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Procurement Operations: An empirical study about the reality of Portuguese SMEs

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Abstract. The purchasing operations in industrial companies affect the supply chain management. Improving procurement allows companies to gain competitive advantages in the purchasing process. However, the top management of companies does not always realize its importance. The purchasing operations are responsible for acquiring production assets and equipment or subcontracting services with high economic value. Companies with different organizational structures, sizes or certification requirements carry out their procurement process and purchases in different ways. Thus, the main objective is to identify how procurement

strategies are applied in the industrial purchasing process, by assessing the frequency of market sourcing, the level of formality to select a supplier and the use of information systems in the support of purchasing operations through a survey application. The survey was divided into 6 main sections: (1) company characterization; (2) respondents' characterization and their experience in the purchasing operations; (3) parameterization of the purchasing operations; (4) assessment of relationship with the supplier; (5) use of information systems in procurement; and (6) the global evaluation. A sample by convenience was selected, by sending the survey to a group of pre-selected companies. Thirty-two valid responses were collected over a period of approximately one year. The data obtained were processed and analyzed using MS Excel® spreadsheets and descriptive statistics. Results show that, of the 32 surveyed companies, a total of 24 have a formal department dedicated to purchasing operations. A percentage of 47% of the companies allocate up to 3 employees of their workforce to carry out purchasing operations. A share of 16% indicated that the company has 15 or more employees assigned to the purchasing function and 80% of those correspond to companies with a total staff greater than 250 employees. Regarding supplier selection strategies, only 50% of companies claim to always negotiate purchases with the suppliers, namely prices and delivery times. A share of 85% of the ISO 9001 certified companies use ERP systems and all companies with more than 250 employees included in the study use ERP to support procurement operations.

Keywords: Operations Management, Procurement, Purchasing process; Survey, Descriptive statistics.

1. Introduction

In the face of an increasingly competitive world, Procurement assumes great relevance in any business, whether industrial, retail, or services context. Procurement has historically been a secondary concern for Small and Medium-sized Enterprises (SMEs). However, more businesses have recently come to understand the critical role that procurement plays in their operations.

Procurement is divided into two phases: *a*) supplier selection process, which aims to identify suitable suppliers to whose services will be contracted; and *b*) supplier evaluation, which rates the effectiveness of the selected suppliers [1]. In addition to supplier selection, procurement also addresses contract administration, ordering, delivery, operations follow-ups, and further supplier assessment. Comprehensively,

Procurement is a systematic process used to request and evaluate quotes and process the approved purchasing orders of goods or services. The sourced supplier who submits the most advantageous proposal is given the contract [2]. Improving the procurement process allows companies to gain competitive advantages in purchasing operations. Implementing more efficient purchasing strategies contributes to organizational stability and increased profits in SMEs [3]. Cost reduction is one of the purchasing strategies in which negotiation processes are used throughout the supply chain to reduce the company's financial burden. According to Ferreira and Silva (2022) study [3], price is not the only deciding factor when purchasing raw materials, in-process goods or services, but it still has a great importance for decision-making. In fact, introducing cost-competitive goods in the manufacturing-added value chain directly impacts the organization's profitability [4]. Total Quality Management (TQM) is also one of the most important approaches to improving the overall process and product quality. To comply with customer specifications, providing quality goods and controlled processes is essential. This requires the organizations to consider the possibility of involving suppliers in product development and manufacturing process optimization. For some activity sectors, the suppliers' certification is mandatory for achieving final product quality [5]. Global sourcing is increasingly becoming a differentiating strategy between organizations. With the increase in demand and competitiveness, adopting global sourcing is a differentiating strategy because it considers cost reduction, quality improvement, and delivery time compliance, leading to customer satisfaction [6]. In general, organizations that have a limited scope of global sourcing face difficulties in terms of price competitiveness, innovation standards, and quality standards [7]. With technological development and process digitization, many companies saw electronic procurement as an opportunity to stand out. E-procurement allows companies to improve their ability to respond to all stakeholders through the processes of standardization: ordering completion, logistic control, and billing [8]. As far as SMEs are concerned, they gradually have been introducing e-procurement in their organizations. E-procurement in this context represents excellent benefits for organizations regarding the daily support of administrative tasks, support in decision-making, strategic activities, productivity increase, risk reduction, and resources and operations optimization [9]. Also, some companies use Rappel techniques. Rappel is a discount given for a certain purchase amount, made within a certain time frame. This type of quantity discount is commonly used, as the supplier discount is assumed to be a bonification and incentive for buying [10]current auction methods rarely consider the existence of quantity discounts. To fill this research gap, we introduce quantity discounts into the procurement Vickrey–Clark–Groves (P-VCG. Rappel discounts are intended to strengthen relationships with suppliers contributing to their partnership.

The main goal is to identify how procurement strategies are applied in the purchasing process of Portuguese SMEs through the application of a survey. The survey was sent to a group of industrial companies which represent a sample by convenience and it includes a total of thirty-nine questions divided into six topics.

2. Literature notes on purchasing strategies

A grasp of the fundamental concepts and findings in the context of purchasing strategies, supply chain and operations management are provided as scientific background for the current study and to create a complete and evidence-based analysis. Thus, based on the content analysis of pre-selected papers, the purchasing strategy, the supplier selection method and the respective criteria were identified considering the activity sector for which the study was developed. Also, it was considered the research methods used by the authors. Table 1 summarises the provided literature notes on purchasing strategies research.

Table 1. Purchasing strategies applied in different activity sectors

Author	Activity Sector	Research Method	Purchasing Strategy	Selection Supplier Method
Aslani et al. (2008)	Multi sector companies	Survey	E-procurement	Supplier performance
Azambuja et al. (2014)	Construction Industry	Case study	Strategic procurement practices	Early supplier involvement, long-term relationships, collaborative planning, and shared cost reduction
Igarashi et al. (2015)	Public procurement	Case study	Supplier selection in green public procurement	Multi-criteria decision analysis based in Environment, social responsibility, quality, price, delivery
Naoum and Egbu (2016)	Construction Industry	Interviews	Multi-attribute criteria for procurement	Multi-attribute decision-making considering Time, cost, quality, and risk
Cho et al. (2019)	Food industry	Survey	Supplier integration and strategic sourcing	Supplier integration and performance
Garzon et al. (2019)	Chemical sector	Case study	Green procurement methodology based on Kraljic Matrix	Evaluation and selection of suppliers based on the Kraljic Matrix method considering quality, price, delivery
Hasan et al. (2020)	Wire and Cable Industry	Mathematical modelling	Resilient supplier selection	Analytic hierarchy process (AHP) and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) methods based on Resilience, agility, innovation, flexibility
Schütz et al. (2020)	Purchasing in different industries	Case study and survey	Cost savings and strategic performance	Cost reduction

E-procurement is being widely used due to the integration of information systems. Aslani et al. (2008) [8] studied the impact of e-procurement among different European companies through an online survey. The authors discovered that e-procurement improves procurement process efficiency, supplier performance, and supply chain integration while not affecting cost savings or buyer-supplier collaboration. The relevance of strategic purchasing methods for the industrial supply chain was also studied by Azambuja et al. (2014). Authors conducted interviews with purchasing managers and applied a multiple-case research approach to collect data. The study highlighted five strategic practices: early supplier involvement, long-term relationships, supplier development, collaborative planning, and shared cost reduction [11].

In food industry, collaborative planning between suppliers and clients is also a typical practice. The supplier integration mediates the association between purchasing skills and strategic purchasing, which influences operational and financial performance [12]. Based on the Kraljic Matrix, Garzon et al. (2019) created a green procurement technique for selecting and evaluating suppliers for a case study in the chemical industry. The purchasing strategy should be based in the selection of suppliers that can contribute to the sustainability objectives preconized by the company. Selection criteria is mostly based on identifying environmental and social risks [13].

In the context of Logistics 4.0, Hasan et al. (2020) suggested in their study that a resilient supplier selection technique with heterogeneous information should be implemented, by simulation-based methodology under different scenarios. The study showed that the proposed method performs better than conventional methods in terms of robustness and adaptability to uncertain and dynamic situations [14]. The supplier selection in green public procurement was studied by Igarashi et al. (2015). Through semi-structured interviews with procurement agents, authors discovered that complicated and context-dependent supplier selection criteria exist and that public procurement procedures may have an impact on supplier behaviour in favour of sustainability [15].

Naoum and Egbu (2016) looked at contemporary procurement techniques in the construction sector. Through interviews with procurement specialists, the authors used a qualitative approach to gather their data. The study found that time, cost, quality, and risk are the four key factors to consider in procurement operations. To choose the best method, the authors discovered that the criteria are interdependent and call for a trade-off analysis [16] Emerald; Business Source Premier; Science Direct and Sage were selected to identify journals that have published the most procurement methods-related articles. The search covered the period 1980-2015. Stage 2 (Survey. Schütz et al. (2020) looked into the confluence of cost reductions and strategic performance in purchasing. Data were gathered through case studies of three manufacturing companies as part of the study's qualitative methodology. The authors discovered that

knowledge sharing and cooperation among the departments of procurement, engineering, and production can facilitate the simultaneous achievement of cost savings and strategic performance [17].

3. Methodology

A survey methodology was implemented to understand the procurement operations at Portuguese SMEs. A survey is a research approach used to describe specific findings through a selected sample of the population under study. Descriptive statistics is used to analyse the data collected from the questionnaire responses.

3.1 Survey design

A survey was elaborated to collect data about the approaches that have been applied by SMEs regarding their purchasing operations in different activity sectors. It was also aimed to understand how the companies organize and operate their purchasing department. From a methodological point-of-view, a sample by convenience was considered to collect the data. Thus, the survey was made available through an online platform to a group of pre-selected companies operating in the north of Portugal. The platform for completing the online survey was available for one year. The survey included a total of 39 questions and its structure was divided into 6 main sections. The two first sections were focused on the company and respondents' characterization. The initial questions aimed to know the company size, the number of employees assigned to the purchasing department, annual business turnover and certification that the company entails (ISO 9001, ISO 14001 and OSHAS 18001). The third section was focused on the characterization of the purchasing operations. This section comprised eleven questions to identify if the company has a formal purchasing department responsible for the procurement activities. Also, companies were questioned about the methods and frequency of market sourcing, the negotiating ability as well the formality level that each company conducts to select a supplier. In the fourth section, companies were questioned about the criteria relationship difficulties to select and assess. The fifth section questions on the use of information systems in the support of purchasing operations and, the last section inquiries about the global evaluation of purchasing department.

3.2. Characterization of inquired companies

According to PORDATA, in 2021, there was 66 924 SMEs in the Portuguese industrial sectors, being 80% located in the North Region (NUTS II) [18]. Thus, it would

be recommended a sample of 68 companies to achieve a survey confidence level of 90%. Nevertheless, it was only possible to validate a total of thirty-two responses, presenting an error margin of 14.53%. The collected data were processed and analysed with access to statistical analysis tools available at MS Excel® spreadsheets. The most representative group of companies that have responded to the survey, about 34%, are medium companies (with 50 to 250 employees), followed by the small companies (with 10 to 50 employees) with a percentage of 28%. The large companies with more than 250 employees represent 22% of the respondents and the companies with less than 10 employees correspond to a share of 16%. Figure 1 presents the distribution of respondent companies according to their size and business turnover. Only large companies with more than 250 employees have a turnover higher than 5 M€.

The type of certification is typically a criterion for the supplier qualification in different activity sectors. The three main requirements related to certification include the quality management system (ISO 9001), the environmental management system (ISO 140001) and the effective management of occupational health and safety (OHSAS 18001). Figure 2 provides the characterization of respondent companies according to size and certification. Only two of the respondent companies with less than 10 employees are certified and only by ISO 9001. A total of 62.5% of the companies are certified by ISO 9001, but only 25% are certified by the environmental management system (ISO 140001).



Figure 1. Characterization of inquired companies according to their size and business turnover.

Figure 2. Characterization of respondent companies according to size and certification

When asked about the region and market in which the company operates, it was found that 34% of the companies operate only in Portugal and the second highest share corresponds to the Portuguese and European Union (EU+28) market (Figure 3). A total of 24 out of 32 companies involved in the study (75%) have a formal

purchasing department in the company. Figure 4 presents the data regarding the number of company employees assigned to the commercial and purchasing department. Most of the companies have a reduced number of employees allocated to procurement operations. A percentage of 43% of the respondent companies have less than 3 employees working in the purchasing department. Considering the duration of their integration in the respective company, most respondents (40.6%) have been working in the purchasing department for at least 5 years. Only 15.6% works in purchasing less than a year.

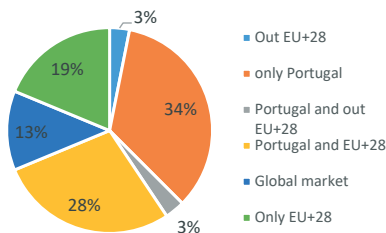


Figure 3. Relative distribution of region and market of companies' integration.

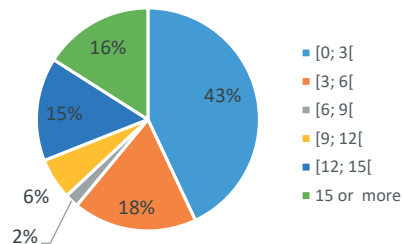


Figure 4. Number of company employees assigned to the commercial and purchasing department.

4. Results and discussion

This section presents the results from the survey answers considering the use of descriptive statistics. The results were grouped in two main analyses: the identification of procurement strategies applied in the purchasing process and the use of information systems to support purchasing operations.

4.1 Procurement strategies applied in the purchasing process

Companies were inquired about the frequency with which a purchasing originates market sourcing. As presented in Figure 5, a percentage of 37.5% of the companies stated that more than 75% of their purchasing operations originates a market sourcing. This has a great impact due to the current global market volatility, the scarcity of raw materials and of their prices instability, the fragility of supply chains associated with the economic restrictions imposed by the Pandemic and the armed conflict in Europe condition the profitability associated with the procurement process. Companies were asked if the sourcing queries for each purchasing process are archived for future consultation. Around 72% of the companies support that the received quota-

tion information is treat in that way. When questioned whether they negotiate with suppliers in their purchases (Figure 6), only 3% answered that they never negotiate. Half of the respondent companies (50%) always negotiates with their suppliers. This statistic might be related to the fact that 59.4% the companies answering the survey have indicated that their relationship with the suppliers is formalized through a contract. Nevertheless, only 8 of the 32 companies apply penalties in case of non-compliance with deadlines for goods delivery or services provision and only 6 of them establishes those penalties by contract.

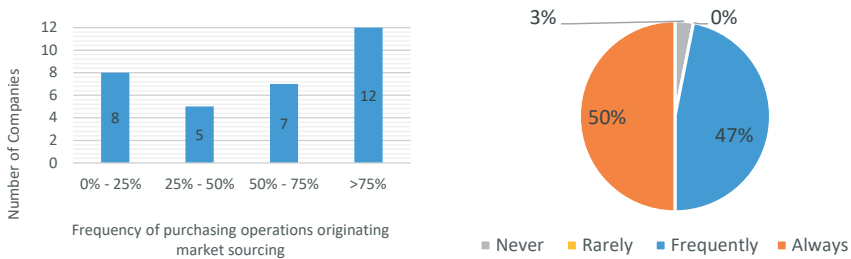


Figure 5. Frequency of purchasing operations originating market sourcing.

Figure 6. Relative share of companies that negotiate with suppliers during the purchasing process.

Companies were also asked about the use of Rappel. A share of 65.6% of this organizations implement Rappel techniques to take advantage of quantity discounts, managing the increased Total Cost of Ownership (TCO) with the cost of placing orders. Regarding the supplier selection criteria, the quality of the product/services provided by the suppliers, the cost/price of the goods and the compliance with the delivery dates are the three main criteria identified by the companies, regardless of size or purchasing strategy. Supplier response capacity and the performance history have become more and more prevalent in qualifying, selecting and evaluate processes. As corroborated by the literature, the integration of suppliers in the production process from the beginning, contributes to achieve long-term goals along the entire supply chain [3, 19]. About the evaluation of suppliers, 23 companies (72%) carry out a formal evaluation process.

4.2 Use of information systems to support purchasing operations

Carrying out procurement operations is increasingly supported by the integration of information systems and Enterprise Resource Planning (ERP) systems. Based on the questionnaires analysis, a share of 75% of the companies perform the purchasing management through an ERP.

Figure 7 presents the relative percentage of companies carrying out purchasing management through an ERP considering the company size and the type of certification. Only 20% of the companies with less than 10 employees use ERP, whereas, all companies with more than 250 employees use ERP to support purchasing operations. Thus, the smaller the size of company, the lowest number of companies using ERP systems. A share of 85% of ISO 9001 certified companies use ERP systems.

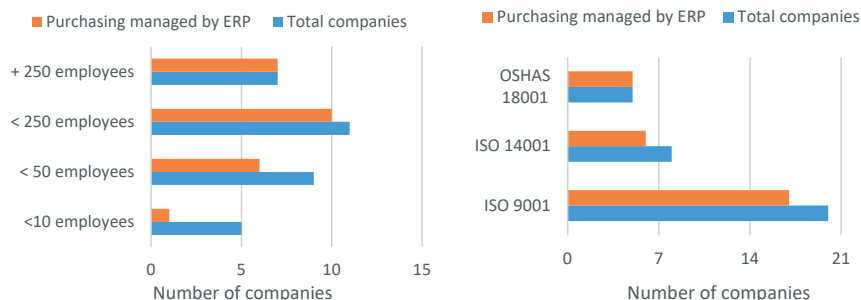


Figure 7. Companies carrying out purchasing through an ERP: by company size (left) and type of certification (right)

Despite the advantages of using information systems for purchasing management, there are some difficulties that the companies face (Figure 8), namely, the highly complex interface, the reduced adaptation to the company needs, the lack of full knowledge of ERP operation, low interactivity level and difficulties in updating the system. The companies identified as main difficulties the ERP reduced adequacy to the company needs and the lack of knowledge about the ERP.

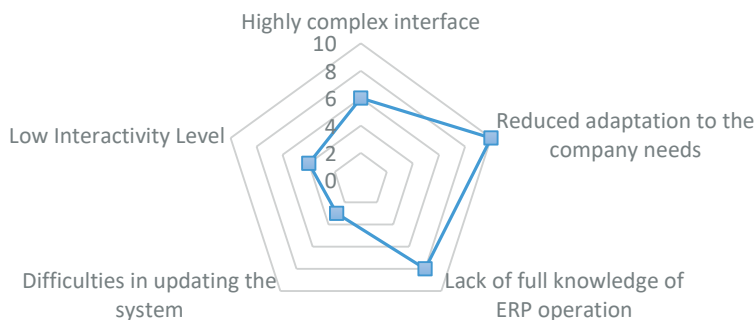


Figure 8. Difficulties using ERP systems in the context of purchasing operations.

5. Final considerations

The paper aimed to identify the procurement strategies applied in the purchasing process of Portuguese SMEs. Aspects such as the frequency of market sourcing, the level of formality to select a supplier and the use of information systems in support of purchasing operations were analysed by implementing a survey. A total of 32 questionnaires' answers were validated. Cost-based negotiation still has great relevance in the purchasing decision-making. In companies with more than 10 employees, the supplier's evaluation is formally conducted. However, the process is not always standardized. The use of ERP systems improves the purchasing operations when it is well adapted to the companies needs and the purchasing managers are properly trained.

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