



Information Systems

Sklavenitis S.A. IT Business

Analysis Case Study

&

Business Process Management

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Course Assignment

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Part A – Sklavenitis S.A. AS – IS

Organization's Overview: SKLAVENTIS Group - SKLAVENTIS HELLENIC HYPERMARKETS S.A.

SKLAVENTIS HELLENIC SUPERMARKETS S.A. is a purely Greek company established in 1971 and operates in the retail sale of food, consumer goods, and durable goods^[1]. SKLAVENTIS HELLENIC HYPERMARKETS S.A. owns a group of companies operating in Greece and Cyprus. In 2015, the SKLAVENTIS Group was created, including the following companies i. SKLAVENTIS HELLENIC HYPERMARKETS S.A, ii. SKLAVENTIS CYPRUS LIMITED, iii. CHALKIADAKIS S.A. and iv. The Mart Cash and Carry S.A. The Group has a total of 511 stores, more than 33,000 employees, and serves an average of 550,000 customers daily, while the Group's turnover amounted to 3.98 billion € for 2021^[2].

The leading company of the aforementioned Group, SKLAVENTIS HELLENIC HYPERMARKETS S.A. (Sklavenitis S.A.), has a total of 440 stores (86,1% of the Group's stores), four eMarket^[22] Order Distribution Centers and six Distribution Centers in Greece, serves an average of 513,000 customers daily (93,27%), employs more than 29,000 employees (87,87%) and cooperates with more than 5,000 suppliers from Greece and abroad^[3].

Vision

The primary vision of Sklavenitis S.A. is to enhance the lives of its customers, by providing quality products at a market-leading value, whilst ensuring that customer satisfaction is at the heart of everything the company and its people do. Moreover, the company defines its mission as its ultimate goal, which is to deliver and maintain outstanding customer satisfaction by constantly innovating and optimizing its efficient processes, driven by technology and people feedback. Regarding the company's business partners, keen on sustainable relationships while contributing positively to local communities. Finally, during all the years of its existence, the company has grown steadily, remaining faithful to the principles and values established by its founders.

Culture

Sklavenitis S.A.'s organizational culture affects the way every company handles its functions within and outside of it. Culture is essential to create an environment within the organization to work frequently with the employees while attracting more customers to the stores. Therefore, if the workers get a positive atmosphere in the workplace, their outcome gets more significant than ever. To maintain this culture and positive environment, as described by all the company's employees and many of its customers, Sklavenitis S.A. focuses more than everything on the CPP factors (Customers, Personnel, Partners - ΠΠΠ).

Customers

As a leading company in the retail commerce of commodities services, a big variety of customers can be classified into many distinct classes depending on different criteria such as socioeconomic characteristics, total amount and type of products purchased, etc. Among these classification models, the most exploitable in terms of impact on business process differentiation is the distinction between retail in-store customers and online customers. Moreover, the second customer category has two sub-categories regarding the way of online shopping platform they use. These online customers can complete their orders via either Sklavenitis eMarket or e-food platform^[8] (third-party associate) and this leads to a further categorization of the online customers^[9].

Products

The main product categories of Sklavenitis S.A. are discerned to the Sklavenitis private-labels products and the third-party private-label products. Sklavenitis private labels constitute of FMCG (Fast Moving Customer Goods) packed products under its label and the products produced by its lines. More specifically, compared to most of its competitors (at least in Greece), the company's portfolio includes private-label products, which take about 13% of its total sales, have been very successful in the market, and contain the labels such as Drolio (cleaning products), Glaros (household products), Marata (bakery products and foodstuffs), Meat House (packaged meat products), etc. The third-party private labels are discerned to the centralized distributed products and decentralized distributed products, which are distinguished to the same product categories. Furthermore, it

would be necessary to highlight the fact that, following the retail commerce industry pattern, Sklavenitis S.A. classifies its products into two main categories regarding its time-to-market: FMCG^[6] and non-FMCG. Both of the aforementioned time-to-market categories are distinguished into two main products: food and non-food. For instance, a sample of FMCG^[7] food products are beverages, dairy, cereals, and fresh food products, FMCG non-food products are household cleaning, personal wash, and hair and oral care products, while, in contrast, and non-FMCG non-food products could be cosmetics and some no so popular personal care and pharmaceuticals products. To sum up, the total number of product codes (active and inactive) is approximately 650,000.

Competitors

Let alone the aforementioned achievements; It should be pointed out that the Greek retail industry is a competitive field. As the latest research showed^[5], Sklavenitis S.A. is one of the leading companies, fighting for the top spot in Greece along with Masoutis S.A., Alfa-Beta Vassilopoulos (Ahold Delhaize Group) and Lidl Hellas (Schwarz Gruppe GmbH).

Partners

In the retail industry. retail partners are two organizations that have collaborated on a project. The partners typically have complementary but non-competitive audiences, making this a great way to expand their own audiences throughout those deals. Therefore, Sklavenitis S.A. could not be the exception, and as one of the largest retailers in the Greek market. The Piraeus Bank^[10], Eurobank^[23], National Bank of Greece^[24], and OTE Group - COSMOTE S.A.^[13] are two essential partners both of them provide their customers with a variety of bonus privileges such as reward programs (Piraeus Bank's yellows^[11], Eurobank's epistrofi^[23], and NBG's go4more^[24]) and discounts (COSMOTE DEALS for YOU^[12]).

Another important Sklavenitis S.A. partner in the field of e-commerce is the e-food platform hosting and promoting 2,500 private labels available through Sklavenitis S.A. distribution channels to online customers through the e-food platform. A strategic retail commerce alliance is the Sklavenitis S.A. partnership with the SEP markets^[14], an organization with 11 retail stores in Western Greece, allowing both parties to expand their market shares in the Ioannina region and augment their profits. Another domain of partnership agreement in the energy field is where Sklavenitis S.A. and DEH Blue^[15] promote cooperation that leads to the establishment of 687 electricity charge stations in 119 Sklavenitis S.A. retail stores.

Suppliers

As Sklavenitis S.A. suppliers can be considered all the private label brands that use or participate in Sklavenitis distribution channels to sell their labels. The company makes special commercial agreements with its suppliers that are strictly respected and constantly reviewed on a yearly basis. The product quantities and the unit price are the main contract issues between the organization and its suppliers. In these terms of commercial agreements, as mentioned before, Sklavenitis S.A. has more than 5,000 private-label suppliers.

Vendors

Sklavenitis S.A. has mainly two broad categories of vendors, firstly software vendors offering smart solutions in warehouse management and inventory monitoring services. Among the most important vendors of this category, is the WMS were the aberon^[18] complete solution offers a software package that covers warehouse management's tasks along with inventory management tasks and it is utilised in Sklavenitis S.A. Distribution Centers. Specifically, the aberon WMS is a flexible Warehouse Management Information System and constitutes the main core of the solutions provided by VELTIONoptimum for managing and optimizing the supply chain, aberon WMS is friendly, easy-to-use, flexible and modular. It has been created this way so as to insure that all your customers' specific needs can be met. Regarding the retail store level, the MRP software by SingularLogic^[17] which is used to monitor inventory stock levels and proceed to automated replenishment orders on constant basis. The company uses ERP system by SAP^[19] software vendor covering capabilities such as data collection from various forms and integrates them in the Oracle^[20] database. Among the used

databases there is the Master Data database, a database responsible for hosting the distinct product codes for the store's product collections.

In addition, a variety of vendors provide the company with third-party logistic companies that offer order fulfillment services, cross-docking services, chilled and frozen storage, and general premises adapted specially to food requirements. One of the most contributonal vendors for the company's primary services completion is the Parametros Logistic^[16] company. This third-party logistics (3PL) vendor offers its warehouse facilities and warehouse management services as it specializes in providing high-standard warehousing, distribution, order fulfillment, and transport services for temperature-controlled products in Greece since 2005. In this way, Sklavenitis S.A. maximizes the efficiency and cost-effectiveness of its supply chain management as it expands its retail network and inventory quantity management needs.

Facilities and Infrastructure

Regarding the facilities and infrastructure, the Sklavenitis S.A. has one of the largest network of stores in Greece, consisted of a total of 440 retail stores. Moreover, for its storage and transportation to replenish the store's inventory, it has four eMarket^[22] Order Distribution Centers, located in Athens, Thessaloniki, Patras, and Larisa, and six private-owned Distribution Centers in Greece. Finally, as mentioned above, Sklavenitis S.A. has a variety of third-party vendors in order to fulfil its needs.

Organizational Structure

Regarding its structure, Sklavenitis S.A. has a centralized organizational structure with centralized leadership and a defined chain of command. That means that in the company, there is a specific hierarchy of superiors and subordinates, and there are very clear responsibilities for each role, with subordinate roles defaulting to the guidance of their superiors. To be more precise, Sklavenitis S.A. has at the top of its organizational pyramid the owners and board of directors followed by the nine General Directorates with their General Managers and their subordinates' teams, where each team has its supervisor.

The General Directorate of Network

Sklavenitis S.A.'s network of stores is undoubtedly one of the densest networks in Greece. Therefore, this General Directorate plays a major role in coordinating all these stores while studying and designing the next steps in the future of the franchise network. Under this General Directorate, there are the Directorate of Administrative District and the Directorate of Network Support, which provide individual support and assistance to each retail store regarding its needs and location. Moreover, there are also the Directorate of Franchise and the Team of Stores Architecture, both of which are responsible for the next steps in the expanding process of the Sklavenitis S.A. network. Finally, in this General Directorate, there is the Directorate of Services which provides services to all the organization's Directorates, the Directorate of E-Market for remote shopping services, and the Directorate of Customer Support, which provides assistance to the company's customers and trying to receive the feedback and improve from the retail store to the executive's level.

The General Directorate of Human Resources

The General Directorate of Human Resources guides, coordinates, plans, and develops the company's policies, activities, and staff, ensuring legal compliance and implementing the organization's mission, vision, and talent acquisition strategy. Furthermore, this General Directorate and its subordinates are responsible for finding and interviewing qualified candidates and, finally, making selections and negotiating compensation after applying its strategy through job alerts and adverts while also being responsible for retaining talented employees and maintaining a fair pay system, which requires careful consideration of the employee's years of service with the company, experience level, education skills, etc. Last but not least, some training programs run by the General Directorate of Human Resources subordinates' departments include team-building activities, policy, and ethics education, and critical for the job instructions and skills to improve or learn.

The General Directorate of Finance

Finance and accounting departments have an essential role in every major organization nowadays. Being responsible for the daily account record keeping, the general directorate of finance examines financial statements and reports to the board of directors, evaluates economic trends to help identify its future investment, and cultivates long-term business plans. Moreover, the above general directorate prepares the annual balance sheet and, along with internal and external statistics data and trends, forecasts the budget. The primary responsibility of this directorate is to maintain the cash flow at high levels and try to increase it.

The General Directorate of Information Technology

The General Directorate of Information Technology (IT) connects retail stores, offices, and distribution centers. From technical support and innovative new solutions to maintaining Sklavenitis S.A. infrastructure and securing its information, IT is essential in helping us grow safely and efficiently. This General Directorate is also responsible for the supervision of the stores and associated coordination among them to ensure the integration of its activities and make the most of the possibilities available to them while identifying the needs of departments and stores associated hardware, equipment, and IT tools, and providing follow-up and development. Furthermore, being responsible for all the maintenance and updates of the hardware, software, and information technology used by the organization, it could also recommend the acquisition of new ones. Moreover, the General Directorate of IT can provide proposals to modify or develop rules and regulations, instructions, and decisions that actively own management and administrative procedures according to emerging business and technology needs. At the same time, it goes without saying that to have evaluation data collects, compiles, and saves the data and information from the owned IT systems in use.

The General Directorate of Sales

The General Directorate of Sales of Sklavenitis S.A. is responsible for identifying sales goals and objectives and preparing a sales plan that acts as a guide to achieving them. The directorate comprises a sales team that works together with the General Directorate of Marketing to increase profitability, build and maintain supplier relationships and monitor and evaluate existing agreements, and make new ones.

The General Directorate of Marketing

The marketing department is responsible for defining and managing the Sklavenitis S.A. brand. Conducting campaign management for marketing initiatives and suggesting new agreements to the General Directorate of Sales, after the necessary research, that helps the directorate to define new and worthy opportunities. To reach this point, the General Directorate of Marketing collects and evaluates internal (from products and/or retail stores' sales) and external (bought from third-party data companies) statistical data regarding the customers' behavior and possible new market trends.

The General Directorate of Infrastructure

The General Directorate of Infrastructure of Sklavenitis S.A. is responsible for all the distribution centers and retail stores' equipment - the most important of them being the stores' shelves. This Directorate manages the budget, plans the utilization of resources, and plays an active role in planning and designing new stores or distribution centers along with the Team of Stores Architecture of The General Directorate of Network. Lastly, it provides oversight and support concerning infrastructure performance and planning portfolio management.

The General Directorate of Production

The General Directorate of Production of Sklavenitis S.A. exists to ensure that the organization's productivity is optimized. Since Sklavenitis S.A. has a vast portfolio of private-labeled products, this General Directorate has a significant role in the company's workflow and is responsible for enhancing speed and efficiency without compromising product safety or integrity, ensuring that all the employees follow the company's health and safety guidelines, striving to reduce expenses and increase productivity across all production lines and in the

end, ensuring that the final product meets quality standards and customer specifications and meeting strict deadlines.

The General Directorate of Supply Chain

Sklavenitis S.A. is responsible for the supply chain and the distribution procedure validation for a set of thousand different commodities that require to be handled under various constraints. The supply chain network contains different suppliers, warehouses, distribution centers, and local stores covering the entire mainland and the islands. A significant number of suppliers have settled abroad, so the supply chain design, coordination, and oversight are carried out on a global scale. The functions of a supply chain include commercial agreements with suppliers, marketing, operations, distribution, finance, and customer service. Effective supply chain management results in lower costs, so the procedures must be organized and performed effectively.

The main goals of Sklavenitis S.A.'s supply chain design and optimization of its supply chain management strategy aimed at an increased velocity of commodities distribution, collaboration encouragement among the individual components in the supply chain, the discovery of new technologies that improve the processes, metrics implementation that allow employees to measure the success or failure of each step in the supply chain. For these reasons, Sklavenitis S.A.'s general supply chain model has organized and allocated all the supply chain procedures in three main directorates that monitor stages of the supply procedure. The directorate of logistics, the directorate of distribution and reporting, and finally, the directorate of inventory and retail store management.

The Directorate of Logistics

The Directorate of Logistics manages the operations and monitoring of the Sklavenitis S.A. central warehouses, as well as the Third-party logistic (3PL), warehouses Sklavenitis S.A. rents. Essential tasks that concern the logistic operational management at the warehousing level contain scheduling and executing out the receiving of inventory to the warehouse, sorting, managing, and accounting for all stock, maintaining inventory in proper conditions, negotiating discounted transport rates, picking, packing, and sending products and assembling products if necessary. Supplementary warehouse logistic operations are damaged goods handling, safety policies, human resources management, customer returns, cost controls, and security.

The Directorate of Distribution

The Directorate of Distribution and reporting controls and coordinates the distribution channels. Channels deal with institutional linkages between wholesalers, general suppliers, distribution centers, and retail stores. The directorate reforms these channels to ensure transportation and organizes routing and combined transport problems for all product categories and their transportation constraints. One of the main tasks is also reporting in constant time for all aspects of the distribution processes carried out daily, such as shipping, deliveries, product quantities, costs, etc.

The Directorate of Inventory Management

The Directorate of Inventory Management and Retail Store Inventory Management handles or manages its inventory from one process to another, along with minimizing intermediate costs. In more specific terms, it controls every inventory item, optimizes inventory storage cost for different products and different storage duration, and notifies the re-order levels of every inventory item. The last ensures that none of the inventory items is out of stock, hindering any process and enabling optimum storage capacity utilization. An inventory management process will always tell the company's fast and slow moving stocks, showing how an inventory item contributes to the company's success. Based on this information, the company can increase or decrease sales and supply quantity agreements long term. Another fundamental characteristic of the Sklavenitis S.A. inventory management processes, even at the retail store level, is the streamlined (automated) processes of inventory supplementation. These streamlined processes are helpful to the company as less time and less human workforce are required for carrying out the process management and monitoring.

Work System Under Study: Directorate of Inventory Management

Organizational Structure of the Directorate of Inventory Management

Every directorate is organized under a general supervisor responsible for the coordination of every department of the directory that gathers the general performance reports of every distinct department. The Directorate of Inventory Management has two Department branches the first is the Distribution Centers' Inventory Management under the responsibility of one supervisor, and the second is the Department of Retail Stores' Inventory Management under the supervision of another supervisor. The Department of Retail Stores' Inventory Management has direct cooperation with every retail store format and with the General Directorate of Sales. The inventory fluctuation of every product code in retail stores is strictly monitored on a daily basis, and the inventory management department appraises and forms the replacement inventory needs while keeping and exporting statistical data for review purposes provided in the General Directorate of Sales.

More specifically, the two Departments have a distinct role in the supply chain in order to replace the inventory in optimal ways so as to avoid primarily deficits in product ranges or major surpluses that can cause serious cash flow issues for the company. The Distribution Centres Inventory Management Department conducts the service process for the retail store's orders, the replacement of the warehouse's inventory needed on a daily basis, the ordering handling from order forms preparation, inventory receipt, retail store's order pick up to warehouse storage management. In the sequential place of the supply chain, the retail stores have to monitor sales constantly during operational hours, inspect the inventory for every different product code, re-feed the shelves storage space for every product, and make accurate assumptions for the next day's demand. Every retail store must also register returns, thefts, and inventory losses. Finally, after operational hours every store prepares the order forms for essential inventory replacements either via MRP systems or with the manual order procedure. The order recipients are mainly distribution centers for the mass majority of products that are transported to the final commerce spots via a centralized retail supply chain model. Otherwise, the order recipient responsible for the new inventory delivery is the official product supplier.

Strategy of the Directorate of Inventory Management

This Directorate of Inventory Management is responsible for the inventory replacement constantly in an optimal way in order to avoid unnecessary surpluses or deficits that can cause serious problems in the supply chain operation. The main customers of the Directorate are internal retail stores of all different formats in every distinct location of the country. In the external customer list belongs the suppliers that transport their products in their centralized warehouses where the distribution services are provided by the company, the final retail store customers, the e-market customers, and the suppliers that promote their products in certain inventory quantities that are intended for extra stand promotion positions in retail stores. Another internal company customer is the General Directorate of Sales which receives data for the sales products review. The primary services offered by the directorate are centralized supply chain distribution of products to retail stores, via e-market to final customers, intended for promotional purposes, and self-labeled products. In addition to main core services, the Directorate of Inventory Management also adjusts the final routing schedule for order distribution at the country level for all centralized distributed products and constantly monitors the routings and delivery characteristics of non-centralized distributed products. To summarize, the Directorate's main purpose is to conduct almost real-time the inventory amount needed estimation and reassurance of this inventory delivery per every product. At the same time, the company's cash flows remain healthy in the long run.

The Directorate represents the core operational services of a retail commerce company in the hypermarket field. So, it does not have direct competitors in the domain where competition is significantly augmented. On the other hand, the Directorate depends on partners that complete the distribution process of the non-centralized products. In this case, after the order format sends to the supplier, he is responsible for the order's execution and the final transportation of products to the retail shop. The transportation service of the supplier's company using its distribution channel constitutes an essential partner for the Directorate in terms of

order management and execution and final transportation. Among the 5000 suppliers of Sklavenitis S.A., some of them are the actual distribution partner (self-delivery of their products). Another crucial aspect of Sklavenitis S.A.'s business strategy and operating model especially considering the performance of the supply chain is the 3PL (third-party logistics) warehouse vendors of the Directorate of Inventory Management. All the distribution centers of Sklavenitis S.A. are not actual company-owned warehouses that host Sklavenitis S.A. inventory, but they are rented warehouses and warehouse management services that other third service companies offer to Sklavenitis S.A.

The organization is active in retail commerce as well as in commodity packaging. The facilities that constitute the company's assets are mainly warehouses, building infrastructure for retail stores, office buildings, and production lines for packaging different product types. Apart from the aforementioned facilities, the company acquires a big track fleet for commodities transportation in every condition, such as refrigerated trucks and specially designed parking spaces. To summarize, Sklavenitis infrastructure consists of four eMarket Order Distribution Centers and six Distribution Centers in Greece, 520 retail stores in total, 232 in Attica region, 86 in Northern Greece, 62 in central Greece, 62 in Peloponnese, 57 in Crete, 20 in the rest Aegean and Ionia islands and 18 in Cyprus. Sklavenitis S.A. retail stores cover all the range of possible formats, so the 520 retail stores include 43 Hypermarkets, 466 Supermarkets, and 11 Cash and Carry. From all the above, the Directorate of Inventory Management occupies office buildings, retail store's buildings, and warehouses.

During the supply chain process, the human presence is crucial for conducting every business process in the inventory management duties. The main roles in distribution centers supplementation and the retail stores materials planning are the retail inventory controller responsible for inspecting all products inventory fluctuation and reporting at the store level. He is responsible for constantly checking the identification of the inventory recorded in MRP systems and the actual stock in the store's storage. Predicting the demand level for all types of products is a challenging task, especially because of seasonality phenomena and expected events. This task is performed by the demand planner, mainly at the retail management level. Consequently, after inventory monitoring and demand planning, the order draft forms are the responsibility of the purchasing clerk in both levels of distribution centers and retail stores, considering manual orders. In the central distribution, the logistic procedure inside the warehouse needs many different roles, such as warehouse picking clerk, warehouse order recipient checker, warehouse storage clerk, load planner, and warehouse manager. Eventually, the inventory manager monitors the inventory management at the warehouse and retail stores, respectively. He inspects the inventory quantities and ensures the lack of deficits and unnecessary surpluses in both central warehouses and stores.

Business Processes Analysis

The work system under study is a part of the Sklavenitis S.A. organization, and specifically, it is the Directorate of Inventory Management, one of the three Directorates that belongs to the General Directorate of Supply Chain. The Directorate of Inventory Management monitors the inventory levels of the distribution centers and the retail store's network of Sklavenitis S.A., evaluates the performance of the product codes, estimates the forthcoming demands, takes, limits shortages and surpluses while scheduling their resupply in time in the most efficient way possible for both centralized and uncentralized products, and reporting to other directorates to maintain the information flow. The aforementioned actions represent the work that is needed to be done on a regular base in order to maintain consistency at the higher standards possible and achieve the primary goal of Sklavenitis S.A. organization, which is to fulfill the needs of its retail customers.

Therefore, the first core process identified is the product assortment of the retail store's collection that designs, reforms, and updates the collection of the product codes in every retail store of each distinct format in the network. The second core process is the replenishment of the Distributions Centers' inventory which assures that central warehouses will have adequate inventory levels at any time in order to service the replenishment of the network's retail store concerning the centralized distributed products. The next core process is the replenishment of retail stores' inventory that assures that every retail store in the network replenishes its inventory on time, monitors every inventory fluctuation and its proper registration in the MRP systems, and handles the orders fulfillment in the most efficient way for every store of each format in the network. Finally, the last core process is the reporting and information flow, where the exchange of information among people, processes, and systems within the organization involves relaying information from the Directorate of Inventory Management to other General Directorates of Sklavenitis S.A. Moreover, it should be highlighted that through this core process, by using an information flow efficiently, the organization can avoid mistakes resulting from a lack of knowledge or misdelivered information while improving productivity and speeding up its processes.

1. Product assortment of the retail store's collection	3. Replenishment of the retail store's inventory
1.1. Update of product assortment renewal by General Directorate of Sales	3.1. Monitor the identification of the physical inventory and the MRP record per product code
1.1.1. Updating in case of barcode, external, or internal code changes of existing product codes in the Sklavenitis S.A. distribution channel	3.1.1. Receiving feedback from the retail stores in case of mismatched inventory records
1.1.2. Updating in case of new product codes inserted in the Sklavenitis S.A. distribution channel	3.1.2. Identifying the causes of the mismatched records
1.1.3. Updating in case of temporal deactivation or reactivation of product codes in the Sklavenitis S.A. distribution channel	3.1.3. Passing on the guidelines to the stores network from suppliers or governmental agencies regarding products lots that should be returned
1.1.4. Updating in case of permanent removal of product codes in the Sklavenitis S.A. distribution channel	3.1.4. Receiving information from the retail stores about expired products abortion
1.1.5. Updating in case of new sticker or promo codes being available, by a supplier, in the Sklavenitis S.A. distribution channel	3.1.5. Receiving information for delivery delays or cancellations
1.2. Product assortment in new retail stores in the network	3.1.6. Informing the retail stores about promo codes and their promotion guidelines
1.2.1. Creating the basic retail store's product collection depending on its format	3.2. Update of the MRP records
1.2.2. Adding local product codes to the retail store's basic collection	3.2.1. Modifying the MRP inventory records to be equivalent to the physical inventory level
1.2.3. Adjusting the retail store's basic collection by adding seasonal products codes	3.2.2. Informing the retail store team of the modifications on the MRP
1.3. Revision of product assortment in the retail store	3.2.3. Denoting the to-be-returned products in order to not be computed in the MRP procedures
1.3.1. Revising the product's collection depending on previous periods sales' performance for each product code	3.2.4. Supervising the removal of the expired quantities from the MRP inventory records
1.3.2. Readjusting product's collection with product codes replacement	3.2.5. Handling the orders delays and cancellations
1.3.3. Defining product codes that should be deactivated	3.2.6. Denoting in order to be excluded the promo product's codes from the automated MRP order
1.3.4. Defining product codes that should be deleted	3.3. Fulfillment of order procedure
1.4. Configuration of the MRP system for every product assortment adjustment	3.3.1. Defining the methodology in MRP automated orders quantity estimation
1.4.1. Configuring the MRP parameters for new products inserted in the Sklavenitis S.A. distribution channel	3.3.2. Setting the minimum needed quantity per product code
1.4.2. Updating the MRP parameters in each store for the available product codes	3.3.3. Defining the methodology in complementary manual orders quantity estimation
1.4.3. Deactivating the MRP parameters for the inactive codes	3.3.4. Supervising for proper order completion
1.4.4. Removing the MRP registration records for the deleted codes	3.3.5. Handling the non-proper order delivery cases
2. Replenishment of the distribution center's inventory	4. Reporting and Information Flow
2.1. Fulfillment of the warehouse inventory replenishment for centralized distributed products	4.1. Reporting to the General Directorate of Finance
2.1.1. Receiving the total quantities for all customers (retail stores and eMarket)	4.1.1. Reporting to the Directorate of Accounting the submitted order forms to the suppliers
2.1.2. Monitoring the inventory level of each product code stored in the distribution center	4.1.2. Reporting the warehouse's existing inventory quantities to the General Directory of Finance
2.1.3. Analyzing the demand of the previous time period per product code and for all retail stores that are serviced from the particular center	4.2. Information flow on sales performance
2.1.4. Analyzing the previous demand per code from Sklavenitis S.A. eMarket platform	4.2.1. Gathering the sales raw data from the network's stores
2.1.5. Estimating the needed quantity per code that the Distribution Center should order from the supplier	4.2.2. Providing sales reports to the General Directory of Sales
2.1.6. Completing and sending the order forms addressed to a particular supplier	4.3. Providing inventory reports to the General Directory of the Supply Chain (General Supply Chain Manager)
2.1.7. Informing the responsible production line per every private labeled code for the future time period demand	4.3.1. Reporting on the retail store's network inventory levels
2.2. Confirmation of the ordered products delivered to the Distribution Centers	4.3.2. Reporting on the Distribution Center's inventory levels
2.2.1. Settling per every product code the lifetime period that the product is accepted to be distributed	4.3.3. Reporting on unexpected inventory losses in the store's network level
2.2.2. Configuring warehouse system with the accepted dates per every product code	4.3.4. Reporting on unexpected inventory losses at the Distribution Centers level
2.2.3. Accepting or not, the rejected, from the warehouse system received lots	4.4. Providing reports to the General Directorate of Information Technology for system flaws (WMS, MRP)
2.3. Update the warehouse inventory after replenishment fulfillment	4.4.1. Exporting the crashes reports of the retail store's MRP system to the General Directorate of IT
2.3.1. Designing the product placement for optimal inventory settlement in the warehouse	4.4.2. Exporting the crashes reports of the Distribution Centers' WMS system to the General Directorate of IT
2.3.2. Updating the inventory records in the warehouse systems after the completion of order receipts	
	Directorate of Inventory Management - Business Process Tree

1. Product assortment of the retail store's collection

The first core process of the Directorate of Inventory Management of Sklavenitis S.A. is the product assortment of the retail store's collection for each store of the network. This core process consists of four main processes. To begin with, the main process of the update of the product assortment renewal by the General Directorate of Sales the work system understudy is informed of all possible modifications that should be incorporated into the retail store's collections updating the variety of products available to the retail customers. Sequentially, the main process of product assortment in the new retail stores in the network contains the formation of the product codes collection of a retail store according to its format, depending on the available product codes that are updated and shared by the General Directorate of sales. In the next step, the main process of the revision of the product assortment in the already existing stores in the network is carried out constantly, and reforms the selected codes belonging to a store's collection according to the modifications to the available product codes of Sklavenitis S.A. commercial agreements and according to the sale's performance levels of each product code. Meanwhile, the latest main process of the core process product assortment of the retail store's collection is the configuration of the MRP system for every product assortment adjustment. Through this process, the MRP software's database is updated and modified by the manager and the responsible team of the Directorate of Inventory Management to contain and represent all the active product codes to their latest version, while denoting the inactive and removing the deleted ones.

The first case that the product assortment needs to be renewed is when there are changes either to the external (product's barcode), the supplier's product code, or the internal product's code. To be more precise, the updating stage in case of changes to existing product codes in the Sklavenitis S.A. distribution channel begins with the Directorate of Inventory Management receiving the updated product codes documents, containing all the attributes of the products - both the changed and the non-changed ones, through internal email from the General Directorate of Sales, and then the database administrators employees of the inventory management team update the altered attributes of the product into the Masterdata database. By applying the changes to the Masterdata database, an automated email update is sent to the Directorate of Retail Store's Inventory Management Supervisor, containing the altered codes, the time that the update took place, and the id and name of the database administrator who operates it.

Secondly, updating and informing the Directorate of Inventory Management also entails the information about the new codes inserted into the Sklavenitis S.A. variety of products. An employee of the General Directorate of Sales sends an email containing the set of new products along with their barcodes to the Retail Store's Inventory Management team. The registration for every new barcode is created by assigning the Sklavenitis S.A. internal product code to this barcode and the supplier's external product code. The Masterdata database promotes the new registration forms to the Supervisor of the retail store's Management Team with an automated produced email after the completion of the registration in order to inform him of the new products and their codes that should be incorporated into the store's collections along with the administrator's credentials and the time that the insertion took place.

Many commercial agreements are interrupted temporarily, and the codes should be deactivated and not presented as available codes that can be distributed in the network or through the eMarket platforms. The product codes that are no longer available for the next time period are sent via email from an employee from the General Directorate of Sales to the Retail Stores Inventory Management Team and the Masterdata database administrator locks the registrations of the particular product codes so as not to appear as available products that can be picked and incorporated into the store's collections. The Masterdata automatically sends to the Retail Inventory Management Supervisor containing the deactivated codes, the timestamp when the deactivation happened, the agreement contract number that was cancelled or not renewed, and the name of the administrator who carried out the deactivation. At 6 months and one year time periods, the Retail Store Management team employee sends to the General Directorate of Sales an internal request to be informed if the agreement contracts are renewed for the specific product code or if the deactivation will be continued. The

General Directorate of Sales responds to the request via email and if the product code is going to be reactivated the Retail Store Management team employee informs the database administrators to perform the unlock of the registration of the product code in order to be available to be part of the network stores' collection. The above adjustment to the database by the administrator, will trigger the automated sending of a description email to the Supervisor containing the employee's credentials and the time that it took place.

To move one step further, if the product codes remain deactivated for over 12 months, then the Masterdata record will be permanently deleted from the database. To do that a database administrator employee of the inventory management team, is needed to inquire through an internal formal communication (email) to the Directorate of Retail Store's Inventory Management Supervisor regarding the approval for the permanent deletion of the record of the 12 months formerly deactivating code. Then and after receiving the approval for deletion - through email from the Supervisor, the database administrator will permanently delete the record of the product from the Masterdata database. After, submitting the database update, an automated email will be sent to the Directorate of Retail Store's Inventory Management Supervisor containing the deleted product code data, the credentials of the database administrator, and the timestamp of the update.

Lastly, there is an occasional commercial procedure in which the supplier of Sklavenitis S.A. disposes distinct quantities of some product codes either to be settled on separate shelves at discount prices for promotion purposes, or in special offers packages where the customer buys additional product quantity in the exact price of the initial product. In the first case of promo product quantities, new internal promo product codes that are not related to the permanent product codes should be created in the Masterdata database by the database administrator following the insertion of a new product code procedure. In the second case of special offers, new internal product codes should be created for every different special offer package but in this case, the code of the special offer is called sticker code and it is related to the initial code of the original product which is called the mother code and the sticker code could be reordered multiple times. The General Directorate of Sales sends to the Retail Stores Inventory Management Supervisor via email the new agreements concerning the promo products and the special offers packages along with all the attributes that specify both promo and special offers products. The database administrator opens new registrations for new codes for the promo products and new sticker codes for the special offers products. After the registration is completed, the database automatically sends to the Supervisor a procedure description email.

The second main process leads to the formation of the collection of a new retail store or a retail store that undergoes a renovation process and changes format. The Retail Inventory Management team selects the number of product categories, the total number of product codes that the store can host depending on its format (supermarket or hypermarket etc.), the product codes available per category depending on the sales performance of every code (the codes are selected to be incorporated to a collection with the criterion of their sales performance, the good sellers have higher priority and form the basic collection). Then the Retail Inventory Management team accesses the Masterdata database and picks the product codes sequentially, the Supervisor of the team approves the assembled collection and sends it via internal email to the particular retail store's Supervisor to be informed of the store's collection and to the Retail Inventory Management Masterdata database administrators to create the database's records containing the collection of the new retail stores. After the registration of collection records for the new retail stores, an automatically produced procedure completion report email is sent to the Supervisor of the team.

Another essential decision that has to be taken into consideration is the region that the retail store is located. More specifically, depending on the region that the store is located, its product collection will differ, and it is needed to contain local products among its basic ones. To do that, the Retail Inventory Management team is informed of the local product's agreements and depending on the local products' sales performance, it is evaluated which local products will be contained. Then, the Retail Inventory Management team Supervisor approves or does not the proposal of the team, and if a new product code is inserted into the Masterdata database, the database administrators will need to create a new database record for the new local product

inside the collection record of the particular store. After the completion of the adding procedure, a description email will be sent to the Directorate of Retail Inventory Management Supervisor, containing the employee's credentials and the details of the procedure.

A similar procedure needs to be taken regarding the seasonal product codes. To be more precise, the General Directorate of Sales informs the Retail Inventory Management Supervisor and the subordinate team regarding the seasonal product agreements and the product codes available. Then the Supervisor and the team decide, which product codes will be available to each store of the network - the decision is taken depending on the region where the store is located and the format of the store. Afterward, the database administrators of the Directorate of Retail Inventory Management will update the retail store's collection with the new seasonal codes and then the automated Supervisor's information procedure about the database update will be executed.

The agreements with suppliers concerning every distinct product are constantly revised every six or twelve months in terms of the distribution of the product itself, the quantities delivered from the supplier, the unit prices, the mother and sticker codes available for each product, and the promo codes, the alteration of a product's internal code or the removal of the code. Supplementary, the revision of a collection process is necessary when a particular product code does not perform well in a certain store. The Directorate of Sales accesses the Oracle Sales Database^[20] that is updated by the Retail Stored Inventory Management team, gathers, processes, and computes the performance indicators it needs to edit the evaluation forms. In the first step of the performance revision procedure, the General Directorate of Sales informs the Retail Store's Inventory team every three months of the evaluation of the sales performance per product code and per store by sending via an internal email the evaluation forms to each employee of the Retail Stores Inventory Management team, who is responsible for a particular store, containing the sale performance indicators per product. The employee decides which codes should be replaced with codes of similar products because of their poor sales performance in the particular store and promotes the alteration suggestion to the Supervisor of the team for approval. If the Supervisor rejects the suggestion, the employee proceeds with a different replacement suggestion and repromote it otherwise, after the approval the employee promotes the product codes replacement schema to the Masterdata database administrators to do the changes in the database registration concerning each particular store. After the completion of the code replacement in the database, a confirmation email is sent to the Supervisor with the details of the substitution procedure.

Then the database administrators are informed by the Retail Inventory Management Supervisor and the subordinate team regarding possible product codes which need to be readjusted. More specifically, the team and the Supervisor through an internal email containing the necessary to be readjusted product codes, inform the database administrators of the Directorate, who have access and are capable of updating the Masterdata database with the new product code details. Lastly, after the conclusion of the update, an automated email will be sent to the Retail Inventory Management Supervisor containing the database administrator who performs the adjustments credentials and the timestamp of the update.

Two final readjustment processes in a store's collection take place in cases of deactivated products or permanently delete products. When the Retail Inventory Management Supervisor is informed about the deactivation or the deletion of a code, promotes it to an employee of the Management team responsible for a specific store in order to select product codes to replace the deactivated or deleted ones. The replacement suggested schema is sent to the Supervisor for approval. After the approval step, the Retail Stores Management team employee promotes the replacement schema to the Masterdata administrators to perform the store's collection product codes update. Lastly, a description email containing the alternation details and the credentials of the administrator who completed it will be sent to the Retail Inventory Management Supervisor.

Since the update procedure of all stores collection in the network is completed at the level of the database registrations in order to form the new differentiated collections, the changes should be depicted in the MRP system where the configurations change so as to include the new product codes inserted into a collection and

deactivate or delete the configuration for the abolished products that are no longer part of the collection, and they should not be replenished. In the event of new product codes incorporated into the Sklavenitis S.A. retail network, the Retail Stores Inventory Management team Supervisor along with the MRP controller in his team decides how the MRP system would monitor the inventory, the format of the MRP reports for its product code, the estimation of demand calculations for this product code, the lead time for this product code and the minimum standard demand quantity for its product code. The aforementioned indicators are set with caution in order to create a balance between customer demands, product inventory, and production levels. In the last stage, the MRP controller actually performs the configurations on the system. Finally, the system prints the new product codes as available codes to be replenished via an automated order procedure or available codes to be reported in terms of inventory levels overview.

Complementary, the MRP system configurations should be updated after the code changes or collections modifications in a store are performed. The already set system parameters are customized each time changes are performed in sales performance or commercial agreements concerning quantity disposals of a product code or the numbers of the product codes (internal, external). More specifically, the updated parameters are the minimum standard demand quantity, lead time for replenishment orders, and inventory reports fields. After a modification or a collection update in a store takes place, the Retail Store Inventory Management team employee responsible for a particular store suggests the possible alterations in the MRP system configurations regarding the product code numbers, the minimum standard demand quantity, the lead time of order replenishment, the inventory reports fields concerning that particular code. The employee informs the MRP controller with an internal email for the essential new configurations, and the MRP controller performs them in the system. Once the Retail Stores Management team employee sees that the configurations are available, the configuration process is complete otherwise, the employee informs the MRP controller once again via internal email or calls.

As mentioned before, deactivated product codes exist in the database registrations. Therefore, a procedure is needed in order for these deactivated product codes to be depicted in the MRP system for each retail store of the Sklavenitis S.A. network, where the product code is included in the products' collection. The process begins again with the Directorate of Retail Stores Inventory Management employee responsible for a particular store informing the MRP controllers to perform the changes on the selected stores' MRP system database for the deactivated product codes so as to suppress MRP automated order and inventory reports capability. Another process is needed to be followed when there are deletion procedures for the abolished products that are no longer part of the products' collection and should not be replenished. More specifically, only in the deletion phase, the Supervisor of the Directorate informs the responsible team of the MRP controllers who perform the deletion process of the particular product code from every retail store's collection. The Supervisor accesses the MRP system and checks if the codes are deleted.

2. Replenishment of the Distribution Center's inventory

The replenishment of the Distribution Centers Inventory is a very important process that entails the intermediate step of storing the inventory in multiple central warehouses where the products are gathered and distributed to the retail stores' network or the retail eMarket customers using Sklavenitis S.A. transportation services so as to set the product delivery schedule in an efficient way that is actually executed on time without insecurity. Initially, the process starts with the fulfillment of the warehouse inventory replenishment for centralized distributed products where the inventory per product code is monitored in all Distribution Centers in order to serve and replenish all the stores of the network, ensure enough stock for emergency situations for a standard time period and finally submit orders to the suppliers. After the replenishment and order submission main process is completed, the next primary step is the approval of the delivered ordered products before they are accepted to enter the warehouse and be stored. The Distribution Centers Inventory Management team should prepare and parametrize the WMS system concerning the lead times and the final dates for the distribution ban of each distinct centralized product code in order to have an able system that controls (approves or rejects) the

delivered product lots. Eventually, the process is fulfilled after the update of the WMS inventory records when new inventory is received and properly stored. This final main process is essential as the WMS system is the inventory control tool and the data source for reporting about inventory quantity levels and it should be updated in order to depict the physical levels of inventory settled in the Distribution Centers.

The first main process of the fulfillment of the warehouse inventory replenishment for centralized products is the first component of the total Distribution Centers replenishment procedure that serve the retail stores and eMarket retail customers and is actually served by the suppliers who deliver the newly ordered inventory to the Distribution Centers. To begin with, the Retail Stores' that are serviced by a particular Distribution Center submits to the WMS system order forms with the expected quantity that the store will need to cover its future demand until the next lead time is completed. In addition to that, the retail store sends to the Distribution Center Inventory Management employee responsible for replenishing that particular store, an Excel file containing every product code, referred to the submitted order, and the actual quantities sold in the store in the previous six and twelve days. Then the Distribution Center Inventory Management employee that handles the orders for a particular supplier and for particular product codes accesses the Sklavenitis S.A. eMarket platform and retrieves the records of the order quantities from eMarket customers for these particular products for a time period of the previous six and twelve days as well. As a confirmation step, the Distribution Center Inventory Management employee promotes the orders submitted by the retail stores to the Supervisor of the team in order to take his or her approval and proceed to the order satisfaction. After the retail stores' order approval from the Supervisor of the team, the responsible employee proceeds and monitors the Distribution Centers inventory levels already existing in the warehouse at the particular moment of the analysis by accessing the WMS system. The modification of the WMS inventory levels records is performed every time the warehouse clerks (pickers) collect from the warehouse shelves the products contained in the order form submitted by a retail store. The picker scans with the particular WMS scanners the product code when it is collected from the shelf and in this way the inventory quantity recorded in the WMS for this particular code is modified because the quantity the picker collected is deducted from the initial record.

Consequently, the Distribution Center Inventory Management team employee who is responsible for the replenishment of a particular Distribution Center concerning particular product codes analyzes the demand of the previous time periods of six and twelve days for the retail stores and the eMarket platform and provide the forthcoming period demand estimation and also takes into consideration the additional inventory quantities that the Distribution Center should have in order to cover the needs of all retail stores it serves as well as the eMarket platform demand for the next fifteen days (2 x lead times) without submitting any order for the replenishment of Distribution Center. The analysis is being held in an Excel document that entails the demand of the Distribution Center that should be covered by its next order. To be more specific the Distribution Center's Inventory Management team employee creates the analysis summary demand estimation excel spreadsheet and the Supervisor of the team approves it. An analysis summary demand estimation excel spreadsheet is created in two versions, one that is built after taking into consideration the retail stores' demand and another that is built after taking into consideration the eMarket platform demand, and both of them are approved by the team's supervisor. One next step is the final order quantity estimation. The Distribution Center's Inventory Management employee comes down to the final quantity estimation that should be incorporated into the Distribution Center's order form.

Moreover, the Distribution Centers Inventory Management employee completes the appropriate order form document with the final estimated order quantity per product code along with the product's barcode and the suppliers' external corresponding code, the suppliers' information, and the accepted delivery dates. The order form document is signed by the employee who created it and it is promoted to the Supervisor for his approval and his signature. Afterward, the order form is sent to the Third-Party Supplier and at that time, the order form document is an irrevocable document. The aforementioned process is also followed in the case the final recipient of the order is the Sklavenitis S.A. Private Labels Products production lines.

After the first main process regarding the fulfillment of the warehouse inventory replenishment for the centralized distributed products, then in order to move toward the completion of the core process, there is the necessary confirmation of the ordered products, which takes place at the Distribution Centers' location. This main process consists of three distinct subprocesses, with the first one being the settlement of the lifetime period that the product code is accepted to be distributed through the Sklavenitis S.A. network. More specifically, the guideline that is followed regarding the product's lifetime is the 75-25 rule, meaning that the product can be accepted to be distributed into the Sklavenitis distribution channel only if until the delivery time the product is at max at the first quarter of its lifetime (having at least $\frac{3}{4}$ of its lifetime until it expires). Therefore, the 75-25 rule is a generalized guideline, and in certain cases, particular product codes that are slightly over the first quarter of their lifetime are occasionally accepted as delivered products in the warehouse. These product codes mainly belong to the non-FMCG category and have a small variation between their accepted and their actual lifetime being, and in order to be accepted there is a need for approval from the Distribution Centers Inventory Management Supervisor after being contacted by the Distribution Center employee who evaluates the delivered order in the Distribution Center's location after the order has been rejected. To be more precise, the WMS scanner handled by the Distribution Center employee who scans the entire ordered products, is able to alert its handler in case of a product overpass the suggested accepted delivery date - already configured by the Distribution Centers Inventory Management Supervisor and the WMS database administrators team of the Distribution Centers Inventory Management to follow the 75-25 guideline for each product code with the submitted input (through the scanning procedure) being the product's date of creation.

The third and final main process of the replenishment of the distribution center's inventory replenishment core procedure is the update of the inventory levels after the replenishment fulfillment of physical inventory takes place. More specifically, the inventory records of the Sklavenitis S.A. Distribution Centers need to be updated dynamically through the WMS system in order to extract real-time data for the designing of the products' order schedule in the most efficient way. Furthermore, the stored products of a Distribution Center need to be placed in a way in order to be able to store as many products as it can (to the quality standards that are provided by each product's supplier) while at the same time assisting the internal Distribution Center's workflow. To have the optimal inventory settlement in the Distribution Centers, the products are placed in a way that is helping both the way of collecting items for the to-be-delivered orders and the unloading of the orders received. The warehouse clerk follows the optimum suggested course by the system in order to store the received inventory according to the rules that are inserted into the WMS after the system's parametrization. The rules that indicate the system's parametrization is defined by the Distribution Centers Inventory Management team and approved by its Supervisor after taking into consideration each product's needs (eg. freezers storage). The WMS system^[18] along with its feature Warehouse Analyzer, utilizes the OLAP technology, reliably and quickly extract the inventory levels from the Distribution Center's database and with a large number of indicators (KPIs) and statistics cubes which are being integrated into the system, provide the optimal place (shelf) to unload the inserted products and the most efficient collection path of the to-be-delivered ordered items by the Distribution Center's employees (pickers). When the to-be-delivered order is completed and ready to be shipped to the retail store(s) that the Distribution Center services, the order document is scanned in order to update the inventory levels of the Distribution Center through the WMS system, while a similar procedure is followed when an order has been delivered to the Distribution Center and the Distribution Centers Inventory Management employee scans the supplier's order document and both the employee and the system approves all the products of the order (75-25 rule). By scanning the order document, a process to update the inventory database of the WMS system is triggered and the main goal of this essential level subprocess is fulfilled so the WMS database's inventory records depict the physical levels of inventory settled in the Distribution Centers.

3. Replenishment of the retail store's inventory

The third core process is the replenishment of the retail stores' network inventory in a responsible and consistent way so as to monitor the procedure that handles the replenishment rate in all network units. In all steps of the retail stores' replenishment fulfillment, the Retail Stores' Management Team supervises and monitors all the stages that are followed in all stores. The first main process the management team is informed of all kinds of mismatches in all the networks' retail stores' classified depending on the cause of the mismatch of the MRP inventory level records and the physical inventory level and the significance in terms of inventory's quantity. Then the main process of updating the MRP records at the system's level in order to correct the mismatches and the system's records to present the real state of the inventory available in stores. Finally, the last main process depicts the actual and practical steps in the coordination of the order's completion from the initial step of the definition of the needed order quantity and order submission and the order receipt in the store.

The first main process of the replenishment of the retail store's inventory core process has as its main goal to supervise the identification procedure regarding the physical inventory and the MRP record for each unique product code and for each retail store of the Sklavenitis S.A. network. It is obvious that for such a big retailer as Sklavenitis S.A., the monitoring of the inventory levels in real-time has an essential role in order to maintain the products flow from the central warehouses to the retail stores and the final customers. Thus, for the aforementioned reasons, Sklavenitis S.A. establishes a monitoring process. This main process consists of the receipt of the necessary feedback from the retail stores - in cases that a mismatch situation occurs, the identification step regarding the causes that lead to the mismatched inventory levels, parsing the guidelines to the stores regarding product lots returns, receiving information about expired products, abortions, delivery delays or cancelations from the stores, and parsing the incoming promotion codes guidelines to the retail stores.

The trigger of this main process is happening through the received feedback from the retail stores' network of Sklavenitis S.A. Therefore, the retail stores, through their office, inventory teams, or even their supervisor, if needed, provide the mismatched records issue to the Directorate of Inventory Management and its responsible team coordinated by the Directorate of Inventory Management Manager. Afterward, the Directorate's team will try to identify the causes that lead to the mismatched inventory issue, and if needed, they will contact through an internal email or a call, the particular retail store's supervisor, or employees in order to collect more data to make their assumptions and summaries. The above-mentioned may reach the Directorate of Inventory Management Manager if the responsible team thinks that the issue needs his/her opinion to move forward with the final summaries and actions. It goes without saying that the Directorate of Inventory Management Manager can at any time have access to any investigation in progress and express his/her opinion.

Furthermore, in cases where a particular product lot is recalled by the suppliers or governmental agencies, the Directorate, through the particular team regarding the product lots, will inform through email the retail stores about the lot's unique lot number (lot - code) and parse the settled guidelines regarding the return procedure of the products to either the suppliers' agreement points or to the central facilities of Sklavenitis S.A. Through the information flow between the Directorate and the stores, the seconds also provide feedback regarding expired and aborted products along with delivery state updates which will point out delivery delays and cancelations, which eventually may be used as a supplier or delivery third-party vendors, evaluation metric. As an additional part of this information flow between the Directorate and the stores, the first will inform the selected stores to receive promotion product codes (promo codes) and parse the settled by the supplier promotion guidelines regarding the particular products.

The main process of the MRP records update is the monitor stage which actually has the main purpose of implementing the correction of the mismatches found in the first main process and updating the MRP registration in a state-of-the-art stage where it denotes the realistic levels of inventory in all network stores. During the first step of the procedure, the Retail store's management team actually enters the system and

updates the mismatched records per product code and particular store's system field. After this step, the retail store's office team is informed of all the changes on the MRP records regarding the mismatched product code records. Then the Retail Stores Inventory Management team informs the office team of all the physical inventory quantities that are not included in the MRP reports per product code because of the expiration and return protocol for products that should no longer be available in the network's stores. After the expired products return, the Retail Store's Inventory team is informed, and proceeds in the MRP records update considering the expired products. In addition, the Retail Store's Management team handles all orders' delays or cancellations in terms of taking decisions about future order quantity that will not lead to excess surpluses or deficits. Lastly, the Retail Store Management team, on a weekly basis, denotes the promo codes of particular products and the sticker codes of particular products in the system registry in order for every store in the network to know which codes will exclude from the automated order procedure every week because of promo or ad-hoc commercial agreement purposes.

To begin with, modifying the MRP inventory records to be equivalent to the physical inventory levels, the Retail Stores Management team's responsible employee of a particular store's inventory monitoring, after having identified a mismatch and its cause, enters the system and updates the inventory level records for the particular product code in the particular network spot. Then the system automatically produces the code update report that is shared as a system's notification with the particular store's system-authorized user to see MRP inventory records updated. The authorized MRP user belongs to the retail store's office team and, after the receipt of the MRP's update, forwards the update's notification to the store's warehouse inventory levels responsible employee to make the final check of the identification of the MRP's records and the physical inventory's quantities for a particular product code. Then the warehouse employee informs the office team of the final result of the check with a report call. Another important aspect of the main process is the denoting of the to-be-returned products in order not to be computed in the MRP procedures and calculations. The Retail Stores Inventory Management team is informed of all retail stores' product lots that should be aborted. These product quantities are in the store's warehouse as a physically present inventory, but they are not available for sale. For this reason, the MRP records should contain these quantities, but the MRP should not take them into consideration in the calculations for the automated MRP order procedure. So, after the Retail Store's Inventory Management team responsible employee for a particular store is informed of the to-be-returned quantities of a particular product code and a particular retail store accesses the system's configurations and declares the quantity number of the product code that should not be calculated as available stock in the automated MRP order. Then the employee sends to the retail store's office team via email the product code and the quantity that is considered on hold and cannot be used as available-for-sale inventory.

In addition, the handling of orders' delays and cancellations in terms of the MRPs configurations. In the MRP automated order procedure, the system renews the inventory record after one lead time passes by adding the ordered quantity that is considered to be delivered to the store. In cases of an order delay or cancellation, the retail store Supervisor sends via email the ordered forms to the responsible employee of the Retail Stores management team responsible employee with the labeling delay in cancellation. In the first case, the number of days of delay and the actual expected day of delivery should be included in the order form as well. Then the employee accesses the system and updates the MRP records in order to subtract the quantity of the delayed order from the automatically updated MRP records that add the ordered inventory quantity after a lead time period that is considered as a time period that all submitted orders should be delivered to the store. In case of delayed orders when the actual delivery takes place, the retail store Supervisor informs the office team, which updates by adding the receipt quantity to the MRP records for a particular product code. The system forwards an automated notification to the Retail Store's Responsible team for the MRP's records update. Furthermore, in every delay case, the retail store's warehouse employee makes a cross-validation check of the MRP records and the physical quantities, and if a mismatch is identified, they write a report to inform the office team. Finally, every week the sales department sends via email all the product codes that will provide promo product quantities on discount along with the new promo product codes for these discount quantities to the Retail Store's Inventory Management team. The responsible employee that handles the inventory replenishment of a

particular store accesses the MRP and creates a new registration for a new promo product code along with the configurations on the quantity levels and the time period within which the promo products will be available in the selves. When the new registration is completed, the employee sends via email to the office team the report with the new promo codes. The office team informs the warehouse employee of the new promo products and their quantity levels in order to make the warehouse employees find the right place of storage for the particular codes.

The main process of the MRP records update is the monitor stage which actually has the main purpose of implementing the correction of the mismatches found in the first main process and updating the MRP registration in a state-of-the-art stage where it denotes the realistic levels of inventory in all network stores. During the first step of the procedure, the Retail store's management team actually enters the system and updates the mismatched records per product code and particular store's system field. After this step, the retail store's office team is informed of all the changes on the MRP records regarding the mismatched product code records. Then the Retail Stores Inventory Management team informs the office team of all the physical inventory quantities that are not included in the MRP reports per product code because of the expiration and return protocol for products that should no longer be available in the network's stores. After the expired products return, the Retail Store's Inventory team is informed, and proceeds in the MRP records update considering the expired products. In addition, the Retail Store's Management team handles all orders' delays or cancellations in terms of taking decisions about future order quantity that will not lead to excess surpluses or deficits. Lastly, the Retail Store Management team, on a weekly basis, denotes the promo codes of particular products and the sticker codes of particular products in the system registry in order for every store in the network to know which codes will exclude from the automated order procedure every week because of promo or ad-hoc commercial agreement purposes.

To begin with, modifying the MRP inventory records to be equivalent to the physical inventory levels, the Retail Stores Management team's responsible employee of a particular store's inventory monitoring, after having identified a mismatch and its cause, enters the system and updates the inventory level records for the particular product code in the particular network spot. Then the system automatically produces the code update report that is shared as a system's notification with the particular store's system-authorized user to see MRP inventory records updated. The authorized MRP user belongs to the retail store's office team and, after the receipt of the MRP's update, forwards the update's notification to the store's warehouse inventory levels responsible employee to make the final check of the identification of the MRP's records and the physical inventory's quantities for a particular product code. Then the warehouse employee informs the office team of the final result of the check with a report call. Another important aspect of the main process is the denoting of the to-be-returned products in order not to be computed in the MRP procedures and calculations. The Retail Stores Inventory Management team is informed of all retail stores' product lots that should be aborted. These product quantities are in the store's warehouse as a physically present inventory, but they are not available for sale. For this reason, the MRP records should contain these quantities, but the MRP should not take them into consideration in the calculations for the automated MRP order procedure. So, after the Retail Store's Inventory Management team responsible employee for a particular store is informed of the to-be-returned quantities of a particular product code and a particular retail store accesses the system's configurations and declares the quantity number of the product code that should not be calculated as available stock in the automated MRP order. Then the employee sends to the retail store's office team via email the product code and the quantity that is considered on hold and cannot be used as available-for-sale inventory.

In addition, the handling of orders' delays and cancellations in terms of the MRPs configurations. In the MRP automated order procedure, the system renews the inventory record after one lead time passes by adding the ordered quantity that is considered to be delivered to the store. In cases of an order delay or cancellation, the retail store Supervisor sends via email the ordered forms to the responsible employee of the Retail Stores management team responsible employee with the labelling delay in cancellation. In the first case, the number of days of delay and the actual expected day of delivery should be included in the order form as well. Then the

employee accesses the system and updates the MRP records in order to subtract the quantity of the delayed order from the automatically updated MRP records that add the ordered inventory quantity after a lead time period that is considered as a time period that all submitted orders should be delivered to the store. In case of delayed orders when the actual delivery takes place, the retail store Supervisor informs the office team, which updates by adding the receipt quantity to the MRP records for a particular product code. The system forwards an automated notification to the Retail Store's Responsible team for the MRP's records update. Furthermore, in every delay case, the retail store's warehouse employee makes a cross-validation check of the MRP records and the physical quantities, and if a mismatch is identified, they write a report to inform the office team. Finally, every week the sales department sends via email all the product codes that will provide promo product quantities on discount along with the new promo product codes for these discount quantities to the Retail Store's Inventory Management team. The responsible employee that handles the inventory replenishment of a particular store accesses the MRP and creates a new registration for a new promo product code along with the configurations on the quantity levels and the time period within which the promo products will be available in the selves. When the new registration is completed, the employee sends via email to the office team the report with the new promo codes. The office team informs the warehouse employee of the new promo products and their quantity levels in order to make the warehouse employees find the right place of storage for the particular codes.

The third and final main process, regarding the fulfillment of the order procedure, consists of the definition process for the manual and the automated - through the MRP - order, the supervision of the order's proper completion, the handling of non-appropriate deliveries, the evaluation of the demand and the settlement of the minimum needed quantity per product code.

The Retail Stores Inventory Management team defines, with its supervisor's approval, the methodology for the estimation of the order quantity in case of the automated MRP order procedure. The team defines the methodology and then incorporates it in the system's general configurations so that the system will choose to order the right amount per product code needed for the replenishment of a store in every order until the next lead time when the system would consider ordering inventory per product code again. The already existing inventory quantity is the MRP records plus the on-hold orders that already have been made, and the inventory has not yet been delivered but will be in the next hours or days, and the demand quantity is the estimated demand quantity for the product code multiplied by two lead times where the lead time is expressed in days. Finally, it subtracts the existing quantity from the demand.

Another very important step that plays a major role in the product flow is the computation of the estimated needed quantity for the forthcoming period. To do so, the Retail Store's Management teams work in collaboration with the Supervisor to try to predict the demand regarding the period (eg. sunscreen in summer or honey in winter), the location of the retail store (eg. anti-mosquito gel products remain for almost all year in Crete), the previous periods recorded data to define market trends, and the past years exactly identical calendar-wise period to have a knowledge base for the prediction. Afterward, these predictions result in the final demanded quantity for the next order while also defining the minimum quantity per product code and for each retail store by computing the demand for two lead times without receiving an order delivery.

In cases when the automatically ordered quantity is not enough to cover the selling needs of the particular product code, the responsible retail store employee for the shelves replenishment informs the office team to check the particular upcoming inventory depending on the MRP order quantities. The office team finds out the additional quantity needed to be ordered apart from the automated orders that take place. Thus the office team informs the responsible retail store's employee for executing manual orders per particular code that an additional order should be done and the estimated quantity for the manual order for the additional inventory quantity that should be ordered. The employee estimates the exact order quantity for the manual order of the particular product code in the excel spreadsheet and then fulfills the order form document. When the actual

order document is submitted, then it is shared with the responsible employee from the Retail Stores Inventory Management team via email, in order to inform the team of this additional replenishment requirement.

When an order is submitted to the final supplier or a central warehouse with the manual or automated procedure, the order document should be shared with the responsible employee for monitoring a retail store's replenishment process belonging to the Retail Store's Inventory Management team. In the automated MRP order, the employee sees the submitted order forms via the system. Every order submitted contains product codes that have a particular lead time and delivery schedule. When an order is delivered on time to the retail store, and the procedure of products receipt is complete, the store's office team sends an email with the order form and the proper delivery document to the Retail Store's Responsible Inventory Management employee, and in this manner, the Retail Store's Management team is informed for the schedule adherence of orders either automated or manual. For any kind of order delivery delay, the Retail Store's Inventory team is informed with a similar procedure as is referred to in the 3.2.5 subprocess in order to handle the situation in terms of replenishment assurance. From the combination above, the Retail Store's Management team checks the orders' proper delivery schedule.

During the receipt procedure, some packages are damaged to a dangerous extent, or inventory quantities are not equal to the ones initially ordered. So, there are steps that are followed to handle these problems' cases. The order should not be accepted to enter a retail store's warehouse while the employee in the receiving procedure informs the retail store's office team. The office team sends an excel file at the business hours containing all the rejected orders, the reason for rejection, and the quantity per product code that is not delivered to the responsible employee from the Retail Store's Inventory Management team. The employee accesses the MRP and updates the records after the two lead time periods. Then the retail store employee who sends the rejected order resends the order and manually sends all the MRP rejected orders.

4. Reporting and Information Flow

The fourth core process has as its main goal to maintain all the employees on the same page and up to dated knowledge-wise. Therefore, the reporting and information flow through the exchange of information among the employees within the organization is trying to maintain the consistency of the workflow. To be more specific, the reporting and information flow consists of four main processes regarding the type and the recipient of the reports. The Directorate of Inventory Management reports to the General Directorate of Finance and its subordinate Directorate of Accounting the submitted suppliers' order forms and warehouse's existing inventory quantities, to the General Directorate of Supply Chain inventory reports directly to the General Manager of the Supply Chain, to the General Directorate of Information Technology reports regarding the in-use information systems and to the General Directorate of Sales, sales raw data from the network's stores and performance-oriented reports.

The Retail Store Inventory Management team constantly submits reports of crucial importance to distinct directorates of the General Directorate of Finance. In the first level of practical interdepartmental communication, the Distribution Centers Inventory Management team sends on a daily basis all order forms submitted to the Suppliers to the Accounting Directorate. All the order forms for the Distribution Centers replenishment are submitted to the Suppliers, and after they are accepted by the supplier, the Distribution Center Inventory Management employee who has signed the order form promotes it via internal email to the Accounting Directorate to inform it of the upcoming payments to the suppliers. Simultaneously, the Retail Stores Inventory Management team collects on a daily basis all the order forms submitted directly to the suppliers by each retail store's office team for all non-centralized distributed products that should be replenished and are available to that particular store. The Retail Stores Inventory team aggregates the order forms and sends them via internal email to the Accounting Department in order to be considered for the upcoming payments to the suppliers.

Another essential interdepartmental report procedure is the analytical inventory reports for the centralized distributed products that are settled in all Distribution Centers and represent the assets of Sklavenitis S.A. The Distribution Centers Inventory Management team accesses the WMS system and retrieves the data considering the inventory quantities available per product code in each distinct Distribution Center in a particular timestamp. Then inventory analyst of the team summarises the inventory level quantities per product code for all active, centralized distributed codes for all the Distribution Centers. In both procedures, the first data gathered are going to be collected in Microsoft Excel^[27] spreadsheets and in table formats for each Distribution Center and for the overall Distribution Center's network. The Microsoft Excel^[27] files are used by the inventory analyst as raw data inserted into the Business Intelligence software as the core for the reporting procedure that describes the current inventory levels fluctuation during different time periods and in all available aggregations depending on different characteristics concerning the Distribution Centers. The generated reports are promoted only to the Distribution Centers Inventory Supervisor through the Business Intelligence software capabilities and after their approval, they are submitted to the General Directorate of Finance. These reports are sent with an internal email to the responsible employee from the General Directorate of Finance as are used for computing essential performance indicators for the whole organization and on this ground, they have confidential character.

A substantial main reporting process is the internal reports that inform the General Manager of the Supply chain for the directorate's performance. Both the sub-directorate of Retail Stores Inventory Management and Distribution centers Inventory management submit reports on a constant basis that summarize the inventory quantity levels fluctuation in one month and present the fundamental and most fast-moving products and an overview of the estimation of the inventory quantities in all network places, central warehouses, retail stores' warehouses, retail stores' shelves. The Retail Stores Inventory Management team accesses the MRP (singular logic) system and retrieves for all network's stores the inventory records for inventory sales and inventory replenishments with aggregations considering the network's locations and the products categories created under different conceptual needs. The reports are created under the Business Intelligence software by different employees and members of the Retail Store Inventory Management team. The reports are shared with the team's Supervisor. The Retail Store Inventory Management team Supervisor edits the reports and creates the final report containing the most essential data that should be presented. The Supervisor sends via an internal email the final report to the General Supply Manager along with some clarifying comments. Complementary, the Distribution Centers Inventory Management team for the same time period creates reports that contain the presentation of the inventory levels hosted in all Distribution Centers, the Distribution Centers' replenishment rates, the percentages of the centralized products, and the inventory quantities that serve each distinct shop and the eMarket platform. The employees of the Distribution Centers Inventory Management team access the Warehouse Analyzer feature of the aberon WMS system^[18], select the useful views and incorporate them into the reports. In this case, the team's Supervisor accesses the system and selects the reports that should be promoted to the Supply Chain General Manager. The reports are exported from the system and the Supervisor sends them via an internal email to the General Manager.

Furthermore, the two sub-directories send to the Supply Chain General Manager emergency reports whenever unexpected losses appear. If the Retail Stores Inventory Managements team finds out that in a particular retail store in the network and in particular product codes for a certain amount of time the MRP inventory records do not match the physical inventory quantities, indications that the retail store management needs to be supervised. The employee that detects the unjustified inventory losses informs the Retail Stores Inventory Management team Supervisor and the Supervisor investigates the losses and creates a report that monitors and presents the inventory quantity levels of unjustified differences. The Supervisor sends the report to the Supply General Manager via an internal email. Additionally, the Distribution Center Inventory Management team automatically receives a WMS system message every time a picker warehouse employee executes an order, and although the system informs that a product is available the picker finds out that the product is not actually available or there is not the inventory quantity that the system presents. Then the responsible employee who receives that message informs the team's Supervisor and gets his permission to create a report after checking if the physical inventory of a specific product code in the particular Center matches the WMS record. This

identification procedure is carried out with the assistance of the warehouse clerks and the Distribution Centers Inventory Management employee who handles the system's functionalities. The warehouse clerk after the inventory control completes a form that states the physical inventory quantity, signs the form, and sends the physical form document to the responsible employee. The report along with the scanned form document is sent to the Supervisor of the team and then the Supervisor sends it via internal email to the General Manager of the Supply Chain.

The latest reporting main process is the utilization of automated information systems features, which provide the General Directorate of Information Technology, with computerized log files and crash analytics reports. The two information systems of Sklavenitis S.A. that are able to export and forward these reports to a pre-determined recipient - a member of the information system maintenance team of the General Directorate of Information Systems are the Material Requirements Planning (MRP) and the Warehouse Management System (WMS). To be more precise, both the systems forward a crash analytics report and a detailed log of the information system state when it crashed or stopped working properly. Then the recipient team will investigate the crash and will try to identify the cause of it, in order to fix it.

Regarding the sales performance of its product, Sklavenitis S.A. establishes an information flow to gather the collected sales raw data from its store's network and to provide the first drafts of sales reports to the General Directory of Sales, edited by the Retail Store's Inventory Management. The first main process, regarding the gathering of the sales raw data from the network, starts with the Retail Store's Inventory Management team responsible employee for every particular store accessing the store's sales Oracle Database^[20] through the corresponding Oracle access application platform and retrieving the sales performance raw data for all products codes of interest. This procedure is carried out for all stores in the network, and then the sales data per code are aggregated so as to contain the sales per code in the entire network by the Retail Stores Inventory Management team retail inventory analyst, who undertakes the sales reporting filtering. Consequently, every employee from the Retail Stores Inventory Management team responsible for monitoring the inventory levels of particular store of the network edits a sales report per store for all the product codes of its collection every month or wherever it is supplementarily asked from the General Directorate of Sales and the retail inventory analyst creates the reports considering the aggregated sales reports considering the entire retail network. Then, the second subprocess takes place, and the reports are uploaded to the workspace of the Business Intelligence software reporting tool and are available for the employees of the General Directorate of Sales to access them. After the completion of each report, its editor sends an internal email to the General Directorate of Sales to inform them that the reports are available on the Business Intelligence software provided workspace. The General Directorate of sales every three months sends via internal email specific sales reports that contain sales performance indicators that are called evaluation form documents in order to evaluate the sales performance of particular codes in different retail stores supporting in this way the decision-making process of the Retail Stores Inventory Management team revaluation and reformation of the product assortment in every store.

WCA-Snapshot of the Work System Under Study.

Work System Under Study Title: Directorate of Inventory Management

Customers:

- Retail stores in every location of the country (In the Environment of the Work System Under Study)
- Distinct eMarket retail customers (Out of the Environment of the Work System Under Study)
- General Directorate of Sales (In the Environment of the Work System Under Study)
- General Directorate of Supply Chain (In the Environment of the Work System Under Study-Manager)
- General Directorate of Finance (In the Environment of the Work System Under Study)
- General Directorate of IT (In the Environment of the Work System Under Study)

Products & Services:

- Update of the Masterdata database
- Update the MRP systems configurations
- Monitor the replenishment procedure of the Distribution Centers
- Monitor the replenishment procedure of the retail stores' network
- Inventory Quantity Reports
- Sales Reports
- Systems Reports

Business Processes:

- Product assortment in new retail stores in the network
- Revision of product assortment in the retail store
- Configuration of MRP system for every product assortment adjustment
- Fulfillment of the warehouse inventory replenishment for centralized distributed products
- Monitor of the identification of the physical inventory and the MRP record per product code
- Fulfilment of order procedure
- Reporting to the General Directorate of Finance
- Information flow on sales performance
- Providing inventory reports to the General Directory of the Supply Chain

Participants:

- Retail Store's Inventory Management team employees (Internal)
- Retail Store's Inventory Management team Supervisor (Internal)
- Masterdata Database Administrators (Internal)
- MRP controllers (Internal)
- Retail Store's Supervisors (External)
- Retail Store's Office team's employees (External)
- Retail Store's Inventory employees (External)
- Distribution Centers' employees (External)

Information:

- Update product codes document (In)
- Handling guidelines per product code category (In)
- Sales performance evaluation forms (In)
- Complementary manual order form (In)
- Rejected orders' spreadsheets (In)
- Order schedule adherence spreadsheet (In)
- Distribution Centers' Order forms (Out)
- Identification of inventory level reports (Out)

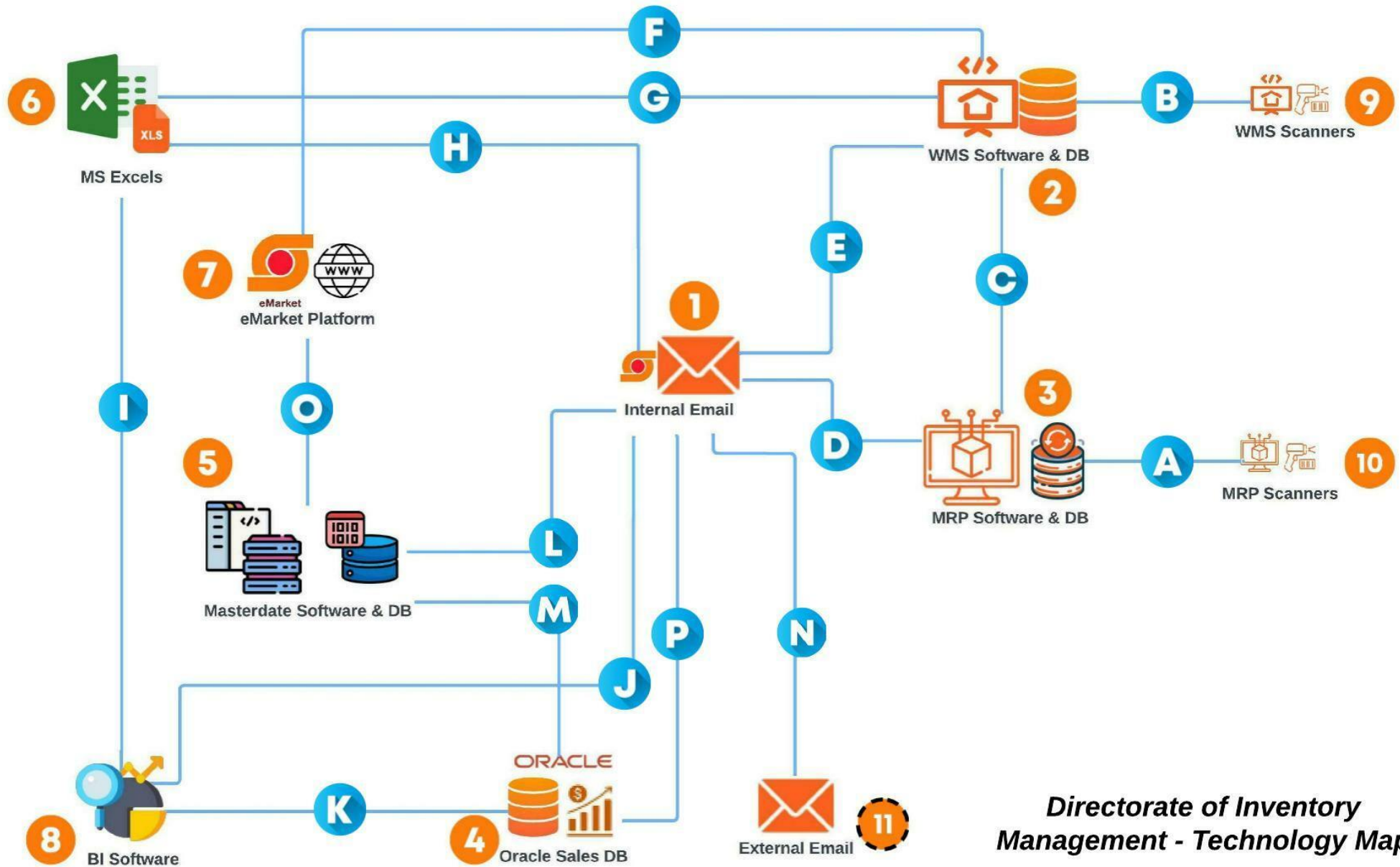


- Inventory quantities reports (Out)
- Creation of the new product collection document (Out)
- Update of product collection document (Out)

Technology:

- MRP Software (SRS)
- MRP special scanners
- WMS Software
- WMS scanners
- Masterdata (products codes DB)
- Oracle Database (products sales DB)
- Emails (mainly internal email)
- MS Excel
- Business Intelligence Software

Technology Map



**Directorate of Inventory
Management - Technology Map**

Part B - Architectural and Performance Management Evaluation

In this section there is going to be performed and described the Architectural and Performance management evaluation of our work system under study.

Architecture Perspective Evaluation

Architecture evaluation is the activity of evaluating the architectural design decisions of the under-study work system to build confidence that the system can fulfill the stakeholder concerns. Therefore, by applying it to the work system under-study, the following five design decisions have been determined that can be further improved:

1. Non-Centralized Product Distribution - Design of customer-facing processes - Main Process 3.3.
2. Low Automation Level - Design of Business Processes:
 - a. at the Estimation of Demand – Sub Process 2.1.5.
 - b. at the Order Submission procedure for Distribution Center Replenishment – Sub Process 2.1.6.
3. Members of the Inventory Management Team have both the responsibility of monitoring and reporting upon inventory level fluctuations - Design of Structure and Roles – Main Processes 4.1., 4.2., 4.3.
4. There is a delay in information flow because, in the final stage of reporting, the inventory reports, in contrast to the sales reports, are created depending on data stored in ad hoc created flat files (Excel files) and not from data gathered and shared in a more automated manner that could accelerate the procedure. - Design of Business Information Architecture – Core Process 4.
5. There is no an automated procedure that informs the Directorate of Inventory Management about the delivery completion or failure in real-time, and that leads to delays - Design of Business Processes – Sub Processes 3.1.5., 3.2.5., 3.3.3.

First of all, throughout the collecting data from the field procedure to assemble Part A - AS-IS section of this business study, we found some processes designs that can further improve and be more efficient for our work system under study.

The first observation regarding the process designing is a design of customer-facing processes issue and is located in the main processes 3.3., where the fact that lots of product codes are coming through third-party distributors directly to the retail stores leads to higher investment and operating costs and control expenditure. The above led the organization to a higher effort for inventory management (calculation of third-party delays, order cancellation, no properly delivered products) and higher minimum demanded stocks in cases where a third-party incident occurred. Additionally, to the aforementioned cons of the decentralized products, Sklavenitis S.A. and the Directorate of Inventory Management need to take into consideration the possibility of not on-time deliveries, which can lead to product codes being out-of-stock or in low stock levels. Therefore, it is obvious that a large-scale retailer such as Sklavenitis S.A. needs to increase the number of centralized product codes to eliminate the probability of those incidents and improve the efficiency of its predictors.

Furthermore, it is evident the fact that a retailer like Sklavenitis S.A., whose purpose is to deliver to the final customer, needs to maintain its stock on standard levels regardless of the incidents that may occur from time to time. These processes (Estimation of Demand (2.1.5.) and Order Submission for Distribution Centers Replenishment (2.1.6.)) present a design of business processes issue since we observe a low automation level and a lack of technology used to assist these valuable for the replenishment of the distribution centers inventory processes. To be more precise, lots of complimentary estimations are computed manually, and a portion of order submissions are sent through emails. This way, lots of work hours have been consumed in order to complete these manual procedures, while an automated solution may accelerate these situations simultaneously by offering more time for the employees to be spent on other - more technical tasks.

Moreover, it is obvious from the fourth core process the reporting obligations are of extreme value and importance in our work system under study. Apart from the monitoring of inventory levels in every node of the distribution network on an almost real-time basis, reporting needs are essential. The information on the inventory and sales fluctuation needs to be measured and shared with other General Directorates and, of course, with the General Manager of the Supply Chain of the organization. In the first case, the inventory performance is part of the fundamental data for other kinds of analysis such as sales performance analysis, financial performance analysis, and secondly, the basic information for the work system's performance appraisal from the manager. More specifically, the main processes 4.1., 4.2., and 4.3. of the work system's process tree refer to reporting analysis that addresses the General Directorates of Finance, Sales, and to the General Manager of the Supply Chain, respectively. One critical organizational observation regarding the roles and responsibilities of the Directorate is that the same roles that undertake the duties of monitoring the inventory levels, assure for inventory replenishment, and minimize the hazard of surpluses and deficits appearance undertake the reporting duties as well. There is no distinction between the job titles, and this in the reporting aspect, at least concludes to creating a smaller number of reports with less granularity or data aggregations and less specialization. In this level of participants in the work system's architectural analysis, a more detailed organization chart with distinct analyst roles could present much more productive and creative results in the reporting responsibilities.

On a more technical level, the reporting procedure of the work system under study presents another interesting observation. Although, the sale reports are created in BI software that is connected with the Oracle Sales DB schema directly. The data flow is very instant, and the employee who carries out the analysis retrieves the data fast from the database tables that are presented automatically as options in the BI Software along with their variables. So, there is no intermediate step of data export or data collection in order to create the basic sales reports considering the sold and subtracted inventory. On the other hand, the quantity inventory reports are created from data exported from the MRP application in the case of retail stores and the WMS application in the case of Distribution Centers. These raw data are gathered as exported time series system records in flat files such as CSV files. The ad-hoc flat files are created every time a responsible employee needs to publish a quantity inventory report again and again in order to contain the last version of the most updated data. Consequently, the flat files are imported as the data source in the BI Software in order to create the report. These two steps are considered very time-consuming additional steps and reveal a more complex process that entails restricted accessibility information architecture design.

One of the most important core processes is the monitoring of the replenishment procedure of the last node of the Supply Chain, the retail stores' network. The proper completion of the order delivery schedule is very important so as to replenish a retail store with new inventory on time without delays that lead to temporary deficits in products, although this inventory is actually ordered on time. In the third core process, the monitoring of the order delivery adherence schedule is a very important subprocess that is carried out manually. Every time an order is properly delivered to a retail store or is delayed, or it is cancelled, a sequence of incident reporting emails starts in order to inform the Retail Stores Inventory Management team to act and handle the situation. This manner of communication is time-consuming, based completely on human effort, and many times fails to be carried out in time, and this leads to the reordering of unnecessary inventory quantities or updating MRP records with invalid information. The aforementioned procedural steps imply a technology gap in the delivered orders schedule adherence process.

Performance Perspective Evaluation

After the architecture evaluation, we implement the performance evaluation. The performance evaluation is the activity of management evaluation of the work system under study, where the performance metrics (indicators - KPIs) used or to be used to manage the performance of the whole organization or the work system under study.

Financial (value) layer of the Balance Scorecard measures and indicate whether the company's strategy, implementation, and execution are contributing to bottom-line improvement from the stakeholder's viewpoint.

The first KPI of the Financial layer is the *Inventory Sold Rate*. This KPI is an operational easily-to-measured efficiency metric that shows the number of times the average balance of inventory was sold during a period. To be more precise, a low inventory sold rate can indicate that the Sklavenitis S.A. is buying too much inventory or that sales are weak, while a higher rate indicating less inventory or stronger sales. An extremely high rate could indicate that Sklavenitis S.A. doesn't have enough inventory to meet demand, limiting sales. The KPI consists of Actual Inventory Sold (RI), and Average Inventory Balance (PI), its measurements units are the number of times the average balance inventory sold and can be measured on a quarter basis by the following metric type: $(\text{Actual Inventory Sold per product code} / \text{Average inventory balance per product code}) * 100$.

Then we have the *Days Inventory Outstanding (DIO)*, that as an additional financial KPI provides another way to determine how quickly Sklavenitis S.A. sells its inventory. More specifically, it measures the average number of days required to sell an item in inventory. Then through DIO we convert the inventory sold rate metric into a number of days (measurement units). DIO, measurement frequency is on a daily basis, can be considered a very easily measured KPI and its metric type is the following: $90 \text{ days} / \text{Inventory Sold Rate}$ (the above mentioned KPI).

Moreover, the third financial related KPI is called *Local Product Codes Market Share*. Local Product Codes Market Share is used to monitor the sales of the local product codes regarding the total sales (retail customers) of the retail stores where these local product codes are available. Indication for availability expansion of the product codes (more retail stores and eMarket). Obviously, its measurement units are the sales of local product code, used per month, consists the Local Product Codes Sales (RI), Retail Stores Total Sales (that offer the local product code - RI) and is calculated through the following type: $(\text{Local Product Code's Sales} / \text{Total Sales of the Retail Stores that the product code is offered}) * 100$.

The *Customer layer* of the Balance Scorecard identifies how a company provides value to its customers (for our work system under study are the retail stores of Sklavenitis S.A. distribution network and the eMarket customers) and understands how satisfied the customers are with products or services. Customer satisfaction indicates – most of the times - a company's success.

The initial KPI of the Customer layer is the *On-Time Delivery Percentage*, that counts the On-Time Deliveries (OTD) for all the retail stores for each distinct distributor supplier (not for the centralized products). The On-Time Delivery is defined as the delivery in the agreement time and in two-hours margin otherwise counts as not OTD. Measured per day and exposed output and summaries per month. Its calculation type is consisting of Agreement Time (PI), Actual Delivery Time (RI) and is presented below: $(\text{On-Time Delivery} / \text{Total Purchase Orders}) * 100$.

The *Inventory Replenishment Necessity* monitors on daily basis the inventory levels drop as it measures the number of stocks per product code and per its daily average sale quantity. This KPI's measurements units are inventory pieces and is the output of the metric's type: $(\text{Inventory pieces available} / \text{daily average sold number of pieces}) * 100$, containing the Inventory pieces available on stock (PI), and the Daily average sold number of pieces (RI).

Afterwards, there is the *Customer Service Rate*, that indicates the total number of boxes (measurement units) actually delivered to the all retail stores in the network in comparison with the total number of boxes actually asked from all the retail stores in the network, on a daily basis. The KPI's metric type is the following: $(\text{Number of boxes delivered to all the retail stores} / \text{Number of boxes asked from all retail stores}) * 100$, and it consists of the Number of boxes delivered to all the retail stores (PI), and the Number of boxes asked from all retail stores (PI).

A fourth KPI of the Financial layer is the *Customer Service Failure* KPI, that shows the total number of rejected delivered orders is presented in comparison with the total number of delivered orders in the retail stores. Obviously, its measurement units are the number of orders and it is implemented daily. Related PIs to the above mentioned KPI are the Number of rejected delivered orders to all retail stores (PI), and the Number of delivered orders to all retail stores (PI), while its metric type is the presented below: $(\text{Number of rejected delivered orders to all retail stores} / \text{Number of delivered orders to all retail stores}) * 100$.

The *Process layer* of the Balanced Scorecard method is a very critical level of appraisal that depicts the misdesigns or the bad performance management in the conduction of the various processes of the work system under study.

The first KPI is *Inventory Identification* at the Retail Store Level. It shows the percentage of inventory system records that were estimated to be correct to the actual quantity held. The formula which expresses it is: $((\text{physical inventory} = \text{MRP record per product code}) / \text{all product codes}) * 100$, it is measured every day, and it is calculated every week. It consists of one RI calculation of Physical Inventory quantity and the retrieval of the MRP Record considering the particular product code. It is measured for the most crucial product codes that the Retail Stores Inventory Management Team's Supervisor indicates. This KPI helps the Supervisor to keep track of how well and trustworthy the MRP records and records updates are, and this actually leads to proper order quantity estimations and proper replenishment rates.

The *Out-of-Stock Days* KPI represents a pass or failure of the work system's role in the organization's KPI. This KPI expresses how many days a stock-out incident occurred in a particular time period concerning a particular product code. It is measured every month in days for all products that presented a stock-out incident in the previous time period. Its formula is: $\text{Count of the days (inventory level} = 0) \text{ per product code}$. In normal functionality, there should not be any stock out in the replenishment process of the Distribution centers or the Retail Stores at all especially because of the work system's responsibility, as new inventory was not ordered from the Supplier on time. So, if such an incident occurs, this KPI reveals it and leads to further investigation into the reasons for this failure in the process's execution.

The extent to which the processes are automated is partially expressed in the *Excel Tasks Ratio* KPI. This KPI measures the number of critical processes performed in Excel in comparison with the total number of processes performed in a working system. The formula of the KPI is: $(\text{Total number of tasks performed in excel files} / \text{Total number of tasks performed in work system}) * 100$, it is measured every year as the new

architectural and technological implementations change at a relatively slow rate. The KPI entails two important PIs: the total number of tasks performed in excel files and the total number of tasks performed in the work system under study. It is a measure that expresses the automatic calculations and estimations by systems and AI applications ratio and this is a valuable indicator for a work system that does not include manual tasks that do not require computer skills.

The last but not least layer of the Balanced Scorecard method contains the *Learning and Growth layer* that represents the participant's attitude in a work system under study. How the participants are educated, trained, and constantly motivated is an aspect that leads to successful process execution with high levels of productivity.

The first KPI of this category is the *Employees Improvement*, which actually expresses the number of staff that has attended training courses in comparison with the number of employees. Its formula is: $(\text{Number of employees that attended a training course}) / (\text{Total Employees}) * 100$, is constituted of one PI and one RI, the total number of employees and the number of employees that attended training courses, respectively. The KPI is measured every quarter of the year and as it gets higher depicts a larger proportion of participants becoming well-informed, better trained, and consequently more efficient.

The *Computer-Skilled Employees Ratio* is a KPI that denotes the special, upgraded computer skills that some employees attain. More specifically, indicates the number of employees that are capable to create reports (bi) to carry out their responsibilities, and its formula is: $(\text{Number of employees who have report-created skills}) / (\text{Total Employees}) * 100$. Both the number of employees that have report-created skills and the total number of employees are PI that needs to be pre-calculated in order to express this particular KPI. The KPI is calculated every quarter as many three-month seminars in the relative subject are carried out. This ratio denotes the percentage of employees that present BI analytic skills and could possibly undertake more sophisticated reporting duties in order to help the organization's prosperity.

Another useful learning and growth KPI is the *Techwise Feedback* which indicates the employee's satisfaction with the current technology use in their daily tasks. All the employees that have roles that demand the usage of different technological systems in the level of hardware or software express their opinion and rate the different applications used with grades from one (less appreciated) to ten (most appreciated) in order to appraise how useful and productive is the role of each technological application they use to perform their responsibilities. The questionnaires for this KPI are completed one time every year. The comments of the real users of technology in the field lead to ameliorating the architecture design at the technological level, filling gaps and bringing even more efficient technological innovations every year.

Finally, the KPI of the *Overtime Working Hours* is presented. This KPI shows the employee's overtime working hours per job title so it reveals if the job title's workload is overloaded and it belongs in a badly designed process or group of processes or the employee's level of skills for the task is insufficient, or there is a need for recruitment. The KPI is measured on a monthly basis for all distinct job positions in the teams of the work system under study. In the case of consistently high overtime working hours in particular job titles, the Supervisors have indicators that some roles are overloaded, so either a structural or organizational redesign should take place or recruitment with new and skillful employees so as not to let the work system's understudy performance fall.

Balance Scorecard

Balance Scorecard (BSC) is used to help in the strategic management of organizations and it is anchored on four perspectives - layers, which include financial (value), customer, process and (people) learning and growth. Through the balance scorecard the company (in our case Sklavenitis S.A.) enables entities to discover their shortcomings and come up with strategies to overcome them.

BSC area	Title of KPI	Description of KPI (why this KPI is related to critical factors for business success)	Measurement Units	Meas. Frequency	Time zone (Past, Current, Future)	Feasibility (how easy is measured 5=very easy, 1=very difficult)	Related PIs and RIs	KPI's Metric Type
(Financial) Value Layer	Inventory Sold Rate	The Inventory Sold Rate is an operational efficiency metric that shows the number of times the average balance of inventory was sold during a period. A low inventory sold rate can indicate that the Sklavenitis S.A. is buying too much inventory or that sales are weak, while a higher rate indicating less inventory or stronger sales. An extremely high rate could indicate that Sklavenitis S.A. doesn't have enough inventory to meet demand, limiting sales.	Number of times the average balance inventory sold	Per Quarter	Past	4	Actual Inventory Sold (RI), Average Inventory Balance (PI)	(Actual Inventory Sold per product code / Average inventory balance per product code) * 100
(Financial) Value Layer	Days Inventory Outstanding	The Days Inventory Outstanding (DIO) inventory management KPI provides another way to determine how quickly Sklavenitis S.A. sells its inventory. It measures the average number of days required to sell an item in inventory. DIO converts the inventory sold rate metric into a number of days.	Days	Per Quarter	Past	5	Inventory Sold Rate (KPI)	90 days / Inventory Sold Rate
(Financial) Value Layer	Local Product Codes Market Share	Monitor the sales of the local product codes regarding the total sales (retail customers) of the retail stores where these local product codes are available. Indication for availability expansion of the product codes (more retail stores and eMarket).	Local Product Code Sales	Per Month	Past	4	Local Product Codes Sales (RI), Retail Stores Total Sales (that offer the local product code - RI)	(Local Product Code's Sales / Total Sales of the Retail Stores that the product code is offered) * 100
Customer Focus	On-Time Delivery Percentage	Counts the On-Time Deliveries (OTD) for all the retail stores for each distinct distributor supplier (not for the centralized products). The On-Time Delivery is defined as the delivery in the agreement time and in two-hours margin otherwise counts as not OTD. Measured per day and exposed output and summaries per month.	On-Time Deliveries per supplier	Per Day (Summaries per month)	Current	3	Agreement Time (PI), Actual Delivery Time (RI)	(On-Time Delivery / Total Purchase Orders) * 100
Customer Focus	Inventory Replenishment Necessity	This KPI monitors on daily basis the inventory levels drop as it measures the number of stock per product code and per its daily average sale quantity.	Inventory pieces	Per Day	Past	5	Inventory pieces available on stock (PI), Daily average sold number of pieces (RI)	(Inventory pieces available / daily average sold number of pieces) * 100
Customer Focus	Customer Service Rate	Total number of boxes actually delivered to the all retail stores in the network in comparison with the total number of boxes actually asked from all the retail stores in the network.	Number of boxes	Per Day	Past	3	Number of boxes delivered to all the retail stores (PI), Number of boxes asked from all retail stores (PI)	(Number of boxes delivered to all the retail stores / Number of boxes asked from all retail stores) * 100
Customer Focus	Customer Service Failure	The total number of rejected delivered orders is presented in comparison with the total number of delivered orders in the retail stores.	Number of orders	Per Day	Past	3	Number of rejected delivered orders to all retail stores (PI), Number of delivered orders to all retail stores (PI)	(Number of rejected delivered orders to all retail stores / Number of delivered orders to all retail stores) * 100

BSC area	Title of KPI	Description of KPI (why this KPI is related to critical factors for business success)	Measurement Units	Meas. Frequency	Time zone (Past, Current, Future)	Feasibility (how easy is measured 5=very easy, 1=very difficult)	Related PIs and RIs	KPI's Metric Type
Process Layer	Inventory Identification in Retail Stores Level	Shows the percentage of inventory system records that were estimated to be correct to actual quantity held (identification of the physical inventory with the MRP records).	Valid inventory records (identical record between the two levels)	Per Day (Summaries per week)	Current	4	Physical Inventory (RI), MRP Records (PI)	((physical inventory = MRP record per product code) / all product codes) * 100
Process Layer	Out-of-stock Days	This KPI expresses for how many days a stock-out incident occurred in a particular time period concerning a product code.	Days	Per Month	Past	5	Out-of-Stock Days (RI)	Count of the days (inventory level = 0) per product code
Process Layer	Excel Tasks Ratio	Number of critical processes/tasks performed in Excel in comparison with the total number of processes/tasks performed in a work system.	Number of tasks	Per Year	Past	4	Total number of tasks performed in excel files, (PI), Total number of tasks performed in work system (PI)	(Total number of tasks performed in excel files / Total number of tasks performed in work system) * 100
Learning and Growth Layer	Employees Improvement	Number of staff who have attended training courses in comparison with the total employees.	Number of Employees	Per Quarter	Past	5	Number of employees that attended a training course (RI), Total number of employees (PI)	(Number of employees that attended a training course) / (Total Employees) * 100
Learning and Growth Layer	Computer-Skilled Employees Ratio	Indicates the number of employees that are capable to create reports (bi) to carry out their responsibilities.	Number of Employees	Per Quarter	Past	5	Number of employees that have report created skills (PI), Total number of employees (PI)	(Number of employees have report created skills) / (Total Employees) * 100
Learning and Growth Layer	Techwise Feedback	Indicates the employees satisfaction with the current technology use in their daily tasks.	1-10 rating per question	Per Year	Current	5	The employees satisfaction with the current technology (RI)	-
Learning and Growth Layer	Overtime Working Hours	Showing the employees over time working hours per job title/role. Indicates if the job's workload is overloaded and either the employees level for the task are inefficient or there is a need for recruitment.	Hours per job title	Per Month	Past	5	Total Overtime Working Hours (RI)	Total Overtime Working Hours per job title

Part C – Recommendations for Interventions

After the completion of the evaluation of the work system understudy in all levels, the work-centered analysis method indicates we have reached some interesting observations about all levels of the components of the system under both perspectives of architectural design and performance management. In Part A, the whole work system understudy is analyzed, and its elements are defined and presented. The motive and its strategic elements are the systems of the customers that need to be serviced in high standards level quality with its main products that are represented by the monitoring services of the replenishment and of the retail stores' network on time and in sufficient quantities that cover retail customer needs along with the financial and cash flow constraints of the organization. The work system understudy and, more specifically, the Directorate of Inventory Management of Sklavenitis S.A. is presented along with its structure and strategy and the architectural design of all of its processes presented in a hierarchical manner. All the processes were defined by their participants that represent different roles of the work system understudy, along with each role's contribution to the execution of different parts of the processes. In addition, the different information entities that are distributed or generated from different processes, along with the technological applications used to complete the tasks in each process, are described in detail. The effectiveness and efficiency of all these components are dynamically linked with each other, and interaction is a key factor for the system's productivity and performance. So, after a thorough analysis, a conclusion of observations is made concerning different aspects and system levels.

The observations are found mainly on the technology level where the gaps appear, and the low level of automation appears as well. In many cases, the communication is being made with email exchanges of handwritten or flat files reports and not through automated system communication reports. In addition, many tasks are carried out without the support of technology applications, such as the estimation demands for future needs or the confirmation of orders receipt procedure, orders delayed delivery, or orders cancellation. Due to the fact that many hours are consumed by these tasks and processes, a higher possibility of human mistake exists. Another substantial factor is the real-time update capability as for some processes, such as the orders delivery schedule adherence, this would be very important so as to take action of handling delays or cancellations as fast as possible in order to limit the negative impact of slow information flow in cases that demand handling actions. Secondly, some observations concern the architectural design of processes and their flow of work or the organizational structure with the different roles and tasks assignments. In conclusion, some critical observations especially focusing on the technological level are tackled with recommendations that make changes to the workflow and efficiency by adopting the new applications that broaden the work system's understudy capabilities.

Our first recommendation for possible interventions comes to encounter the major issue regarding the low automation levels in the ordering procedures. As we mentioned before, we observe that information has been exchanged through flat files, mainly Excel and files, via internal emails. Therefore, it is obvious that lots of work hours have been consumed to perform these low-level and easily-executed tasks on a daily basis. This will eventually lead to a portion of the employees being uninterested to keep improving (eg. training through educational courses) and will cause the organization to have unmotivated and lazy to make any decisions at all, employees. To prevent this, we suggest that these 'not so interested' but essential for the organization structure of the Sklavenitis S.A. tasks need to be decreased or executed by a specialized software application that could be able to perform in the same efficiency as it was previously when executed from the employees.

Our recommendation for intervention origins from the technology field, since we live in the information age (a.k.a. computer age), which is characterized by a rapid shift from traditional industries to industries that are based heavily on information technology. More specifically, it goes without saying that nowadays, machine learning can be regarded as a 'synonym' for technology, and together assemble smart AI applications that can

trace patterns and are able to segment and take decisions based on collected historical data (training data for the AI used for a supervised learning procedure by labeling datasets to train the application's algorithm in order to classify data or predict outcomes accurately). Thus, we suggest the trial and the pilot phase, at least for the first while, implementation of a machine learning and AI application that would be able to predict correctly the demanded stock ordered for the 10 Distribution Centers of the Sklavenitis S.A. that will then fulfill the orders for the retail stores of the distribution network and the eMarket customers. This application, which needs to function orthodoxically, collected data from prior years (at least 2 years to have 2 epochs for its AI and ML training) from most retail store orders that reach the Distribution Centers in order to make the computations needed for the final predictions. The major challenge for these systems is the prediction of seasonal needs or newly developed trends (eg. honey and powdered sugar in the Christmas period and trends like veganism in the previous years) that will change the products sales normal distribution and will establish - at least for a period - different product codes at the top of the market shares ladder. From our study, we found out that these situations can be traced from an AI and ML system, which can predict a very good approximation of the demanded inventory regardless of the lack of normality in sales distribution. To summarize our recommendation, we suggest the collection of as much as the organization can order data and a trial monitoring implementation of a technology application like the one described above, simultaneously with the manual creation and exchange of flat files (excel files), until the organization is totally confident that the proposed system results in the same level or even better estimations of the demanded stock and then can replace at all the manual tasks by the automated procedures that a system like the proposed one can offer.

In our second recommendation for intervention, we thought that since the reporting obligations are of extreme value and importance not only in our work system under study but also to the whole organizational structure of Sklavenitis S.A., we should again point out the lack of automation regarding the reporting procedures that lead in delays and a not on-time synchronized information flow. Moreover, except for the monitoring of inventory levels, we should highlight that to every node of the distribution network, there are reports that flow in and out. To be more precise, our work system shares and gathers reports on a daily basis, apart from the internal needs, with the General Directorate of Finance and the Directorate of Accounting, the General Directorate of Sales, and the General Directorate of Supply Chain. Thus, since we can not reduce the number of reports - as mentioned before, it is not an option - and in order to maintain the same or even more granularity and data aggregations of the significant value for our work system reports, we thought that it would be worthing to collect all the data on a central node that will be accessible from work system's internal and external - that belong to the work system's environment - employees. To be more precise, we thought that the sale reports that are created with the assistance of Business Intelligence software applications, which is connected with the Oracle Sales Database schema directly, the quantity inventory reports that are created from data exported from the MRP application in the case of retail stores and the WMS application in the case of Distribution Centers, and the raw data that are gathered as exported time series system records in ad hoc flat files could all be stored in a Data Warehouse application environment.

Therefore, we suggest the construction of a data warehouse that will be connected with the Oracle Sales, the MRP, and the WMS Databases and also getting as an input the ad-hoc flat files that are created every time quantity inventory change occurs. This way, the above will be the Data Warehouse (DW) data sources that will be collected after an automated ETL process to check that all data are in the desired format and then will be stored in relational databases schemas that regarding the needs can be connected with multidimensional models and OLAP Cubes that can be handled from internal and external employees and produce further aggregation that will improve the report's Business Intelligence levels and consumes less time to be created. Additionally, through a DW the whole organization improves its data quality and business intelligence, consumes less time to create the - essentially valuable - reports, increases data security, and leads to data consistency, while also can be further expanded at any time. More specifically, the OLAP reports that origins from an OLAP cube can be done through a third-party Business Intelligence software application - like the one that is already in

use and the employees are more familiar with, and can also, if needed, establish a stream data service very easily in the future.

Thirdly, an essential field of possible intervention is recognized depending on how the Inventory management teams, and especially the Retail Stores Management Team, monitor the proper completion of the retail stores' replenishment procedure. To be more specific, the retail store's replenishment procedure is completed when the order is delivered to the retail store, on time and with the right quantities of products asked in the order form that are products in such a physical condition that can be sold to the final customer. All possible cases of an order completion stage should be shared with the team and handled properly as they affect the inventory levels of a store, its next orders, and the next steps for replenishment, as the renewal of stock, is a constant, almost real-time procedure that never stops. Every time an order is properly delivered to a retail store or is delayed, or it is cancelled, a sequence of incident reporting emails starts in order to inform the Retail Stores Inventory Management team to act and handle the situation. Firstly, the delivery on time is a positive measure that should be reported to the Management team, then in case of delay, the Management team should be informed in order to update the MRP inventory records of a retail store so as not to contain any stock quantity that actually has not physically arrived at the store. The multiple delays are indicators of inefficiency as well, especially when they come from particular suppliers or Distribution Centers, and as a fact, it should be known to the Management team. The same applies to the cases of an order cancellation or order rejection at the spot of delivery because it is incorrectly executed and delivered.

The process that informs the Retail Store Management team of the proper order delivery on scheduled and expected time is carried out multiple times every day at every retail store all over the network of the country. The steps of the procedure entail that the responsible employee for the order delivery control and acceptance informs the retail store's office team of the problem or the completion of the order's receipt. The office team categorizes the problem (rejection, delay, cancellation) and completes the corresponding excel spreadsheet. In order not to send multiple versions of an excel spreadsheet every time an update takes place, the office team of every retail store after business hours sends an email with the distinct spreadsheets. All this procedure is time-consuming for both the retail store's employees and the Retail Stores Inventory Management team employees. To tackle this problem, as a huge volume of orders are distributed every day, a technological recommendation that contains the use of an adherence schedule application is proposed. Such applications, in their simple form, can be linked in the MRP system a retail business uses and easily incorporate information about product codes, supplier codes, and retail store codes. This connectivity capability enables less setting and configuration time when such an application is enforced initially. In a more detailed view, such applications create records of orders submitted. In the case of automated orders from MRP, the application already knows the submission of a particular order otherwise, after a manual order, the employee who sent should add it to the application's orders repository. Every time an order is properly delivered, the employee who receives the order enters the system, finds the order id, and confirms the proper delivery for the already existing order code. If the order is delayed, cancelled, or rejected, the employee completes the corresponding status along with the time period of the delay and the reason, the timestamp of cancellation and the reason, and the timestamp of the rejection and the reason. The Retail Stores Inventory team employees can access the application with their user profile credentials and at any time check the schedule of the order adherence status instantly without sending and receiving lots of emails and opening and exploring flat files.

Thus, to conclude this business case study, our recommendations for intervention are presented below:

- I. Embrace the automated procedures in the DC order fulfillment.
- II. Gather all the data in one DW accessed by both internal and external of the WS employees.
- III. Adopt an adherence schedule application to track order deliveries at any time so as to monitor inventory replenishment completion in the entire retail network of Greece.

Glossary

A

Active Product Codes. *See* product codes that are distributed from Sklavenitis S.A. channels

B

Barcode. *See* a machine-readable code in the form of numbers and a pattern of parallel lines of varying widths, printed on a commodity and used especially for stock control

Business Intelligence Software. *See* is a type of application software designed to retrieve, analyze, transform and report data for business intelligence. The applications generally read data that has been previously stored, often - though not necessarily - in a data warehouse

C

Centralized Products. *See* the products that are stored in the central warehouses

Collection. *See* variety of product codes offered

Crash Analytics Reports. *See* is a detailed log of an information system state when it crashed

Customer Bonus Privileges. *See* a sum of money that someone is paid as a reward for being a regular customer

D

Database Administrator. *See* an employee, who organize the Sklavenitis S.A. database, such as product codes and sales performance records. They also make sure that the data are available only to the authorized users

Deleted Product Codes. *See* product codes that are not available to the Sklavenitis S.A. network permanently

Distribution Ban. *See* is the date before its actual expiration date after which a product should be aborted and it can no longer be available for distribution in order to be sold

Distribution Center. *See* is a product storage and shipping building that stores the Sklavenitis S.A. products. Distribution centers are a key part of the distribution chain for products, order fulfillment, and storing produced goods prior to their shipment to retail stores

E

ERP. *See* Enterprise resource planning (ERP) is software used by a company to manage key parts of operations, including accounting and resource management

External Product Codes. *See* is the Suppliers' code number assigned to a product barcode

F

Fast-moving consumer goods (FMCG). *See* also called consumer packaged goods (CPG), refer to products that are highly in-demand, sold quickly, and affordable. Such items are considered "fast-moving" as they are quick to leave the

shelves of a store or supermarket because consumers use them regularly

Format. *See* The Retail Store's size is related to how many different product codes can host on its shelves

I

Inactive Product Codes. *See* product codes that are not available to some or all stores of the Sklavenitis S.A. network temporarily

Information Systems. *See* an integrated set of components for collecting, storing, and processing data and providing information, knowledge, and digital products. Sklavenitis S.A. relies on information systems to carry out and manage its operations and interact with its suppliers

Internal Product Codes. *See* is the Sklavenitis S.A. internal identification code assigned to a product barcode

L

Lead Time. *See* is the amount of time that passes from the start of a process until its conclusion. Sklavenitis S.A. reviews lead time in supply chain management

Log File. *See* is a computer-generated data file that contains information about usage patterns and activities

M

Masterdata. *See* a Database server software that is used for storing distinct product codes that belong to the Sklavenitis S.A. variety of products

Mother Product Codes. *See* the initial product code of a product

MRP. *See* is a system designed to plan manufacturing production. It identifies necessary materials, estimates quantities, determines when materials will be required to meet the production schedule, and manages delivery timing – with the goal of meeting demands and improving overall productivity

N

Non-centralized Products. *See* products that are delivered directly to the stores by the suppliers

Non-Fast-moving consumer goods (non-FMCG). *See* have long become a daily part of our lives. For us consumers, it is hard to imagine living without them. Our job in logistics is to create sustainable supply chains for this industry. We know these products well - how to store and distribute them so that they reach consumers safely and on time

P

Product Assortment. *See* the range and variety of products Sklavenitis S.A. offers to its customers

Product Barcode. *See* a machine-readable code in the form of numbers and a pattern of parallel lines of varying widths, printed on a commodity and used especially for stock control

Products Collection. *See* variety of product codes offered

Promo Product Codes. *See* a product code for products that are settled on separate shelves at discount prices for promotion



purposes, this product code differs from the product's mother code

S

S.A.. *See* Société Anonyme (S.A.) is a French term for a public limited company (PLC)

SAP. *See* Systems Applications and Products, is a widely-used enterprise resource planning (ERP) software SAP creates a centralized system for businesses that enables every department to access and share common data to create a better work environment for every employee in the company

Sticker Product Codes. *See* a product code for products that are in a special offer package, this code is related to the product's mother code

Supplier Product Code. *See* an external product identification code used by the supplier

T

timestamp. *See* is a digital record of the time of occurrence of a particular event

W

Warehouse Analyzer. *See* a special feature of the Sklavenitis WMS system provided by aberon

WMS. *See* A warehouse management system (WMS) consists of software and processes that allow organizations to control and administer warehouse operations from the time goods or materials enter a warehouse until they move out

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Appendix – Diagrams



Diagram 1: Sklavenitis S.A. Overview.

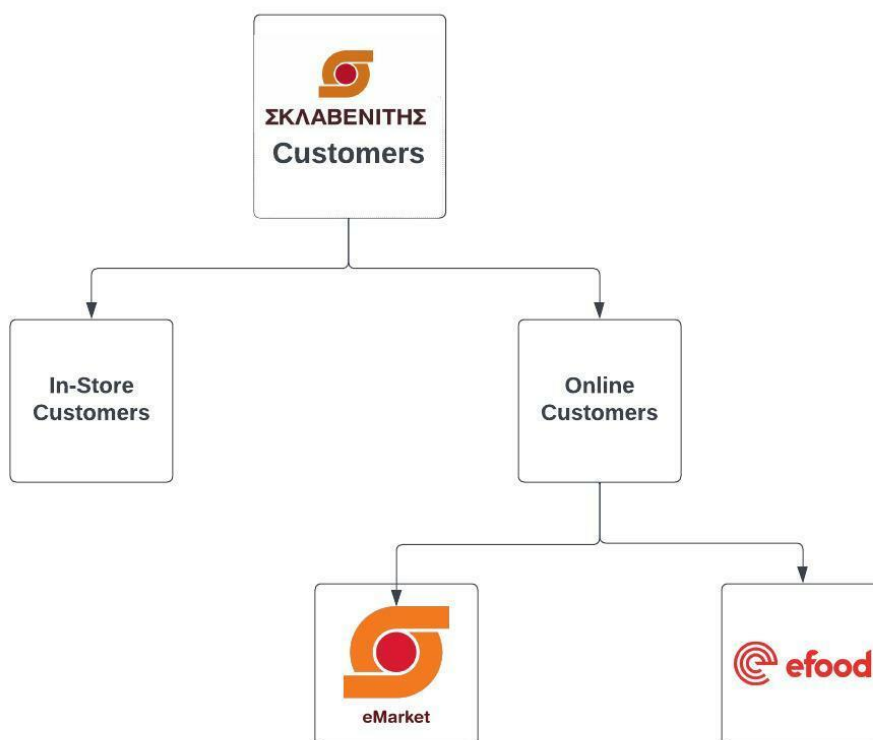
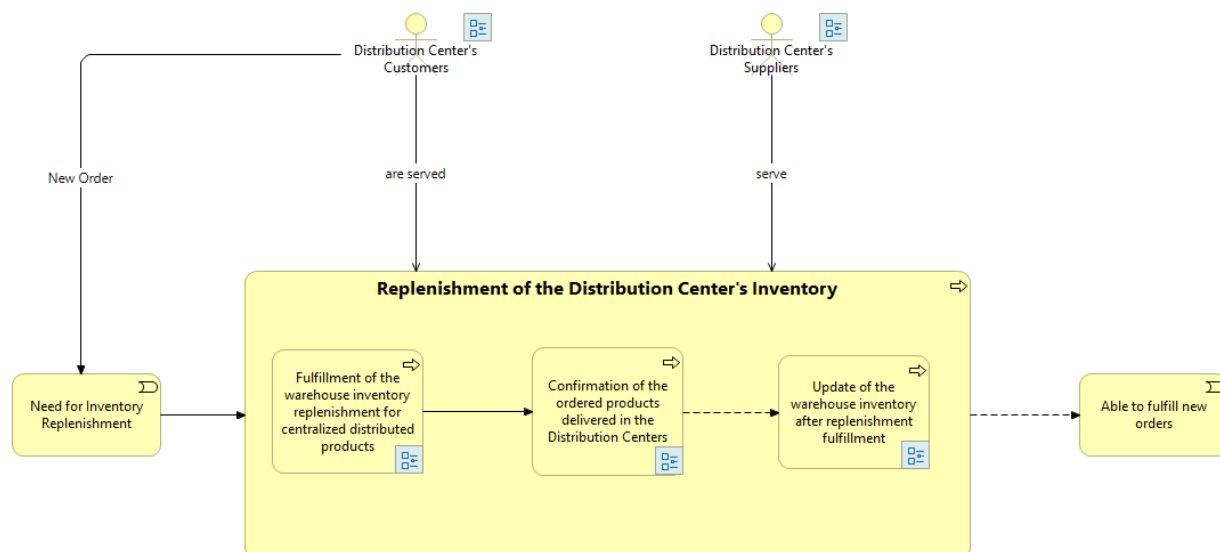


Diagram 2: Custom-made diagram about Sklavenitis S.A. Customers.

Appendix - Modelling assignment in Archimate – Main Process 2.1.

The selected under modelling main process adds value as it assures that all retail stores that present end points of the distribution channel can replenish their inventory levels for any product code constantly, eliminating the possibility of having deficits in any product code of their collection. The replenishment of the Distribution Centers Inventory is a very important process that entails the intermediate step of storing the inventory in multiple central warehouses where the products are gathered and distributed to the retail stores' network or the retail eMarket customers using Sklavenitis S.A. transportation services so as to set the product delivery schedule in an efficient way that is actually executed on time without insecurity.

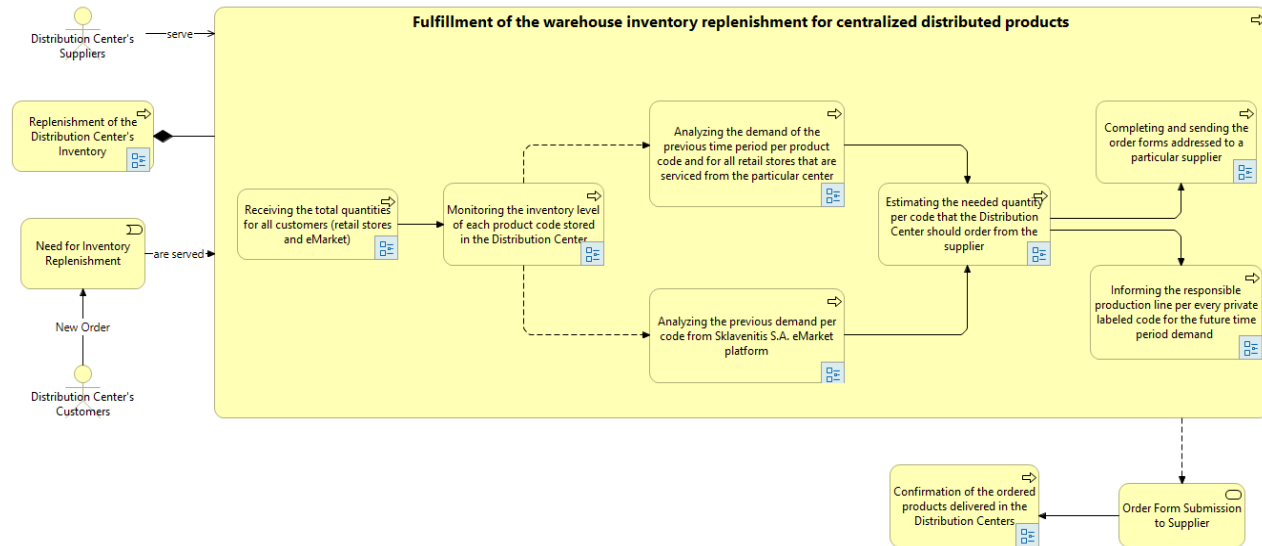
Initially, the process starts with the fulfillment of the warehouse inventory replenishment for centralized distributed products where the inventory per product code is monitored in all Distribution Centers in order to serve and replenish all the stores of the network, ensure enough stock for emergency situations for a standard time period and finally submit orders to the suppliers. After the replenishment and order submission main process is completed, the next main step is the approval of the delivered ordered products before they are accepted to enter the warehouse and be stored. The Distribution Centers Inventory Management team should prepare and parametrize the WMS system concerning the lead times, and the final dates for the distribution ban of each distinct centralized product code in order to have an able system that controls (approves or rejects) the delivered product lots. Eventually, the process is fulfilled after the update of the WMS inventory records when new inventory is received and properly stored. This final main process is essential as the WMS system is the inventory control tool and the data source for reporting about inventory quantity levels and it should be updated in order to depict the physical levels of inventory settled in the Distribution Centers.



Archimate View 1: 2. Replenishment of the distribution center's inventory

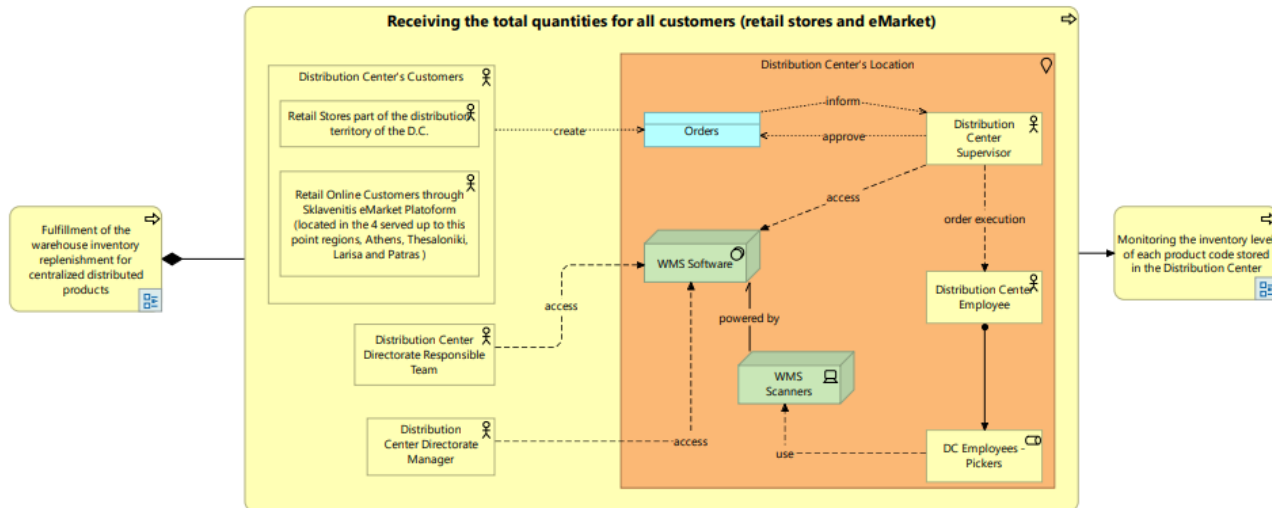
The first main process of the fulfillment of the warehouse inventory replenishment for centralized products is the first component of the total Distribution Centers replenishment procedure that serve the retail stores and eMarket retail customers and is actually served by the suppliers who delivered the newly ordered inventory. The first subprocess describes the collection of the demand of previous periods for every product code and from all possible Distribution Centers customers, the retail stores of the network and the eMarket platform customers. The subprocess that follows depicts the Distribution Centers' inventory levels monitoring procedure and

specifically how the WMS inventory levels' records change while Distribution Centers Customer's orders are executed inside the warehouse. Sequentially, the customers' demand is analyzed in both retail stores and eMarket platform customers cases, and the final demand estimation is finalized. After the demand analysis is completed and the needed quantities estimation is defined the completion of the order form document follows. Finally, the order form documents are approved and signed and send to either external suppliers or the Sklavenitis S.A. Private labels production lines.



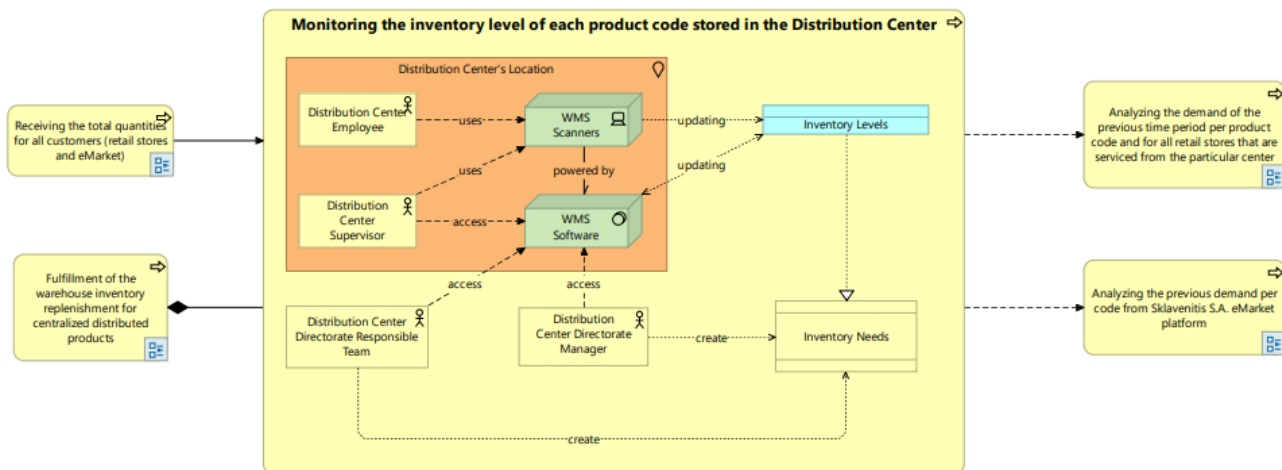
Archimate View 2: 2.1. Fulfillment of the warehouse inventory replenishment for centralized distributed products

To begin with, the Retail Stores' that are serviced by a particular Distribution Center submits to the WMS system order forms with the expected quantity that the store will need to cover the future demand until the next lead time is completed. In addition to that, the retail store sends to the Distribution Center Inventory Management employee responsible for replenishing the particular store, an Excel file containing every product code referred to the submitted order that presents for every product code the actual quantities sold in the store the previous six and twelve days. Then the Distribution Center Inventory Management employee that handles the orders for a particular supplier and for particular product codes accesses the Sklavenitis S.A. eMarket platform and retrieves the records of the order quantities from eMarket customers for these particular products for a time period of the previous six and twelve days as well. As a confirmation step, the Distribution Center Inventory Management employee promotes the orders submitted by the retail stores he services the Supervisor of the team in order to take his approval and proceed to the order satisfaction.



Archimate View 3: 2.1.1. Receiving the total quantities for all customers (retail stores and eMarket)

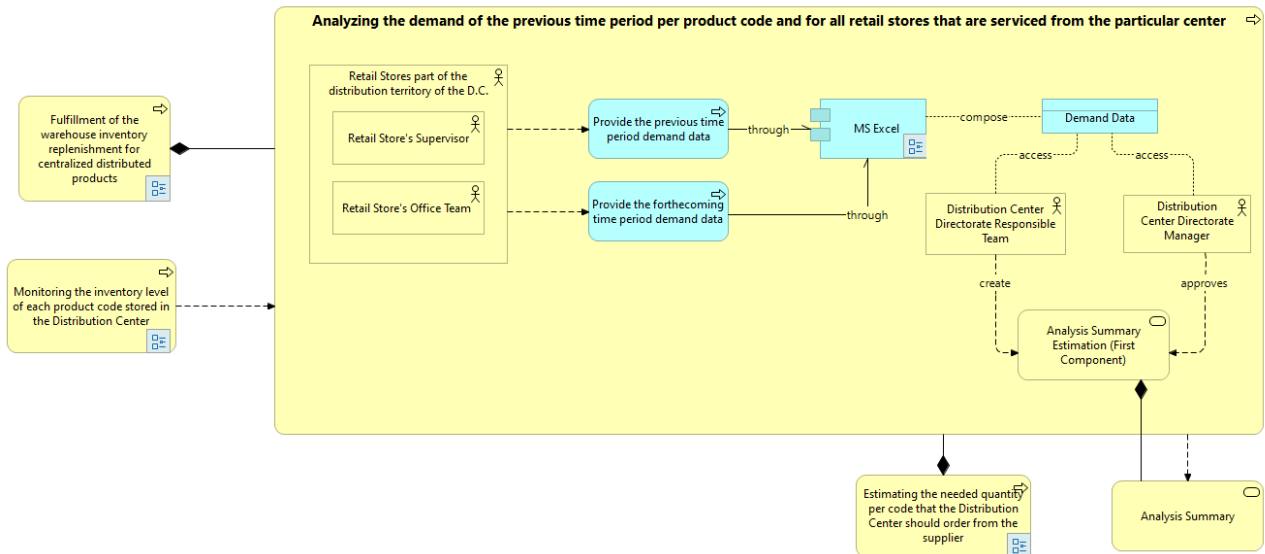
After the retail stores' order approval from the Supervisor of the team, the responsible employee proceeds and monitors the Distribution Centers inventory levels already existing in the warehouse at the particular moment of the analysis by accessing the WMS system. The modification of the WMS inventory levels records is performed every time the warehouse clerks (pickers) collect from the warehouse shelves the products contained in the order form submitted by a retail store. The picker scan with the particular WMS scanners the product code when it is collected from the shelf and in this way the inventory quantity recorded in the WMS for this particular code is modified as the quantity the picker had collected was deducted from the initial record.



Archimate View 4: 2.1.2. Monitoring the inventory level of each product code stored in the distribution center

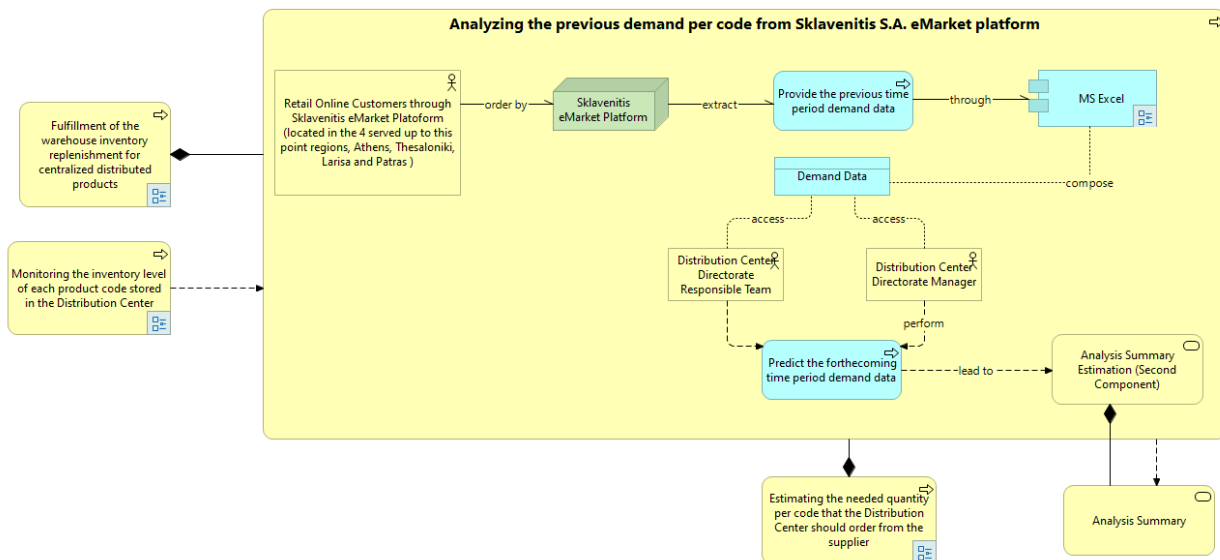
Consequently, the Distribution Center Inventory Management team employee who is responsible for the replenishment of a particular Distribution Center concerning particular product codes analyzes the demand of the previous time periods of six and twelve days for the retail stores and the eMarket platform and provide the forthcoming period demand estimation and also takes into consideration the additional inventory quantities that the Distribution Center should have in order to cover the needs of all retail stores it serves as well as the eMarket platform demand for the next fifteen days (2 x lead times) without submitting any order for the replenishment of Distribution Center. The analysis is being held in an Excel document that entails the demand of

the Distribution Center that should be covered by its next order. To be more specific the Distribution Center's Inventory Management team employee creates the analysis summary demand estimation excel spreadsheet and the Supervisor of the team approves it.



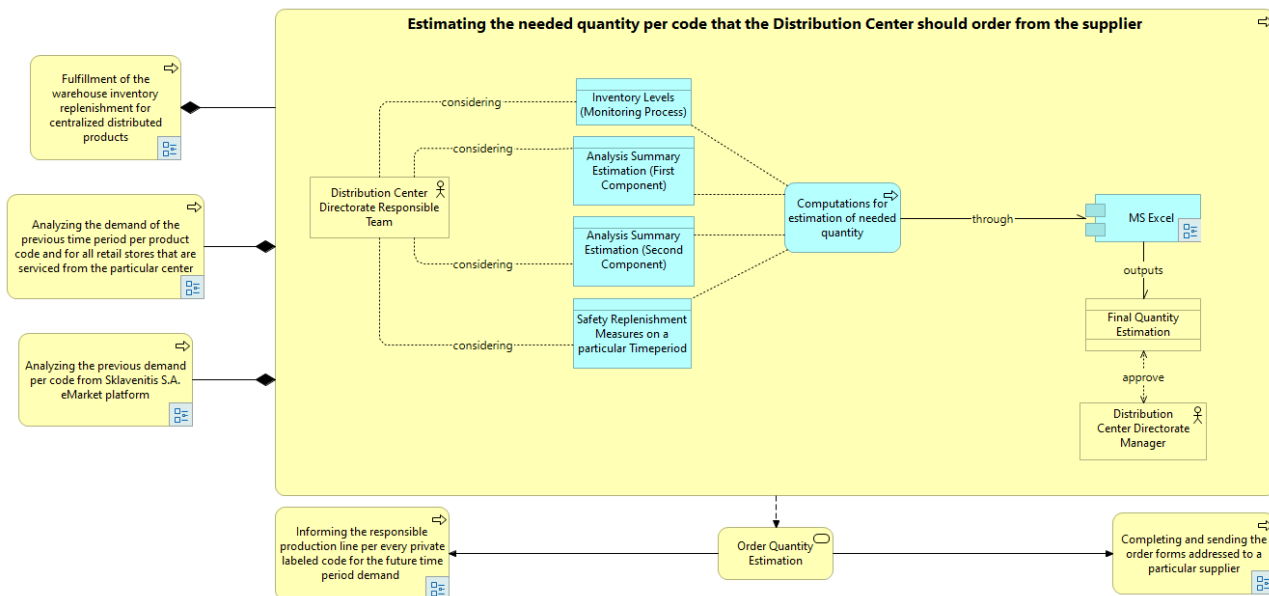
Archimate View 5: 2.1.3. Analyzing the demand of the previous time period per product code and for all retail stores that are serviced from the particular center

An analysis summary demand estimation excel spreadsheet is created in two versions, one that is built after taking into consideration the retail stores' demand and another that is built after taking into consideration the eMarket platform demand, and both of them are approved by the team's supervisor.



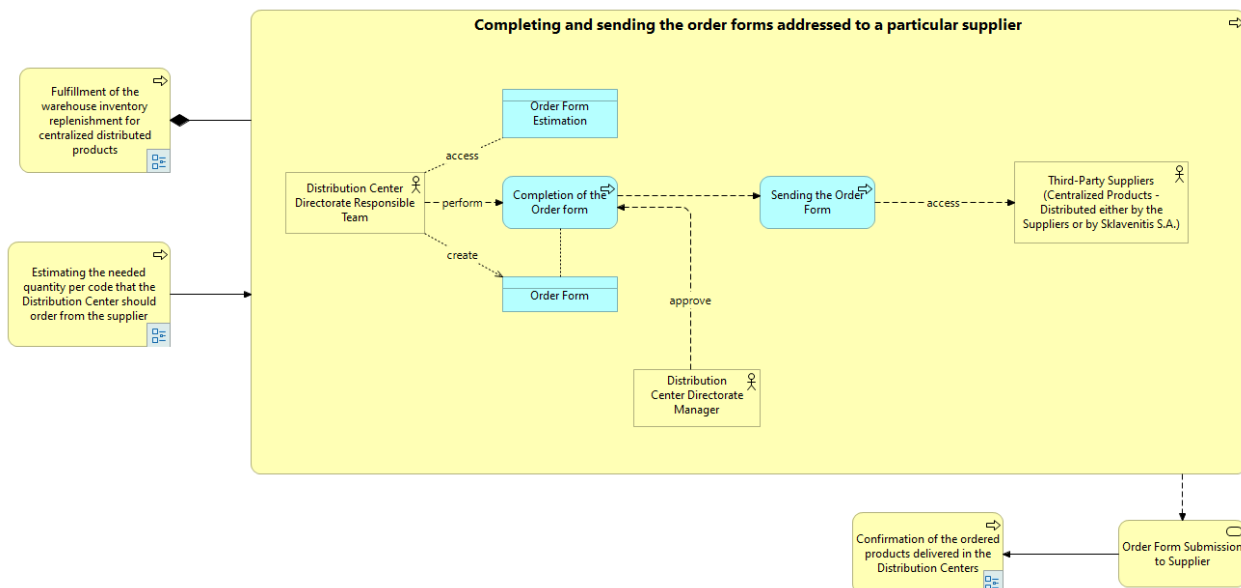
Archimate View 6: 2.1.4. Analyzing the previous demand per code from Sklavenitis S.A. eMarket platform

One next step is the final order quantity estimation. The Distribution Center's Inventory Management employee comes down to the final quantity estimation that should be incorporated into the Distribution Center's order form.



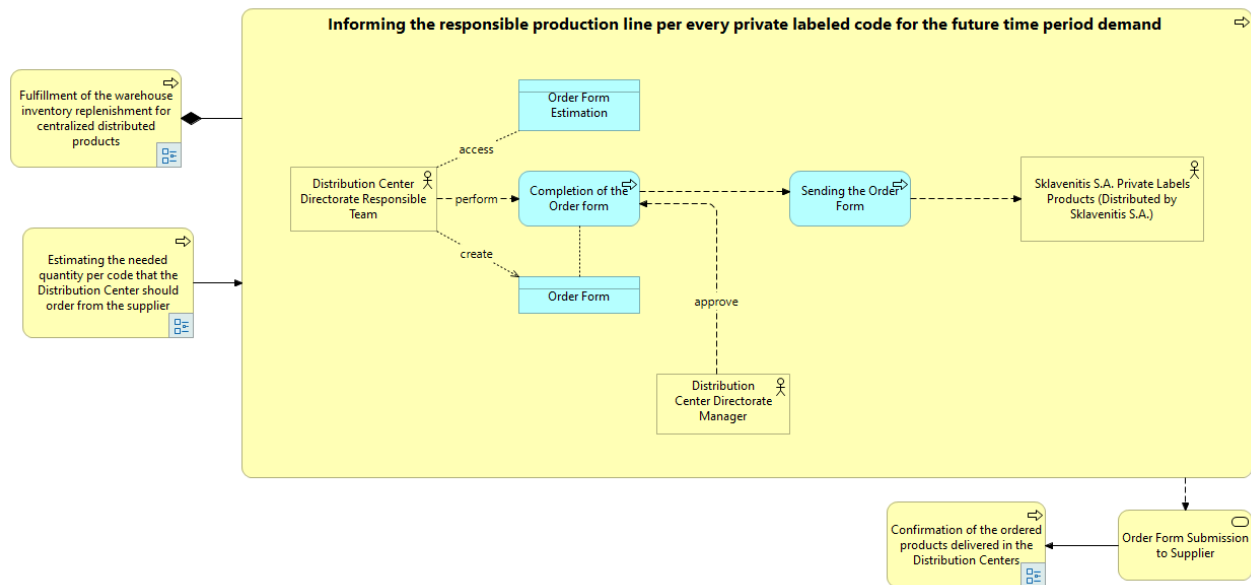
Archimate View 7: 2.1.5. Estimating the needed quantity per code that the Distribution Center should order from the supplier

Moreover, the Distribution Centers Inventory Management employee completes the appropriate order form document with the final estimated order quantity per product code along with the product's barcode and the suppliers external corresponding code, the suppliers information and the accepted delivery dates. The order form document is signed by the employee who created it and it is promoted to the Supervisor for his approval and his signature. Afterwards the order form is sent to the Third-Party Supplier and at that time the order form document is an irrevocable document.



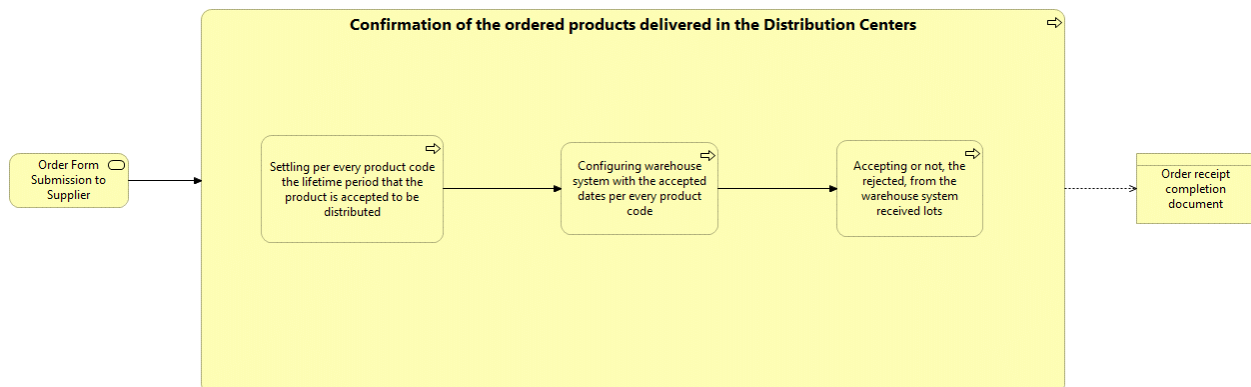
Archimate View 8: 2.1.6. Completing and sending the order forms addressed to a particular supplier

The aforementioned process is also followed in the case the final recipient of the order is the Sklavenitis S.A. Private Labels Products production lines.

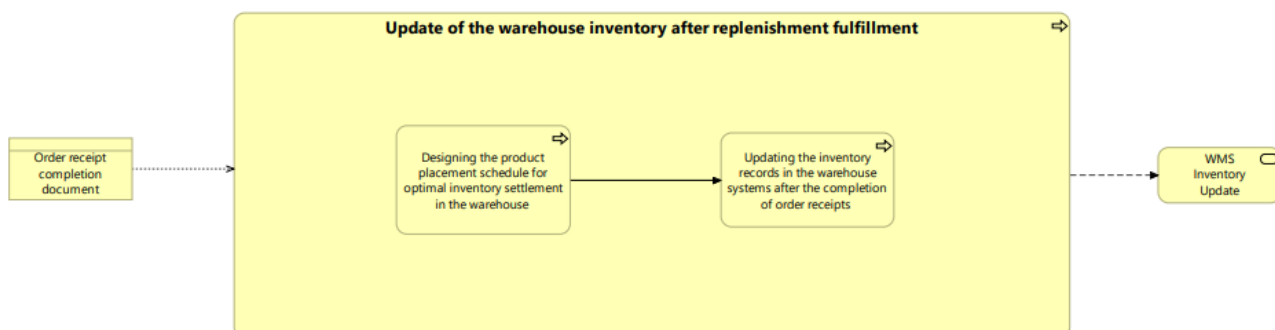


Archimate View 9: 2.1.7. Informing the responsible production line per every private labeled code for the future time period demand

The Archimate views for the other two main processes of the core process follow below.

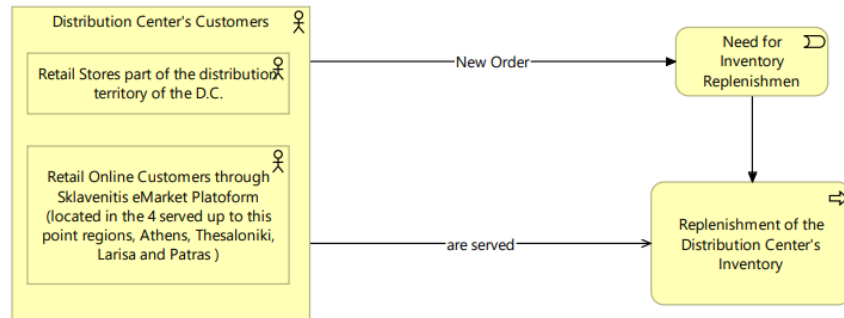


Archimate View 10: 2.2. Confirmation of the ordered products delivered to the Distribution Centers

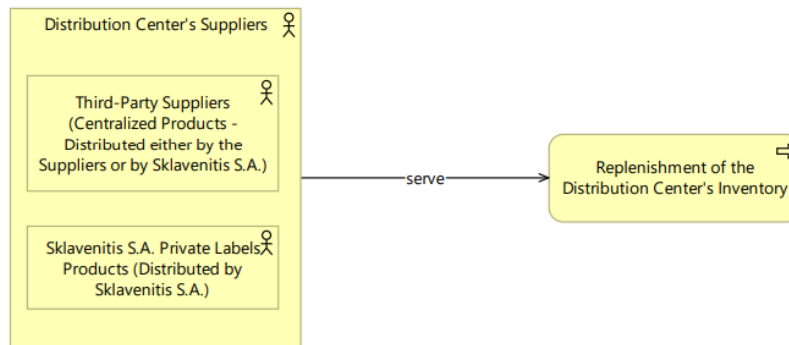


Archimate View 11: 2.3. Update the warehouse inventory after replenishment fulfillment

Two complementary views regarding the Distribution Center's Customers and the Distribution Center's Suppliers are provided, in order to give the stakeholder a complete picture of the participants.

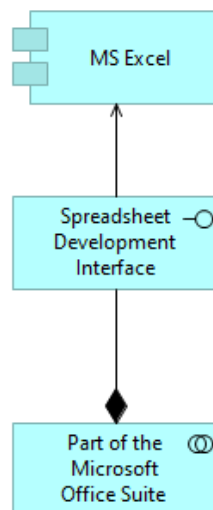


Archimate View 12: Distribution Center's Customers



Archimate View 13: Distribution Center's Suppliers

Finally, following the guidance given on the last lab lecture, a view describing the application component of MS Excel is provided below (as it is part of the MS Office Suite):



Archimate View 14: MS Excel Application Component View.