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Article

SCOR model Application to identify improvement opportunities in the production system of an SME clothing manufacturing. Case study

Modelo SCOR como herramienta para identificar oportunidades de mejora en una PYME del sector textil. Caso de estudio

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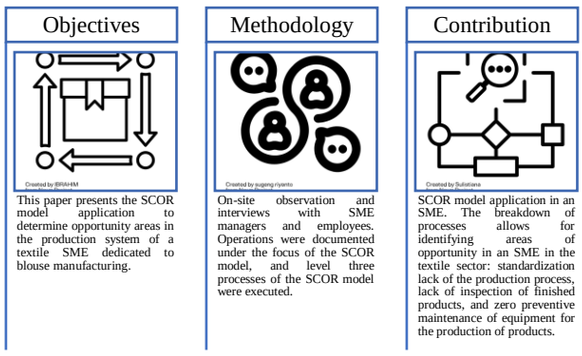
Abstract

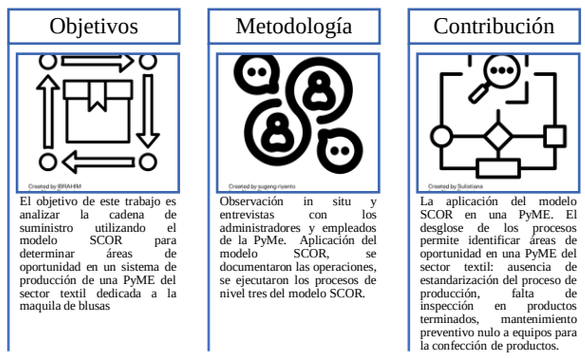
The SCOR model frames a set of processes through a common language. Companies or organizations use the SCOR model as a reference for the diagnosis of their production process. This article presents the SCOR model application to determine opportunity areas in the production system of a blouse manufacturing SME. To carry out this study, information was collected on the production process and the operations were documented under the provisions of the SCOR model. It was identified that the process called "manufacture to order" is the process in which there are opportunities for improvement due to late deliveries in orders and high production costs, with critical processes in scheduling production activities, product manufacturing, and product inspection and testing.



Supply chain, Production system, Textile sector

Resumen

El modelo SCOR enmarca un conjunto de procesos a través de un lenguaje común. Las empresas u organizaciones utilizan el modelo SCOR como referencia para el diagnóstico de procesos y para la optimización de las operaciones. Este artículo presenta la aplicación del modelo SCOR para determinar las áreas de oportunidad en el sistema de producción de una PYME maquiladora de blusas. Para llevar a cabo este estudio se recolectó información del proceso de producción y se documentaron las operaciones acordes a lo establecido en el modelo SCOR. Se identificó que el proceso denominado “fabricación bajo pedido” es el proceso en donde existe oportunidades de mejora debido a entregas tardías en los pedidos y altos costos de producción, con procesos críticos en la programación de actividades de producción, manufactura del producto e inspección y pruebas del producto.



Cadena de suministro, Sistema de producción, Sector textil

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Introduction

The Supply Chain Operations Reference (SCOR) model presents a framework of standard processes that represent the way organizations operate (Chopra et al., 2022). SCOR is a reference model used for managing and improving Supply Chain (SC) efficiency, it involves and synchronizes participants through a common language that encourages communication (Abbaspour, 2019). It is considered as a diagnostic tool that identifies relevant processes, creates a common environment of parameters, terms, language for all constituents for Supply Chain configuration (Chehbi-Gamoura et al., 2020). The application is flexible and can be adapted to increase productivity and meet customer needs (Yuniaristanto et al., 2020).

The SCOR model operates under a systemic approach to manage processes, improve operation strategy and measure performance (Prasetyaningsih et al., 2020). In addition, it links business processes, performance metrics, practices and people skills; it aims to establish a structure of integrated processes to align with functions as well as with the organization's main objectives (Kusrini et al., 2019). It was introduced to measure CS performance and be useful for organizational leaders to make strategic decisions based on the analysis obtained (Ricardianto et al., 2022); performance measurement is achieved through performance metrics that show the state of the chain (Kusrini and Miranda, 2021).

SCOR presents five core processes that most companies execute in their supply chains: (1) Plan, which collects data for market research and supplier selection, obtains information on customer requirements, and seeks to match available resources to meet demand with strategically crafted plans (Alshawabkeh et al., 2022); (2) Source, which is the process of sourcing and sourcing of supply chains, 2022); (2) Sourcing, is the process of acquiring resources for order fulfilment, in this process supplier evaluation and selection is performed (Yuniaristanto et al., 2020). Activities of request, delivery, receipt and movement of materials are executed (Hanh Nguyen et al., 2021); (3) Making, are processes of transformation of materials, for the elaboration of orders and the fulfilment of customer requirements (Sarjono et al., 2021).

It includes production scheduling, production process management and maintenance (Yuniaristanto et al., 2020). (4) Deliver is to provide the manufactured products; it carries out order management, distribution and transportation (Sarjono et al., 2021). It facilitates the flow of products from the manufacturer or supplier to the customer (Kottala and Herbert, 2019); (5) Return, is the process of receiving products returned by customers for any reason (Sooksaksun et al., 2023). For defects, overages, for maintenance, repair or overhaul (Kottala and Herbert, 2019).

The model is applied based on four hierarchical levels, in which the next level precisely details the previous level: Level 1 (Process types) is the top level, consisting of five key processes: plan, procure, manufacture, deliver and return. Here, the scope and definition of the operations of the model is established (Roque et al., 2021); the operation strategy to deliver the products or services to the customers is made (Trueba et al., 2022). Level 2 (Process category) defines by categories each process of the previous level (Ikatrinasari et al., 2020). It shapes the operation strategy given the CS activities by classifying them into categories according to capabilities (Trueba et al., 2022). Level 3 (Process elements) is the lowest level of the CS, detailing each identified process, assigning them performance attributes, metrics and best practices; here the performance level of the processes can be observed (Ikatrinasari et al., 2020). Level 4 (Implementation) applies the previously defined processes, these contain the description of each implementation activity and differs in each organization, for this reason, few consider this level (Roque et al., 2021).

The objective of this paper is to analyse the supply chain using the SCOR model to determine areas of opportunity in a production system of an SME in the textile sector dedicated to the maquila of blouses.

Case study

It is presented an SME located in the northern highlands of the state of Puebla, it operates under the flow of production by order (MTO, Make to order), its economic activity is the manufacture of blouses for wholesale customers, it has a commercial premises to display its product and to sell to those customers who request orders of few units.

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It also manufactures products under design, which are products with specific characteristics such as sports uniforms, school uniforms and typical costumes for cultural events. It has clients in states such as Puebla, Mexico, Guerrero and Veracruz; it makes use of delivery parcels when they are outside its boundaries. The acquisition of materials is done one day a week, as well as the delivery of the product to customers, for both cases the company makes use of its transport resources for procurement as well as for delivery.

The SME has been operating for 10 years, was created empirically by the owners, has no applied management system, methodology or tool to manage the processes; it operates immediately upon receipt of an order and does not forecast demand with proper methods but with its own experience which is highly inaccurate. Furthermore, orders are not tracked in the internal production process, the stages are not clearly identified, which makes it difficult to detect critical points.

Methodology

A two-stage methodology is presented: 1) representation of the supply chain and 2) application of the SCOR model.

For the representation of the supply chain, the flow of materials was analyzed through on-site observations and interviews with the organization's managers and employees to understand the production process. The flow of materials was tracked from arrival to final state conversion, the stages of the flow were distinguished, the existing areas were identified and the operators in each area were counted. With the participation of the workers, the activities carried out in each area were recorded; the use, quantity and mode of use of the materials were observed. During the application of the SCOR model, the operations were documented as described in the model, and the level three processes of the model were executed to identify problems in efficiency.

Results

The supply chain shown in figure 1 represents the activity of a production system of an SME in the textile sector, starting with the customer order, from which information for order fulfilment emerges.

This information is received by the administration, which registers it and makes the corresponding quotation, and then verifies the availability of the materials in the warehouse. When the list of materials for the production of the requested products is ready, the information is sent to the suppliers for the supply and that they have the materials ready; then, the movement of products begins, the company sends the transport with each supplier so that they can load the supplies and then move them. Once the products arrive, they are moved to the Raw Material Warehouse, there the Production area takes what is required and executes the processes for the manufacture, when it finishes, it sends the articles to the Finished Product Warehouse where it packs the blouses and seals them. When the packages are sealed, they are loaded to the transport, then the process of delivery to the clients begins, when they are far away from the delivery area, the product is taken to the parcels. In the case of retail customers, they are expected to purchase the product at the retail outlet; likewise, customers with orders under design are notified to pick up their product at the retail outlet.

Application of the SCOR model

The SCOR model establishes standardized processes that encompass activities generally performed in most organizations, so, using the tools it provides, the processes executed by the case study company were identified. This facilitated the location and classification of each operation, which, although they have always been executed, were not visualized as the model describes them, in an organized and systemic way.

Strategic plans were established for the efficient function of the supply chain, the model defines this category as "Plan"; likewise, procurement, where supply activities identified as source are executed; manufacturing operations were classified according to the type of order, i.e. whether it is an order under order or under design (Make); it was also the case of distribution (Deliver) and returns (Return) that depending on where they are made, if they are from customers to the company as (DR) and if it is from the company to suppliers (SR). The processes of the SCOR model are detailed in figure 2.

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Box 1

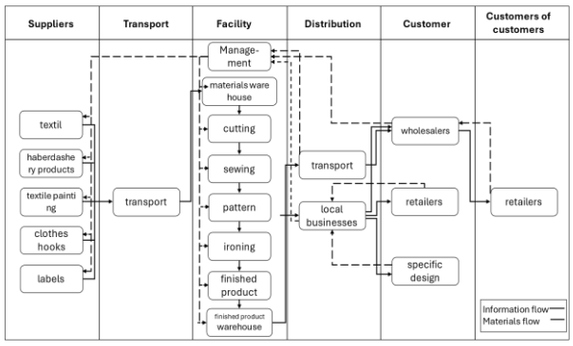

Figure 1

Supply chain of a production system of an SME in the textile industry

Source: Own elaboration based on on-site observation techniques and interviews with business owners

Box 2

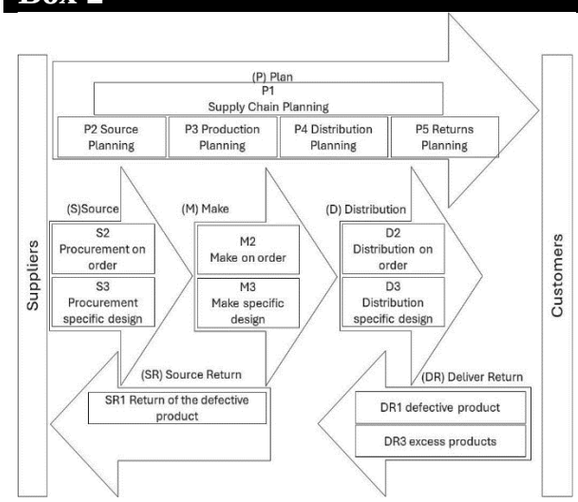

Figure 2

SCOR model for an SME supply chain in the textile industry

Source: own elaboration based on on-site observation techniques and interviews with business owners

Level one processes (plan, source, source, production, distribution and return) are considered as macro-processes covering multiple operations. Level 2 describes the capabilities of the main processes according to the situation of the organization, these are more specific; in the case of Plan, 5 categories emerge for the strategic planning of each macro-process; in the Source (S) process, operations are separated for orders to order (S2) and design (S3) as the materials differ.

The same happens with the manufacturing process, for the first case the activities are carried out for the elaboration of the orders, however, for the second case the activities vary due to the unique characteristics requested by the customer even in the order. For distribution, the products are delivered to the customers if they are in range, otherwise, other means such as parcels are used and the cost is covered by the customer; for orders under design, the products are delivered to the commercial premises since the customers are usually located in nearby areas and the quantity of these is not regularly high enough to cover the cost of transport. Retail sales are not of great importance in this case, in the normal production of orders there may be surplus products and these are sold in the shop. Returns are made in case the product has defects or excess, the customer returns the product, corrections are made and it is delivered again in the next purchase or the monetary refund is made; the same happens with the products received from the supplier, but on the other hand there is never a surplus due to the supplier's error because the company goes to the supply.

Process flow

For a better visualization of the processes, Figure 3 shows the flow of materials from the supplier to the customer, which is another way of representing the supply chain with the implementation of the SCOR model. It illustrates the movement of materials and information from one process to another, which allows to analyze problems in the structure.

Box 3

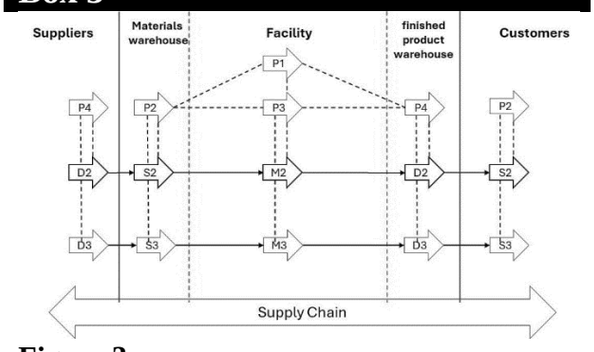

Figure 3

Material process flow of a textile SME defined with the SCOR model structure

Source: own elaboration based on on-site observation techniques and interviews with business owners

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Planning, identification of supply chain needs, scheduling and prioritization is done in P1 and covers the whole company. It is assumed that all suppliers plan the distribution P4, the delivery of material for MTO is D2 and for orders under design D3. In P2 the planning of the suppliers is done and even if there is only information flow it is classified as part of procurement, the company stores the materials in the raw material warehouse, S2 for materials under order and S3 for under design. P3 plans the production process, facilities and resources needed to proceed to M2 for make-to-order production and M3 for make-to-design production. The products arrive at the Finished Goods warehouse, P4 plans the delivery, transport and quality standards, D2 delivers the order on demand and D3 the order by design. Finally, the customers also plan their procurement P2, and each receives the product that D2 and D3 have ordered.

Level 3 processes

Level 3 analysis of the processes is performed to have more precise details in order to visualize and detect problems following the standard of the model. The level 3 manufacturing processes of the orders to order (M2) are shown in figure 4.

Box 4

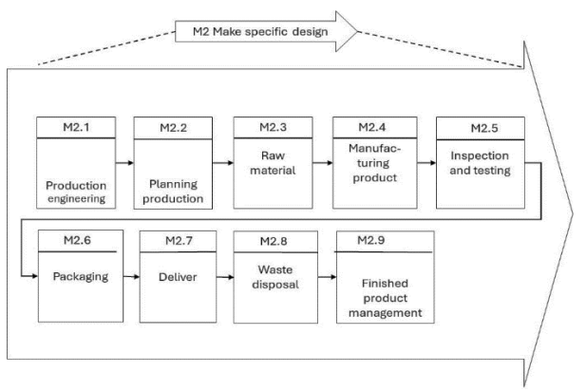

Figure 4

Level 3 process breakdown of the Make-to-Order (M2) process of an SME in the textile sector

Source: own elaboration based on on-site observation techniques and interviews with business owners

The processes shown in figure 4 are executed in the SME without any control, determination or standardization, which is one of the problems encountered.

In the M2.2 process, information is not disseminated for the efficient scheduling of activities; the parts that make up the production are notified of the order at the moment without prior notice. In M2.4 of product transformation, it was determined that the standardization of operations is necessary to control production time, as well as to determine production capacity and to be able to set performance metrics, without which high production times and delays in delivery result in high production costs.

In M2.5 inspections are not regulated, sometimes they are not carried out and therefore defective products are detected in the batches, which causes customer dissatisfaction. M2.9 the company does not carry out preventive maintenance, only when irregularities occur or when they stop working they are subjected to maintenance.

With the implementation of the model, the processes were managed to detect performance gaps which highlighted the following: poor communication between external and especially internal customers (M2.2), lack of standardization of the production process (M2.4), lack of inspection of finished products (M2.5), no preventive maintenance of equipment for the manufacture of products (M2.9); which are considered of greater impact because they cause delays in production and consequently late delivery and high production costs.

Conclusions

The SCOR model is flexible and adaptable to any type of organization to manage, measure and increase productivity. It is used to improve supply chain strategies and communication between participants from suppliers to customers. The model shows the status of processes through their levels of implementation and allows to visualize areas of improvement to develop an optimal future.

The implementation of SCOR facilitated the location of supply chain procedures and actors that served to visualize these efficiency gaps, once presented, can be followed up in future research to measure performance and present improvements to increase performance.

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Declarations

Conflict of interest

The authors declare no conflict of interest. They have no known competing financial interests or personal relationships that could have appeared to influence the article reported in this article.

Author contribution

López-Lucas, Ricardo: Contributed to the project idea and research method.

Sánchez-Galván, Fabiola: Contributed to the conceptualization, technique, writing - review and editing, supervision.

Bautista-Santos, Horacio: Contributed to the conceptualization, writing - original draft preparation, project administration.

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Abbreviations

MTO	Make to Order
PyME	Pequeña y Mediana Empresa
SCOR	Supply Chain Operations Reference

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Background

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Basics

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