocated and placed in the centralised inventory warehouse and consists of seven columns: date, quantity, exiting unit, internal product reference, product description, storage unit destination, and signature.

4.6. Fifth Phase: Design the storage unit's restocking process

To prevent simultaneous restocking from different social responses and multiple exits from the centralised inventory warehouse at the same time, a specific restocking day was assigned to each social response, as shown in Table II.

TABLE II

RESTOCKING DAYS PER SOCIAL RESPONSE

Social Response	Restocking Day
1	Monday
2	Monday
3	Tuesday
4	Tuesday
5	Friday

Note: Wednesday and Thursday were not used for restocking purposes, as they were defined as the days for supplier deliveries.

According to the assigned restocking day, each social response should use the stock in the centralised inventory warehouse to satisfy its product needs. The possibility of assigning a specific day for each social response was allowed by the calculation of product consumption rates in weekly, bi-weekly, monthly, bi-monthly, and annual terms.

For example, if S.R. 1 has a product with a predefined weekly consumption rate, that product must be restocked every Monday. However, if the product has a defined monthly consumption rate, it should be restocked only on the first Monday of every month.

The restocking amount of each product is not the established consumption quantity. Due to the need to consider consumption variations, the restocking amount was established as the difference between the stock in storage units and the established consumption quantities. Therefore, in cases where consumption is lower than initially established, the restocking amount will be proportionally lower. However, in cases where consumption exceeds the initially established level, and considering that the predefined consumption rates include safety stock to prevent ruptures in storage units, social responses must realise an eventual and exceptional withdrawal from the centralised inventory warehouse.

The centralised inventory warehouse and all storage units are managed under the FIFO system. Whenever restocking occurs or a delivery is made, the social response's operational managers must store the newly arrived products in the back of the warehouse or storage units to easily access the older products and consume them first.

4.7. Sixth Phase: Improving the facility's current purchase process

Once the control processes were implemented, the facility's purchase process became the main focus. Despite being highlighted only in the sixth stage of the development process, minor improvements to the purchase process were made throughout the previous stages. The standardisation of similar products, consumed across the five social responses of the OASF, emerged in early phases as a necessary step to reduce product variety and inventory management complexity. However, since the main focus before this phase was on designing the inventory management system, market procurement analysis was not developed. The above-mentioned product standardisation was performed by simply choosing one already-consumed product per consumption purpose, according to two main attributes: price and delivery time benefits. Purchasing centralisation was another strategy implemented to achieve closer and more reliable communication with suppliers, allowing for efficiency improvements and consequently strengthening relationships. This was necessary since most of the institution's social responses, including the OASF, had direct communications with suppliers regarding operational and commercial aspects, which generates information dispersion.

As the next step in optimising the purchase process, an automation strategy was implemented, where the required quantities would be automatically generated according to centralised warehouse inventory. This improvement has eliminated the subjectivity of required quantities, thereby reducing the generation of product surplus compared to the established monthly consumption rates. Given the immense variety of products consumed in the OASF and because its purchase orders would be placed alongside the remaining social responses, it was established that the inventory and purchase orders would be executed on a fixed day per month. This necessity was highlighted due to the complexity and inefficiency of the institution's current purchase process, as well as the lack of capable human resources for managing inventories on a daily basis. The automatically generated quantities to be purchased are calculated by subtracting the in-house inventory from the monthly consumption. However, considering that the inventory is realised ten days before receiving the merchandise, the consumption of the ten-day period was also added to the purchase order. The constant actualisation that this process requires is of significant relevance since it is necessary whenever the supply conditions of a specific product vary. Two types of variation require actualisation, namely the substitution of a product for another with similar technical specifications that serve identical needs, and when a product's consumption rate varies compared to the established value.

The minimum stock, a vital concept for inventory management as enunciates the quantities that signal the need for placing a purchase order, in the institution's case represents a minor role because the adopted purchasing strategy defines that an order would be placed per supplier per month, regardless of whether a specific product is at its optimal reorder quantity. Therefore, purchase orders are placed according to the quantities mentioned in the monthly inventory, which generally equal the minimum quantities to minimise safety stock quantities and holding costs. In situations where the consumption rates suffer downward variations, the minor importance of the concept of minimum stock is highlighted. The institution will continue to place purchase orders, but in lower quantities than if the consumption rate remained as established. On the other hand, if upward variations occur, meaning the quantity in storage on inventory day is lower than established, depending on the variation's strength, stock ruptures can occur if the safety stock is insufficient to compensate for the variation. In these situations, the safety stock of other social responses is used to mitigate the otherwise unsatisfied necessities.

4.8. Seventh Phase: Improve the institution's supplier portfolio management

The primary goal of the seventh phase is to establish and develop more trust-based and mutually advantageous supplier relationships, thereby enhancing the institution's current supplier portfolio. Most of the following adopted strategies had as their initial development point the internal environmental awareness and insights gained in previous stages. Therefore, it is possible to affirm that what was developed and implemented in the OASF served and continues to serve as a pivot point for multiple improvements in SCMA.

Before the development of improvement efforts, the institution had a major problem regarding supplier portfolio management, specifically a lack of qualified human resources to implement procurement strategies that optimised its current supply chain. This issue led to stagnation in product variety consumption and negotiation, resulting in the maintenance of substandard market prices and financial conditions for an extended period. Additionally, whenever a new consumption need appeared, procurement strategies were restricted to portfolio suppliers, neglecting the possibility of a better market opportunity.

The institution's types of purchases consists on five product categories, namely: disposable products (gloves, aprons, shoe-covers, among others), office supplies (comprised of products such as printing paper and writing pens and also didactic products, such as colored pencils and paper, among others), incontinence products (diapers, bed-covers, among others), hygiene supplies (hair and body products, intime hygiene products, among others), and cleaning products (cleaning hardware, disinfectants, among others). To satisfy these needs, SCMA had adopted an overly diversified supplier portfolio strategy, scattering its purchasing power and damaging the development of closer relationships.

Initially, it was defined that the seventh stage would comprise two sub-stages. The first focused on developing procurement strategies within the current supplier portfolio, while optimising the institution's purchase process by rearranging the supply chain structure aligned with a centralisation ideology. The second substage would seek to develop procurement strategies outside the institution's supplier portfolio to identify the optimal market offerings, which is only possible after negotiating the best conditions for the in-house supplier portfolio. Due to its complexity and the time-consuming nature of the efforts, only the first substage will be fully explained in this dissertation.

The institution's supplier selection process was based on four main criteria: financial conditions, quality, delivery time, and customer service. In SCMA's case, financial conditions determine product prices, payment terms, and "rappel", an annual credit note provided depending on the annual billing cycle. Product quality plays a crucial role, given the nature of the institution's end users, which strongly impacts their quality of life. In addition, delivery time is also a major aspect of supplier triage, due to the institution's scarcity of financial resources and lack of storage space, which consequently leads to an inability to maintain an optimal safety stock. Therefore, lacking the ability to continuously maintain a constant delivery lead time, representing a lack of inventory availability, heavily influences the selection process. Customer service is the characteristic that encompasses in-field support from suppliers to ensure optimal product utilisation, consistent and honest communication, and satisfaction of any urgent requests that the institution may have.

Guided by the storage and purchase centralisation implemented in the OASF, a similar strategy was developed for the entire institution. Resources allocated to managing relationships with low-billing suppliers were withdrawn, focusing on developing stronger relationships with the institution's main suppliers. To make this change feasible and advantageous, generating at least 15% in savings per basket of purchased products cost was set as a requirement for choosing the new supplier. This strategy has allowed the institution to optimise its consumption costs and empower negotiation efforts by switching to suppliers offering better financial conditions. The increase in purchase quantity stability and regularity, resulting from reducing ordering quantities to match multiple months of consumption, was a key factor in determining the accurate consumption rates of each social response and enhancing supplier relationships. Implementing a single monthly purchase order per supplier improved the institution's desirability because this strategy directly reduces supplier distribution costs and the management time required.

Before implementing the supplier portfolio optimisation strategies, five main suppliers, illustrated in Table III, satisfied most of the institution's consumption needs. Suppliers 1 and 2 both offer the same scope of products. However, due to quality preferences rather than financial conditions, the purchase of incontinence products was centralised on Supplier 1, while elderly hygiene products were centralised on Supplier 2. The institution also refers to Supplier 2 for the consumption of disposable products for

bacterial protection. Supplier 3 supplies the institution with cleaning products, while Supplier 4 satisfies most of the institution's office supplies and teaching materials. Finally, Supplier 5 is a retail supermarket for businesses where the institution obtains a wide variety of products, ranging from hygiene products to food and cleaning supplies. The consolidation of the supplier portfolio does not pose a high risk of supplier dependency, as a substitute product can usually be sourced within the institution's existing supplier portfolio.

TABLE III

SCOPE OF PRODUCTS SOLD PER SUPPLIER

Supplier ID	Scope of Products Sold
Supplier 1	Incontinence and hygiene products
Supplier 2	Incontinence and hygiene products
Supplier 3	Cleaning products
Supplier 4	Office and teaching supplies
Supplier 5	Household products

Despite the centralisation strategy and changes in the supplier selection process, the number of main suppliers remained unchanged. However, the representative billing of each supplier on the institution's yearly consumption cost underwent alterations. One of the first actions taken was to force the withdrawal of all cleaning products supplied by Supplier 5, and, after extensive negotiations, adjudicate them to Supplier 3. Allowing an increase in the consistency and quality of the supplied products, a quicker delivery time, and better financial conditions. Therefore, by implementing this change and given the achieved conditions in negotiations with Supplier 3, the institution will save on overall cleaning expenditure, despite having higher unitary costs, due to the lower levels of consumption resulting from the higher quality of the products. In addition, Supplier 3 has approximately half of the delivery time, provides "rappel" on its offered products, and helps the institution achieve optimal product utilisation by executing regular formations. Due to the disadvantages enumerated above regarding Supplier 5, the supply for every possible product was changed to another supplier within the institution's portfolio.

Regarding the necessary products to meet the needs of elderly users, primarily incontinence and hygiene products, an extensive procurement analysis was conducted to

determine which of the two suppliers, Supplier 1 or Supplier 2, offered the better conditions. Since the characteristics of delivery time and customer service are identical, the analysis focused on quality and financial conditions, especially product prices. Regarding incontinence products, despite Supplier 2 offering lower unitary prices, the supply of these products was awarded to Supplier 1 due to the higher product quality, resulting in lower levels of consumption. In contrast, regarding hygiene products, despite Supplier 1 offering lower unitary prices, the institution chose Supplier 2 under the same conditions as in the previous scenario. Therefore, we can conclude that the institution strongly advocates for quality over cost regarding products that strongly influence the well-being of its users.

5. Discussion

The discussion chapter critically analyses the case study's findings by comparing them with the established relevant literature topics, inventory management, procurement strategies, supplier selection, buyer-supplier relationships, and supplier portfolio management. By situating the institution’s inventory management transformation and consequent impacts on the supplier's portfolio, it becomes possible to assess the alignment of the implemented strategies with the illustrated research and authors. This comparative analysis provides insights into the practical implications of the case study and the theoretical relevance of its outcomes, particularly regarding the impact of inventory management on supplier portfolio management.

The inventory management actions developed in phases one through five of the case study strongly correlate with central ideologies in the relevant literature. Aligned with the primary objective of inventory management advocated by Munyaka and Yadavalli (2022), the establishment of accurate and sustainable inventory levels has generated, as illustrated in the case study, lower purchasing and holding costs, while boosting end-consumer service levels, which in the institution’s case are its users, by extinguishing stock ruptures and increasing stock availability. Therefore, it is possible to conclude that identifying consumption rates, rather than managing inventory with no pre-established supplied and used quantities, positively impacts a company’s overall performance.

Despite implementing a centralisation strategy within each social response, exemplified by creating a centralised inventory warehouse in the OASF, the institution

opted to remain decentralised regarding the integrated inventory management. While Milewski (2020) suggests that centralisation could lead to high consumer satisfaction, the institution, due to a lack of financial resources and specially qualified labour, does not have the leverage capabilities to possess a centralised warehouse to satisfy its entire needs, as supported by Pedersen *et al.* (2011). Moreover, as proposed by Milewski and Wiśniewski (2022), centralisation aggravates costs related to transportation. Although the institution maintains its own transportation fleet, expanding its logistical capacity would necessitate additional investment in acquisitions, as the current fleet is already operating at full capacity. Hence, centralisation strategies can be considered beneficial at a micro level for small and medium enterprises with limited financial resources, where a higher level of inventory control can be implemented and still take advantage of the supplier's transportation network.

Demand uncertainty is the main factor influencing the decision-making process for the inventory management model (Munyaka and Yadavalli, 2022; Inegbedion *et al.*, 2019). SCMA operates in the social sector, targeting the resolution of the community's needs through social responses, where users are integrated. Therefore, the institution is independent of demand variables, as purchased products are consumed in-house rather than being sold. Given the outsourcing of food services, the types of purchases are centred on non-perishable items, which can be kept in inventory until the consumption need materialises. As presented in the case study, given the immense product variety, complexity of the purchase process, and the lack of qualified labour, the institution chose to conduct monthly fixed purchase orders of unequal quantities, opting not to wait for the inventory level to reach optimal order quantity. Considering the inventory management models suggested in the relevant literature, SCMA operates under a deterministic, specifically a fixed-time, multi-period inventory model.

Procurement activities in the public sector are emphasised by transparency and compliance with complex governmental regulations (Landale *et al.*, 2017). Despite not being a government entity, the institution falls under the scope of public contracting obligations, a complex and time-consuming task. Centralisation of the purchasing department, automation of the purchasing process, and reduced interactions with suppliers, based on the fixed-period inventory management model, emerged as necessary purchasing and procurement strategies to address the complexities of such governmental obligations. These strategies collectively enhanced cost and compliance control, reducing

opportunities for buyer-supplier miscommunication and purchasing and procurement inefficiencies.

Novack and Simco (1991) suggested four procurement activity groups that maximise the supply chain value: planning, implementation, control, and environmental. Throughout the case study's sixth and seventh phases, implemented strategies were showcased that can be categorised as one of the proposed groups. Product standardisation, as defined by the institution's existing needs, and the analysis of the institution's current supplier portfolio, as an evaluation of the final tier of possible suppliers, falls under the procurement planning group. Negotiation strategies and restructuring of the supplier portfolio, as well as the selection of suppliers based on consumption needs, can be categorised as activities of the implementation group. Monitoring inventory levels and adjusting consumption rates, as well as implementing a product verification process, are considered control activities as part of post-trial performance evaluation.

The developed inventory optimisation strategies in the early phases of the case study leveraged a structured and step-by-step supplier selection process aligned with the propositions of Handfield et al. (2009). Despite purchasing an immense variety of products under unequal contexts, given the adoption of a centralised and standardised procurement process, the impact of purchase typologies in the institution's supplier selection process is neutral, contradicting the ideologies of the De Boer *et al.* (2001) framework. The establishment of consumption rates and higher inventory control highlighted inefficiencies and unsustainable costs, creating the need to adjust the institution's current supplier base, similar to the first step of Handfield *et al.* (2009) process. Subsequently, the institution defined its guiding selection criteria, implemented a centralised purchasing strategy, and performed a comparative analysis between in-house portfolio suppliers, allowing for the selection of suppliers based on consumption needs. Rather than selecting new suppliers, the institution acknowledged the improvement and savings opportunities in optimising the current supplier portfolio, a less resource-intensive and time-consuming procurement and supplier selection strategy, especially for stagnated enterprises, in terms of negotiation.

Aligned with the supplier criteria prioritisation proposed by Dickson (1966), the institution classified product quality, price, and ability to maintain constant delivery lead times as the primary factors for choosing suppliers. Furthermore, per Cheraghi *et al.* (2011) and Thiruchelvam and Tookey (2011) suggestions, the institution categorises

reliability, flexibility, and involvement of suppliers in internal operations processes, all described as customer service in the case study, as vital supplier characteristics and pillars to develop long-term and trust-based buyer-supplier relationships.

Ford (1980) argues that closer, more strategic partnerships are preferable to overly diversified supplier portfolios of exchange-based buyer-supplier relationships. The case study aligns with this notion by advocating the reduction of the supplier base and centralising resources on high-performing suppliers, demonstrating reliability and a desire to develop trust-based long-term relationships. Therefore, the case study appears to position itself within Tangpong *et al.* (2008) autonomous-link or constrained-link buyer-supplier relationship typologies, and Tangpong *et al.* (2015) voluntary collaboration, buyer-led collaboration, bilateral partnership, or supplier-led collaboration types of relationship, which are driven by relational attributes and mutual empowerment rather than power asymmetry. In the latter author's matrix, bilateral partnership and supplier-led collaboration are more suitable typologies given the higher buyer dependence factor. The institution's emphasis on quality, transparency, and accountability ideologies indicates an environment of collaborative interdependence, mirroring Caniëls and Gelderman (2005) ideal of symmetric interdependence and representing a deliberate effort to avoid opportunistic behaviour. However, regarding Supplier 5, a household goods retailer, the institution's withdrawal of consumption due to a lack of the desired supplier characteristics led to establishing a non-relational relationship with such a supplier.

The five-step buyer-supplier relationship development model proposed by Ford (1980) applies to the case study, but only from the development stage onward. The pre-relationship and early stages focus on onboarding new suppliers, while the case study focuses on deepening existing partnerships and optimising the institution's supplier portfolio.

The case study closely aligns with Olsen and Ellram (1997) supplier portfolio management framework. Despite not selecting new suppliers, the institution performed extensive internal reorganisation, reallocated consumption sourcing, and optimised relationships. These strategies offer a real-world validation of the theories presented in the relevant literature, particularly in resource-constrained and socially oriented contexts.

The categorisation of purchase situations performed by SCMA is based on the supplier in question, rather than the respective product typology. Suppliers 1, 2, and 3 fall into the leverage category on Olsen and Ellram (1997) matrix, given the high strategic importance of incontinence and hygiene products and cleaning supplies, a consequence of the severe impact on the institution's users' well-being, and insignificant difficulty in managing the type of purchase, measured by low levels of product variety. In contrast, purchases from Supplier 4 can be classified as a bottleneck due to the high difficulty in managing purchases, given the extensive array of acquired products, and their low importance to the institution. Moreover, Supplier 5 offers non-critical products, aligned with both low levels of strategic importance and difficulty in managing purchases.

The supplier portfolio optimisation strategies implemented in the business case align with the action plans proposed by Olsen and Ellram (1997) in step three. The consolidation of consumption and resources allocated in negotiation efforts with Suppliers 1, 2, and 3, given both their high levels of attractiveness and the strategic importance of purchases for the institution, solidified the development of long-term, trust-based relationships. Regarding Supplier 5, which could not provide significant long-term cost savings and operational involvement, the institution diminished allocated resources to maintain the partnership.

6. Conclusion

The dissertation had as its primary objective the association between inventory management and supplier portfolios, considering the influence of procurement strategies, supplier selection processes, and buyer-supplier relationships within a social sector context, emphasising the need for efficiency gains and cost savings.

Gaining internal environmental awareness through the identification of consumption rates and consequently implementing inventory optimisation strategies that leverage higher control and expenditure efficiency is heavily influential on a company's supplier portfolio. Inventory management processes are required to be comprehensive and adaptable to immediately absorb any change in in-field consumption needs or desires. Moreover, supplier portfolios are highly valuable and sustainable when assembled with sufficient diversity to capture near real-time the inventory management adjustments. Centralisation and standardisation are commonly implemented strategies, as demonstrated in the case study, that generate a restructuring of the consumption

framework, which must be accompanied by an adjustment of the supplier base. In the social sector context, non-profit and resource-limited companies may seek to initially optimise their current supplier portfolio rather than selecting new suppliers, given the lower administrative cost and the advantages of retaining highly attractive suppliers that already possess internal operational knowledge.

Other ideologies related to inventory and purchasing management, as illustrated in the case study, have a direct influence on managing supplier portfolios. Based on a fixed-period inventory model, regularity in purchase orders and reduced unnecessary interactions with suppliers can improve relationships. Furthermore, insights generated by effective inventory management processes influence supplier criteria that consequently dictate future restructures in supplier portfolios.

Analysing the influence of inventory management in supplier portfolios contributes significantly to understanding the effects that operational aspects have on a company's long-term financial sustainability. The importance of such a task is heightened by the variability of consumption requirements, which develops the need for continuous and never-ending monitoring and adjusting the cost structures and supplier bases. Annexe B illustrates the decision-making process used in the case study for the implementation of a newly developed inventory management process, considering the relation with the existing supplier portfolio. This process must occur iteratively over time whenever an optimisation need is identified in the consumption structure.

The case study encountered many limitations throughout the design, implementation, and control phases. The lack of structured historical consumption data, a common characteristic for companies with no implemented inventory management processes, represented the primary difficulty of this dissertation, which extended the observation and discovery phase for longer than expected. This limitation could be mitigated with software that supports the management of the inventory processes and functions as an information repository for all past financial exercises. Despite the case study being developed within a social sector context, the inability to fully analyse the social impact that the portfolio restructuring had on the institution's suppliers, more specifically its employees, prevents the conclusion of the improvements being completely beneficial for all involved parties.

Both concepts, inventory management and supplier portfolios, have undergone extensive research in the past decades. However, there is a severe lack of studies that analyse how the topics are connected and influence each other, which represents a tremendous opportunity for future research. Furthermore, given the qualitative nature of this dissertation, a quantitative study regarding the topic at hand also represents a great opportunity for future research to fundament the presented relation between the two concepts. Allowing the acknowledgement, based on data-driven studies, that inventory management influences supplier portfolios and augmenting the awareness of the significance of operational aspects.

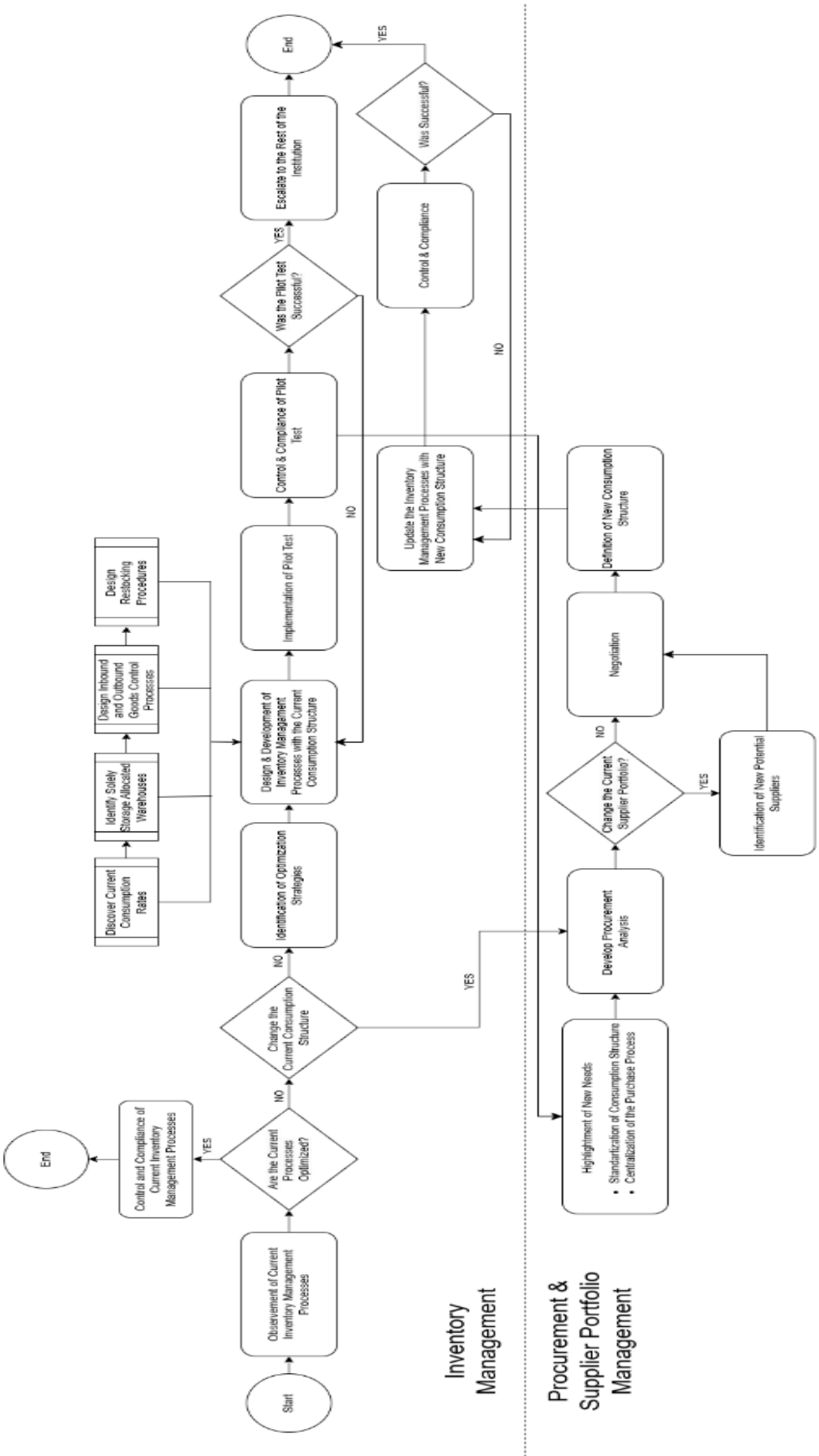

FIGURE 2 - CASE STUDY'S DECISION-MAKING PROCESS

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