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SUPPLIER SELECTION AND PROCUREMENT IN SMES: INSIGHTS FROM THE LITERATURE ON KEY CRITERIA AND PURCHASING STRATEGIES

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ABSTRACT

Effective strategic purchasing and supplier selection in companies provides businesses with leverage in acquiring goods and services. Thus, companies are in a better position to negotiate prices, discounts, delivery times and logistic channels. Also, strategic purchasing allows for performing a risk assessment to ensure the company's profitability. This research aimed to identify the key currently deliberated by SMEs for supplier selection, considering such purchasing strategies as (1) cost reduction, (2) risk management, (3) global sourcing, (4) total quality management, (5) sustainable management and (6) supplier management. Also, it aimed to identify the emerging issues related to purchasing strategies. This research work performed a content analysis following a literature review. The Scopus indexation database was selected to conduct the document search. After the refinement process, based on 59 analysed documents, bibliometric assessment tools were applied to identify the key criteria for supplier selection. The TOP6 highest ranked criteria, which corresponds to 80 % of the most referred criteria, include: (1) the quality of goods; (2) compliance with the delivery times; (3) price/cost; (4) supplier reputation and/or market positioning; (5) geographical location; and (6) supplier performance history. The goal of strategic purchasing is to support the companies in achieving long-term goals through its integration into the company's strategic planning process. It should be identified by the managers as an important resource. Several factors elevate the importance of strategic purchasing, namely, environmental protection, technology advances related to logistics 4.0, and risk assessment related to global sourcing and sustainability. The present research is in line with the findings of the referred literature, i.e., the application of prioritised criteria for the procurement and supplier selection operations in the industrial context, aiming to reduce lead times and logistic costs. The criteria must be aligned with the purchasing strategies adopted by the companies. The manuscript aims to demonstrate that the fundamentals of strategic purchasing strategies can contribute to the improvement of the SME supply process with the application of simple and cost-effective approaches.

KEY WORDS

supply chain management, strategic purchasing, supplier selection

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INTRODUCTION

Until the early 2000s, the focus of SMEs was more centred on the customer and their requirements, whereas supplier selection and purchasing were not afforded the same importance. However,

with the growing competitiveness of the world market, companies are more willing to establish stronger relationships to achieve the required quality and good market prices. For a long time, companies have been choosing their suppliers solely based on the price and

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compliance with delivery times. Over time, this method was understood to be inefficient, and the need arose to include more criteria.

Nowadays, supplier selection is among the most important strategies to increase SME market competitiveness. Technological innovations are transforming the industrial sector. Procurement has become faster due to digitalisation, the Internet of Things (IoT) and process robotisation. As a result, production and operations are becoming more demanding at every stage of the supply chain: strategic procurement, supplier selection, process manufacturing and distribution to customers (Manavalan & Jayakrishna, 2019). Fast information exchange, short production deadlines and the quality level of products and services have encouraged companies to implement purchasing strategies.

Recently, the supplier selection and procurement in SMEs have drastically changed, mostly due to the need to adapt purchasing strategies to societal changes, i.e., scarce high-added-value raw materials; market mutability due to a pandemic or a war in Europe; the impact of logistic costs and transportation due to the rising fuel costs; and the increased concern with the industry's impact on climate change. This study aims to consider the paradigm changes in the supplier selection process. Thus, it is crucial to understand the best strategies companies implement to enhance the nexus between procurement, supplier selection and strategic purchasing.

This study aims to identify the key criteria currently used by SMEs for supplier selection, considering the most relevant purchasing strategies identified in the literature: (1) cost reduction; (2) risk management; (3) global sourcing; (4) total quality management; (5) sustainable management; and (6) supplier management. Also, it aims to identify emerging issues regarding purchasing strategies. From the methodological point of view, based on the proposed research question, a content analysis of the literature was performed. The Scopus database was selected to conduct the documental search. After the refinement process, and based on 59 documents, bibliometric assessment tools were applied to support the literature analysis.

The first section presents brief notes regarding the literature review. After a contextualisation, the analysis was divided into three parts: the most important aspects of strategic purchasing strategies, the most relevant criteria for supplier selection in the literature, and the emerging issues regarding the purchasing strategies. The second section explains the

methodological approach used in this study. The listed research questions are followed by the protocol for the literature review. The third section presents the most relevant insights drawn from the study. This section presents correlational bibliometric maps and the remarks from content analyses. Based on this latter assessment, the supplier selection criteria are then presented and ranked. The fourth and last section presents the main research conclusions.

1. LITERATURE REVIEW

Strategic purchasing and supplier selection are two aspects that directly affect the procurement function, which affects Supply Chain Management (SCM) (Huemer, 2006). Supplier selection and purchasing strategies are key aspects of SCM decision-making. Both processes are critical for increasing the company's competitiveness (Carr & Pearson, 2002; Carr & Smeltzer, 1997). A suitable supplier selection can decrease product lead time, reduce purchasing costs, improve profits and contribute to customer satisfaction. To do so, companies require the assessment of different alternative suppliers based on different criteria. Managers need to know how to give the best answers to the growing demands of customers in terms of delivery times, product availability, cost of stock ownership and reliability of operations (Belekoukias et al., 2014). From a strategic perspective, it is necessary to make a joint assessment of the processes and make decisions that maximise the benefits as a whole, where the purchasing strategies and the supplier selection criteria have a preponderant role (Fernie, 2014; Saengchai & Jermsittiparsert, 2019).

1.1. STRATEGIC PURCHASING STRATEGIES

Large organisations are continually investing in the development of their purchasing departments to face the competitiveness of the market, which is increasingly globalised. In the past, purchasing was seen as a support department, and many companies did not even have it. Each department made its purchases according to its needs, without any procedure or process. Cases were possible when different departments worked with the same supplier but had different prices for the same product/service, creating discrepancies and wasting resources. Nowadays, the purchasing department is considered a strategic area that needs attention from all organisations operating in different fields and dimensions to be competitive.

Strategic purchasing is defined as the process of planning, implementation, evaluation, and strategic control and operational purchasing decisions to define all the activities of the purchasing function consistently and aligned with the company's long-term objectives (Carr & Smeltzer, 1997). The goal of strategic purchasing is to support the companies in achieving long-term goals through its integration into the company's strategic planning process; it should be identified by the managers as an important resource (Carr & Pearson, 2002).

The impact of purchasing, supplier involvement in strategic purchasing and its impact on firms' performance have been analysed in the literature (Carr & Pearson, 2002; Ondoro et al., 2013; Schütz et al., 2020). Some authors believe that purchasing and supplier involvement has a positive impact on strategic purchasing and strategic purchasing has a positive impact on performance (Carr & Pearson, 2002).

A case study of public bus transport firms in Kenya analysed the role of strategic purchasing and supply management practices in firms' performance and statistical treatment of data obtained by a survey of 183 senior executives of public bus transport firms. The survey results indicated that public bus transport firms practising strategic purchasing and supply management had improved their performance (Ondoro et al., 2013).

More recently, Schütz et al. (2020) derived a theoretical framework for examining how purchasing knowledge and integration impact cost and strategic performance, demonstrating that purchasing knowledge is a major antecedent for savings and strategic purchasing performance, emphasising the role of purchasing integration.

Nowadays, other factors are elevating the importance of strategic purchasing, namely, environmental protection (Bohari et al., 2020; Garzon et al., 2019), technology advances related to logistics 4.0 (Hasan et al., 2020), the risk assessment related to global sourcing (Hawkins et al., 2020; Wong, 2020) as well as sustainability (Rashidi et al., 2020), which implies more responsibilities for the purchasing managers. With the increasing awareness of environmental protection, supplier selection becomes an important issue for almost every manufacturer and will determine the characteristics of the final product; therefore, a performance evaluation system for suppliers is necessary to determine the suitability of the final product (Garzon et al., 2019). This issue is directly related to sustainability, which is considered imperative for societies.

In the strategic purchasing process, especially from a global point of view, one of the most important phases is supplier selection, which involves their identification, evaluation and contracting (Taherdoost & Brard, 2019). The next section presents the supplier selection activity explored in the recent literature to identify the key performance indicators used by different companies to select their suppliers.

1.2. SUPPLIER SELECTION CRITERIA

The practice used by a company to identify, evaluate and establish a commercial relationship corresponds to the supplier selection process (Taherdoost & Brard, 2019). The process plays a central role in the success of any organisation because it is responsible for moving a considerable amount of capital. Since capital is a finite resource, a correct supplier selection reduces purchasing risk (Adeinat & Ventura, 2018; Taherdoost & Brard, 2019; Wong, 2020).

Based on the literature review, the most cited criteria were technology and capability, cost, delivery, price and production capacity. Relative to the supplier selection methods, they identified different method classes, namely, statistical, multi-attribute decision-making, cost-based, mathematical programming, artificial intelligence and combined (Brewer et al., 2019; Germain et al., 2011). The overall research on the supplier selection criteria and the supplier evaluation methods allows to optimise the process of supplier evaluation and selection as a sequential process of several steps (Taherdoost & Brard, 2019):

- Recognising the need for supplier selection;
- Identifying the key sourcing requirements;
- Determining the sourcing strategy;
- Identifying the potential supply sources;
- Reducing the suppliers' number in the selection pool;
- Determining the method of supplier evaluation and selection.

Numerous studies identified several criteria applied to supplier selection. The most important aspects include (Belekoukias et al., 2014; Pitchaiah et al., 2020; Taherdoost & Brard, 2019):

- Long-term relationships purchasing;
- Delivery control system;
- Supplier's involvement in design;
- Quality of products and/or services;
- Frequent and reliable deliveries;
- Cost-based negotiation;
- Improved communications;
- Standardised containers;

- Reduced paperwork;
- Supplier's location.

Flexibility in negotiation is an important criterion mostly because it provides a total perspective of the costs and deadlines. A more effective commitment can be promoted by evaluating whether the supplier in question offers competitive prices and payment conditions or benefits and discounts. Price is always an important criterion since it directly affects the costs, planning of new projects and products and, consequently, the final price (Konys, 2019). The evaluation of the product or service quality is an essential criterion that directly influences the final product and customer satisfaction. Reputation is linked to historical analysis, which shows how the market sees the company in question. An important guarantee is to verify the credibility of a supplier to prevent unforeseen events and delays. Establishing efficient communication channels contributes to a strengthened relationship with the supplier. Communication that integrates end-to-end operation with technology improves understanding and interaction between all involved parties (Rashidi et al., 2020; Pitchaiah et al., 2020; Taherdoost & Brard, 2019; Zekhnini et al., 2020). Supplier's location and documentation procedures (e.g., ordering, receiving, distribution and delivering) are also relevant criteria. There is no point in producing products that fail to be delivered for a fair price and at adequate deadlines (Silva & Ferreira, 2021).

1.3. EMERGING ISSUES IN PURCHASING STRATEGIES

Several other aspects have been emerging in recent studies as important considerations in supplier selection, such as sustainability (Ghadimi et al., 2019; Kannan et al., 2020; Rashidi et al., 2020), environmental protection (green suppliers) (Gao et al., 2020; Garzon et al., 2019; Oroojeni Mohammad Javad et al., 2020), and resilience, risks and uncertainty of the market (Hasan et al., 2020; Hosseini et al., 2019), (Chen et al., 2020a; Ivanov et al., 2018). Recently, a meta-literature review was conducted in the field of sustainable supplier selection, presenting exceptionally interesting remarks (Rashidi et al., 2020):

- There is a gap between the industry and academia that needs to be bridged;
- More studies in the area of global sourcing are required;
- Outcomes of different supplier evaluation methods should be compared;

- There has been no major shift or change in the traditional supplier selection practices;
- The ratio of the applied social criteria is relatively low compared to the total number of criteria;
- The innovation capability of suppliers must be further considered;
- More studies on sustainable supplier selection are needed in the e-procurement area and such service-based industries as healthcare;
- Evaluating the sustainability of suppliers in a dynamic environment needs to be further studied.

Thus, it is important to study the complexity of the supply market, constrained by supply scarcity, quantity and quality of goods/services, logistic costs and business conditions. Also, attention should be paid in terms of the value-added by SCM in total costs and the impact on companies' profitability. All these aspects may contribute to minimising the supply chain vulnerabilities of SMEs (Gupta & Barua, 2017; Pal et al., 2013; Pressey et al., 2009; Stekelorum et al., 2020).

Recently, data collection and information exchange in the industry has been increasingly assisted by digital technologies, integrated into the context of Industry 4.0, which includes multi-faceted technological approaches to improve SCM based on real-time information: industrial IoT, big data, additive manufacturing, artificial intelligence, blockchain, cloud and simulation (Matthess et al., 2022; Bai et al., 2020). Supplier selection, considering the Industry 4.0 requirements, is essential in promoting collaborative strategies between suppliers and manufacturers (Resende et al., 2021).

2. RESEARCH METHODOLOGICAL APPROACH

To understand the key factors to be considered in strategic purchasing in SMEs, one research and two sub-research questions were defined, as presented in Table 1. The analysis was conducted through the implementation of a literature review and the respective content analysis. Content analysis is a widely used qualitative research technique to correlate concepts within some given qualitative data.

According to Snyder (2019), this methodological approach aims to identify evidence from published research work, considering pre-specified criteria to answer a particular research hypothesis. Thus, a search is systematically conducted, depending on

Tab. 1. Definitions of research and sub-research questions

RESEARCH QUESTION (RQ)	SUB-RESEARCH QUESTIONS (SRQ)
RQ: Which key criteria that companies apply when selecting their suppliers?	sRQ1: What are the best purchasing strategies currently implemented by SMEs?
	sRQ2: What are the emerging issues concerning strategic purchasing in SMEs?

I	<ul style="list-style-type: none"> • Research question formulation: RQ and sRQ1 and sRQ2 • Planning the LR search
II	<ul style="list-style-type: none"> • Search database: Scopus • Search by (inclusion criteria): TITLE-ABS-KEY • No-filter on document type or scientific field — Result with 1663 documents
III	<ul style="list-style-type: none"> • R1 — Result with 165 documents Inclusion criteria: documents from the scientific field of Engineering, Management, Economics and Econometrics and Decision Sciences • R2 — Result with 86 documents Inclusion criteria: documents published between 1990 and 2021 Exclusion criteria: documents in languages other than English • R3 — Result with 59 documents Only papers from peer-reviewed journals were selected for the content analysis because of their availability online
IV	<ul style="list-style-type: none"> • Content analysis and use of VOSviewer®. This software allows constructing and visualising bibliometric networks based on the bibliographic coupling of co-occurrence networks of important keywords extracted from the scientific literature.
V	<ul style="list-style-type: none"> • The best purchasing strategies and the key criteria that companies use when selecting their suppliers were identified through the content analysis • Key findings were aggregated and summarised

Fig. 1. Methodology applied in the present research work

the availability of current research in scientific databases. The implemented methodology was based on the following five steps:

I. Unequivocally and clearly formulate the research questions and plan the review queries, addressing the main topic;

II. Select the database to be used for searching studies, defining the inclusion and exclusion criteria for the search process;

III. Based on the number of collected works, define search refinement criteria. These refinements can be related to the typology of the document (journal papers, conference papers, books, book chapters, editorial reviews, and others), the publication period interval, the scientific field (engineering, mathematics, computer science, business and management, decision sciences, among others) and writing language. A more refined in-depth search improves the analysis development;

IV. Perform a content analysis of the selected documents in the scope of the research questions.

V. Report the key findings, identifying the highest contribution of the published research on shedding light for further research (Denyer & Tranfield, 2009).

After defining the research question, the Scopus database was selected for document search. This database contains titles from more than 5 000 international publishers, including peer-reviewed journals, in the field of Logistics and Supply Chain and Operations Management. As inclusion criteria, it was considered the search by “Title”, “Abstract” and “Keywords” (TITLE-ABS-KEY). Initially, the main keyword combination was: [“purchasing”] AND [“procurement”] AND [“SME”] AND [“supplier”] AND [“industry”], limiting the timeline to the period between 1990 and 2021. The steps followed while conducting this research are presented in Fig. 1.

Regarding the document typology and scientific field, no filter was considered in the first search, i.e., “all fields” was selected. As expected, many documents were obtained (over 1663). Several document types were considered: most were papers in international journals (53.5 %), followed by conference papers (37.8 %), reviews (3.5 %), book chapters (2.4 %) and short surveys (1.1 %). With these results, a three-iteration refinement was performed. In the first iteration (R1), only documents within the industrial engineering context were selected. This restriction significantly reduced the number of documents for the research (165 documents). In the second refinement (R2), all the documents that do not meet one of the following specifications were excluded: (1) not addressing the main topic issue and (2) written in languages other than English. At this point, 86 documents were available for content analysis. The number of obtained documents was reduced dramatically during this refinement iteration by eliminating documents based on the industrial context. Although with minor adjustments, the distribution of various document types remained unchanged: most were papers in international journals (68.6 %), followed by conference papers (26.7 %), reviews and book chapters with 2.3 % each. In the last refinement iteration (R3), only papers from peer-reviewed journals were selected for the content analysis (59 documents). This consideration was taken since the remaining documents are not available online. Documents that were

written in languages other than English were also eliminated.

Based on the selected set of documents, a critical analysis was made. For viewing bibliometric maps, helping the analysis and discussion, the free software VOSviewer was used (van Eck & Waltman, 2020) for the construction of the co-occurrence networks maps based on indexed keywords (Szpilko & Ejdyś, 2022).

3. RESEARCH RESULTS AND KEY FINDINGS

Strategic purchasing management implies a process of negotiation, implementation, and evaluation to carry out operations and make products and services available in companies. Thus, the selection and evaluation of suppliers require the inclusion of methods and criteria adjusted to the purchasing strategy that each company adopts.

3.1. BIBLIOMETRIC CONTENT ANALYSIS

The collected data was used to perform a content analysis with VOSviewer to visualise the bibliometric networks, which allowed a clear study of the topics under research. As can be seen from the bibliometrics shown in Fig. 2, the publications are distributed in four main clusters: (1) supplier selection methods, (2)

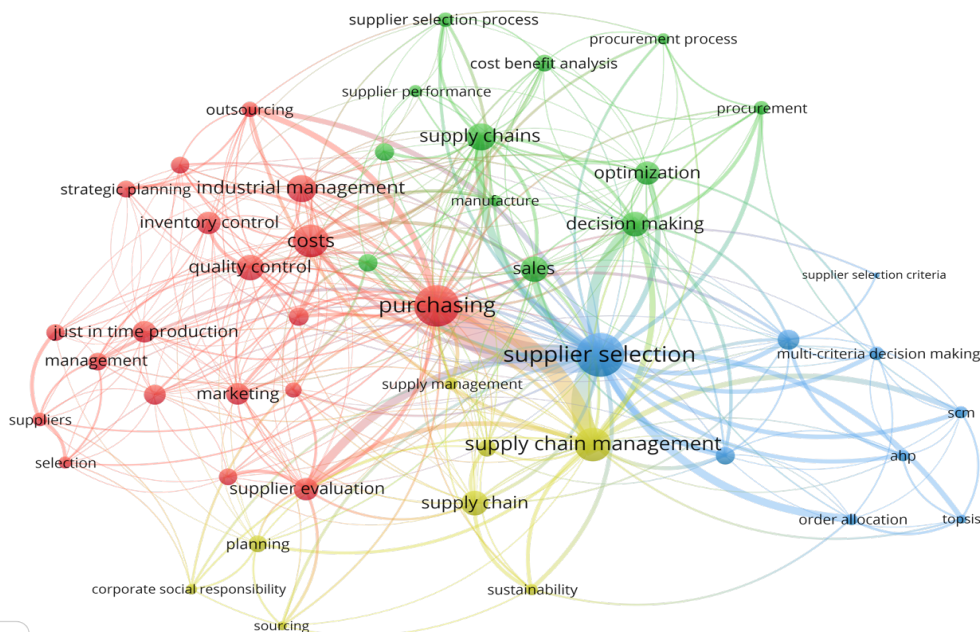


Fig.2. Bibliometric co-occurrence map of keywords for supplier selection and strategic purchases

identified as less important (Chen et al., 2020a; Hosseini et al., 2019; Jain & Singh, 2020a; Kamalakannan et al., 2020; Konys, 2019; Oroojeni Mohammad Javad et al., 2020; Rashidi et al., 2020; Pitchaiah et al., 2020; Taherdoost & Brard, 2019; Zekhnini et al., 2020).

With the recent increase in the cost of materials and the uncertainty of logistics and supply chain, supplier reliability seems to have become fundamental. This criterion is related to supplier trustworthiness and dependability. Frequently, this aspect is based on the perception of the supplier's financial stability (annual turnover and capital availability) and past and current business partnerships (Florez-Lopez, 2007).

To evaluate the relevance of each supplier selection criterion, a ranking was established, considering their relevance in the contents analysis of the selected papers, as presented in Fig. 4. The ranking was defined considering the frequency of indexed keywords and through the application of the Pareto principle. This means that the highest ranked criteria correspond to 80 % of the most referred in the literature.

Of the total of 59 analysed papers, 14 considered the "quality" criterion as the most important. In practice, different criteria are associated with the overall quality criterion, including rejection and return rates, the ratio of products rejected after inspection, the number of invoices received without errors, the quality of shipment and many others. In the papers, 12 included the criterion of "compliance

with delivery time" in their lists of the most important criteria. For its quantification, criteria include, e.g., delivery delays, fulfilment of delivery requirements, lead time, and total time between order and final delivery. Price/cost is pointed out as the most important criterion in nine publications. It is reasonable to expect that purchasing managers tend to choose an alternative with a lower acquisition cost as long as technical requirements and mandatory requisites are fulfilled, determining all the costs associated with the acquisition and underlying charges (Hasan et al., 2020).

The TOP6 highest ranked criteria, which corresponds to 80 % of the most referred criteria, include: (1) quality of goods, (2) compliance with the delivery times, (3) price/cost, (4) supplier reputation and/or market positioning, (5) geographical location, and (6) supplier performance history. Together, these six criteria represent about 80 % of the most used and valued aspects across different purchasing strategies applied by SMEs in the industrial sector (Azambuja et al., 2014; Carr & Pearson, 2002; Çebi & Bayraktar, 2003; Chan & Chan, 2004; Monczka et al., 2009; Naoum & Egbu, 2016; Pal et al., 2013; Pressey et al., 2009; von Haartman & Bengtsson, 2015). It is important to mention that according to the analysis, supplier financial health and internationalisation level are the criteria with a lower priority. Indeed, supplier selection is a multiple-criteria decision-making process divided into two main steps: the determination

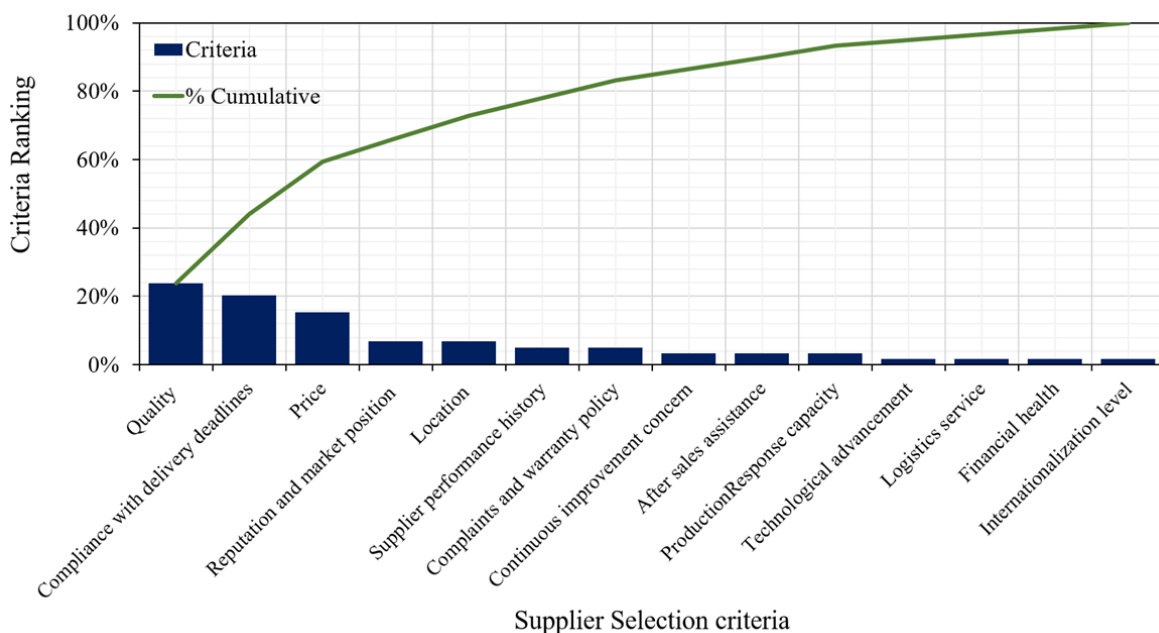


Fig. 4. Identification and classification of most valued supplier selection criteria

of weighted criteria and supplier ranking (Zimmer et al., 2016).

3.3. PURCHASING STRATEGIES TYPICALLY IMPLEMENTED IN SMEs

Effective implementation of purchasing strategies contributes to clever purchasing decisions and, consequently, to their profit. From a wide point of view, the degree to which purchasing is seen as a “strategic” approach by SMEs and the implementation of an evaluation of a supplier selection process has not been addressed properly.

SMEs aim to purchase goods and/or services, respecting their requirements and specifications, at the lowest price with better delivery timings. Yet, the question arises, “Should strong supplier relationships, total quality management and sustainable practices

be included in the balance without compromising the financial and business stability of companies?”. There is no single recipe in terms of the best purchasing strategy to adopt. Each company in the most diverse sectors of activity and the most different markets must study the most relevant aspects of its supply chain to define its strategy (Ellegaard & Andersen, 2015; Naoum & Egbu, 2016). After a careful analysis of the literature review, six main strategies applied by SMEs were identified, as presented in Table 2.

Once purchasing strategies are identified, the next step is to establish the relationship between the supply process requirements and these strategies from an SME point of view. The requirements included in the study were defined.

In Fig. 5, a matrix of relationships is presented and an attempt to measure the intensity of this relationship is described as strong (●), moderate (○)

Tab. 2. Predominant purchasing strategies implemented by SMEs

STRATEGIES	SUPPORTING REFERENCES	DESCRIPTION
Cost reduction	Mohammad et al. (2020) Azambuja et al. (2014) Carr & Pearso (2002)	In this strategy, the companies consider supplier segmentation to ensure that different categories of materials/products have appropriate cost levels. The purchasing strategy is based on comprehensive negotiation processes aiming for cost reduction along the supply chain
Risk management	Wong (2020)	Companies, especially in some segments of the industrial sector, operate on markets of some uncertainty, such as variation in demand, variation in supply, and visibility to the customer, which means that purchases need to include strategic risk analysis. Risk management strategies account for internal and external variables while establishing procurement activities
Global sourcing	Schütz et al. (2020) Konys (2019)	Global sourcing allows a company to search for suppliers with a reasonable price or fit for the specifications unavailable in the domestic market. This strategy is also applied by companies that are constantly getting ahead in innovation standards
Total quality management	Sánchez-Rodríguez et al. (2004)	It is a strategy that allows companies to increase the quality of their products while keeping the cost of supplies in a queue. There is considerable evidence indicating a strong relationship between quality and profitability, mostly if it entails such aspects as supplier certification, investment in training and support of suppliers, supplier involvement in product design, and information sharing
Sustainable management	Tunca & Zenios (2006)	It is a strategy that integrates social and environmental responsibilities into purchasing decisions while meeting the company's requirements. Thus, it can be defined as a strategy for combining the best output for the economic, corporate interests, environment and society together with quality and price
Supplier management	Seuring & Müller (2008)	This strategy includes the selection of a solid mix of suppliers who can provide the goods required to meet the company's business requests. It is usually used when suppliers cannot meet the pricing, quality and delivery times, resulting in constant market consultation and product quotation requests

or weak (▽). For each purchaing strategy, the direction of improvement was also indicated, i.e., maximise (↗), target (◇) and minimise (↘).

The supplier process requirements were chosen to consider the frequency of their citation in the literature review. The price and supplier positioning in the market are the requirements that seem to be more representative of the majority of purchasing strategies.

On the other hand, the supplier management strategy is the approach that has the strongest relationship with most of the requirements.

This outcome is partially corroborated by Qian (2014), who proposes a strategy for supplier selection based on the combination of decision factors: price, service level, delivery time and supplier reputation.

The quality of provided products/services has a strong relationship with costs reduction and total quality management strategies since quality implies

investments, namely, in quality certifications, to provide warranties to customers, which sometimes is a requirement of the client (Konys, 2019; Tunca & Zenios, 2006).

Compliance with delivery deadlines is a crucial requirement for all companies, especially in the actual global and unstable market, which has an enormous impact on supply chain performance, since companies, even SMEs, try to implement the Just-In-Time and Lean philosophy, which implies a direct dependency of the delivery deadline compliance of their suppliers.

3.4. EMERGING ASPECTS OF PURCHASING STRATEGIES

Supplier selection and procurement in SMEs have changed due to the need to adapt purchasing strategies to the most recent challenges: scarce mate-


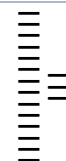

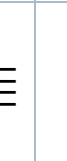

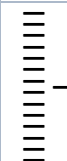
Supplier selection criteria	Purchasing strategies					
	↘	↘	◇	↗	↗	◇
	Cost	Risk management	Global sourcing	Total quality management	Sustainable management	Supplier management
(1) Quality of products/services	●	▽	○	●	○	○
(2) Compliance with delivery deadlines	○	○	●	▽	▽	○
(6) Supplier performance history	▽	○	○	●	○	●
(8) Complaints and warranty policy	○	○	○	●	●	●
(10) Supply response capacity	●	○	●	○	▽	●
(3) Price/cost	●	○	●	●	○	●
(5) Location	●	●	●	▽	○	○
(7) Continuous improvement concern	●	○	▽	●	○	●
(4) Supplier reputation and market position	▽	●	○	●	●	●
(11) Technological advancement	●	●	○	○	○	●
Strength of supply process requirements in Purchasing Strategies	76%	68%	72%	76%	60%	88%
						

Fig. 5. Supply process requirements versus purchasing strategies

rials and their availability on due times, economic market mutability, the impact of logistic costs and transportation due to rising fuel costs, and climate change. Thus, some emerging issues regarding purchasing strategies are reported in the most recent papers. Smart, sustainable, social and environmentally responsible supply chains are some of the most cutting-edge dimensions of purchasing strategies (Brady et al., 2018; Chen et al., 2020b; Eggert & Hartmann, 2021; Florez-Lopez, 2007; Jain & Singh, 2020b; Shen et al., 2021; Stekelorum et al., 2020; Zimmer et al., 2016). Due to environmental policies and legislation demands and social accountability before their stakeholders, companies have introduced other emerging requirements into their purchasing strategies.

Table 3 summarises some of the current issues based on the reduction of supply chain logistics, the environmental impacts and the need for certification

in terms of quality and environmental management systems (Sánchez-Rodríguez & Martínez-Lorente, 2004; Shen et al., 2021; Stekelorum et al., 2020; Winter & Lasch, 2016; Zimon & Zimon, 2019).

CONCLUSIONS

The paper presented research on identifying the main criteria adopted as a key aspect in a company's supplier selection. The study was performed considering the content analysis of a literature review based on a proposed research question. The Scopus database was selected to conduct the document search. After the refinement process and based on 59 documents, bibliometric assessment tools were applied to support the literature analysis. Regarding the main research question, "Which are the key criteria that companies seek when selecting their suppliers?"; the TOP6 high-

Tab. 3. Predominant purchasing strategies implemented by SMEs

REQUIREMENTS	SUPPORTING REFERENCES	DESCRIPTION
Reduction of logistic supply chains	Gao et al. (2020) Schütz et al. (2020)	Nowadays, the supply chain is engineered to be agile, flexible and customised. Advanced communication tools, IoT technologies and the digitalisation of processes in the industry have been used to enhance SCM practices and reduce the logistic steps. The technological capability of a supplier and its ability to acquire new technical knowledge greatly impact the supply chain length
Environmental impacts	Gualandris et al. (2014) Haeri & Rezaei (2019)	It is urgent for companies to contribute to minimising the climate change problem by reducing the so-called greenhouse gas (GHG) emissions associated with the transportation and delivery of goods. Decreased delivery time and transportation distances actively contribute to emissions and pollution reduction. Also, companies are nowadays more invested in choosing suppliers based on their responsibility to use natural resources carefully, minimise damage and ensure resource availability for future generations
Quality and Environmental Management System	Zimon (2019) Garzon et al. (2019)	In many sectors of activity, such as the automotive, food industry, medical devices and others, the selection of a supplier implies the need for certification of quality and environmental performance. Thus, the supplier selection can depend on implemented ISO 9001 standards (Quality Management System) and/or adopted the ISO 14001 standard (Environmental Management System), establishing a beneficial synergy between quality and environmental performance
New Technologies Integration	Matthess et al., 2022 Bai et al., 2020 Resende et al., 2021	Industry 4.0 relates to several new or enhanced core capabilities, expressed through new technology areas: more intelligence and integration in business processes, proximity to the client, closing the loop, smart products and services, business connectivity and intimate human-machine collaboration

est ranked criteria were identified. The most relevant criteria included (1) the quality of goods, (2) the compliance with delivery times, (3) price/cost, (4) supplier reputation and/or market positioning, (5) geographical location, and (6) supplier performance history. T

The content analysis has shown that the selection and evaluation of suppliers presume a process where the evaluation criteria are in the scope of the purchasing strategy and the main interests of the procurement department. The definition of these criteria is fundamental not only for supplier selection but also for their evaluation.

The choice of inappropriate criteria can result in wasted time and resources and reduced profit margins. More recently, the price criterion has no longer been seen as simple as the unit price but rather the total cost from a purchase order. The content analysis also showed that the publications were mostly distributed in four main clusters: (1) supplier selection methods, (2) the procurement process, (3) SCM parameters, and (4) different approaches to the decision-making process.

Regarding sub-research question sRQ1, “What are the best purchasing strategies currently implemented by SMEs?”, the purchasing strategies identified in the literature are (1) cost reduction, (2) risk management, (3) global sourcing, (4) total quality management, (5) sustainable management, and (6) supplier management. SMEs are powerfully affected by the purchasing function efficiency. Depending on the adopted purchasing strategy, different requirements have a specific impact on the way the supplier is selected. Nevertheless, cost-based negotiation still has great relevance in the decision-making process. The study allowed to conclude that strategic purchasing is nowadays perceived as a cornerstone for organisational development and competitiveness.

The study also allowed answering sub-research question sRQ2, “What are the emerging issues concerning strategic purchasing in SMEs?”. The reduction of logistic supply chains, the environmental impacts and the integration of quality and environmental management systems are the emerging aspects pointed out by the literature regarding purchasing strategies.

The development and implementation of a survey of Portuguese SMEs is proposed as a future study subject. The focus is to develop a conceptual model for supplier selection and a simulator considering the weighted parameters from the decision model.

LITERATURE

- Adeinat, H., & Ventura, J. A. (2018). Integrated pricing and supplier selection in a two-stage supply chain. *International Journal of Production Economics*, 201, 193-202. doi: 10.1016/j.ijpe.2018.03.021
- Aminoff, A. (2007). *Global Purchasing and Supply Management: A Research Agenda*. IPSERA German Node conference, Wiesbaden, Germany.
- Azambuja, M. M., Ponticelli, S., & O'Brien, W. J. (2014). Strategic procurement practices for the industrial supply chain. *Journal of Construction Engineering and Management*, 140, 1-4. doi: 10.1061/(ASCE)CO.1943-7862.0000851
- Bai, C., Dallasega, P., Orzes, G., & Sarkis, J. (2020) Industry 4.0 technologies assessment: A sustainability perspective. *International Journal of Production Economics*, 229, 107776. doi: 10.1016/j.ijpe.2020.107776
- Banaeian, N., Nielsen, I. E., Mobli, H., & Omid, M. (2014). Green Supplier Selection in Edible oil Production by a Hybrid Model Using Delphi Method and Green Data Envelopment Analysis (GDEA). *Management and Production Engineering Review*, 5, 3-8. doi: 10.2478/mper-2014-0030
- Brewer, B., Ashenbaum, B., & Blair, C. W. (2019). Cross-Functional Influence and the Supplier Selection Decision in Competitive Environments: Who Makes the Call? *Journal of Business Logistics*, 40, 105-125. doi: 10.1111/jbl.12199
- Cho, M., Bonn, M. A., Giunipero, L., & Divers, J. (2019). Restaurant purchasing skills and the impacts upon strategic purchasing and performance: The roles of supplier integration. *International Journal of Hospitality Management*, 78, 293-303. doi: 10.1016/j.ijhm.2018.09.012
- Florez-Lopez, R. (2007). Strategic supplier selection in the added-value perspective: A CI approach. *Information Sciences*, 177, 1169-1179. doi: 10.1016/j.ins.2006.08.009
- Gao, H., Ju, Y., Santibanez Gonzalez, E. D. R., & Zhang, W. (2020). Green supplier selection in electronics manufacturing: An approach based on consensus decision making. *Journal of Cleaner Production*, 245, 118781. doi: 10.1016/j.jclepro.2019.118781
- Garzon, F. S., Enjolras, M., Camargo, M., & Morel, L. (2019) A green procurement methodology based on Kraljic Matrix for supplier's evaluation and selection: a case study from the chemical sector. *Supply Chain Forum*, 20, 185-201. doi: 10.1080/16258312.2019.1622446
- Gualandris, J., Golini, R., & Kalchschmidt, M. (2014). Do supply management and global sourcing matter for firm sustainability performance? *Supply Chain Management: An International Journal*, 19, 258-274. doi: 10.1108/SCM-11-2013-0430
- von Haartman, R., & Bengtsson, L. (2015). The impact of global purchasing and supplier integration on product innovation. *International Journal of Operations & Production Management*, 35, 1295-1311. doi: 10.1108/IJOPM-03-2015-0128

- Haeri, S. A. S., & Rezaei, J. (2019). A grey-based green supplier selection model for uncertain environments. *Journal of Cleaner Production*, 221, 768-784. doi: 10.1016/j.jclepro.2019.02.193
- Haldar, A., Banerjee, D., Ray, A., & Ghosh, S. (2012). An Integrated Approach for Supplier Selection. *Procedia Engineering*, 38, 2087-2102. doi: 10.1016/j.proeng.2012.06.251
- Hasan, M. M., Jiang, D., Ullah, A. M. M. S., & Noor-E-Alam, M. (2020). Resilient supplier selection in logistics 4.0 with heterogeneous information. *Expert Systems with Applications*, 139. doi: 10.1016/j.eswa.2019.07.016
- Hawkins, T. G., Gravier, M. J., & Muir, W. A. (2020). The role of supplier performance evaluations in mitigating risk: Assessing evaluation processes and behaviors. *Industrial Marketing Management*, 87, 2-17. doi: 10.1016/j.indmarman.2020.03.004
- Hosseini, S., Morshedlou, N., Ivanov, D., Sarder, M. D., Barker, K., & Khaled, A. A. (2019). Resilient supplier selection and optimal order allocation under disruption risks. *International Journal of Production Economics*, 213, 124-137. doi: 10.1016/j.ijpe.2019.03.018
- Huemer, L. (2006). Supply Management: Value Creation, Coordination and Positioning in Supply Relationships. *Long Range Planning*, 39, 133-153. doi: 10.1016/j.lrp.2006.04.005
- Kannan, D., Mina, H., Nosrati-Abarghoee, S., & Khosrojerdi, G. (2020) Sustainable circular supplier selection: A novel hybrid approach. *Science of The Total Environment*, 722, 137936. doi: 10.1016/j.scitotenv.2020.137936
- Konys, A. (2019). Methods supporting supplier selection processes - Knowledge-based approach. *Procedia Computer Science*, 159, 1629-1641. doi: 10.1016/j.procs.2019.09.333
- Lammgård, C., & Andersson, D. (2014). Environmental considerations and trade-offs in purchasing of transportation services. *Research in Transportation Business & Management*, 10, 45-52. doi: 10.1016/j.rtbm.2014.04.003
- Manavalan, E., & Jayakrishna, K. (2019). A review of Internet of Things (IoT) embedded sustainable supply chain for industry 4.0 requirements. *Computers & Industrial Engineering*, 127, 925-953. doi: 10.1016/j.cie.2018.11.030
- Marufuzzaman, M., & Ekşioğlu, S. D. (2017). Managing congestion in supply chains via dynamic freight routing: An application in the biomass supply chain. *Transportation Research Part E: Logistics and Transportation Review*, 99, 54-76. doi: 10.1016/j.tre.2017.01.005
- Matthess, M., Kunkel, S., Xue, B., & Beier, G. (2022). Supplier sustainability assessment in the age of Industry 4.0 – Insights from the electronics industry. *Cleaner Logistics and Supply Chain*, 4, 100038. doi: 10.1016/j.clscn.2022.100038
- Oroojeni, M. J. M., Darvishi, M., & Oroojeni, M. J. A. (2020) Green supplier selection for the steel industry using BWM and fuzzy TOPSIS: A case study of Khouzestan steel company. *Sustainable Future*, 2, 100012. doi: 10.1016/j.sfr.2020.100012
- Rashidi, K., Noorizadeh, A., Kannan, D., & Cullinane, K. (2020). Applying the triple bottom line in sustainable supplier selection: A meta-review of the state-of-the-art. *Journal of Cleaner Production*, 269, 122001. doi: 10.1016/j.jclepro.2020.122001
- Resende, C. H. L., Geraldes, C. A. S., & Junior, F. R. L. (2021), Decision Models for Supplier Selection in Industry 4.0 Era: A Systematic Literature Review. *Procedia Manufacturing*, 55, 492-499. doi: 10.1016/j.promfg.2021.10.067
- Sánchez-Rodríguez, C., & Martínez-Lorente, Á. R. (2004). Quality management practices in the purchasing function: An empirical study. *International Journal of Operations & Production Management*, 24, 666-687. doi: 10.1108/01443570410541984
- Saengchai, S., & Jemsittiparsert, K. (2019). Supply chain and firm performance: examining the moderating role of supply chain information strategy. *Polish Journal of Management Studies*, 20(2), 454-465.
- Schütz, K., Kässer, M., Blome, C., & Foerstl, K. (2020). How to achieve cost savings and strategic performance in purchasing simultaneously: A knowledge-based view. *Journal of Purchasing and Supply Management*, 26, 100534. doi: 10.1016/j.pursup.2019.04.002
- Seuring, S., & Müller, M. (2008). From a literature review to a conceptual framework for sustainable supply chain management. *Journal of Cleaner Production*, 16, 1699-1710. doi: 10.1016/j.jclepro.2008.04.020
- Silva, Â., & Ferreira, A. C. (2021). Impact of Lean Tools on Companies During Industrial Engineering Projects Implementation: A Correlation Study. In Tavares Thomé, A. M., Barbastefano, R. G., Scavarda, L. F., Gonçalves dos Reis, J. C., & Castro Amorim, M. P. (Eds.), *Industrial Engineering and Operations Management* (pp. 79–91). Springer Nature Switzerland.
- Stekelorum, R., Laguir, I., & Elbaz, J. (2020). Cooperation with international NGOs and supplier assessment: Investigating the multiple mediating role of CSR activities in SMEs. *Industrial Marketing Management*, 84, 50-62. doi: 10.1016/j.indmarman.2019.04.001
- Szpilko, D. & Ejdy, J. (2022). European Green Deal – research directions. a systematic literature review. *Economics and Environment*, 81(2), 8-38. doi: 10.34659/eis.2022.81.2.455
- Taherdoost, H., & Brard, A. (2019) Analyzing the Process of Supplier Selection Criteria and Methods. *Procedia Manufacturing*, 32, 1024-1034. doi: 10.1016/j.promfg.2019.02.317
- Tunca, T. I., & Zenios, S. A. (2006). Supply auctions and relational contracts for procurement. *Manufacturing & Service Operations Management*, 8, 43-67. doi: 10.1287/msom.1060.0097
- Winter, S., & Lasch, R. (2016). Environmental and social criteria in supplier evaluation – Lessons from the fashion and apparel industry. *Journal of Cleaner Production*, 139, 175-190. doi: 10.1016/j.jclepro.2016.07.201
- Wong, A. S.-H. (1995). Total quality in purchasing. In *Total Quality Management* (pp. 181-184). Dordrecht: Springer Netherlands.

- Wong, J. T. (2020) Dynamic procurement risk management with supplier portfolio selection and order allocation under green market segmentation. *Journal of Cleaner Production*, 253, 119835. doi: 10.1016/j.jclepro.2019.119835
- Zimon, D., & Zimon, G. (2019). The Impact of Implementation of Standardized Quality Management Systems on Management of Liabilities in Group Purchasing Organizations. *Quality Innovation Prosperity*, 23, 60. doi: 10.12776/qip.v23i1.1210s