

INVESTIGATION OF PROCUREMENT PROCESS PROBLEMS IN A SELECTED DISTRIBUTION CENTRE

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Purpose: The main objective of this article is to identify and analyse the disruptions that occur in the procurement process of a selected distribution centre, together with suggestions for improvement.

Design/methodology/approach: The study used qualitative research, including participant observation and interviews. In addition, selected methods and techniques were used and techniques, including the FMEA (Failure mode and effects analysis) method and the A3 report.

Findings: Empirical studies indicate that the problems occurring in a distribution centre in the procurement process are mainly caused by the use of two non-integrated WMS (Warehouse Management System) systems.

Originality/value: The results of the research can be used to improve the procurement process in the studied distribution centre by using the proposed solution, i.e. integrating existing warehouse management systems, which will have a significant impact on reducing stock discrepancies.

Keywords: procurement process, distribution centre, FMEA, A3 report.

Category of the paper: general review.

Introduction

Today's market development offers many opportunities not only for companies but also for distribution centres, encouraging creativity and innovation. Changes are taking place in many areas directly or indirectly related to logistics. They are taking place in procurement logistics, warehousing and inventory management, and customer distribution logistics (Dyczkowska, 2013).

As a key element of any company's operations, procurement logistics is an integral part of the supply chain. It encompasses a set of processes related to the planning, organisation and execution of the procurement of raw materials, materials, components and other goods required

for production or service delivery. The same applies to the distribution centre, where procurement logistics, as the foundation of the organisation's operations, has a direct impact on the company's profitability and competitiveness. This is particularly true in the case of food distribution, where market dynamics, specific quality requirements and the need to maintain the cold chain present additional challenges for companies.

It is therefore essential that procurement processes are continually improved and integrated with the rest of the business, as they are the backbone of any organisation.

Therefore, the main objective of this article is to identify and analyse the disruptions that occur in the procurement process of a selected Italian food distribution centre, and to propose improvements. The study used qualitative research, including participant observation and interviews. In addition, selected methods and techniques were used, including the FMEA method and the A3 report.

In addition, the article attempts to verify the hypothesis: Problems occurring in the distribution centre during the procurement process are caused in particular by the use of two non-integrated WMS systems. The integration of a warehouse management system will have a significant impact on reducing discrepancies in stock levels.

The role and importance of procurement in the distribution centre – theoretical background

The increasing popularity of outsourcing business operations has led to sourcing becoming a business area of strategic importance. This means that as suppliers become more important to a company's competitive position, it has become increasingly important to align sourcing objectives with business objectives (i.e. strategic alignment). (van Weele, Rozemeijer, 2022).

Sourcing focuses primarily on the bottom-line benefits of purchasing through cost savings, ensuring on-time delivery and improving quality. How distribution centres can best mobilise their supplier networks to create a sustainable competitive advantage is a question that has yet to be fully answered. Operational excellence is therefore one of the key tasks of any procurement organisation. It should strive to ensure that the best products are delivered at the right time, in the best possible quality and at the best possible price to meet the needs of internal customers (van Weele, Rozemeijer, 2022, p. 49).

When considering how to develop procurement as a strategic business function, it is important to consider the key differences between organisations and industries. The roles, responsibilities and level of authority assigned to procurement vary even between companies in the same industry (van Weele, Rozemeijer, 2022, p. 49).

The main procurement responsibilities in the distribution centre are (van Weele, Rozemeijer, 2022, p. 49):

1. Operational Excellence:
 - Ensure timely and uninterrupted availability of purchased goods and services.
 - Working with suppliers to ensure continuity of supply and high product quality.
 - Optimise purchasing processes to reduce costs and and increase efficiency. Customer focus.
 - Ensure the smooth running of the purchasing department.
2. Controlling costs and reducing expenditure:
 - Negotiate favourable prices and purchasing terms.
 - Minimise the direct and indirect costs associated with the purchase and use of materials.
 - Procure materials and services with the best value for money.
 - Work with reliable suppliers who offer competitive prices.
 - Make informed purchasing decisions.
3. Supply risk management:
 - Diversify suppliers and avoid over-reliance on a single source.
 - Work with established and reputable companies.
 - Minimise technology and supply risks associated with supply.
4. Innovation and continuous improvement:
 - Working with suppliers on product and process and process innovation.
 - Collaboration with suppliers in research and development.

Procurement in a distribution centre is a complex process with many stages. Although the organisation of procurement is different in each company, the basic phases can be distinguished (Bozarth, Handfield, 2007; Żabińska, 2015):

1. Identify needs:
 - Identify the need for raw materials, materials, finished products or services.
 - Analysis of customer requirements and demand forecasts.
2. Description of user requirements:
 - Precise definition of order specifications (e.g. technical parameters, quantity, delivery date).
 - Communicate data to suppliers.
3. Identifying and evaluating suppliers:
 - Decide whether to source internally or externally (outsourcing).
 - Define the sourcing strategy.
 - Identifying potential suppliers and strategic market analysis.
 - Evaluate suppliers against criteria chosen to suit the organisation.

4. Supplier selection:
 - Selecting the supplier with the highest rating or, alternatively, the preferred supplier, i.e. a supplier with whom a successful relationship has already been established.
 - Negotiation or tendering.
5. Order preparation:
 - Establishing the terms of co-operation (timing, volume of deliveries, transport, packaging, payments, complaints).
 - Conclude a formal contract with the supplier (usually long term).
 - Establish a clear contractual order.
6. Receiving and checking:
 - Check quantity, quality and timeliness of delivery.
 - Compare with documentation and schedule.
 - In the event of delays or shortages, inform procurement management and propose solutions.
 - Possibility of complaints, renegotiation or cancellation of the contract.
7. Approval and payment of invoices:
 - Approve invoices in the system.
 - Settling accounts with the supplier.

Today's competitive market conditions are forcing DCs to take a fresh look at the procurement process. It is becoming necessary to view it in the context of the entire supply chain. This change of perspective requires taking into account the interdependencies between logistics subsystems within the company, the links with other functions of the company and, above all, the links with suppliers' logistics systems (Bendkowski, Radziejowska, 2005, p. 58).

Methodology

Qualitative methods such as participant observation and interview were used to investigate problems in the procurement process. According to Pegani A. (2023), the qualitative method in conducting scientific research is more effective and allows for a comprehensive coverage of the research topic. In addition, it allows for a more extensive amount of data to be obtained, thus focusing on a comprehensive analysis of the phenomenon in question (Pegani 2023).

The study used a range of research tools and techniques. These included:

- FMEA methodology - aimed at identifying and analysing the disruptions occurring in the different areas of the supply process in the DC under study. It also enabled the development of preventative measures by examining the cause-and-effect relationships for the disruptions identified.

- The A3 report - allowed for a more in-depth analysis of the occurrence of the highest priority disruption, C. The causes of its occurrence were identified and countermeasures were proposed to minimise or eliminate it.

Results

Identification and analysis of problems in the supply process using the FMEA method.

An FMEA analysis was used to identify and analyse failures in the supply process of a company that is the largest importer and distributor of high quality food products in Poland. In addition to the identification of disturbances, the FMEA method also enabled the investigation of their causes and effects.

On the basis of observations and interviews with employees, the following were analysed:

- Order preparation and placement.
- Transport and storage.
- Delivery acceptance.

Table 1 defines the frequency of disturbance (R), where its probability and characteristics are defined on a scale of 1 to 10.

Table 1.

Frequency of interference - R

Incidence	FMEA of the product	R	Frequency of disturbance
Unlikely	Interference is unlikely	1	Less than 1/1 000 000
Very rarely	Very few malfunctions	2	1 per 20 000
Rarely	Relatively few interruptions	3	1 per 4 000
On average	The fault occurs sporadically from time to time	4-6	1 per 1 000 1 per 400 1 per 80
Often	The fault is repeated cyclically	7-8	1 per 40 1 per 20
Very often	Disruption is almost inevitable	9-10	1 per 8 1 per 2

Source: Author's compilation based on interviews with company employees.

Table 2 shows the significance of disturbances (Z), also rated on a scale of 1 to 10, for disturbances ranging from very small and insignificant to very large, causing further problems. In contrast, Table 4 shows the probability of detection (W) of a fault.

Table 2.
Significance of interference - Z

Importance of the disruption to the customer		Z
Very small	Minimal impact, the customer does not notice, the disruption does not affect the conditions of use of the product.	1
Small	Minimal effect, causing minor discomfort, moderate deterioration of product properties may be noticeable.	2-3
Average	Interference causes limited dissatisfaction and minor inconvenience; the product does not meet needs or is a source of inconvenience; the user perceives shortcomings in the product.	4-6
Large	Customer dissatisfaction occurs; cost unknown.	7-8
Very large	High customer dissatisfaction, high costs due to total or partial spoilage. May compromise user safety or contravene legislation.	9-10

Source: Author's calculations based on interviews with company employees.

Table 3.
Probability of detection - W

Interference detection	Probability of detecting a fault	W
Very high	Very low probability of undetected interference, automatic control of 100% of components, installation of protection.	1-2
High	Low probability of undetected fault before end of operation; fault is obvious, multiple faults may go undetected.	3-4
Average	Medium probability of not detecting a product failure before the end of the operation; manual control difficult.	5-6
Low	Probability of non-detection of interference high, subjective judgement in terms of sampling.	7-8
Very low	High probability of non-detection; point is uncontrolled; fault not visible	9-10

Source: Author's calculations based on interviews with company employees.

As a result of the FMEA analysis (Table 4), 7 disruptions were identified, including 4 critical ones that exceeded a priority score of 100 (the score was determined based on interviews with company personnel). These included: inadequate forecasting of requirements, limited communication from the supplier, inadequate securing/storage of products, discrepancies in stock levels. Their causes and effects were then identified. Following in-depth analysis, preventive measures were proposed to increase their detectability and reduce their incidence. As a result, the detectability of some was increased and the incidence of all was reduced.

The disruption related to stock discrepancies scored the most points. The source of the problem is the use of two different WMSs, which leads to differences in stock levels between the two systems - and it is worth noting that the actual number of products in stock is often still different. Also important is the fact that data is entered manually into both programmes, which only adds to the difficulties and slows down the whole process. To overcome this disruption, a single WMS should be implemented that is tailored to the needs of all parties involved in the process, so that everyone can use it easily. This system should also allow for the use of RFID technology for data entry, which would greatly streamline the process and reduce human error that often occurs when activities are performed manually.

Problems were then identified in communicating with suppliers, who often did not respond to emails or phone calls. When contact was made, it was not uncommon for the supplier to give a cursory response rather than complete information. As a result, the company was unable to obtain and pass on information to the customer, often concerning the expected delivery date or confirmation that the quantity ordered would be delivered. As a result, there were quantity errors in deliveries due to the supplier's lack of production capacity. This led to a number of other problems, such as not being able to fulfil the customer's order on time, or trying to source similar goods immediately from another supplier, incurring additional costs. The solution is to develop and periodically run a supplier selection and evaluation process that would select the best suppliers while rejecting the problematic ones. It would also make it possible to develop an action plan for suppliers with an average score. As a result, communication with suppliers should improve.

Difficulties in forecasting customer demand due to inaccurate forecasting by the buyer or errors due to manual execution of the process were also identified. The food industry is characterised by fluctuating seasonal demand, which needs to be taken into account when planning demand for individual products. Unfortunately, the buyer is not always able to anticipate changes in customer buying trends for individual products. Therefore, the focus should be on automating and refining the process using IT tools that also enable the automatic collection of statistical data on demand variability.

Subsequently, irregularities were detected in the protection and storage conditions of the products. Food products require a certain temperature and ambient humidity - they must not be too high, as this causes spoilage of the articles, resulting in delays or non-fulfilment of the customer's order. Due to the need to store them in cold stores, additional costs are incurred, hence negligence on the part of the supplier. It is advisable to contact the supplier to raise this issue and, if this does not work, to change supplier.

As a result, out-of-stock situations have become common, causing disruption in downstream processes and often leading to delays in customer orders. The source of the problem is errors made by the supplier, either due to inadequacies in their system or the human factor in picking the delivery. The solution is to talk to the supplier to identify the source of the problem on their end and work together to develop countermeasures to reduce the number of errors.

In addition, distortions have been identified at the stage of acceptance of deliveries into stock, manifested in the acceptance of incorrect quantities of products or the acceptance of products that do not meet quality standards. This results in incorrect data in the system due to products that have been accepted but are not fit for consumption. This results in delays in fulfilling the customer's order, or even the inability to fulfil the order. The existing delivery control procedure should be analysed for possible improvements, followed by training of warehouse staff. It is also advisable to create a checklist of the next steps in the inspection process to be made available to staff - and to post signs with the key rules of the process.

The lowest number of points was given to the disruption caused by the difficulty of finding a suitable means of transport. Foodstuffs must be transported under controlled conditions, i.e. in refrigerated trailers, of which there are relatively few on the market. It is advisable to talk to a shipping company in order to find more hauliers and to conclude long-term contracts with them in order to have access to a more specialised fleet.

This was followed by a simulation of the proposed improvements, which primarily involved the implementation of a single WMS and the development and periodic implementation of a supplier selection and evaluation process. They also included discussions with suppliers and the freight forwarder with a view to attracting new carriers and securing permanent, long-term contracts with them. They also included changes to individual procedures and additional staff training in the areas concerned. As a result, the frequency of all disruptions was significantly reduced and the detection rate slightly increased. As a result, the company's entire procurement process has been streamlined.

Identification and analysis of problems in the procurement process using the A3 report. The A3 report was prepared for the inventory discrepancy failure, which received the highest score of C (priority number was 504) in the FMEA analysis. In addition, interviews with employees and observations confirmed that this failure had a significant and major impact on the procurement process in the DC. In addition, the A3 report provided a better understanding of the causes of the identified disruption in the procurement process so that appropriate remedial actions could be developed.

The A3 report identified the causes of the main disruption in the company's procurement process, namely the discrepancy in stock levels.

These included:

- Poor training of staff (short working hours due to high staff turnover - especially warehouse staff).
- Lack of accuracy.
- Lack of proper communication between departments.
- Complicated procedures (need to enter the same data into different systems - use of different systems, many unnecessary steps).
- Lengthy processes (manual operations), computer breakdowns and software bugs.
- Use of 2 non-integrated WMS.
- Poor division of labour (responsibilities).
- Lack of management supervision.
- Supplier errors (order errors, lack of communication - due to strained relationships with due to strained relationships with individual suppliers).
- Tense atmosphere between employees.

Table 4.
FMEA Worksheet

Area	Potential interference	Potential effects of interference	Potential causes of interference	Z	R	W	C	Recommended action	Responsibility	Results of actions			
										Z	R	W	C
Preparation and ordering	Inadequate demand forecasting	Inability to meet customer needs	Inaccurate forecasts, employee errors	9	5	3	135	Process Automation	Procurement Specialist	9	3	2	54
	Limited communication from supplier	Inability to meet customer needs	Lack of a process for the selection, evaluation and evaluation of suppliers	8	7	5	280	Develop and periodically review a supplier selection and evaluation process.	Manager	8	4	2	64
Transport and storage	Difficulties in finding suitable transport	Delayed order receipt, higher transport costs	Low availability of specialised carriers specialised in food transport	3	6	2	36	Alks with a shipping company	Transport Specialist	3	2	2	12
	Incorrect protection/storage of products	Product unfit for consumption - Delays in fulfilling customer orders	Neglect of duties	7	3	6	126	Discussions with the supplier	Procurement Specialist	7	2	4	56
Acceptance of delivery	Acceptance of incorrect quantity/quality of products	Delayed or impossible processing of customer orders	Lack of adequate supply control	3	4	4	48	Training on delivery control procedures	Manager	3	3	3	27
	Supply shortages	Delayed or impossible processing of customer orders	Supplier errors	7	4	3	84	Discussions with the supplier	Procurement Specialist, Manager	7	2	2	28
	Stock discrepancies	Need to take stock - delays in fulfilling customer orders	Use of 2 different WMS	7	9	8	504	Use of 1 WMS	Manager	7	3	3	63

Source: Author's calculations based on interviews with company employees.

Table 5.
Report A3

Problem: STORAGE DIFFICULTIES																																									
<p>1. Description of the problem</p> <p>Stock irregularities mainly due to the use of 2 independent and non-integrated WMS. and non-integrated WMS where data is entered manually.</p>	<p>4. Cause and effect analysis</p>																																								
<p>2. Current status</p> <p>The two WMS systems show different stock levels, while the actual stock levels are still different.</p>	<p>5. Preventive actions</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #c8e6c9;">Lp.</th> <th style="background-color: #c8e6c9;">Problem</th> <th style="background-color: #c8e6c9;">Action</th> <th style="background-color: #c8e6c9;">Who</th> <th style="background-color: #c8e6c9;">Deadline</th> <th style="background-color: #c8e6c9;">Status</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Poor training of employees (short working life due to high turnover - especially for warehouse staff).</td> <td>Investigate the reason for the high turnover and develop preventive measures (e.g. additional employee benefits), organise additional training.</td> <td>Manager</td> <td>01.04.2024</td> <td>Made</td> </tr> <tr> <td>2.</td> <td>Lack of accuracy.</td> <td>Development of an incentive system for employees.</td> <td>Manager</td> <td>01.03.2024</td> <td>Made</td> </tr> <tr> <td>3.</td> <td>Lack of communication between departments.</td> <td>Introduce additional communication tools (e.g. teams), organise cross-departmental integration.</td> <td>Manager</td> <td>01.03.2024</td> <td>Made</td> </tr> <tr> <td>4.</td> <td>Complicated procedures (need to enter the same data in different systems - use of different systems, many unnecessary systems, many unnecessary steps).</td> <td>Unify and integrate systems, analyse individual activities to shorten and automate the process.</td> <td>Manager / Dział IT</td> <td>01.05.2024</td> <td>Made</td> </tr> <tr> <td>5.</td> <td>Long-term processes (manual execution of activities).</td> <td>Automate the process of bringing items into stock using RFID technology.</td> <td>Manager</td> <td>01.05.2024</td> <td>Made</td> </tr> </tbody> </table>					Lp.	Problem	Action	Who	Deadline	Status	1.	Poor training of employees (short working life due to high turnover - especially for warehouse staff).	Investigate the reason for the high turnover and develop preventive measures (e.g. additional employee benefits), organise additional training.	Manager	01.04.2024	Made	2.	Lack of accuracy.	Development of an incentive system for employees.	Manager	01.03.2024	Made	3.	Lack of communication between departments.	Introduce additional communication tools (e.g. teams), organise cross-departmental integration.	Manager	01.03.2024	Made	4.	Complicated procedures (need to enter the same data in different systems - use of different systems, many unnecessary systems, many unnecessary steps).	Unify and integrate systems, analyse individual activities to shorten and automate the process.	Manager / Dział IT	01.05.2024	Made	5.	Long-term processes (manual execution of activities).	Automate the process of bringing items into stock using RFID technology.	Manager	01.05.2024	Made
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	6.	Computer and software failures.	Report problems to manufacturer, replace electronic equipment.	IT department	01.05.2024	Made
	7.	Use of 2 non-integrated WMS.	WMS unification and integration.	Manager / IT department	01.05.2024	Made
	8.	Poor division of labour (responsibilities)	Reorganisation of processes and responsibilities.	Manager	01.04.2024	Made
	9.	Lack of management control.	Establish regular management meetings with staff, organise internal audits.	Manager	01.03.2024	Made
	10.	Supplier errors (errors in orders, lack of communication - resulting from strained relationships with individual suppliers) with individual suppliers).	Discussions with suppliers - suggestions for streamlining the process with dedicated procurement platforms.	Procurement Specialist	01.05.2024	Made
	11.	Tense atmosphere between employees.	Talking to employees to find the source of problems, organising integration.	Manager	01.04.2024	Made

Source: Author's compilation based on interviews with employees and company matrices.

After analysing the causes identified, preventive actions were defined and the person responsible for them was appointed, along with a deadline for implementation.

Based on the observations, the most significant cause of inventory discrepancies was identified - the use of 2 non-integrated and independent WMS systems. The best solution is to implement a single WMS, which, despite the high cost, will deliver the best results in the long term. It will have a significant impact on process time and reduce employee frustration caused by constant system errors and the need to manually enter the same data twice. In addition, the new WMS will enable data entry using RFID technology. This improvement will require additional training in the use of the WMS system and the use of RFID technology, but attention to reducing employee turnover will significantly reduce training costs. This solution will allow the use of a comprehensive WMS that will enable the activities of all the company's departments and whose data will be in line with reality.

4. Conclusion

The study confirmed the following hypothesis The problems encountered in the DC during the replenishment process are mainly caused by the use of two non-integrated WMS systems. The integration of the WMS will have a significant impact on reducing stock discrepancies. The FMEA analysis identified stock discrepancies as a priority disturbance, while the A3 report enabled a more precise identification of its causes and impact on the research subject's procurement process. All this demonstrated the complexity of the problem and its impact on the company's operations. The research can be used in the activities of the research company.

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