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SCOR Model for a Dual-Channel Supply Chain using Drop Shipping to Reduce Overstock in Small- and Medium-Sized Retail Enterprises

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Abstract. Sales are central to retail companies. One of the main problems for these companies is when products are sold later than expected, causing overstock due to lower inventory turnover, which increases inventory levels. Therefore, for many retailers, it is important to solve this problem. This is mostly applicable to companies engaged in sales; however, if we take into account the main supplier and the way they act within the supply chain, we must also consider an additional approach. Since online sales are a major innovation brought about by the new digital era, it is standard for sales strategies to focus on this new requirement of customers. In this way, the main supplier takes a leap forward on Internet sales, creating another sales channel. This is when companies under the supply chain start losing sales. According to the above, a dual supply chain model was suggested using the SCOR model and drop shipping. After the improvement proposal was implemented, the company reported a reduction of approximately S/13,000 when comparing the first quarter of 2018 to that of 2019.

1. Introduction

According to Statista, the retail industry is growing worldwide [1]. In fact, from 2013 to 2018, the industry has grown approximately $1,4 billion per year. At the national scale, this industry is fourth in the national production ranking per economic sector issued by the National Institute of Statistics and Information Technology (INEI by its Spanish acronym) [2], being surpassed only by the following sectors: manufacturing, other services (real estate and personal services), and mining and hydrocarbons. Additionally, according to the last few business demography reports published by INEI [3] [4] [5] [6], retail companies, retailers, and wholesalers report the highest number of sales drops in each quarter. Finally, as the last important piece of information provided by INEI for this economic sector [2], the retail industry also reports the highest amount of loan debt in national currency with an amount of approximately S/18,051,68, surpassing the manufacturing, real estate, and transport

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industries, among others. The main reason behind this is that retail companies ask for loans in order to buy several products and, thus, offer a wide variety of items on their inventories.

According to estimates from the Institute of Business Economy and Development [7], at the end of 2018, the retail industry was to report a growth of 3.2%, higher than the 3.1% estimated for Latin America. Since it is constantly growing, great importance should be placed on companies within this sector to foster their continuous growth. The retail industry has greatly progressed with time, with online product sales and promotions becoming extremely profitable for some companies. Progress has also been made in manufacturing tools that provide better inventory management and control, which is paramount for companies wishing to prevent overstock. The main characteristic of the sector is the wide variety and high quality of products offered to customers. Another characteristic of retail companies is the time spent in fulfilling and shipping customer orders, since a company often depends on these aspects to improve its sales and profitability.

It is important to solve the problems that business companies (retailers) face because, as mentioned above, the ceasing of activities is more frequent in companies in this sector than that in in companies in other economic sectors. Therefore, failure to execute demand forecasts is the second most important problem of these types of companies, according to Gestión [8]. The purpose is to provide a proposal to solve the problem of ceasing of activities of many retailers of the industry and offer retailers a completely functional alternative channel that is fully independent from the traditional channel and not limited to selling products from a single supplier.

2. State of The Art

2.1. Single- and Dual-Channel Supply Chain
According to the literature reviewed, there is a recent combination of the traditional retail (single channel) and direct online (dual channels) channels to reach a wider range of customers. Therefore, the management of the supply chain and issues therein are prioritized in the review, beginning with supply chain management.

For a single channel, we mention a success story. Nucamendi et al. [9] designed a "Newsvendor" model, which shares some characteristics with the retail sector. In addition, Zare et al. [10] concluded that a supply chain that is neutrally integrated to risk always leads to an insufficient inventory, while a negative anchorage may cause inventory excesses.

In terms of dual channels, we have Modak and Kelle [11] and Yang et al. [12]. Modak and Kelle [11] manage it according to the stochastic demand dependent on the price and lead time while Yang et al. [12] take the "Newsvendor" model as a reference pursuant to changes in consumer behavior based on stock-out to include the lead time. If we focus on retail, Saha et al. [13] use product price as a basis to suggest that the lead time is critical for buyer decision processes. This is because a longer lead time reduces acceptance and customer loyalty.

2.2. SCOR Model
Different publications address the SCOR model and its wide application in different types of industries. Some researchers like Fasika et al. [14] and Kusrini et al. [15] prove how the SCOR model can be adapted to the industry, using different approaches. Fasika et al. [14] propose an SCOR model adapted to and modified for developing countries while Kusrini et al. [15] introduce a new simultaneous approach to design the performance of the supply chain actors and the regulator on innovative products owing to a comprehensive model, which comprises the balanced scorecard (BSC) model, the SCOR model, and contributions from the regulator.

Additionally, if we consider specific success stories, we can mention Jamal et al. [16] for the modelling, assessment, and analysis of the performance of inventory management systems using the combination of the SCOR model with Petri's networks, a determinist of batches and stochasticity. Furthermore, Qing Lu et al. [17] apply the reference framework of SCOR to the context of humanitarian supply chains to develop a set of indicators for human resources organizations.

Finally, Wojciech and Richard [18] focus their study on identifying approaches and metrics of supply chain performance and its validation on different types of companies (logistics, retail, automobile, and others). As per the result of the study, the approach most used by companies is BSC.

3. Contributions

In the general model, in order to adopt drop shipping, we need to add the information flow required for the main supplier in order for the latter to send the products to the selected place in the right amount and to the correct customer (Figure 1).
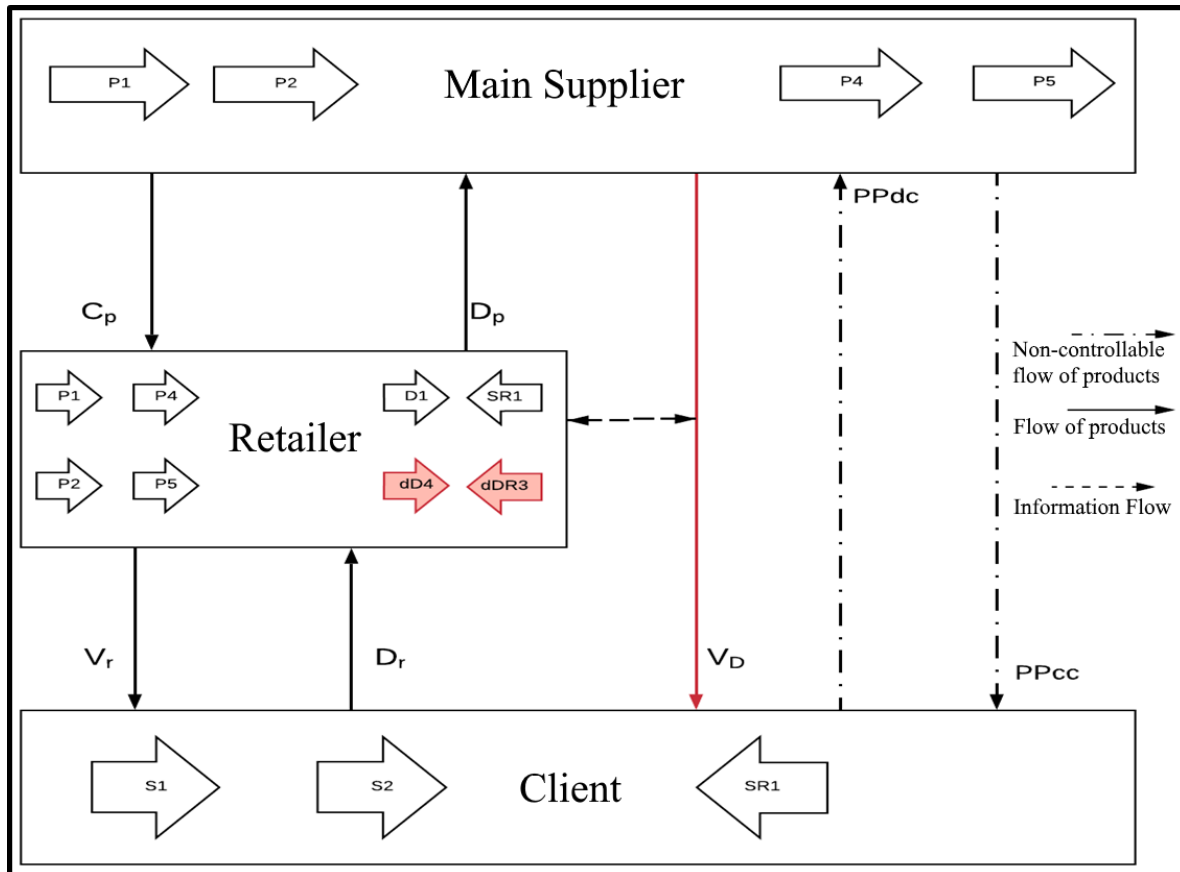

Figure 1. Proposed model for the dual channel supply chain

As a basis to apply the SCOR model in an organization, the following steps need to be followed for its correct application:

Awareness: Here is where the need for a change with the input of the initial diagnosis is evidenced, with all staff members understanding that there is a problem that needs to be fixed. Staff members also understand how the SCOR model works and the management tools it uses.

Discoveries: In this step, a model with the awareness of the current supply chain level is created, which can be viewed according to the following supply chain levels:

- First: What is the level of performance of supply chain operations?
- Second: Is the proper strategy in place and are the information and resource flows available to support and reach the desired level of performance?

Analysis: In this step, the value of the proposal is defined in the terms required by the new financial management of the company: cash to cash time cycle, order fulfilment, other channels and/or niches to cover, and other factors to be considered by the organization.

Design: Resource flows and workflows (process information) are the two key components to define flows by discovering disconnections in their processes and defining optimal flows that help eliminate disconnections.

Development and application: The execution of the model is carried out as per the deadlines established in the work plan.

3.1. Proposed Method

The flowchart below (Figure 2) depicts activities to be carried out in each application phase, in addition to inputs and outputs within the phases. These artefacts from the model's components provide information for the correct development of the said model.
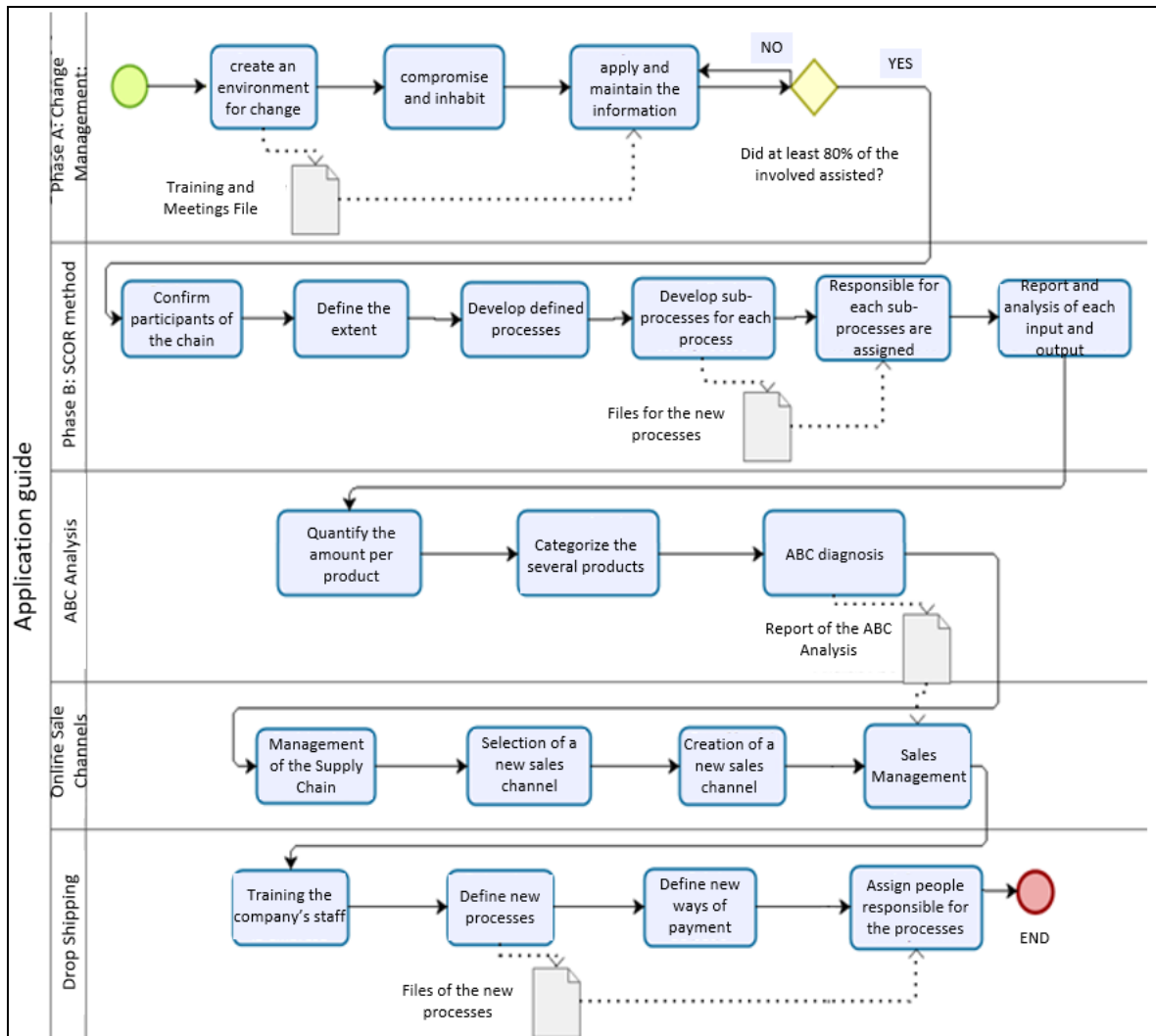

Figure 2. Proposed method

3.2. Indicators

3.2.1. Unsold Stock Ratio

$$USR = \frac{Stock\ of\ products\ at\ the\ end\ of\ the\ period\ i}{Purchases\ in\ the\ i\ period\ of\ the\ product} \tag{1}$$

3.2.2. Average Inventory for the First Trimester of the Year

$$Av.Inv. = \frac{Total\ Inventory\ in\ the\ 1st\ Trimester}{Total\ of\ months\ to\ estimate} \tag{2}$$

3.2.3. Percentage of Online Sales

$$\%O.S = \frac{Sales\ through\ online\ channel}{Total\ of\ Sales\ of\ the\ company} \tag{3}$$

4. Validation

4.1. Case Study

Kmavi E.I.RL. is a small retail company that started operations on March 19, 2013, under Business ID number 20552087357 and is located at Av. Los Portales Mz. A Lt. 03b–Los Olivos - Lima. This retailer is engaged in buying and selling five different types of products (collectibles, books and magazines, leisure goods, accessories, and home goods), using Grupo El Comercio as its sole provider.

Figure 3. Warehouse of products of Kmavi E.I.R.L.

Figure 4. Types of products

4.2. Initial Diagnosis

Taking into account the annual levels of inventory, the following data were obtained: the inventory levels registered values of S/216,670, S/282,510, and S/337,320 in 2016, 2017, and 2018, respectively. Thus, comparing 2017 inventories with 2018 inventories, the level increased 19.40%.

In 2018, the company presented an unsold stock ratio of 41%, which is considered an unsuitable value in the sector. In addition, the average inventory in the first quarter of 2018 was S/27,720.

4.3. Model Application

4.3.1. Stage 1: Change Management. This stage starts with raising the awareness of the company manager and other staff members regarding the need to perform changes in the company.

4.3.2. Stage 2: SCOR Model. At this stage, the assessment of the year is made (in this case, 2018) to validate the existence of accumulated products.

Table 1. Inventory categorization.

Type of product	Inventory category (in units)						
	TC	D	SO	RT	RM	NA	NA (%)
Aggregate	17812	8509	431	0	1509	7363	41%

It can be seen that overstock reaches 41%.

4.3.3. Stage 3: ABC Analysis

Table 2. Categorization of groups of products.

Products Group	Sales Quantity (S/)	% of Total Sales	% Accumulated Sales	Category of importance for the company
Recreational	S/.37,621	39.60%	39.60%	
Collection	S/.25,414	26.75%	66.34%	A
Books and Magazines	S/.14,263	15.01%	81.35%	
Home	S/.12,128	12.76%	94.12%	B
Accessories	S/.5,588	5.88%	**100%**	C
TOTAL	**S/.95,014**	**100%**		

In this way, the most important group of products for the company can be identified.

4.3.4. Stage 4: Online Sales Channel. Once the main product groups that the company sells are identified, focus must be placed on these product groups for advertisement purposes through the new online sales channel.

4.3.5. Stage 5: Drop Shipping. Before applying drop shipping, the company informed the supplier regarding the shipping costs of its products, stating that the cost for every two clients is S/50. Thus, customers were notified about the new shipping method for their products, and nine of them selected this shipping method.

Table 3. Comparison of costs

Cost comparison for the execution of Drop Shipping			
Warehouse Cost		Drop Shipping Cost	
January	S/.1,500.00	January	S/.250.00
February	S/.1,500.00	February	S/.250.00
March	S/.1,500.00	March	S/.250.00
April	S/.1,500.00	April	S/.250.00
May	S/.1,500.00	May	S/.250.00
June	S/.1,500.00	June	S/.250.00
TOTAL	**S/.9,000**	**TOTAL**	**S/.1,500**

According to the cost comparisons, if the company continued its activities in the same manner, the costs for renting the warehouse would have been S/9,000 during the first six months of 2019. By applying drop shipping, the facilities would no longer be used; thus, only the product shipment costs will have to be considered.

4.4. Results

Table 4. Comparison of indicator's results

Indicator	Traffic Light			Base Line	Improvement
Unsold Stock Ratio	> 30%	21% - 30%	12% - 20%	41%	28%
Average Inventory I Quater	> S/ 20K	S/13K - S/20K	S/5K - 12K	S/ 27.7 K	S/ 14.7 K
Percentage of Online Sales	< 14%	14% - 21.3%	> 21.3%	0%	18.6%

5. Conclusions
- The execution of the improvement proposal was correctly carried out and reduced to approximately S/13,000 in the average inventory. This means a 47% reduction in contrast to the first quarter of 2018.
- To reduce the overstock and finally eliminate it, many efforts are required, one of these is to adapt to the new trends of acquisition by consumers. These seek non-physical channels for the acquisition of products and are not indifferent to the payment of the transport associated with it.
- Drop shipping is considered an additional sales channel instead of a replacement for the current channel; this is a medium-term decision, since what is sought is to completely eliminate the physical inventory and that the new internet sales channel is preferred by customers.

- The addition of the online sales channel by the main supplier entails a major risk for the rest of the chain participants.

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