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STRATEGIC MANAGEMENT OF PROCUREMENT LOGISTICS IN MODERN SUPPLY CHAINS

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Abstract: *In globalised supply chains with extended transport flows, procurement logistics goes beyond a supporting operational function and becomes a strategic management discipline. This paper reviews scientific literature on procurement logistics, outlines the procurement process chain and identifies major strategies with regard to purchasing structure, inventory management, sourcing decisions, and virtual logistics.*

Keywords: *procurement logistics, supply chain management, strategic sourcing, inventory management, supplier selection, Just-in-Time, digitalization, risk management.*

1. INTRODUCTION

Procurement used to be seen as an internal purchasing function that mainly involves negotiating purchase prices and placing orders. However, as supply chains have extended due to globalisation and digitalisation trends, procurement has taken on added significance as one lever to directly influence operational efficiency, cost competitiveness, risk exposure and strategic market position. Today's procurement logistics connects the company's external supply markets with internal material flow and production systems. Ensuring material availability is therefore not just an operational concern but has strategic importance.

Over the last decades, supply chains have fundamentally changed their structure. Companies are sourcing goods from increasingly distant markets, transport flows cover longer distances and are more internationalised than ever before. Manufacturers utilise global supplier networks and many purchased components contain several tiers of suppliers themselves. Naturally, these trends enable access to lower-cost supplier markets and specialised expertise. On the other hand, they also come with challenges such as increased uncertainty, longer supplier lead times, and exposure to additional supply risks. Recent years have seen global supply chains impacted by pandemics, war, energy crises, transport bottlenecks, rising inflation, and volatile currency markets. Today we know that purchasing decisions can have strategic ramifications downstream. Material availability can thus be a critical element of business continuity.

Procurement logistics can be described as a chain of interconnected planning and execution processes. The purchasing process begins with demand definition and includes supplier evaluation and selection, delivery scheduling, transport planning, receiving, and warehousing. Every step of the procurement process chain needs to be aligned with production planning and inventory management. Improper procurement decisions can lead to high inventory levels, stock-outs, capital tie-up or production downtime. Procurement logistics spans activities before and after the production process and needs to be planned with regard to other business functions and company objectives.

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Beyond optimising for cost efficiency, sustainable procurement logistics considers environmental and social sustainability criteria when planning purchases and selecting suppliers. At the same time, procurement must balance lean inventory approaches with safety stocks and other buffering strategies to mitigate supply risks.

Digitisation trends have had and will continue to impact procurement logistics as well. Planning systems and enterprise resources planning (ERP) software help coordinate purchasing activities internally. Electronic data interchange (EDI), supplier portals, and automated order processing streamline purchasing operations. Automated identification technologies like barcodes help track materials already in-house. Real-time shipment tracking and load sensing technologies provide additional transparency upstream. These technologies allow procurement managers to base decisions on more data than ever before.

Procurement logistics should therefore not be seen as an isolated function within companies. It reaches far beyond negotiating purchase prices for urgently needed materials. Nowadays, procurement logistics interfaces with external markets and suppliers, supports horizontal and vertical coordination processes across companies, and ties into long-term strategic objectives.

The scientific staff members of the Institute of Logistics have been dealing with the topic of procurement logistics for several decades, making extensive and high-quality contributions to scientific research in this area (Borodavko et al. [1]; Nagy G. et al. [2], Bányai Á. [3-4]). Thanks to close ties with businesses and industries, the results could be transferred to industrial practice as well as to operational supply chains at the latest when graduates started their careers. The results of these decades of scientific work are integrated into the curriculum at the University of Miskolc to this day and this article deals with the topic of procurement logistics. Building on this already high-quality groundwork, this paper will provide additional research insights into the field of procurement logistics.

2. LITERATURE REVIEW

In this chapter, the research results in the field of procurement and purchasing logistics are summarized. This section includes a descriptive and a content analysis. Within the frame of the literature review, Scopus was used to identify the most important scientific results regarding procurement and purchasing logistics. The review focuses on the highlight and main research directions.

Firstly, the relevant terms must be defined. In this first phase I have chosen the keyword: (TITLE (purchasing) OR TITLE (procurement)) to find a wide range of articles to perform a descriptive analysis of articles. Initially, 28479 articles were identified.

As Fig. 1 shows, procurement and purchasing has been researched in the past 170 years. The first article in this field was published in 1855. The number of published papers has significantly increased in the last 50 years; it shows the importance of this research field.

We can analyze the distribution of published articles per year and per source, as shown in Fig. 2.

It can be seen, that a wide range of articles in the field of logistics of dangerous goods has been published in five scientific journals: Sustainability Switzerland (294 articles), International Journal of Procurement Management (230 articles), Journal of Purchasing and Supply Management (211 articles), Journal of Public Procurement (189 articles), European Procurement and Public Private Partnership Law Review (137 articles). The CiteScore is shown in Fig. 3.

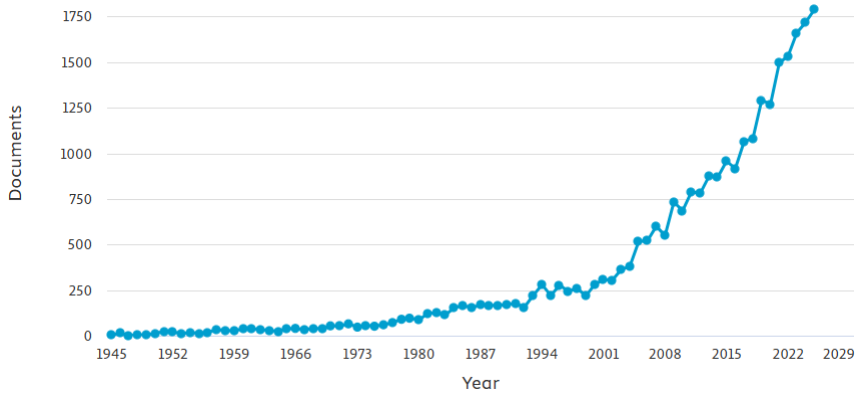

Figure 1. Published articles per year between 1945 and 2025 in the field of procurement and purchasing resulted by a Scopus search (Source: www.scopus.com)

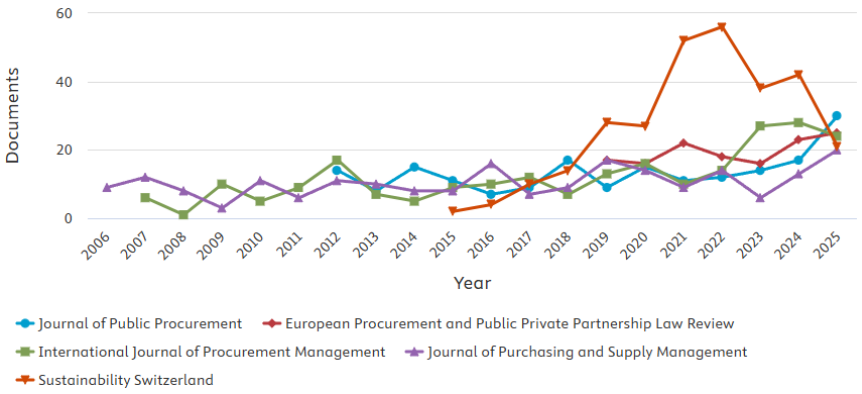

Figure 2. Published articles per year per source between 2006 and 2025 in the field of procurement and purchasing resulted by a Scopus search (Source: www.scopus.com)

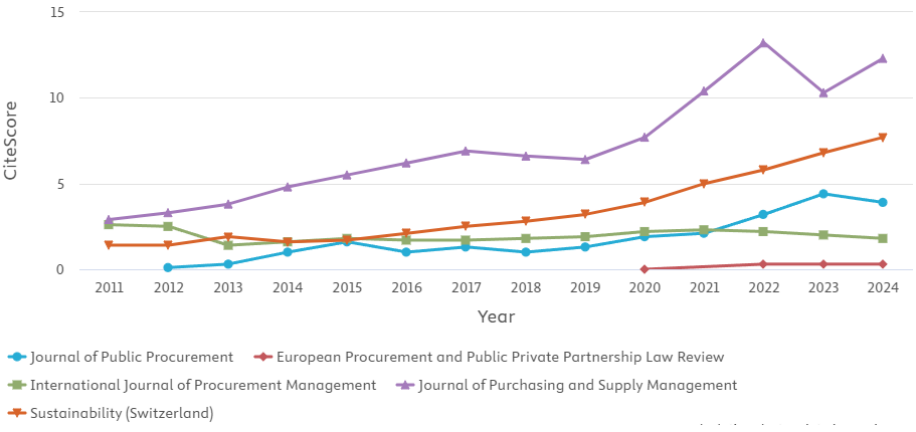

Figure 3. CiteScore publication per year between 2011 and 2024 in the field of procurement and purchasing resulted by a Scopus search (Source: www.scopus.com)

The analysis of the subject area of research works shows (see Fig. 4), that the most important subject areas in the Scopus are the followings: business and management, social sciences, engineering, computer sciences, and economics.

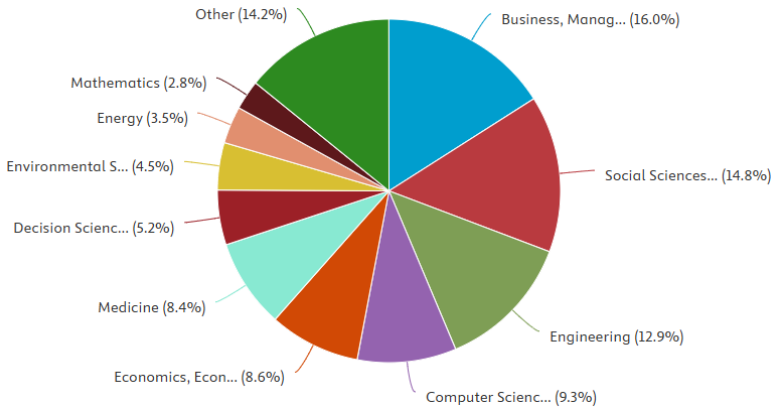

Figure 4. Published articles by subject area related to dangerous goods logistics resulted by a Scopus search (Source: www.scopus.com)

Based on our analysis of publication volume and subject areas, article metadata is then reviewed in further detail. This is done by presenting a curated selection of articles based on citation count. Citations can be used to approximate scientific impact and therefore relevance. From these articles, leading insights and arguments are presented to illustrate prevailing research themes and approaches in purchasing behaviour.

Examining consumer behaviour, Donovan et al. [5] establish that positive emotion induced by atmospheric cues increase both time spent shopping and additional spending. Baumeister [6] focuses on impulsive buying and finds that lack of self-control, rather than subconscious influences, drives spontaneous purchasing. Park et al. [7] show that both review quantity and perceived review quality positively influence consumers' purchasing intention online. When consumers are highly involved in the purchase decision, review valence moderates this effect. Tsai et al. [8] find that increasing users' perception of information salience regarding their privacy data on ecommerce websites causes consumers to favour stores with prominent privacy policies. Their behaviour is further motivated by increased privacy concern. Interestingly, some consumers were even willing to pay more if their privacy could be protected by the store. Laato et al. [9] study panic buying behaviour during the COVID-19 pandemic. The authors find that heavy exposure to COVID-related information through social media and other online channels caused respondents to experience higher levels of COVID perceived severity, information overload, and cyberchondriam which then positively influenced their likelihood of engaging in pandemic related panic buying.

Some articles tackle environmental impacts and consumers' attitude versus behaviour gap when it comes to green purchasing. Schlegelmilch et al. [10] measure consumers' level of environmental consciousness and demonstrate that it better predicts "green purchase behaviour" than demographics. Young et al. [11] similarly investigate the "attitude–behaviour gap" when it comes to green consumer behaviour. The researchers argue that lack of time, as well as vague labels and vague incentive structures, stand in the way of consumers

acting on their pro-environmental attitudes. Jaiswal and Kant [12] present a validated hypothetical model of green consumer behaviour which is based on empirical data from India. The authors' results show that environmental concern, perceived consumer effectiveness, and attitude towards green products directly influence consumers' green purchase intentions and behaviour.

Cooper and Ellram [13] use the SCM concept to frame purchasing beyond traditional vertical-channel-relationship thinking. Highlighting its strategic nature, they emphasise the importance of aligning purchasing and logistics decisions. Pagell [14] identifies factors that enable integration throughout companies along the operations-purchasing-logistics boundary. The study highlights the central role of organisational structure as well as culture, rewards systems, and communication style when breaking down siloes. Chen et al. [15] support the argument for strategic purchasing through empirically demonstrating its positive impact on firm performance. They find that close, communicative supplier relationships as well as a long-term orientation drive better performance. Gulati and Sytch [16] show that manufacturers benefit from procurement relationships characterised by joint dependence. Better performance was reached via embeddedness constructs such as calculative-based joint action and joint information sharing. Edler and Georghiou [17] take a different approach and look at public sector purchasing. They argue that governments, given certain preconditions are met, can utilise public procurement as a demand-side lever for innovation policy. Carithers et al. [18] highlight biomedical procurement as an example of a structured industry with applications and processes resulting in high-quality purchases. The authors describe GTEx as one such standardised process facilitating coordination between multiple organisations.

Focusing on purchasing from a foreign exchange-rate perspective, Rogoff [19] reviews what has come to be known as the "PPP puzzle". The article outlines that real exchange rates deviate significantly from PPP and mean-revert very slowly. This conflicts with theoretical predictions, which most economists justify with realism arguments. O'Connell [20] expands upon previous studies showing that Purchasing Power Parity (PPP) does indeed hold in the long run. In his work, the author argues that earlier studies based on panel data overstated evidence for PPP because they did not account for cross-sectional dependence in their tests. Perron and Vogelsang [21] propose unit-root tests that account for structural breaks. Applying their methodology to the PPP-question, the authors show how ignored regime changes affect conclusions about PPP. Pedroni [22] uses cointegrated panel techniques to study PPP and rejects the strong-form hypothesis. The study also documents heterogeneity in the speed of long-run equilibrium adjustment across currencies. Taylor et al. [23] propose nonlinear models of mean-reversion in real exchange rates as a possible solution to inconsistent empirical results. Taylor & Taylor [24] conclude their literature review on PPP by reviewing and linking together major theories and findings on the subject.

The articles and literature reviews selected for discussion cover a wide range of topics related to purchasing behaviour. While some articles look at consumer behaviour from a psychological perspective, others tackle sustainability and the influence of pro-environmental attitudes on actual purchasing behaviour. At the corporate level, various articles highlight the strategic nature of procurement decisions and their impact on firm performance. Still others take an unconventional approach and apply purchasing to topics like energy prices and biomedical procurement.

3. THE PROCUREMENT LOGISTICS PROCESS AND PLANNING

Procurement logistics primarily serves to supply production and service systems with the necessary input materials. As part of the logistics process, procurement creates the link between external supply markets and the internal material flow system of the company. Procurement has an influence on cost structure, operational risk, running efficiency and service level. Procurement logistics involves more than buying activities. It needs a systematic approach to planning and implementing purchasing activities including demand definition, supplier selection, procurement scheduling, delivery scheduling, transport coordination, receiving, and warehousing decisions. In recent years procurement logistics has gained importance as supply chains have become globalized and extended (see Fig. 5)

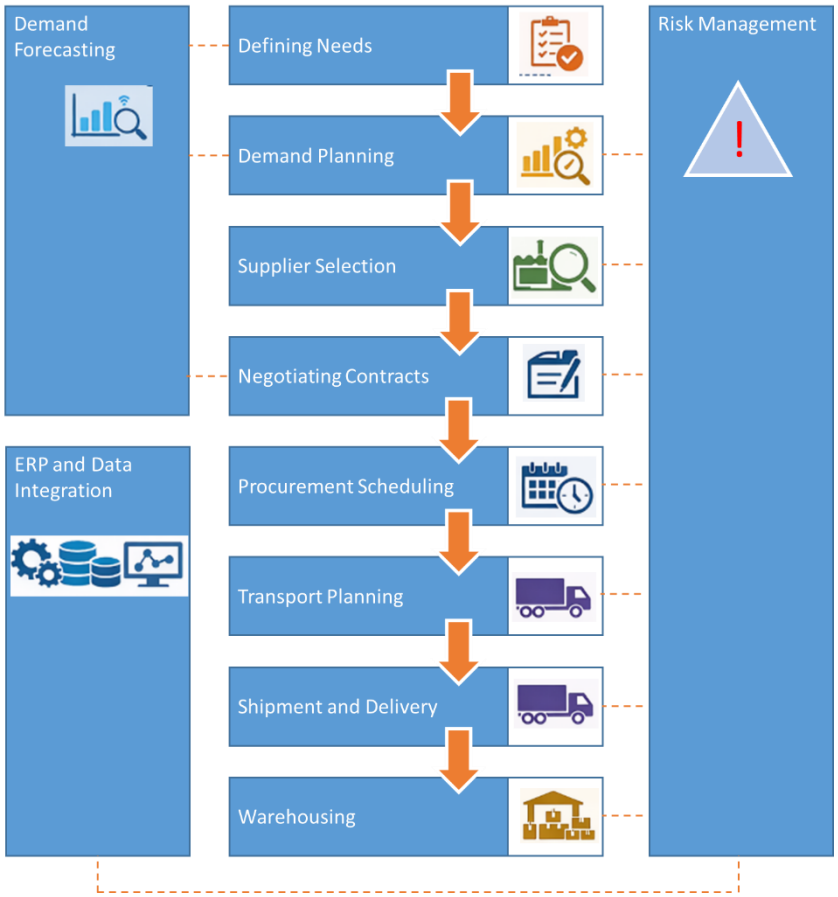

Figure 5. Comprehensive Framework of the Procurement Logistics Process

The procurement process starts with a clear definition of demand. Demand is usually coordinated between procurement and production planning and aligned with sales forecasts and inventory planning. Procurement needs to understand what is required, how much is required, at which quality level and when it is required. This can be calculated through

production plans, bill-of-material, past consumption, or sophisticated material requirements planning (MRP) systems. Incorrect definition of demand may lead to unnecessary stocking of goods and materials tying up capital or worse production shortages halting operations. Demand definition should also allow for flexibility so sudden changes in demand can be met. Many companies will use rolling forecasts which are integrated into their planning systems.

Supplier selection often depends on the outcome of needs definition. In addition to price, companies evaluate their suppliers' performance history. Which suppliers have proven to deliver on time and with consistent quality? What are the capabilities and technologies of the suppliers? Are suppliers financially healthy? Location and sustainability certifications might also play a role in supplier selection. Often companies strive to maintain long-term partnerships with their suppliers. Long-term partnerships enable better collaboration between buying and selling companies and aid in joint product development. Risk can be spread by sourcing from multiple suppliers. Sourcing globally can help reduce cost but creates additional complexity in transportation and customs. Procurement planning should evaluate total cost, risk, and exposure.

After suppliers have been selected, timing should be coordinated with production planning and inventory policy. Large order quantities will decrease cost per unit but increase inventory holding costs. Placing frequent smaller deliveries decreases inventory levels but can increase transportation cost and administration time. Finding the balance of order quantities and timing will decrease overall logistics costs while maintaining a smooth production process. Planning systems can help run different scenarios to assist in procurement decisions.

The timing of when materials will be received also plays a big role in procurement logistics. Which mode of transport will be used and how does that impact cost and lead time? International procurement adds additional complexity with customs and accurate documentation. Integrating transport management systems and digital material identification allow companies to track materials as they arrive into the receiving area. If issues occur companies can adjust production schedules to account for delays. Alternative transportation modes can also be assessed to meet demand if required.

During material reception it is important to verify that the quantities and quality of the materials received match what was ordered. If not action should be taken to resolve any discrepancies. Efficient receiving will reduce congestion in the receiving area and create a smoother material flow. Companies can use technologies such as barcodes to identify received materials faster and ensure they are registered in inventory.

After materials are received they should be stored in a predetermined location. Depending on how often the material will be used it can be located closer to areas of use. The type of material will determine how the material should be stored. Warehouse management systems can help location decisions and facilitate stock rotation guidelines such as first in first out (FIFO) or first-expired first-out (FEFO). In some cases materials can be cross docked which means they will not take up storage time in a warehouse and go directly to their area of use.

The procurement logistics process should also include uncertainty and buffer for risk. Global sourcing has increased the efficiency of procurement but has left companies vulnerable to unexpected events. Many companies have reacted to this by creating contingency plans, holding safety stock of critical materials, and assessing secondary suppliers. Scenario planning can help structure this uncertainty as can supplier risk assessments.

Thanks to new technology procurement logistics has become more data driven than ever. Today most ERP systems are integrated allowing for demand information to flow through to suppliers, inventory to be managed, and expenses to be tracked and accounted for [25]. Electronic data interchange (EDI), supplier portals, and automated ordering cut down on administrative tasks. New technology allows for predictive risk analysis and better decision making. Digitalization allows for increased transparency which can allow companies to respond to changes faster.

In conclusion procurement logistics process is a set of linked planning and logistical tasks which serve to supply materials to a production system. Demand should be well defined and tied to production plans and sales forecasts. Suppliers should be chosen based on multiple factors and not just price. Order quantities and timing should be determined based on inventory policy and production levels. Transportation modes should be evaluated based on lead time and cost. Efficient receiving will help with material flow inside the company. Warehouse location should be determined by usage and material type. Finally procurement logistics planning should account for uncertainty and risk.

Table I.

Functional and Performance Characteristics of Procurement Logistics Activities

Process Step	Primary Objective	Key Activities	Main Risks	Performance Indicators
Demand Forecasting	Ensure accurate material planning	Sales analysis, forecasting, production alignment	Forecast errors, demand volatility	Forecast accuracy, planning variance
Defining Needs	Specify quantity, quality, timing	Requirement specification, BOM analysis	Over/underestimation	Material availability rate
Supplier Selection	Identify reliable suppliers	Supplier evaluation, audits, comparison	Supplier dependency, quality issues	Supplier reliability, defect rate
Contract Negotiation	Establish commercial & operational terms	Price negotiation, delivery terms	Unfavorable terms, hidden costs	Cost savings, contract compliance
Procurement Scheduling	Align orders with production	Order planning, lot sizing	Stockouts, excess inventory	Inventory turnover, service level
Transport Planning	Ensure timely inbound delivery	Mode selection, carrier coordination	Delays, transport disruption	On-time delivery
Receiving and Inspection	Verify conformity	Quantity and quality check, documentation control	Damaged goods, discrepancies	Receiving accuracy rate
Warehousing	Secure and manage inventory	Put-away, stock registration, storage allocation	Misplacement, inventory inaccuracy	Inventory accuracy, storage utilization

4. PROCUREMENT LOGISTICS STRATEGIES

Procurement logistics strategy can be described as how a company sources materials, manages suppliers and control material flows to meet company goals. Procurement logistics strategy defines how purchasing is structured within an organization. Globalization of supply

chains and advances in technology have changed how companies approach procurement logistics. Cost leadership is no longer the only focus of procurement strategy. There has been an increased need for risk management and flexibility in procurement (see Fig. 6).

One of the first decisions that companies need to make is if procurement should be done centralized or decentralized. In a centralized procurement structure purchasing power is held by a central department. This allows for companies to aggregate demand which can create better negotiation power with suppliers. Standardization of specifications can be pushed through this department and expenditure can be monitored and optimized. Companies can benefit from economies of scale where larger volume pushes down prices. On the other hand, decentralized purchasing allows for individual business units to purchase materials they need. This allows for greater flexibility when working with local suppliers. Therefore, there is a trade-off between efficiency and responsiveness [26]. Many companies tend to use hybrid structures where strategic procurement is done centrally and executed locally.

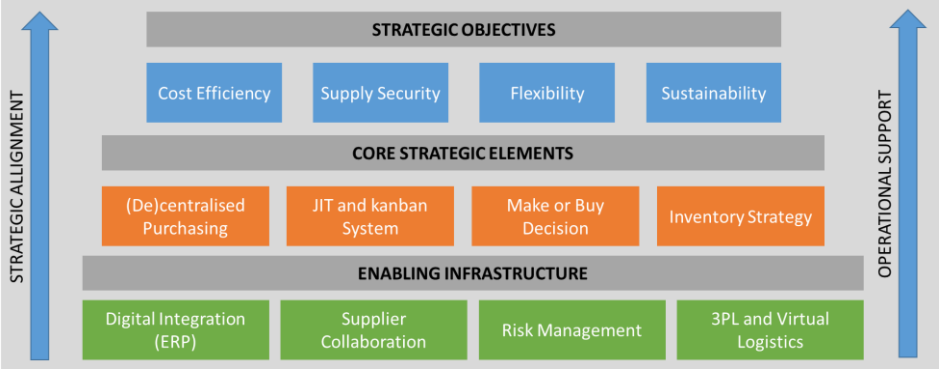

Figure 6. Strategic Framework of Purchasing Logistics

Just-in-Time (JIT) is an inventory strategy that forces companies to decrease their stockholding. The goal of JIT is to synchronize supply with production. Companies can benefit from implementing JIT as it can increase efficiency and reduce cost. Kanban is another inventory strategy where replenishment is driven by actual consumption [27]. Kanban allows for increased transparency within the supply chain. However, both of these strategies rely on trustworthy suppliers and consistent lead times. If there is a supply interruption it can halt production as company do not have any safety stock. Both JIT and Kanban could be implemented by companies to streamline processes.

Companies not only have to manage purchases of raw materials, but also need to decide if certain components are better produced in-house or purchased from a supplier. There are benefits and costs to both decisions. Producing in-house increases control but typically requires higher capital investment, while outsourcing reduces investment needs but increases dependency on suppliers. However, some companies might have core competencies that make outsourcing a better decision. There are risks that need to be considered when outsourcing components. If a company holds all production in-house they are only at risk of their own suppliers. As supply chains have globalized companies need to decide how much of a risk outsourcing produces is worth taking.

Warehouse strategy can also play a large role in procurement logistics. Companies can split up their materials into categories using ABC classification. Each category can be given

different levels of importance and safety stock [28]. Higher value materials can have a higher assigned safety stock and multiple suppliers. Lower value materials can have simpler reorder points. Consignment stock agreements can help reduce storage time and improve cash flow. Cross docking is another strategy where materials do not take up storage time in a warehouse. These strategies can help procurement improve their performance.

In recent years there has been a shift towards digitalization in procurement logistics. Digitalization allows companies to have increased transparency in the supply chain. New technologies such as enterprise resource planning allow for information to flow through the entire supply chain. From demand planning to supplier communication, to inventory management, and accounting. Nowadays companies tend to outsource part of their logistics requirements. These are known as virtual logistics companies. Companies act as network members and rely on 3rd party logistics providers. Technology allows companies to not worry about operational activities and focus on coordination [29].

As presented in Table II, each procurement logistics strategy involves specific trade-offs between cost efficiency, flexibility and risk exposure, requiring context-dependent managerial decisions.

Table II.

Comparative Characteristics of Procurement Logistics Strategies

Strategy	Primary Objective	Advantages	Risks-Limitations	Suitable Environment
Centralised Purchasing	Cost optimisation through volume aggregation	Strong negotiation power, standardisation	Lower flexibility	Large, multi-unit organisations
Decentralised Purchasing	Local responsiveness	Faster decision-making	Fragmented demand, weaker bargaining power	Regionally diverse markets
Just-in-Time (JIT)	Inventory minimisation	Reduced holding costs, improved flow	High disruption sensitivity	Stable supplier environment
Kanban System	Consumption-based replenishment	Process transparency, reduced overstock	Requires real-time coordination	Lean production systems
Make Strategy	Internal control	Quality control, IP protection	High fixed costs	Core strategic components
Buy Strategy	External sourcing efficiency	Lower capital investment	Supplier dependency	Non-core activities
Consignment / Flexible Warehousing	Working capital reduction	Reduced inventory ownership	Supplier negotiation complexity	Long-term supplier partnerships
Virtual Logistics Model	Network-based coordination	Scalability, digital transparency	Dependence on external providers	Globalised, digital supply chains

5. DISCUSSION AND CONCLUSIONS

Procurement logistics should no longer be understood as tactical purchasing process, but as a strategic lever of supply chain management. Procurement logistics consists of demand forecasting, purchasing processes, transport management, inventory control and IT information flows. These processes have influence on costs as well as on company continuity, risk management, sustainability and competitiveness.

As discussed in the paper, companies need to consider multiple aspects when outsourcing components from various suppliers around the world. Sourcing globally allows companies to reduce costs and potentially source from specialised providers, but they also introduce higher risks such as supply disruptions, import regulations, and longer lead times. The COVID-19 pandemic is a recent example of how efficient supply chains such as Just-in-Time can cause large setbacks due to low inventory levels. It is therefore advised that companies ensure proper backup systems are in place when utilising lean strategies. This can include safety stocks as well as multi-sourcing.

The organisation of procurement logistics depends on multiple factors. There is always a trade-off between centralised and decentralised purchasing departments. Centralised purchasing benefits from higher purchasing power, but decentralised purchasing can act more locally focused and responsive to changes [30]. Some companies might benefit from hybrid purchasing structures. Hybrid structures can allow corporations with multiple departments or divisions to align their overall procurement strategy, while letting each department adapt the strategy to their specific needs. Make-or-buy decisions can also influence company strategy. Buying from suppliers might be more cost-efficient but can cause a company to lose strategic control over their supply.

Advancements in information technology allow companies to streamline their procurement logistics. From Enterprise Resource Planning systems to track packages in realtime, to data analytics and supplier portals. Information technology can help companies better predict risks and overall help with the decision-making process. But beware of creating systems your company will become too dependent on.

To conclude, every company is different and will require different procurement strategies. When determining your procurement strategy, companies should identify how much weight they want to give to cost-savings, flexibility and buffer. Procurement logistics should be treated as an integral part of the firm.

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