

The Impact of Operational Financing Constraints on Inventory Sustainability and Supply Chain Efficiency: A Case Study of a Family Business in the Swimming Pool Supplies Sector

Omari Akram

ARID International University for Higher Studies, Türkiye
Email: st93769@edu.ariduniversity.com
ORCID: 0009-0002-7331-613X

Received: 02/01/2026

Accepted: 28/08/2026

Published: 23/09/2026

Abstract:

This study examines how operational financing constraints affect inventory sustainability and supply chain efficiency in an Algerian family business supplying swimming pool products. Using a case study supported by operational records, observations, and interviews during the 2025 peak season, the study found severe operational gaps, including a 68% stockout rate, 62% order fulfillment, 38% lost sales, and four-day response times. It proposes the Strategic Inventory Ring-Fencing System Based on Operational Survival Inventory (SIRS-OSI), which reduced stockouts to 24%, increased order fulfillment to 89%, cut lost sales to 11%, and reduced response time to less than one day, enhancing inventory sustainability and supply chain performance.

Keywords: Operational Financing; Inventory Sustainability; Supply Chain Efficiency; Family Businesses; Operational Survival Inventory.

Jel Classification Codes: G32, M11, L25.

1. INTRODUCTION

Family businesses operating in seasonal sectors face a growing challenge in ensuring continuity of supply and maintaining product availability during peak periods under limited operational resources and increasing financing requirements related to inventory. This challenge becomes more severe when short-term financial decisions affect the institution's ability to replenish and build inventory capable of absorbing sudden fluctuations in demand.

Despite the growing importance of operating financing in supporting daily activities, field practice reveals that many institutions suffer not from weak commercial activity or limited demand, but from imbalances in the allocation of resources directed toward inventory and supply. This situation creates a gap between the available sales potential and the actual ability to meet demand, which is reflected in repeated inventory stockouts, increased lost sales, and declining supply chain efficiency.

This issue is particularly important in family businesses, where operational considerations overlap with the priorities of liquidity management and financial decision making, potentially affecting inventory sustainability during the most sensitive periods of activity. In addition, most traditional approaches focus

on increasing financing or improving supply, while the question of how to protect critical operational resources and maintain inventory readiness has received less practical attention.

Based on this context, this study seeks to analyze the effect of operating financing constraints on inventory sustainability and supply chain efficiency through a case study of a family business operating in the swimming pool supplies sector. The study aims to explain the mechanisms through which financing constraints affect operational performance and to propose a practical solution that is applicable in seasonal environments.

Study Problem:

In light of the continued demand and the increase in the volume of commercial activity within the institution under study, operational imbalances emerged, including repeated inventory depletion and a decline in the ability to meet demand during the peak season, despite the availability of cash flows generated by the business.

Accordingly, the study problem revolves around the following question:

To what extent do operational financing constraints affect inventory sustainability and supply chain efficiency within seasonal family-owned businesses?

The following questions stem from this main question:

- How do operational financing constraints affect purchasing decisions and the continuity of supply during the peak season?
- What is the effect of operational financing constraints on inventory sustainability and the availability of critical products within the institution?
- How are the inventory imbalances resulting from operational financing constraints reflected in supply chain efficiency indicators, particularly the order fulfillment rate, lost sales, and response time?
- To what extent can the Strategic Inventory Reinforcement Framework based on Operational Survival (SIRS-OSI) limit the effects of operational financing constraints and improve the institution's operational performance?

Study Importance:

This study derives its importance from addressing the relationship between operational financing constraints, inventory sustainability, and supply chain efficiency within seasonal family businesses. It also presents a practical framework for protecting critical operational resources and reducing the effects of inventory depletion and supply disruptions during peak periods, thereby contributing to enhanced business continuity and improved operational performance.

Study Objectives:

- To analyze the effect of operational financing constraints on purchasing decisions and supply continuity within the institution under study during the peak season.
- To diagnose the effects of operational financing constraints on inventory sustainability and the availability of critical products.
- To measure the effect of inventory imbalances on supply chain efficiency through the indicators of order fulfillment, lost sales, and response time.
- To evaluate the effectiveness of the Strategic Inventory Reinforcement Framework based on Operational Survival (SIRS-OSI) in reducing the effects of operational financing constraints and improving operational performance.

Study Hypotheses:

- Operational financing constraints weaken the effectiveness of purchasing decisions and limit supply continuity during peak periods.

- Operational financing constraints negatively affect inventory sustainability by reducing the availability of critical products and increasing the likelihood of stockouts.
- Inventory imbalances resulting from operational financing constraints negatively affect supply chain efficiency by reducing the order fulfillment rate and increasing lost sales and response time.
- Applying the Strategic Inventory Reinforcement Framework based on Operational Survival (SIRS-OSI) contributes to reducing the effects of operational financing constraints and improving the institution's operational performance indicators.

Study Scope:

- Subject Scope: The study was limited to analyzing the effect of operational financing constraints on inventory sustainability and supply chain efficiency, with a focus on their effects on purchasing decisions, supply continuity, and operational performance indicators within the institution under study.
- Spatial Scope: The study was conducted in an Algerian family business operating in the distribution of swimming pool materials and equipment. The business represents an operating environment characterized by high demand seasonality and the sensitivity of supply and inventory management operations.
- Time Scope: The study relied on operational data from the 2025 peak season, covering the period from June to August, as it represents the stage with the greatest impact on the institution's activity and on demand and supply levels.

Study Methodology:

The study relied on the case study method, supported by the descriptive analytical method, based on operational records, direct observation, and semi-structured interviews, with the aim of analyzing the effect of operational financing constraints on inventory sustainability and supply chain efficiency within the institution under study.

2. Operational Financing Constraints and Their Reflections on Business Continuity

2.1 Operational Financing and Its Role in Business Continuity

2.1.1 Concept of Operational Financing

Operational financing refers to the financial resources allocated to finance the institution's ongoing activities during the operating cycle, ensuring the provision of inventory, the coverage of short-term obligations, and the continuity of daily operations. It constitutes one of the main foundations of working capital management because of its direct role in supporting liquidity and enhancing the stability of operational activities (Brealey, Myers, & Allen, 2020).

2.1.2 Working Capital and Daily Operational Requirements

Working capital represents the financial foundation of business continuity, as it finances current operational needs and enables the institution to meet its short-term obligations. Its importance is not limited to maintaining liquidity but also extends to supporting the stability of the operating cycle and achieving a balance between financial efficiency and operational requirements. Consequently, any deficiency in its management is directly reflected in the institution's ability to finance inventory, respond to demand, and ensure the smooth flow of operational processes (Brigham & Ehrhardt, 2019).

2.1.3 Operational Financing as a Critical Determinant of Business Continuity

Operational financing is fundamentally important to business continuity because of its direct role in supporting inventory, ensuring the continuity of supply operations, and responding to demand. In contrast, operational financing constraints weaken the ability to replenish inventory and increase the likelihood of inventory depletion, which negatively affects service levels and operational performance. Therefore, providing sufficient operational resources is one of the basic requirements for ensuring supply chain stability and the continuity of product flow (Chopra, 2019).

2.2 Operational Financing Constraints in Family Businesses

2.2.1 Sources of Internal and External Operational Financing

The institution relies on internal and external resources to finance its operating activities, which differ in terms of cost, flexibility, and level of control. The selection of these resources directly affects business continuity and the efficiency of the operating cycle. Family businesses often prefer internal financing to preserve the independence of financial decision making and reduce dependence on external financing sources. However, financing effectiveness depends not only on its source but also on the institution's ability to allocate resources and direct them toward operational needs at the appropriate time. Poor resource allocation leads to imbalances in inventory and supply financing, which negatively affect operational performance and business continuity (Berk & DeMarzo, 2020).

2.2.2 The Specificity of Financial Decision Making in Family Businesses

Family businesses are characterized by the overlap of ownership and management, which links financial decisions to family objectives alongside economic considerations. They also tend to prefer financial independence and the preservation of family control, which is reflected in the allocation of resources and the determination of spending priorities. Financing decisions may be driven more by ensuring business continuity across generations than by maximizing short-term returns. Therefore, the success of financial decision making depends on achieving a balance between family objectives and the requirements of operational activities (Chrisman, Chua, Pearson, & Barnett, 2012).

2.2.3 Agency Theory and the Conflict of Priorities Between Ownership and Operations Management

Agency theory highlights that differences in roles and responsibilities within a business may lead to differences in determining priorities among the parties involved in decision making. In family businesses, this conflict may arise when the owner focuses on preserving liquidity and reducing financial risks, while operations management seeks to secure the resources needed to ensure business continuity and finance inventory and supply. A widening gap between these priorities leads to decisions that may not align with actual operational requirements, which is reflected in operational efficiency and the stability of business operations. Thus, agency theory provides an explanatory framework for understanding the relationship between operational financing constraints and the imbalances that family businesses may face in managing inventory and the supply chain (Madison, Holt, Kellermanns, & Ranft, 2015).

2.3. Implications of Financing Constraints on Operational Performance

2.3.1 The Impact of Financing Constraints on Purchasing Decisions

Purchasing decisions are considered the first link in the operating cycle, as they determine the institution's ability to secure its needs and maintain continuity of operations. When financial resources are subject to financing constraints, the ability to carry out purchases in the appropriate quantities and at the appropriate time declines, weakening inventory readiness and increasing the probability of disruptions during periods of high demand. Liquidity shortages lead to prioritizing short-term decisions over effective planning of actual needs. Therefore, operating financing represents one of the basic pillars of the effectiveness of the purchasing function and the stability of the supply chain (Weele & Rozemeijer, 2022).

2.3.2 The Impact of Financing Constraints on Supply Continuity

Supply continuity is linked to the institution's ability to secure the resources needed to maintain the uninterrupted flow of products across the different stages of the supply chain. Exposure to financing constraints reduces the ability to replenish inventory at the appropriate time and increases the probability of supply disruptions and inventory stockouts. It also limits the ability to build operational reserves and develop alternative sources of supply, weakening the flexibility of the supply chain and its ability to respond to sudden fluctuations and bottlenecks. Therefore, the availability of financial resources is considered a basic condition for ensuring supply stability and the continuity of operational performance in environments characterized by high demand and uncertainty (Ivanov, 2025).

3.3 The Impact of Financing Constraints on Exploiting Peak Season Opportunities

Benefiting from peak season opportunities requires prior preparation that ensures the availability of resources and products before demand rises. Financing constraints limit inventory buildup and the ability to finance supplies at the appropriate time, reducing the institution's ability to respond quickly to market requirements. This leads to the loss of potential sales and a decline in the level of service during the most profitable periods. Therefore, operational financing constitutes a fundamental pillar for transforming high seasonal demand into tangible operational and commercial results (Heizer, Render, & Munson, 2017).

3. Inventory Sustainability and Supply Chain Efficiency as an Outcome of Operational Performance

3.1 Inventory as a Tool for Ensuring Supply Continuity

3.1.1 Concept of Inventory Sustainability

Inventory sustainability refers to the institution's ability to maintain balanced inventory levels that ensure demand is met and the continuity of material flows without creating unjustified operational or financial burdens. This balance contributes to reducing the risks of stock depletion, improving service levels, and enhancing supply chain flexibility in responding to fluctuations and operational disruptions. It also supports the efficient use of available resources and maintains the institution's readiness to respond to market requirements at the appropriate time. Accordingly, inventory sustainability is considered one of the main foundations for operational stability and the achievement of sustainable operational performance over the long term (Jacobs & Chase, 2018).

3.1.2 Safety Stock

Safety stock constitutes a strategic reserve for addressing demand fluctuations and supply delays, ensuring supply continuity and reducing the risks of stock depletion. It provides a margin of protection that helps maintain service levels in environments characterized by uncertainty and enhances supply chain flexibility by absorbing operational disruptions and reducing their effects on product flow. Thus, safety stock is considered one of the basic pillars of inventory sustainability and operational performance stability (Silver, Pyke, & Thomas, 2021).

3.1.3 Stockout as an Indicator of Operational Instability

A stockout represents one of the most prominent manifestations of operational performance disruption, as it reflects a deficiency in the institution's ability to achieve a balance between demand and supply. Its effects are not limited to the loss of immediate sales but also extend to declining service levels, reduced customer satisfaction, and weakened competitive ability. It also reveals imbalances in resource planning and supply management, which are reflected negatively in operational efficiency and business continuity. Therefore, the stockout rate is considered a key indicator for evaluating supply chain reliability and the effectiveness of inventory management in responding to demand fluctuations (Chopra, 2019).

3.2. Supply Chain Efficiency Indicators

3.2.1 Fill Rate

The fill rate reflects the extent to which a business is able to provide the required products in the appropriate quantities and at the appropriate time, ensuring an effective response to customer needs. It is considered an indicator of the efficiency of integration among inventory, supply, and operational activities, while a low fill rate indicates shortcomings in the utilization of available resources. Its improvement is associated with higher service levels, more stable logistics performance, and enhanced customer satisfaction. Therefore, it is considered one of the main indicators used to evaluate supply chain efficiency and the effectiveness of managing material and information flows (Harrison, Hoek, Skipworth, & Aitken, 2025).

3.2.2 Lost Sales Rate

The lost sales rate reflects the volume of demand that a business is unable to satisfy because of product unavailability or shortcomings in operational capacity, preventing market opportunities from being converted into actual revenue. It expresses the gap between existing demand and actual performance, making it an important indicator for evaluating the efficiency of inventory management and the supply

chain. An increase in the lost sales rate is also associated with lower service levels and a greater risk of losing customers and market share. Therefore, it is used to measure the ability of a business to utilize available demand and maintain the stability of its operational performance (Bijvank & Vis, 2011).

3.2.3 Lead Time

Lead time represents the period between receiving an order and making the product available or delivering it to the customer. It is considered one of the basic indicators for measuring supply chain efficiency and the level of service. Reducing lead time contributes to enhancing the speed of response to demand and improving the flow of products across the different links of the supply chain. It is linked to inventory availability and the efficiency of purchasing, distribution, and coordination processes between the parties involved, while an increase in lead time leads to slower order fulfillment and a decline in operational performance. Therefore, lead time is used to evaluate an institution's ability to provide products at the appropriate time and maintain the stability of logistics services (Rushton, Croucher, & Baker, 2022).

3.3 The Relationship Between Operational Financing and Inventory Sustainability

3.3.1 The Impact of Operational Financing on Inventory Availability

Inventory availability is linked to an institution's ability to secure the financial resources needed to finance purchases and replenishment at the appropriate time, with inventory being considered one of the main components of working capital. Adequate financing contributes to maintaining stable inventory levels and reducing the risks of disruption, while financing constraints lead to a decline in operational readiness and delays in meeting demand. The availability of liquidity enhances the institution's ability to respond to market fluctuations and maintain continuity of supply. Therefore, operational financing becomes a decisive factor in ensuring product availability and supporting inventory sustainability within the institution (Muller, 2019).

3.3.2 The Impact of Inventory Availability on Supply Chain Efficiency

Inventory availability is of central importance to supply chain efficiency because it ensures the smooth flow of products and the ability to meet demand at the appropriate time. It contributes to improving the level of service, reducing response time, and limiting operational losses resulting from supply shortages. It also enhances the flexibility of the supply chain in responding to demand fluctuations and supply disruptions, thereby supporting the sustainability of logistics performance. Therefore, supply chain efficiency depends to a large extent on maintaining inventory levels that are consistent with market needs and service requirements (Bowersox, Closs, Cooper, & Bowersox, 2019).

3.3.3 The Integration of Operational Financing and Inventory Management as a Driver of Supply Chain Efficiency

The integration of operational financing and inventory management is of fundamental importance in improving supply chain efficiency, as it ensures the alignment of financial flows with purchasing and supply requirements and contributes to supporting inventory stability and enhancing the ability to meet demand without interruption. This is reflected in improved service levels, reduced lost sales, and shorter response times. Therefore, supply chain effectiveness is based on the continuous alignment between financial decisions and operational processes in a way that ensures the sustainability of performance and the achievement of operational value (Hofmann & Belin, 2011).

4. The Applied Study and Analysis of the Case of a Family Business in the Swimming Pool Supplies Sector

After presenting the theoretical framework of the study, this part is devoted to examining the relationship between the restriction of operational financing, inventory sustainability, and supply chain efficiency through a case study of an Algerian family business operating in the swimming pool supplies sector. This case was selected because of the high seasonality of its activity and its heavy dependence on inventory stability during peak periods. The analysis was based on operational data for the year 2025 derived from internal records and direct observation, with the aim of diagnosing the operational gap, measuring its effects, and evaluating the effectiveness of the proposed treatment.

4.1 Study Methodology and Scope

4.1.1 Study Methodology

The study adopted the case study method, supported by the descriptive analytical method, with the aim of analyzing the effect of restricting operational financing on inventory sustainability and supply chain efficiency in its real environment. This method was selected because of its suitability to the nature of the problem under study and its ability to link operational indicators with decision making mechanisms within the business.

4.1.2 Data Sources

The study relied on three main sources of data:

A. Internal Documents and Records

These included sales reports, purchase orders, inventory movement records, and business operation records extracted from the business's information system.

B. Direct Observation

Daily operational activities were monitored during the peak period extending from June to August 2025, with a focus on replenishment operations, inventory stockout cases, and responses to customer requests.

C. Semi-Structured Interviews

Interviews were conducted with those responsible for operations and supply with the aim of explaining certain operational phenomena that did not appear directly in the recorded data.

4.1.3 Analysis Indicators

The study relied on a set of operational indicators to measure the effect of internal working capital constraints, namely:

- Stock-out Rate
- Fill Rate
- Lead Time
- Lost Sales Rate
- Operational Survival Days

These indicators allow the measurement of the effect of financing decisions on supply continuity and inventory efficiency directly.

4.1.4 Mechanism for Measuring the Operational Indicators

The study relied on actual data extracted from the institution's operational records during the peak season of 2025, including sales orders, inventory movements, replenishment operations, and customer service records.

- Stock-out Rate: It was measured by monitoring cases in which critical products were unavailable when requested by customers during the study period.
- Fill Rate: It was measured based on the ratio of orders fulfilled directly from available inventory to the total number of recorded orders.
- Lost Sales Rate: It was estimated based on the orders that could not be fulfilled because of inventory stockouts relative to the total number of incoming orders.
- Lead Time: It was calculated based on the time period between recording an order and making the product available or delivering it to the customer.
- Operational Survival Days: It was determined based on the average daily consumption and the available inventory level of critical products to measure the institution's ability to continue operating in the event of delayed replenishment.

These indicators made it possible to evaluate the actual effect of financing constraints on inventory sustainability and supply chain efficiency based on the institution's real operational data.

4.2 Diagnosis of the Operational Gap

4.2.1 Presentation of the Institution Under Study

The institution under study operates in the distribution of swimming pool materials and equipment and the provision of maintenance and construction services, relying on both local and imported products to meet the needs of individuals and institutions. Its activity is characterized by high seasonality, as demand increases starting in June and reaches its peak during July and August.

Table 01: General Activity Indicators During the Study Period

Indicator	Value
June Sales	600 million centimes
July Sales	700 million centimes
Average Monthly Purchase Orders	250 million centimes
Average Daily Number of Customers	30 customers
Daily Branch Restocking Frequency	Twice daily

Source: Prepared by the researcher based on the results of the study (2025).

These data indicate a high level of commercial activity during the study period. However, this activity was not reflected proportionately in inventory stability or in the institution's ability to respond to demand.

4.2.2 Analysis of the Reality of Operational Financing

The study showed that the institution relies to a large extent on the Reactive Financing Model, in which purchasing decisions are made in response to actual inventory shortages or incoming orders rather than through proactive planning for the season. The data showed that the monthly volume of purchases remained much lower than the volume of commercial activity achieved during the same period, as purchase orders averaged about 250 million centimes per month compared to sales exceeding 600 million centimes in June and 700 million centimes in July. These data indicate the existence of a gap between the cash flows generated by the activity and the resources actually allocated to inventory refinancing, which represents a preliminary indicator of internal working capital constraints.

4.2.3 Analysis of the Reality of Inventory

Field observation showed that the institution had relied during previous seasons on building inventory in advance before the beginning of the peak period, which allowed it to maintain supply continuity and reduce the risks of stock depletion. However, during the study season, there was a clear decline in the levels of available inventory, as the replenishment process became almost daily, and reliance on reactive purchasing increased instead of preventive purchasing.

This situation led to repeated cases of stock depletion, especially for products with high turnover.

Table 02: Products Most Exposed to Stock Depletion

Rank	Product
1	Liquid Chlorine
2	pH-
3	Algaecide
4	Flocculant

Source: Prepared by the researcher based on the results of the study (2025).

Field observation also showed that stock-out cases recurred on an almost weekly basis, especially toward the end of the operating week, and sometimes as early as the middle of the week when demand increased unexpectedly.

4.2.4 Measuring the Operational Gap

Based on the available data, the effect of the current situation on the institution's performance was measured using basic operational indicators.

Table 03: Operational Gap Indicators

Indicator	Value
Stock-out Rate	68%
Fill Rate	62%
Lost Sales Rate	38%
Average Lead Time	4 days

Source: Prepared by the researcher based on the results of the study (2025).

These results reveal the existence of a considerable operational gap between actual demand and the institution's ability to fulfill it, as the institution lost the ability to respond immediately to a significant portion of incoming orders, despite the continuation of business activity and the increase in sales volume.

4.3. Analysis of the Effect of the Operational Gap

4.3.1 Effect of the Gap on Inventory Sustainability

The internal constraints on working capital weakened inventory sustainability within the institution, as basic products began to run out repeatedly before replenishment arrived, in the absence of actual safety stock capable of absorbing sudden increases in demand. As a result, the institution shifted from a preventive supply pattern to a reactive supply pattern, which increased the likelihood of repeated interruptions in the availability of basic products.

4.3.2 Effect of the Gap on Supply Chain Performance

Stock-out cases directly affected supply chain performance, as the response time increased from immediate supply to an average of about four days in some cases. This led to a decline in the demand fulfillment rate and an increase in reliance on emergency purchasing operations. As a result, pressure on operating resources increased, and supply chain flexibility during the peak period weakened.

4.3.3 Effect of the Gap on Commercial Performance

The effects of the operational gap were not limited to the logistics aspect but were also reflected directly in the institution's commercial performance. The shortage of basic products contributed to the loss of part of the available sales opportunities and redirected some customers toward competing suppliers. Preliminary indicators show that the institution could have achieved higher sales levels if inventory stability had been maintained during the peak season, especially for high-turnover products.

4.3.4 Effect of the Gap on Logistics Relationships

Inventory instability contributed to weakening relationships with both suppliers and customers. On the one hand, purchasing operations became more urgent and less able to benefit from favorable supply conditions. On the other hand, customer satisfaction declined because some products were unavailable at the appropriate time. Repeated stock-out cases also weakened the institution's operational image in the market, which may negatively affect its competitive ability and the sustainability of its business relationships in the future.

The findings of the field diagnosis indicate that the business does not suffer from weak commercial activity or limited market demand. Instead, the main challenge lies in an operational gap caused by the instability of the working capital used to finance inventory. This instability has affected inventory sustainability, disrupted supply chain efficiency, and reduced the level of service provided to customers.

These findings underscore the importance of implementing an effective operational mechanism to protect critical resources, stabilize inventory financing, and ensure business continuity, particularly during periods of peak demand.

4.4 Application of the Strategic Inventory Ring-Fencing System Based on Operational Survival

The diagnostic results showed that the operational gap within the business is not related to weak demand or limited commercial activity but to the absence of an effective mechanism for protecting critical operational resources during the peak season. The business recorded sales of 600 million centimes during June and 700 million centimes during July. However, this performance was not reflected in inventory stability or in the actual ability to satisfy demand, as stock-out cases involving the fastest-moving products continued, revealing an imbalance in the allocation of resources directed to replenishment.

Based on the results of the field diagnosis and the analysis of the operational indicators, the two researchers developed a proposed operational framework named the Strategic Inventory Ring-Fencing System Based on Operational Survival Inventory (SIRS-OSI), with the aim of protecting critical products, enhancing inventory sustainability, and ensuring continuity of supply during peak periods.

This framework represents a developmental proposal resulting from the field study of the business under study. It is not a previously established model or methodology in the scientific literature but was designed in response to the operational gap revealed by the study results, represented by the repeated stock-out of essential products despite the continuation of commercial activity and high demand.

The proposed framework is based on allocating an operational survival inventory for critical products and separating it from daily operational use, thereby maintaining the minimum level of operational readiness and reducing the effects of financing disruptions and delays in replenishment operations.

4.4.1 Identification of Critical Products

Sales data and inventory movements during the study period were analyzed to identify the products with the greatest impact on revenue and business continuity.

The analysis was based on three main criteria:

- Sales volume.
- Inventory turnover rate.
- Stock-out frequency rate.

The results showed that the following products represent the main drivers of the institution's commercial activity:

- Chlore Liquide
- PH-
- Algo
- Flocculant

These products recorded the highest levels of demand and the highest stock-out rates compared to the rest of the products, making them the focus of the proposed protection system.

4.4.2 Establishment of the Operational Survival Inventory

The proposed framework was based on the concept of Operational Survival Inventory (OSI).

It refers to the minimum inventory that must be maintained to ensure business continuity in the event of a supply disruption or a delay in purchasing decisions. Instead of relying on fixed percentages, the protection level was linked to the number of operational survival days for each product according to its consumption rate and operational importance.

Table 04: Operational Protection Levels

Product	Operational Stock Duration
---------	----------------------------

Liquid Chlorine	14 days
pH-	10 days
Algacide	7 days
Flocculant	7 days

Source: Prepared by the researcher based on the results of the study (2025).

This inventory represents protected operational capital that is not intended for use in normal daily operations.

4.4.3 Determining the Operational Risk Level

An operational risk level was established for each product, equal to the average expected consumption during seven working days.

When the operational inventory reaches this level, the following actions are taken:

- Activating the Operational Survival Inventory.
- Launching the replenishment process.
- Giving purchasing priority to critical products.

This procedure allows the institution to shift from crisis management to proactive risk management.

4.4.4 Separation Between Operational Inventory and Strategic Inventory

The proposed framework separates inventory into two categories:

A. Operational Inventory

This inventory is allocated to cover normal daily demand.

B. Operational Survival Inventory

This inventory is allocated exclusively to maintain business continuity during critical situations.

It aims to prevent the complete depletion of inventory as a result of operational pressures or short-term financial decisions.

4.5 Results of Applying the Framework

The impact of applying the SIRS-OSI framework was evaluated by comparing the operational indicators before and after implementation.

Table 05: Comparison of Performance Indicators Before and After Application

Indicator	Before Implementation	After Implementation
Stock-out Rate	68%	24%
Fill Rate	62%	89%
Lead Time	4 days	Less than 1 day
Lost Sales Rate	38%	11%

Source: Prepared by the researcher based on the results of the study (2025).

The results indicate a noticeable improvement in the operational indicators after applying the proposed framework. The stock-out rate declined from 68% to 24%, the order fulfillment rate increased to 89%, and the response time decreased from four days to less than one day for the products covered by operational protection. At the commercial level, lost sales declined from 38% to 11%, reflecting a clear improvement in the institution's ability to convert available demand into actual sales during the peak season.

Table 06: Summary of the Indicators Explaining the Operational Gap in the Institution

Indicator	Value
June 2025 Sales	600 million centimes
July 2025 Sales	700 million centimes
Average Monthly Purchase Orders	250 million centimes
Stock-out Rate	68%
Fill Rate	62%
Lost Sales Rate	38%
Lead Time	4 days

Source: Prepared by the researcher based on the results of the study (2025).

Table (6) presents a composite view of the main indicators explaining the operational gap within the institution. Despite recording high commercial activity during the study period, the indicators showed a high stock-out rate and a decline in the ability to fulfill demand. This confirms that the problem is not related to the level of market demand or the volume of commercial activity but rather to the weak allocation of operational resources toward inventory replenishment and ensuring continuity of supply during the peak season. These indicators point to the existence of a gap between actual demand and the operational capacity to fulfill it, which was reflected in higher lost sales and a decline in the service level.

4.6 Discussion of the Results

The results reveal that the main problem was not weak demand or limited commercial activity but the failure to convert available cash flows into operational capacity capable of supporting inventory during the peak season. Despite achieving sales of 1.3 billion centimes during June and July, purchases remained at levels that were not proportional to the volume of activity, leading to a widening gap between actual demand and the ability to fulfill it.

The recorded indicators, including a stock-out rate of 68% and lost sales of 38%, confirm that the institution was not losing sales because of a shortage in the market but because of the weak stability of its operational resources. The increase in response time to four days also reflects a shift from immediate response to reactive supply, a situation that limits competitiveness in seasonal sectors.

The results showed that operational risk was concentrated in a limited number of high-turnover products, indicating that improving performance does not require a comprehensive increase in inventory but rather the protection of the products that have the greatest impact on business continuity and revenue.

The application of the SIRS-OSI framework proved effective in addressing this gap. The stock-out rate decreased from 68% to 24%, the order fulfillment rate increased from 62% to 89%, and lost sales declined from 38% to 11%. These results confirm that protecting part of the resources in the form of strategic inventory has a greater operational impact than merely maintaining cash liquidity, especially in family-owned and seasonal institutions that depend on taking advantage of time-limited periods of high demand.

5. CONCLUSION

The study proved that the main challenge faced by the institution under study was not weak demand or limited commercial activity, but the fragility of the mechanisms for protecting its basic operational resources. The results showed that high sales do not necessarily guarantee the stability of the activity unless they are accompanied by a clear policy for protecting strategic inventory.

The application of the SIRS-OSI framework also showed that protecting the institution's operational capacity through the creation of an operational survival inventory contributes significantly to reducing stockout rates, improving supply continuity, and increasing the efficiency of the supply chain during peak seasons. This makes the framework a practical proposal that is applicable to family and seasonal institutions with similar characteristics.

Study Findings:

- The study showed the existence of a clear operational gap between the volume of commercial activity and the resources allocated to refinancing inventory. Sales reached about 1.3 billion centimes during June and July 2025, while the average monthly purchase orders remained around 250 million centimes.
- The operational indicators showed a high stockout rate of 68% compared with an order fulfillment rate of 62%, which reflects an actual inability to respond to demand despite the continuation of commercial activity.
- The results revealed that the restrictions imposed on operational financing were directly reflected in the sustainability of inventory and the efficiency of the supply chain through increased reliance on reactive supply, a rise in lost sales to 38%, and an increase in the average response time to four days.
- The study showed that the products most exposed to stockouts were Chlore Liquide, pH-, Algo, and Flocculant, as they are the highest-turnover products and have the greatest influence on the continuity of the activity and revenues.
- The application of the proposed SIRS-OSI framework proved its effectiveness in improving operational performance, as the stockout rate decreased from 68% to 24%, and the order fulfillment rate increased from 62% to 89%.
- The proposed framework contributed to reducing lost sales from 38% to 11% and reducing the response time from four days to less than one day, which strengthened supply continuity and increased the efficiency of the supply chain during the peak season.

Study Recommendations:

First: At the organizational level

- Adopt the SIRS-OSI framework for critical products to enhance inventory sustainability and ensure continuity of supply during peak periods.
- Establish an early warning system based on the Operational Survival Days indicator to support replenishment decisions before risk levels are reached.
- Separate operational inventory from strategic inventory within the organization's information system and link purchasing decisions to actual consumption rates.

Second: At the family business level

- Strengthen the protection of critical operational resources by considering strategic inventory an operational priority that contributes to the continuity of operations and the stability of performance.
- Adopt proactive policies based on operational risk management instead of limiting actions to addressing crises after they occur.

Third: At the research level

- Expand the scope of applied studies to test the SIRS-OSI framework across different economic and seasonal sectors while developing quantitative models to measure the impact of operational protection on supply chain resilience and long-term performance.

Bibliography List:

- Berk, J., & DeMarzo, P. (2020). *Corporate Finance* (5 ed.). Pearson.
- Bijvank, M., & Vis, I. F. (2011). Lost-sales Inventory Theory: A Review. *European Journal of Operational Research*, 215(1), 1–13. doi:10.1016/j.ejor.2011.06.008
- Bowersox, D. J., Closs, D. J., Cooper, M. B., & Bowersox, J. C. (2019). *Supply Chain Logistics Management* (5th ed.). McGraw-Hill Education.
- Brealey, R. A., Myers, S. C., & Allen, F. (2020). *Principles of Corporate Finance* (13 ed.). McGraw-Hill.

- Brigham, E. F., & Ehrhardt, M. C. (2019). *Financial Management: Theory and Practice* (16 ed.). Cengage Learning.
- Chopra, S. (2019). *Supply Chain Management: Strategy, Planning, and Operation* (7 ed.). Pearson.
- Chrisman, J. J., Chua, J. H., Pearson, A. W., & Barnett, T. (2012). Family Involvement, Family Influence, and Family-Centered Non-Economic Goals in Small Firms. *Entrepreneurship Theory and Practice*, 36(2), 267–293. doi:10.1111/j.1540-6520.2010.00407.x
- Harrison, A., Hoek, R. I., Skipworth, H., & Aitken, J. (2025). *Logistics Management and Strategy: Competing Through the Supply Chain* (7th ed.). Pearson.
- Heizer, J., Render, B., & Munson, C. (2017). *Operations Management: Sustainability and Supply Chain Management* (12 ed.). Pearson.
- Hofmann, E., & Belin, O. (2011). *Supply Chain Finance Solutions: Relevance, Propositions, Market Value*. Berlin: Springer. doi:10.1007/978-3-642-17503-8
- Ivanov, D. (2025). *Introduction to Supply Chain Resilience and Viability: Management, Modelling, Technology* (2 ed.). Cham: Springer. doi:10.1007/978-3-031-64267-9
- Jacobs, F. R., & Chase, R. B. (2018). *Operations and Supply Chain Management* (15 ed.). New York: McGraw-Hill Education.
- Madison, K., Holt, D. T., Kellermanns, F. W., & Ranft, A. L. (2015). Viewing Family Firm Behavior and Governance Through the Lens of Agency and Stewardship Theories. *Family Business Review*, 29(1), 65–93. doi:10.1177/0894486515594292
- Muller, M. (2019). *Essentials of Inventory Management* (3rd ed.). HarperCollins Leadership.
- Rushton, A., Croucher, P., & Baker, P. (2022). *The Handbook of Logistics and Distribution Management: Understanding the Supply Chain* (7 ed.). Kogan Page.
- Silver, E. A., Pyke, D. F., & Thomas, D. J. (2021). *Inventory and Production Management in Supply Chains* (4th ed.). CRC Press, Taylor & Francis Group.
- Weele, A. J., & Rozemeijer, F. (2022). *Procurement and Supply Chain Management* (8 ed.). Cengage Learning.