



**SAVONIA**

# **Inventory Process Management & Optimization in Small Businesses**

Based on Warehouse Management Systems & Inventory Management Approaches

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<p>Abstract</p> <p>This study is conducted with a comprehensive review of the most common practices of inventory management strategies and warehouse management systems optimization. Due to a high level of competition in the market, a successful approach of the stock control has a significant impact on a company's operations. According to the analysis of the case organization OOO "Million Roses" (LLC), several scenarios of conceivable modifications of the current inventory management and operations systems are developed.</p> <p>Inventory management procedures described by the case company are revised according to the effectiveness and efficiency of the performance. Thus, improvements proposed with the help of the investigation, focus on the ABC-analysis of the industry's complicated assortment and related procurement strategies, such as JIT and EOQ. An examination of the current database system adjusts concrete alternatives of the further WMS development and human resources allocation excluding the possibility of the existing software replacement.</p> <p>Recommendations established in this paper are based on an extensive literature and other secondary sources review and approximate calculations. Hence, an empirical verification of figures and proposals is required to ensure their practicality. However, suggestions provided in the thesis define a direction of the inventory and warehouse management strategies, which are dedicated to reduce holding costs, decrease the level of obsolete goods and enhance the firm's competitiveness during the process of further expansion.</p>			
<p>Keywords</p> <p>Operations Management, Inventory Management Optimization, Purchasing Process Assessment, ABC-analysis, Warehouse Management System, Just-In-Time Management</p>			

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## 1 INTRODUCTION

In the current business environment, inventories are an essential part of a performance. Depending on the sphere of expertise, inventories may consist of raw materials, spare parts, work-in-progress or finished goods. With the disregard to the class of the inventory, an accurate management of the stock has the core efficiency in operations (Anichibe & Agu 2013).

Thus, inventories is an important variable that may either increase the company's competitiveness and profitability or collapse operations in total. However, a Sales Department has an intention to obtain a larger volume of inventories as it is directly correlated with sales opportunities. Meanwhile, the financial department desires to maintain the stock at its lowest level, to transfer funds to other purposes. (Vohra 2008, 427.)

According to Temeng, Eshun & Essey (2010, 195-199), many enterprises usually ignore the opportunity of possible savings with the help of a Warehouse Management System. Hence, it leads to a disability to meet requirements regarding the inventory distribution among items.

A warehouse management system (WMS) might be an effective tool to optimize inventory transactions, when the level of consumption is relatively high (Ramaa, Subramanya & Rangaswamy 2012). This characteristic is applicable for a flower industry in Russia, where the level of competition is very intensive. Therefore, the main duty of any WMS, as a software database, is to improve the efficiency of the inventory management by the constant on-line control of transactions (Ramaa et al. 2012).

Thus, this report analyses the WMS influence on the company's performance. Moreover, it establishes a possible contribution of inventory management techniques into the warehouse management system development for the firm's future progress.

Summarizing the above-mentioned factors, this report defines optimized methods of the WMS usage with regard on classical approaches of the inventory management:

- An impact of the warehouse management system on company's operation at each level of activities, cost reduction and saving increase;
- A contribution of inventory management techniques to WMS optimization.

## 2 RESEARCH METHODOLOGY

The research mostly focuses on the warehouse management system according to the information provided by the case company. It deeply observes the theoretical acknowledgement of possible inventory management strategies, which are directed to improve the effectiveness and efficiency of the WMS usage. Moreover, it evaluates WMS as a tool of the company's operations and determines favorable methods to solve problems that the company currently meets. This approach is required to find appropriate techniques of the inventory management and exclude problematic issues from the company's further activities.

The project research requires several theoretical knowledge of examination techniques. Due to the fact that the investigation is based on the data provided by the case company, it is necessary to adopt the data, which was gathered from different sources, to the highest level of readability and clearness.

Thus, the practical part of the research is based on a mixture of primary and secondary sources with the further analysis and assessment. Meanwhile, the theoretical acknowledgement is established according to secondary sources, specification to which is given in further sub-chapters.

### 2.1 Case Company Introduction

The case company OOO "Million Roses" (LLC) was established in Saint Petersburg in 1985 by the Chief Executive Officer (CEO), Mr. Oleg Gukasov. Nowadays it is one of the leading distributors of products within the flower industry in Saint Petersburg and the North-West region.

By the current date, the company has established a close cooperation with suppliers and producers all over the world. Thus, it distributes cut flowers, pot plants, garden trees and complimentary products to retailers of the above-mentioned area. Major suppliers of the company are located in the Netherlands, Ecuador, Columbia, Israel, Armenia, Spain, Germany, Belgium, South Africa and China. Moreover, there is a partnership with domestic growers as well. Additionally, the company has several subsidiaries, which are also located in Saint Petersburg. However, subsidiaries mostly specialize on particular divisions of the industry.

"Currently the company is at the expansion stage. We have obtained additional warehousing space and already launched a new database software, which is dedicated to improve the speed of the inventory management procedures. The volume is increasing and the effective strategy is crucial at the moment. For this reason it is

necessary to evaluate the performance nowadays, observe and examine weaknesses that we have already determined and establish solutions, which are possible to apply” (Terekhin 2016b.) Therefore, according to a direction of the investigation given by the Chief Commercial Officer (CCO) of the firm, the research should concentrate on optimization of the new warehouse management system, inventory management and purchasing performance improvements that will increase the productivity with the lowest possible costs.

## 2.2 Case Goals

Generally, the main goal of this study is to conduct a comprehensive review of practical processes of inventory management strategies establishment and warehouse management systems optimization. In a more specific way, the set of targets can be differentiated into two categories: *Contribution to the company and Scholar development.*

### **Contribution to the Company**

The most important goal is to provide a performance assessment in terms of the current purchasing process, customers' satisfaction and the WMS. With the focus on the ABC-analysis, warehouse management strategies, re-order point and JIT management, it is necessary to investigate and evaluate the performance of the case company and define the core weaknesses of the inventory management strategy. Secondly, according to the data collected, several changes of the current purchasing process are needed to be defined and adjusted. Furthermore, due to beforehand established issues that the firm is currently facing, it is necessary to determine practical solutions to optimize and simplify the usage of the database software. Moreover, possible modification alternatives are needed to be considered and compared according to their efficiency, required budget, resources and costs. To provide the most detailed and accurate outcome, the theoretical knowledge of particular strategies should be compared with practical situations to comprehend the realism of possible improvements.

### **Scholar Development**

The preliminary target regarding the study development is to implement on practice the knowledge obtained during university studies. Moreover, it is required to verify and expand the knowledge of purchasing management and logistics conditions. As an example, an in-depth analysis of the ABC-classification approach and relevant techniques of the purchases optimization reflect on the overall understanding of the practical working environment and the industry in particular. In addition, there is a goal



of analytical skills development due to the recognition and consideration of the core weakness of the current WMS. Finally, a necessity to apply a set of improvements regarding the overall process of inventory control at the same time possibly establishes the skill of adjusting a competent combination of several techniques to provide the company's operations efficiency in the future.

## 2.3 Research Methods

### **Primary sources**

Most of the information from primary sources is collected during the internship at the case company. These sources are presented in forms of surveys, questionnaires and personal interviews with customers and the management. This data was analyzed according to general approaches of quantitative and qualitative methods to determine core weaknesses of the inventory management policy established by the company.

#### *Quantitative Method*

According to Babbie (2010), the quantitative method is focused on objective numerical figures that provide a statistical measurement of a data collection through polls, questionnaires and surveys. Muijs (2010) supports this idea as it provides a generalized justification of the particular phenomenon across certain groups of people. Thus, it helps to establish a correlation among certain specific characteristics and variables according to a logical assessment.

This report is based on two quantitative surveys, which were conducted to evaluate to aspects: to determine customer's satisfaction in relation to the inventory management and the questionnaire responded by the purchasing management department, which assesses the purchasing performance. The data was collected with the help of the manual printed copies and/or via e-mail correspondence. This approach has helped to evaluate the current purchasing policy in terms of its effectiveness and efficiency, and investigate benefits and drawbacks of inventory and warehouse management policy, which is directed to clients servicing. Gathered results are used in chapters of the practical evaluation of the WMS, the Inventory Management and the Purchasing Performance assessment as an argument to imperfection of established systems. The more detailed template of each survey can be found in appendices of the thesis.

#### *Qualitative Method*

The qualitative method seeks for understanding of particular phenomenon. It is conducted to understand determined problems from the exact viewpoint. (Family Health

International 2016.) The purpose of this methodology in the performance evaluation is to become more experienced in the particular case of studies and to examine not only the weakest and problematic aspects, but also to assess the behavior of the parties involved (Trochim 2006).

Therefore, this thesis reflects on several interviews conducted during the internship employment at the case company. They were accomplished with the CCO of the case company, the Head of the Sales Management Department, Purchasing and Logistics managers. Thus, the qualitative approach provides a clear outline of the inventory process issues with a particular inference on each sphere of operations.

### **Secondary Sources**

Secondary sources are commonly used as a general illustration of several methods and techniques that can be applied to particular spheres of business operations (ITHACA College Library 2016.) The usage of secondary sources in the research is justified by the fact, that this type of sources interprets the primary sources, which are used for a practical evaluation (Harvard Library 2016). For this reason, secondary sources are usually presented in forms of books, articles, journals, publications, online and media materials. On the one hand, they do not provide a clear and an individual viewpoint on exact aspects of the case. However, they are important in terms of the general observation and provide a direction for further steps of the practical research.

### 3 INVENTORY MANAGEMENT

According to Relph & Milner (2015, 6-8), inventory is the stock of items held in an organization, and to which a firm is going to add value before selling. Thus, inventory management is responsible for the stock maintenance at the desired level. Systems for the inventory tracking should be based on customers' demands, products' possible storage time and processes that make goods available for consumers. (Toomey 2000, 1.)

#### 3.1 Goals of Inventory Management

Broadly, inventory management at the warehouse can be defined as an audit, which is periodically organized to supervise condition of goods, their quantity and value. It should be accomplished regularly as several products have limited storage time in stock. Stock, as one of the main assets of a company, helps to maintain the level of the performance, when the market fluctuates. Usually, companies warehouse different types of stock depending on the firm's sphere of expertise and the availability of the storage space. (Michel 2016.)

Nevertheless, the necessity of keeping the correct amount of stock at the appropriate time is significant. As reported by Dickersbach (2007, 113), stock plays a role of an "insurance" in case of any shifts on the market or unexpected events. Furthermore, the existence of the stock in the storage guarantees its availability for customers, what, as follows, provides their satisfaction and the product value. Finally, physical inventories allow taking an advantage in short-term opportunities being offered with a special price by a supplier. Nevertheless, a large stock maintenance might be risky, as the inventory volume should increase only if benefits of keeping it exceed drawbacks. (Slack, Brandon-Jones & Johnston 2013, 372-374.) Along these lines, a significant responsibility of the management team is to select the most appropriate method of inventory management, which organizes the stock maintenance effectively. Due to the current business situation, inventory costs reduction is one of the critical issues of the inventory management strategy, as it is challenging to reduce arising costs of inventories while maintaining a high level of products' quality and servicing (Mercado 2007, 2.)

As a part of the decision-making process, managers need to cooperate closely to develop a strategy that makes all the products available at the needed time while the storage cost is concentrated at the lowest level. Thus, it is possible to determine three essential decisions of the inventory management:

- **Strategic Decisions**, which forecast activities in a long-term run. They involve a wide range of resources, plan and set the correct production process for the product/market;
- **Tactical Decisions** are forwarded to medium-term activities implementation. They are likely to be used for a single production unit (or a small number of units) or a warehouse;
- **Operational Decisions** are made at a detailed level with regard on a short timeframe. They involve a small amount of resources and forward a production process as near to the real time as possible.

(Relph & Milner 2015, 78-79.)

When the necessary strategy is set, tactical and operational decisions track and evaluate the implementation of the overall inventory management strategy. Usually, decisions of the strategy pass through all the levels of the management hierarchy. Nevertheless, when it comes to a small business, inventory management can be straightforward, but still requires a very careful processing. (Relph & Milner 2015, 76-77.)

### 3.2 Inventory Management Policy

Inventories should be regularly reviewed to lower the investment in inventories and to provide an efficiency of the inventory management. The appropriately selected policy provides the supply at the correct amount, at the right time and at the most profitable cost. It should maintain the balance between “too little” and “too much”. (Chisholm-Burns, Vaillancourt & Shepherd 2012, 167.) Currently, inventory management concepts can be defined into two essential approaches: *traditional approach*, and *scientific approach* (Banerjee 2010, 455-456).

#### **Traditional Approach of Inventory Management Evaluation**

A wide range of firms compares their levels of inventory with competitors' or with itself over certain periods. It provides the establishment of the efficient inventory management norms. However, this kind of approach has certain drawbacks, as it does not take into account shifts of several relevant factors, such as changes in volume. (Banerjee 2010, 456.) The usage of the traditional approach is based on turnover ratios. According to the stock items stage of production, the company applies a specific turnover ratio. As an example, the *finished goods turnover ratio* can be applied in the industry, which operates with an international distribution of products:

$$\text{Finished Goods Turnover} = \frac{\text{Average Finished Goods in Stores}}{\text{Average Cost of Production}} \quad (1).$$

This ratio can be used as an indicator of the inventory management efficiency. Hence, the higher the level of the turnover ratio is, the shorter the period between the investment in inventories and its recovery. Along these lines, it means the better profitability of investments. (Banerjee 2010, 457.)

Summing up the technique mentioned above, it is possible to state that the traditional approach of inventory management evaluation cannot be used as the only tool, but as a guidance to forward the scientific approach of inventory management.

### **Scientific Approach of Inventory Management Evaluation**

The scientific approach involves development of strategies for following essential issues of inventory management:

- The classification problem;
- The order volume problem;
- The order point problem;
- Safety stock.

(Banerjee 2010, 457.)

An accurate solution of each problem may be furtherly used as the relevant data for the warehouse management system development.

This study mostly focuses on the classification, the order point and the safety stock problems due to the highest contribution of these issues into the WMS development. However, a brief observation of the order volume problem is also provided to give a general overview on the approach.

#### **1. The Classification Problem: ABC Analysis**

In many cases, companies have more than the only one type of items stocked. Some of them are frequently used and have a high level of popularity among customers. Other products are more exclusive and have a high level of value. Thus, this type of inventories in large quantities are relatively expensive. One of the most typical methods to differentiate these items is to rank them according to the frequency of usage, or the usage value. (Slack et al. 2013, 393.) In other words, firms divide items according to the annual consumption value, as follows (table 1):

TABLE 1. Classification of inventories according to the ABC Analysis (%) (Slack et al. 2013, 393)

Class of Inventory Items	Percentage of Total Items	Percentage of Total Value
Class A	20	80
Class B	30	10
Class C	50	10
Total	100	100

As the table above demonstrates, a relatively small amount of inventories generates the highest level of the total usage value. This phenomenon is called the Pareto law or the Pareto's principle. It is also commonly known as 80/20 rule, whereas 80% of sales are usually generated by only 20% of inventories stocked and vice versa. However, this is not an ultimate arrangement, and these percentage figures may vary depending on the industry. (Dacko 2008, 382.)

Furthermore, according to Chakravarty (2004, 71) different classes of inventories require managers to make different strategic decisions within the management process:

- **Category "A"**: items should be carefully controlled according to many factors: max. level, min. level., re-order point, EOQ and etc.; due to the fact that these items generate the most significant part of sales and value;
- **Category "B"**: items require more moderate control and are revised regularly and the re-order is less frequent;
- **Category "C"**: items have the lowest consumption value. They are exclusive and generate the smallest part of sales. Orders for such items are usually placed once in six months or once a year, due to a high level of handling costs.

Nevertheless, this approach is not the absolute method of the classification and has certain drawbacks, as well as advantages (table 2):

TABLE 2. Advantages &amp; Disadvantages of the ABC Analysis (Chakravarty 2004, 71)

Advantages of ABC Analysis	Disadvantages of ABC Analysis
<ul style="list-style-type: none"> <li>— Guarantees the strict control of costly items;</li> <li>— Management does not waste any time, as concentrates only on selected items;</li> <li>— Helps to maintain a high level of stock turnover rate;</li> <li>— Combined with EOQ, minimizes costs of placing orders, receiving goods, holding of stock;</li> <li>— Minimizes investments in stock;</li> <li>— Optimizes the level of inventory;</li> <li>— Easy to detect obsolete items.</li> </ul>	<ul style="list-style-type: none"> <li>— Requires standardization and codification for better result;</li> <li>— The classification might be complicated due to a variety of subjective items;</li> <li>— Requires regular revision.</li> </ul>

## 2. The Order Volume Problem: Economic Order Quantity (EOQ) Technique

While considering the volume of the order, it is necessary to keep the balance between costs associated with keeping items in stock and purchasing costs. This is the most problematic issue of the purchasing department of any organization. On the one hand, placing the order only when the item is needed seems to be quite tempting, because it reduces costs of holding inventories in stock. On the other hand, it may cause the frequency of purchases to an absurd amount of times within one day. The opposite example is if the provision is made once within several months. (Aro-Gordon & Gupte 2016.) Thus, the Economic Order Quantity (EOQ) approach helps to minimize total inventory costs, which can be calculated as follows:

$$EOQ = \sqrt{\frac{2 \times D \times C_o}{H}} \quad (2),$$

where

$C_o$  – Ordering Cost per order

$D$  – Annual Demand in units;

$H$  – Holding cost (\$).

(adopted from Slack et al. 2013, 380.)

EOQ approach, as it was mentioned above, helps to adjust the fixed amount of inventories to be ordered to minimize costs of purchasing and costs of holding the inventories (DuBrin 2009, 206). In other words, it answers the question “How much inventories should we order?” This is one of the most important analyses within the inventory management process and it leads to the most significant results in operations management.

Nevertheless, the EOQ model requires several assumptions to be taken into account while planning and calculating. These are the certainty of the demand, which is constant over periods, no delays in order placement or receipt as well as the whole order should be received at once (Schwarz 2008, 142; 147).

Due to constant fluctuations of the market, in which the case company operates, the further consideration of the EOQ model in this particular case is unnecessary, because the industry has a wide range of variables, which regularly shift within a short time frame.

### 3. *The Order Point Problem: Re-order Point, Just-in-Time (JIT) Management*

#### *Re-order Point*

Selection of the most appropriate moment of placing the order is one of the essential issues during the process of inventory optimization. The easiest way to make the company to operate smoothly is to determine the re-order level (ROL). This is the point, which covers the order lead-time after the replenishment order has been placed. When the amount of inventories at stock falls below ROL, it is necessary to initiate the re-order. (Guire 2015, 543; Kerber & Dreckshage 2011, 112.)

The re-order point (or re-order level) consists of the safety (buffer) stock and the average consumption that is predicted during the order lead-time. According to Slack et al. (2013, 388), while generating the ROL, it is necessary to take into account not only the order lead time, but also the safety stock, previous values of consumption and future targets (figure 1).



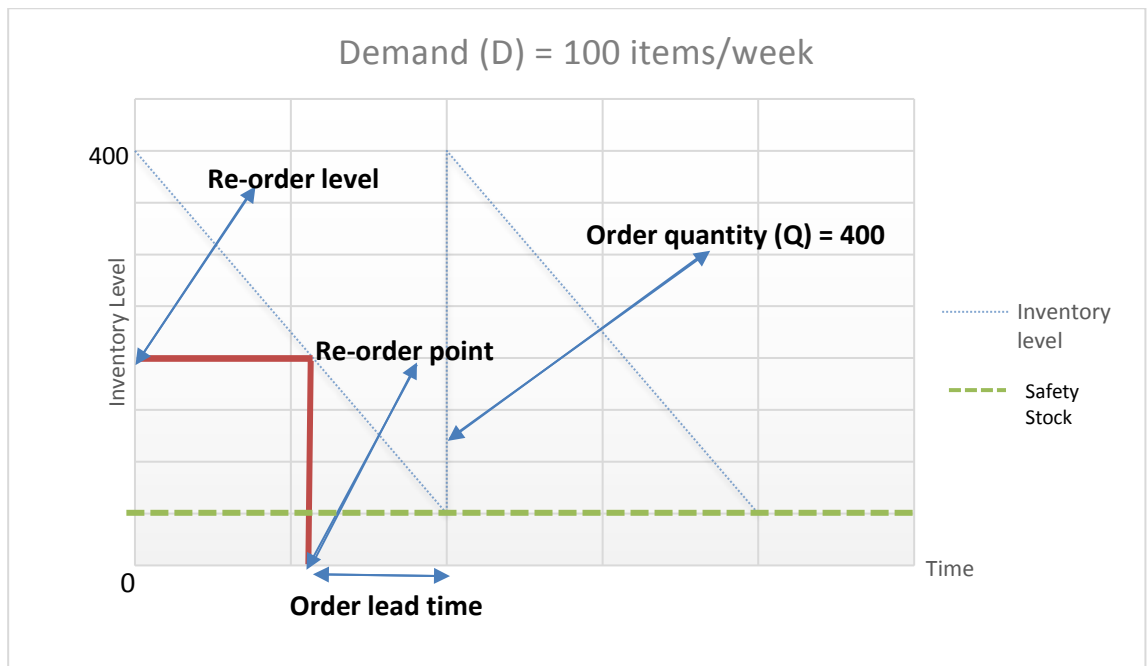


FIGURE 1. Inventory Cycle - with Safety Stock (Slack et al. 2013, 388)

Nevertheless, this practice of ROP and ROL determination assumes that the order lead-time and the demand rate are always constant, as well as the safety stock remains the same. Considering these assumptions, it is possible to define a formula of the reorder level:

$$ROL = \text{Safety Stock} + (\text{Average usage} \times \text{Re-order period or lead time}) \quad (3);$$

(Lal & Srivastava 2009, 88.)

#### *Just-in-Time (JIT) Purchase Management*

Traditionally, many organizations used to keep raw materials, work in products and/or finished goods in stock, which are a “buffer” in case of the urgent necessity. However, the current market situation and the business environment have created another management technique, which reduces costs of holding in stock.

Based on the overall cooperation of the management and individual employees of the organization, Just-in-Time management requires raw materials and/or spare parts to be purchased or produced exactly at the stage, when they are needed in the process of production (Lal & Srivastava 2009, 121). Theoretically, the successful approach organizes the smooth flow of items through the operational network at minimized costs

(Slack, Chambers & Johnston 2009). To establish the most significant differences between the traditional system and JIT system, the table 3 is provided:

TABLE 3. Differences between Traditional & Just-in-Time Approaches (McKinney 2015, 211)

<b>Traditional Approach</b>	<b>JIT (Lean) Approach</b>
Viewed as a tactical function;	Viewed as a strategic function;
Price generates buying decisions;	Quality generates buying decisions;
Specifications define quality;	Clients' expectations define quality;
Buyer dominates the purchasing function;	Dealer dominates the purchasing function;
Many suppliers are maintained with short-term contracts;	Few suppliers are maintained with long-term and closer partnership;
Defects are expected;	No defects are expected;
Frequent inspections are used to maintain quality;	Prevention is used to achieve quality;
Quality is constant;	The level of quality increases throughout the process;
Hand-written-paper based approach;	Electronic communication approach;
Delivery is determined by supplier constraints.	Delivery is synchronized to JIT requirements.

JIT Management is much more customer oriented as well as it involves all the parties of the organization. In case if any problem occurs at the certain stage, the further ones will notice it quite soon. Thus, it effects on the total production process and intends each associated team to exterminate problems. In comparison, traditional approach involves only the problematic stage, while others have a safety buffer. Such a slow problem determination causes delays in finding solutions and in the decision-making.

Thus, the JIT Management system has several advantages over the traditional management system. They can be classified as:

- High level of customer's satisfaction;

- Efficiency in administration and management cooperation;
- Reduced costs of holding.

(Barlow 2015.)

On the other hand, this kind of approach has several risks caused by the lack of the inventory-buffering zone. First of all, the firm operating with the JIT management system should have a reliable delivery as well as a short distance to consumers. Otherwise, any delays in delivery may cause the risk of customers' dissatisfaction due to stock outs. More than that, to arrange the distance to the customer at its shortest, it is necessary to have strong and close information and distribution channels with suppliers. This issue might be critical for companies that have a wide range of suppliers or have a lack of a budget. Furthermore, as the key concept of the JIT purchasing refers to the highest level of production and delivery to the customer, purchased products should require the less frequent inspections as possible. This means that a supplier should guarantee the highest level of the quality. Due to a lack of revisions and an overtrust to the supplier, the products' quality may suffer. (Slack et al. 2013, 455-457; Barlow 2015.)

### 3.3 Purchase Process Management

An effective purchasing management scheme is a critical issue of a successful work of an organization. Development of market relationships determines further steps undertaken by the company. That is why, the importance of defining all possible ways of a rational supply chain, including purchases, delivery of raw materials and inventories, and warehousing is increasing. Each step, starting from a supplier selection to evaluation plays a significant role in operations of the company. Generally, the purchasing function requires the necessary amount of the high quality goods to be delivered to the exact place at the exact time by a supplier that offers the most profitable and the most attractive price (Chand 2016). Due to a high level of competitors in the current market, good services and tempting prices become critical criterions in the process of the supplier selection, because these options may lead to successful activities as well as to a complete shut-down of a firm.

According to Carr & Smeltzer (1997, 201), a strategic purchasing process is "the process of planning, implementing, evaluating and controlling strategic and operating purchasing decisions for directing all activities of the purchasing function toward opportunities consistent with the firm's capabilities to achieve long term goals."

In terms of the overall company's functioning, the strategic purchase process is a quite effective approach. The firm's need in inventories determines a supplier selection task. The company should have a certain plan of partnership operations. This agenda defines

parameters of approaches and activities in a long-term run. The perspective plan should include a data regarding the quantity of suppliers, their shares in overall distributions, risks and etc. Van Weele (2010, 191) offers a model of the strategic purchasing process that dedicates six fundamental activities undertaken by a company (figure 2):

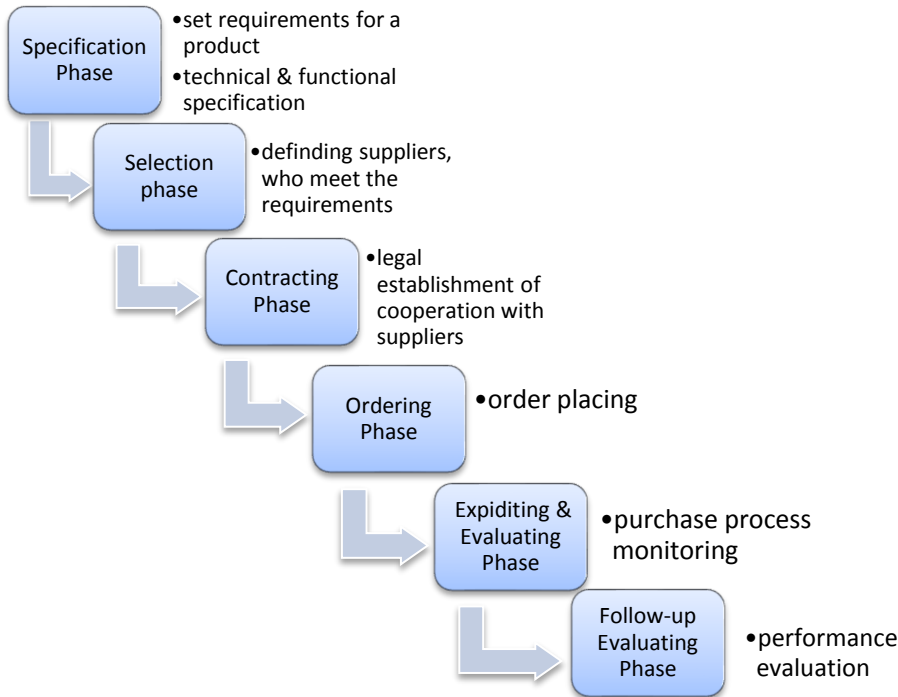


FIGURE 2. Strategic Purchasing Model (adapted from Van Weele 2010; adapted from Apostolova, Kroon, Richter & Zimmer 2015, 6-7)

In terms of this long-term project, the company should predict its demand in inventories as well as set characteristics of inventories to be purchased. Additionally, it is necessary to determine the requirements regarding services provided by suppliers. Furthermore, the market competition enforces suppliers to provide extra offers and benefits to possible partners. According to advantages that are possible to achieve within the cooperation, the company can start the process of the most beneficial prospective supplier selection. Long-term contracts are the most tempting for both, the supplier and the consumer. Thus, it leads to a recognition of relationship terms with future partners and a legal contract of a deal. To provide an effective interaction with the most important

suppliers, the procurement department should establish individual plans of cooperation (Hofmann, Beck & Föger 2012, 173). Nevertheless, it is important to remember, that the significance is determined not only according to the purchased volume, but also by a strategic value of the supplier. Following up, it does not have a significant difference if the order is placed manually or with the help of any software, the purchaser specifies characteristics, terms, volume, place to deliver and other characteristics of the upcoming purchase. Expediting of this process and its evaluation, in other words, means monitoring. The purchaser as well as the supplier mutually monitor the process of the deal from both sides and evaluate it on occasion to define necessary improvements and the satisfaction from the cooperation. The final step, the follow-up evaluation, assesses the overall deal in general, including each of the above-mentioned steps. It helps to calculate the effectiveness and the efficiency of the partnership, determine weaknesses and legitimacy of the process. (Van Weele 2010; Apostolova et al. 2015, 6-7.) However, it is necessary to note, this model is a basic approach of the strategic purchasing process and the more accurate implementation is dedicated by the specification of a business, type of companies and etc.

### **Purchasing Performance Assessment**

One of the most important issues for any company operating with purchases are eventual and frequent measurements and evaluations of the conducted performance over certain periods. As it was mentioned above, the number of orders, frequency, lead-time, inventory replenishment and reduction, and etc. may have a significant influence on the overall procedure. (Van Weele 2010, 302-303.)

Key areas of measurements are closely related to each other and may affect both negatively and positively on the performance. Van Weele (2010, 307-308) supports this idea providing exact definitions to price/cost dimensions, product/quality dimensions, logistics dimensions and organizational dimensions examination criterions and establishes their relations:

#### *Purchasing effectiveness:*

- **Price/cost** control dimensions refer to constant monitoring of products' prices fluctuations within the market. They are determined and announced by dealers and suppliers. Additionally, the company should always measure and develop possible ways of cost reduction to decrease total costs in the most structured way.
- **Product/quality** dimensions (purchasing involvement in new products development and purchasing contribution to Total Quality Control) are those

measurements, which should evaluate the supplier's responsibility in delivery of required goods and products according to requirements set in the contract.

- **Logistics** dimensions refer to an efficient flow of inventories purchased. It includes an accuracy in handling orders, delivery time and quantity. These factors demonstrate the efficiency of the supplier's logistics chain in terms of purchaser's interests in cost reduction. In case established methods of transportation demonstrate no progress in savings, purchasing departments might need to reconsider the negotiation method with providers (Latham 2016).

Purchasing efficiency:

- **Organizational** dimensions evaluate the structure of the organization and resources involved in the process of the purchase. This assessment refers to staff members, management, procedures and information systems.

(Van Weele 2010, 307-308.)

From the company's point of view, constant monitoring, measurements and evaluations of these key factors may help to develop a systematic procedure of purchases conduction and have an impact on the reduction of expenses. The data collected within this evaluation outlines a clear view on the process regarding the objective of purchases, leads to a beneficial decision making in the future process and increases the communication efficiency among parties involved. (Van Weele 2010, 304.)

## 4 WAREHOUSE MANAGEMENT SYSTEM

Effective warehouse management is one of the essential issues to be performed by a logistics department of any company. Warehouse automatization is one of the preliminary goals of the firm due to the fact, that the effective warehouse management is a tool, which helps to provide outstanding services to a client according to his individual demands, as well as to set competitive prices for services/products. (Ramaa et al. 2012.)

Retailer's warehouse automatization helps to achieve significant results in inventories turnover, orders placements and deliveries of those to final customers. Moreover, distributors demonstrate an outstanding performance of the warehouse management, which helps them to maintain leading competitive positions and advantages in a cooperation with retailers and clients by using the automatized system of the warehouse management. (Hompel & Schmidt 2007, 6.) Thus, the warehouse automatization assists in time reduction of operations implementation, reduces operational costs, reduces errors, improves the quality of customer services, increases the efficiency of the personnel, and reduces holding costs (Juarbe 2016). In other words, organizes the most efficient warehouse management process.

A Warehouse Management System (WMS) is a solution that optimizes all business processes at the warehouse and collects data about its performance in real time. One of the most important conditions of the successful warehouse work is a strict observation of technologies and a team contribution of all the parties into the process. (Van Den Berg 2007, 83.)

### 4.1 Goals & Objectives of WMS

Any WMS (regardless if it is an IT-software or a manual paper work) is a tool that provides the automation and optimization of all the operational processes of a warehouse enterprise.

Warehouse Management Systems are created to maximize the optimal functioning of the management including the direct holding. Thus, this leads to increase in the business efficiency in general. Moreover, the WMS is used as an implementation tool for the following strategic and tactical goals and objectives:

- Active management of the warehouse;
- Increase in the inventory turnover;
- Access to the exact information concerning the location of the unit at the warehouse;

- Effective management of inventories, which have limited warranty period;
- To increase the efficiency and the development of processes of the inventory holding and maintenance;
- Optimization of the warehousing space.

(Hompele & Schmidt 2007, 6-7; Van Den Berg 2007, 83-84.)

Achievement of goals mentioned above is combined with a successful solution of the following day-to-day problems and responsibilities of the WMS:

1. *Receipt of raw materials and inventory items:*

- Tracking of inventories flow in real time electronically or in hard copy;
- Printing of bar-codes (if necessary);
- Flexible identification of the buyer;
- Receiving items for safe custody;
- Compliance checking and data adjustment.

(Hompele & Schmidt 2007, 20, 22, 24, 47-55; Van Den Berg 2007, 86-88; Benson 2013b.)

2. *Warehousing:*

- Automated warehousing or warehousing with the personnel supervision;
- Adjusted terms of warehousing to maximize the efficiency of the space usage;
- Preparation of unpacked items from different suppliers for warehousing.

(Van Den Berg 2007, 90; Benson 2013a.)

3. *Automatization of receipt and loading of inventories* (Mirotin 2004, 119).

4. *Flexible orders and groups of orders maintenance:*

- Orders grouping;
- Placement of orders in groups to optimize processes and resources;
- Merger and differentiation of consignments;
- Customized product authentication according to its package at the moment of the dispatch or/and purchase return.

(Van Den Berg 2007, 86; Benson 2013a.)

5. *Purchasing management:*

- Customized settings of ROP;
- Issuing and placing tasks automatically;



- Customized purchasing strategies;
- Different options of purchases according to their volume, packages and etc.

(Van Den Berg 2007, 99-101; Mirotin 2004, 123.)

6. *Orders formation:*

- Formation and placement of tasks to personnel automatically;
- Ergonomic loading of items according to the quantity ordered and measurements of units;
- Customization of clients' orders;
- Generation of authentication numbers of containers for further tracking.

(Van Den Berg 2007, 86; Mirotin 2004, 124.)

7. *Loading:*

- Scheduling of loading/dispatching according to priorities;
- Regulation and merger of items during the loading process according to the delivery order;
- Checking and closing of delivery operations;
- Carrier selection;
- Conformity marking;
- Issuing of documents.

(Van Den Berg 2007, 93-96; Benson 2013b)

8. *Stock maintenance::*

- Stock tracking;
- Flexible transfer and adjustment of stock;
- In-term partial inventory;
- Full inventory process;
- Control of inventories' condition in real time;
- Stock localization according to the warehousing space;
- Tracking of inventories' attributes (code, batch, serial number and etc.);
- Tracking of order placement dates, warranty periods and other important deadlines;
- Tracking of the inventory owner;
- Flexible system of re-shipment, consignments division, stock transfer;
- Flexible methods of inventory accounting and stock values, such as:
  - ◆ FIFO (First-in, First-out)-*assumes that the goods purchased the first will be dispatched the first, regardless of the sales time;*

- ◆ LIFO (Last-in, First-out)-assumes that the latest purchased goods will be sold the first, regardless of the actual sales time;
- ◆ FEFO (First Expire, First Out)-assumes that goods, which expire the first, are the first to be shipped and sold. (Thakral 2015.)

(Hompel & Schmidt 2007, 20, 22, 24, 28-29, 47-55; Van Den Berg 2007, 86, 90, 101; Benson 2013b.)

9. *Personnel tasks management:*

- Automatic tasks formation for loading, dispatching, stock transfer, inventory tracking, stock re-order, orders formation, shipment and etc.

(Van Den Berg 2007, 90; Benson 2013b.)

10. *Planning of the strategic management process:*

- Scheduling the tasks timetable according to priorities;
- Scheduling and task interleaving.

(Mirotin 2004, 128; Benson 2013b.)

11. *Holding maintenance:*

- Progressive optimization of the warehousing process;
- Transfer opportunities within warehousing branches of the same organization;
- Inventories inspections.

(Van Den Berg 2007, 90.)

12. *HR Management:*

- Shifts tracking;
- Personnel tasks tracking;
- Reporting;
- Standards projecting and planning;
- Planning of labor production.

(Van Den Berg 2007, 85; Hompel & Schmidt 2007, 47-55.)

Summing up these activities, the WMS, basically, covers each aspect of the company's operations as well as provides the optimized management and maintenance process of the warehouse work.

## 4.2 Basic Data

The company that wants to integrate a brand new WMS into its operations management faces with a large variety of possible software applications and systematical approaches that are needed to be adopted. The general idea of any WMS is to plan and design the warehouse space and the distributions system for the highest efficiency of processes (Ramaa et al. 2012).

However, this is a complex procedure, which requires certain aspects to be determined according to the firm's sphere of expertise and to set goals and objectives of the enterprise. Therefore, the most simple and general values that are necessary in any WMS are classified as *Basic Data* and *Key Values*. (Hompel & Schmidt 2007, 56.)

Basic Data is a result of statistical measurements, calculations and/or differences of certain items. It is classified as *Master data*, *Inventory Data*, *Movement data* and *Other System data*. The table 4 represents the main characteristics of these basic statistical figures that are required in development of the effectively operating WMS:

TABLE 4. Classification & characteristics of Basic Data (Hompel & Schmidt 2007, 56-57)

<b>Basic Data Classification</b>	<b>Main Characteristics</b>
Master Data	<ul style="list-style-type: none"> <li>— Long-term information;</li> <li>— Mainly represents an assortment of the warehouse;</li> <li>— ABC classification;</li> <li>— Most important data about basic characteristics of articles, loading aid, etc.;</li> <li>— Description of articles independently from the current stock;</li> <li>— Basis of the main warehouse functions and mechanisms.</li> </ul>
Inventory Data	<ul style="list-style-type: none"> <li>— Informs about quantities sorted or provided;</li> <li>— Accurate and up-to-date;</li> <li>— Continuously changing data (dynamic data);</li> <li>— Dimensions the warehouse system.</li> </ul>
Movement Data	<ul style="list-style-type: none"> <li>— Second group of Dynamical data;</li> <li>— Represents physical warehouse process (goods receipt, issue operations, order-picking process, execution and etc.).</li> </ul>
Other System Data	<ul style="list-style-type: none"> <li>— Represents other elementary data (cost data, unit load, structural space and room data, work force data and etc.).</li> </ul>

Thus, the constant tracking of the Basic Data aims to provide the effective development of the WMS and its integration into the company's current operational processes and procedures. It minimizes costs and time wasted on the manual implementation of procedures on a day-to-day basis.

### 4.3 Key Values & Indicators of the Performance Analysis

As it is already so far was discussed in the whole section 4.1, WMS covers every single aspect of the warehouse functioning on a regular basis. That leads to a variety of the data, which is difficult to understand without the context. This affluence generates a complexity of the system evaluation and optimization (Murray 2016a). For example, the quantity of orders during the period provides no objective information without the data concerning the amount of ordered items during the same period (Hompele & Schmidt 2007, 56-57).

All the Basic Data summarized together can already be seen as logistics key performance indicators (KPI) of the warehouse. They indicate different areas of technologies, economics and etc. (Hompele & Schmidt 207, 57). In other words, KPI will illustrate the synergic picture of how successful the warehouse network operates (Reh 2016).

Typically, KPIs describe the productivity in terms of deliveries, shipments, costs, order-picking processes and etc. (Stone 2014). The more detailed logistics and warehouse KPIs examples are listed below:

- **Carrying Cost of Inventory** specifies costs related to any inventory involvement, such as inventory risk, inventory service cost and etc.
- **Inventory Turnover** measures inventories entire lifecycle and the amount of cycles to be accomplished within a year. This figure helps to forecast further operations of the WMS.
- **Order Picking Accuracy** refers to the amount of orders picked per hour, involvement of a labor and its cost, usage of consumables and orders cycles.
- **Inventory Sales Ratio** is effected by economic conditions. It refers to an early identification of cash flow problems. In other words, it determines an increase in inventory stock, while sales decrease.
- **Units per Transaction (UPI)** depending on the industry, the figure may or may not increase. That is why, it is common to compare calculations with the historical statistics of the industry.
- **Rate of Return**, one of the most useful KPIs, refers to those industries, which are tend to have returns on goods due to inaccurate delivery, spoilage of

products, wrong products discretions and etc. It determines spheres of necessary improvements.

- **Inventory Accuracy** refers to the matching of the real inventories to the database of the warehouse. It is directly connected with the Master Data. The most common improvement of visibility performed is regular inspections to adjust the database according to the current assortment.
- **Back Order Rate** indicates a successful forecast of sales and purchases, and is connected with the *Inventory to Sales Ratio* and *Inventory Accuracy*. Temporary increase of this rate might be justified by a sudden boost of the demand. However, a constantly high or escalating Back Order Rate signals of poor planning processes.
- **Perfect Order Rate**, generally, provides the figure of how many orders are successfully delivered to the customer without any accidents and troubles. In the simplest way, the perfect order can be classified as the one that delivers the correct item in a good condition on time to the correct customer, who has placed the order.

(Legacy 2015; Hompel & Schmidt 2007, 59; Stone 2014; Pathak 2013.)

An adjustment of these common KPIs to evaluation of the warehouse management system as well as its combination with KPIs of other areas of operations (as an example, business performance evaluation or operations efficiency) helps to evaluate the overall performance of the WMS and the enterprise in general (Pathak 2013). Additionally, KPIs indicate significant weaknesses in operations that are needed to be improved.

#### 4.4 WMS as A Tool of Inventory Management Optimization

Decrease in expenses and increase in warehouse efficiency are critical issues for any distributor. Cost and production efficiency of inventory operations cannot be implemented without a qualitative IT-support. Increase in stock volume and demand forces companies to develop approaches of successful warehouse functioning. One of the tools that can be used is the Warehouse Management System. Based on the study established by Montgomery (2015), main benefits of the WMS can be summarized as the management of warehouse operations themselves, but not only statements of these operations accomplishment. During these processes, the WMS determines receipt solutions and stocking tasks, commissions and dispatching of items to consumers and a wide range of other activities of inventory stocking. These activities are implemented according to WMS recommendations.

Thus, a warehouse employee is not anymore unique in terms of warehouse processes knowledge, principles of implementation, and storage location of certain items. This factor vanishes the obstruction of warehouse internal processes optimization in general. In other words, the employee, as a unique owner of warehouse knowledge and as an “incontrollable system”, will be placing inventories at those spots, which are the most convenient for him, but not where it is the most comfortable for a consumer to pick the order up. Moreover, being the unique owner of knowledge, the employee becomes a highly paid specialist, therefore, the longer his experience is, the higher paid specialist he becomes. This happens because in case this employee is fired, the company will get more expenses for a replacement. Additionally, the process of instruction may take months: the wider the assortment is, the longer it takes. It causes a complexity in personnel replacement: once an employee is transferred from one site to another, the manual WMS cannot provide an assistance with an introduction quickly. (Southern 2014.) This factor becomes especially problematic if the stock and inventory processes are maintained on paper.

Warehouse Management Systems play roles of the data storages and share the knowledge concerning warehouse operations with the personnel during the process of tasks placements. More than that, it is possible to achieve the highest efficiency using a combination of the WMS and radio-terminals: in this case, tasks are handled from one employee to another in real time, and the only requirement for the staff is accuracy in implementation. (Siddique 2013). As a result, it establishes a higher speed of a new personnel education. The possibility of replacement becomes a flexible tool of HR optimization without any loss in productivity.

Secondly, the WMS helps to establish the effective space usage of the warehouse. There is no doubt, that different warehouses have different costs of handling: different personnel, different equipment of materials handling, different equipment of warehouse automatization (for example, conveyers), different warehouse zones and their costs. Furthermore, storage zones also can be classified according to convenience of warehouse operations. One of the most common problems is non-fulfillment of the expensive and convenient storage space due to the manual assortment binding. The WMS helps to realize the principle of a dynamic allocation. According to iti\_Logistics (2016, 3), the core idea of this principle leads in the allocation of the certain items according to places, which are the most suitable for them at the exact moment. This disposition depends on the intensity of dispatching, storage time, dimensions of units and etc. It means that in case of changes in the above-mentioned characteristics, the new replenishment will be disposed at the new zone and the previous space is the first to be eliminated.

On the other hand, the introduction of any WMS-software to the already existing warehouse may cause large troubles for the organization itself. The issue is in the correct integration of the system. Tyng (2016) insists in his knowledge article that a constant focus on the latest technology with a disregard to the current operations may ensure failure of the WMS introduction. Thus, any errors in synergic approach of the process may significantly decrease the turnover of the warehouse and increase logistics expenses accordingly. It is also important to take into account that due to the WMS introduction, many process of the warehouse will change (especially in terms of switching from the manual warehouse system to a modern WMS with radio-terminals).

Summing up the above-mentioned factors, the idea of technological processes optimization is the critical problem because only according to this optimization, the highest effect can be achieved. The WMS - is only a strong and flexible tool of materials handling schemes realization. However, it does not implement its main task successfully, if it supports illogically planned processes. Hence, it is necessary to accomplish a successful data investigation and entry to establish an accurate process of the WMS operations at the preliminary stage. If such introduction is done appropriately, the WMS has a large potential to simplify the process of the inventory maintenance at the warehouse as well as supports other related activities effectively.

#### 4.5 Contribution of the Inventory Management into the WMS Development

As it is defined in the table 4, master data is a long-term structured information regarding the assortment of the warehouse. It represents the most important characteristics of each variety independently and is furtherly used as the basis of the items movements control and maintenance. Due to the fact that this is the most important piece of the information in the warehouse management database, it should be entered into the software system with the highest level of accuracy. In this case, the ABC-analysis might be used as an effective tool of articles and assortment tracking. This essential technique of the scientific approach of the inventory management delivers a convenient and user-friendly classification of items according to its value. (Hompele & Schmidt 2007, 56-57).

Furthermore, the accurate strategy of the order point determination during the process of inventory management can be used as a movement data, which systemizes a dynamic information of goods transactions.

Finally, the information collected during the purchasing performance assessment represents Other System Data of the WMS' Basic data.

Inventory management system controls the flow of inventories broadly, simply informing the company of the stock volume. Meanwhile, a correctly launched WMS gives an opportunity to find a specific place of the item as well as suggests a better allocation of the stock in the future. (Lewis 2016.)

Thus, according to certain characteristics of the WMS and Inventory management techniques, SAP (2016) indicates, that once a manual inventory management assessment is conducted and the data is gathered, the process of the WMS establishment can be launched (Lewis 2016). Hence, this information is used for preliminary entries into the database of the WMS software basic data. After the accurate introduction, the WMS, despite its complexity, will automatically analyze the performance according to the scientific approach of inventory management (Lockard 2012). As a result, this leads to an optimized process of evaluation and inventory flow tracking, effective storage usage, reductions in human resources and inventory related costs.



## 5 CASE COMPANY ANALYSIS

This section determines a detailed approach of improvements development established during the thesis analysis of the case company OOO “Million Roses”. In addition to this, the chapter outlines the key weaknesses of the firm regarding the warehouse management system and the IT-software in particular.

### 5.1 Data Collection

In terms of the research, which requires evaluation of any performance in figures and their context, the most effective way of observation is to unite both methods of the data research-quantitative and qualitative.

In this research, the quantitative method helps to evaluate the current performance of the company according to statistics of purchases (frequency, volume, losses and etc.) in general, while the qualitative analysis justifies reasons of existing processes of inventory management and the WMS. Moreover, it establishes goals and objectives for the management in future development of the company. Thus, the observation of the case company includes the ABC-analysis and possible calculations. Additionally, the qualitative method together with the evaluation of the operations management are used to determine weaknesses of the current warehouse management system and future plans for improvement.

The basis of development adjustments is chosen according to the theoretical knowledge of WMS main goals and practices of optimization, inventory management techniques, purchasing performance assessment, the current situation of the company and established targets.

The data collection was conducted in a combination with a mandatory internship at the case company. Thus, most of the questions concerning the overall process of inventory and warehouse management were investigated either by the author herself or during direct interviews with employees and management as a part of personal meetings. Due to a small size of the business, it was possible to conduct communication with the CCO directly.

More than that, the key problems for assessment were established by the employer beforehand and required to be evaluated and clarified during the project research and internship.

One of them is the currently non-effective WMS, which leads to a confusion in the stock level and to communication troubles among departments and warehouse branches. The

employer has the highest intension to solve this one, as a successful approach leads to a higher level of replenishment and decreases maintenance costs.

The statistical research consists of the inventory management process observation and purchase management process analysis including the data of the performance regarding to each stage. The data was represented in forms of Excel-tables and statistical graphs, which were designed for the company's internal reports. In addition to this, to evaluate customer's satisfaction, the questionnaire was designed and offered to company's clients. This survey pool gave them an opportunity to express their opinion and to evaluate services of the company. The data of the qualitative method was gathered as interviews with the management and employees. Topics of interviews with the firm's staff members mostly included the inventory processes, self-evaluation and evaluation of the department. Additionally, CCO of the company established main goals concerning the WMS development, as currently this, as it was mentioned above, is one of the critical issues.

As the case company is the distributor for flowers and plants retailers, interviews of customers were also organized as a support to the offered survey. Interviews mostly included negotiations concerning the services provided during their purchase at the distributor's warehouse. For example, the frequency of their purchases, the fulfillment of the stock, order-placement, lead time and etc.

The gathered data was used as a basis of the current performance investigation and evaluation, determination of existing weaknesses and possible improvements to be adjusted to increase the level of operations profitability.

## 5.2 Current Situation

As it was mentioned before in the chapter 2.1, OOO "Million Roses" is a distributor of cut and pot flowers in the north-west region of Russia and in Saint Petersburg in particular. At the current moment, the company is expanding within the market to take control over the larger share of clients. That is why, the firm has introduced the new WMS software, which is called "1C-Enterprise 8" with the module application "1C-Logistics: Warehouse management 3.0". It is dedicated to replace the previous manual system of warehouse, inventory and purchasing management.

According to the official description of this software, it is an automatized decision-making system, "the brain" of the modern warehouse complex. It significantly increases the efficiency of warehouse operations:

- Warehouse storage optimization;

- Decrease holding costs;
- Shorten the time of warehouse operations accomplishment;
- Reduce errors in warehouse operations;
- Exclude losses regarding the limited selling time of products;
- Decrease the dependence on the “human factor”.

(1C Solutions 2016.)

Nevertheless, the current situation of the company demonstrates that the re-launched management system at the warehouse does not increase the efficiency of the warehouse operations, but, unfortunately, creates a misunderstanding among firm’s branches and leads to an imbalanced structure of the inventory turnover, stock replenishment and losses in products. During several personal interviews, the CCO, Mr. Vitaliy Terekhin (2016a; 2016b) states, that the most problematic issue at the moment is the current inventory management system at the warehouse. It operates the way that sometimes items purchased for a “free sale” disappear in the stock record for a while. The stock database demonstrates the lack of these items and sales managers tend to place orders of these products to the purchasing department. However, in reality, these items are stocked in one of the boxes at the cooling chamber. After the overall monthly inventories audit, these items are found. Nevertheless, they cannot be released in sales due to the fact that flowers have a high level of spoilage. Thus, the only solution is to write-off these items.

As the first interview with the CCO demonstrated, the company has troubles of inventory tracking and monitoring. Reasons of this high level of spoiled products, and the inefficiency of the new WMS, as well as related issues, are investigated deeper in further chapters.

The case study is used to observe the impact of the established warehouse management system on the performance of the company. It gives a deeper view into current situation of the particular firm and possible problems that already exist or will possibly appear in the near future in case the actual strategy remains without adjustments. Furthermore, the investigation relies on a deep exploration of complex processes of warehouse and inventory management. It establishes a comparison of theoretical approaches acknowledged during studies with the practical process, which, as it is known, quite often differs. Additionally, this research focuses on the practical side of the connection among undertaken activities, established warehouse and inventory management strategies and further consequences for company’s performance in real-life. More than that, this evaluation forms future goals and achievements in development of this successful performance.

Nevertheless, despite the observation of the exact company, the same kind of problems may occur in firms of the similar sphere of expertise as well.

### 5.3 Core Weaknesses

The majority of issues examined are designed during the introductory stage to firm's operations. They are the core questions of interviews with employees and the management of the company and are used for the following observation:

- Is the current warehouse management successful in terms of the company's performance and customer's satisfaction?
- How to improve the current WMS in particular?
- What kind of changes in the warehouse, inventory and purchase management are needed to improve the performance?

Continuous investigation during the process of the research outlined several weaknesses of the current warehouse management system and its software development in particular, which are described in further chapters.

#### 5.3.1 Basic Data related issues

As it was mentioned in previously, the company has installed a new warehouse management software. It was launched to organize the effective warehouse, operations and personnel management, and to replace the already existing manual ("*paper*") model of inventory tracking, which was used by the company before the expansion. However, this upgrade has created several misunderstandings and delays in stock control, purchases and sales operations.

The upgraded WMS contains terminological names of products. These are official names, which are given to plants in Latin according to botany and phytology. As an example, the name "*Eustoma russellianum*" in fact refers to a commonly known lisianthus, or instead of Latin "*Cymbidium*", the publicly used term is "orchid", which is actually the name of the family, but not the genus in particular. Moreover, these names in the database are written in shortened forms or in forms of abbreviations. "The reason why we use official Latin names with shortened forms in our database is that these names are adopted from invoices, packing lists and other documents as well as these names are noted on pallets and boxes, which we receive. In addition, as our largest suppliers are located in the Netherlands, many of these import documents contain abbreviations, which refer to Dutch words. For example, you can see the name "*Chr G Anast Sunny*", which literally means "*Chrysanthemum Geplozen Anastasia Sunny*". The country of origin for this variety is usually the Netherlands. That is why, instead of the

word “*disbud*” we see the word “*geplozen*”. (Belous 2016.) Therefore, the usage of terms included into import documents avoids misunderstandings among parties involved into the distribution. Additionally, it gives an opportunity to accelerate the dispatch of new goods and enter them quickly into the stock database. (Khmelnitsky 2016.)

Nevertheless, despite the boost in the process of dispatching, the involvement of Latin terminology and Dutch abbreviations develops troubles and delays at the level of sales. Several Russian names for flowers’ genuses differ from commonly known terms used. For example, “*dahlia*” in Russian is “*георгин*” (“*georgin*”). These Russian names are mostly used among private customers, retailers and wholesalers. As it was mentioned by Mrs. Tatyana Gukasova (2016a; 2016b), the new WMS, which is computerized, seems to be more complicated in terms of goods tracking. Due to the fact, that the database contains official shortened forms and terminology, while publicly used names are different, the overall process becomes more confusing. This issue is not relevant to managers of the Roses Division because variety names remain the same in all languages. However, it is very critical for other sales departments. It is necessary for managers to not only write bills and consignments using these untypical for Russia terms, but employees should additionally know the terminology by heart. Nevertheless, it is quite difficult to force the staff to learn these terms, as the assortment is counted in thousands of species in total. On the other hand, the usage of directories to transfer titles each time, when an invoice is written, is not a solution. Searching in catalogues takes a lot of time and develops into long delays in sales to be accomplished.

More than that, the survey, conducted to evaluate customers’ satisfaction regarding goods and accompanying services, such as frequency of purchases, order fulfillment and lead-time provided by the distributor, is an evidence of the established theory, that the new WMS has developed inconveniences not only for employees, but also for clients. Table 5 observes respondents according to their frequency of purchase and their attention to the billing process. It helps to differentiate clients and recognize, whose opinion concerning delays is the most relevant due to regular acquisitions.

TABLE 5. Correlation of Purchasing frequency And Customers' Satisfaction with Serving Time (%) (adopted from OOO "Million Roses" Survey 2016)

	How often do you purchase? (times/week)				Total
	Less than once	1-2 times	3-4 times	More than 4 times	
Has the process of serving become longer?	(n=4)	(n=16)	(n=29)	(n=11)	(n=60)
Did not pay attention	50,0	6,3	3,4	0,0	6,7
The same as previously	25,0	50,0	24,1	45,5	35,0
Has become a little bit longer	25,0	31,3	48,3	36,4	40,0
Has become significantly longer	0,0	12,5	24,1	18,2	18,3
Total	100	100	100	100	100

Approximately 93% of respondents purchase at the company at least once a week. This is the most relevant group of clients, whose opinion is the most important (further referred as "*frequent clients*"). In addition, out of those 7% of rarely purchasing customers (further referred as "*rare clients*"), 50% are also those, who do not pay attention to the lead-time. According to the total data, 18,3% of customers have noticed a significant increase in serving time. Due to the fact that 0% of rare clients have chosen the option "*has become significantly longer*" in the survey, it can be stated that these 18,3% are frequent clients, who are the most important ones. Moreover, taking into the account those respondents, who have noticed the longer billing process (*marked red*), it is possible to conclude that more than 58% of survey participants are dissatisfied with delays.

In practice, this confusion in names and terms in the database forces sales managers to return to the old model. They write an invoice manually to expedite the billing process and to let the customer go quickly. After that, they return to entering the sales data into the database of the WMS. "Such and extended process of data tracking leads to an outdated database. Some of the invoices are not entered by the end of the day. Therefore, they are left for the next work day and so on."(Gukasova 2016b.) As a result, at some certain moment none of the employees can get an on-line access to the updated stock database. It leads to constant inspections at the coolstore itself to determine the exact stock level and the assortment left until the whole database is properly updated again. This issue is one of the most problematic ones as, on the one hand, re-writing the whole database into the most familiar for sales managers terms

might improve the situation and increase the speed of billing. Nevertheless, meanwhile, it might slow down the process of dispatching, for the reason that logistics and purchasing managers will have to transfer abbreviations and terms into required forms. This dilemma should be solved with minimal losses for all involved departments because eventually it influences on the overall process of operations.

### 5.3.2 Information exchange problems

The issue that catches most of the company's attention at the moment is the high level of the spoiled goods in the storage. The problem is that the stock level becomes replenished before it reaches the re-order point due to the disinformation of sales and purchasing departments. In other words, the tracking of inventories in stock illustrates the necessity of placing the new order, while in reality some of the items are still placed at the refrigerating room. One of the reasons that cause such a lack of information concerning the stock level is the complexity in usage of the new WMS.

Nevertheless, complicated software is not the only problem that causes such troubles in inventory management. Two out of three branches of the company (excl. subsidiaries) have close places of allocation. However, they have isolated warehouse stock maintenance. In other words, stocks of two branches are independently operating and differentiated from each other. Both of them have their own inventory tracking processes and do not interact mutually. Such a non-communication between two parties of the same company forces each branch to place separate orders to suppliers. This factor leads to sovereign purchase volumes and increases related costs for each branch, as they need to maintain the stock above the buffer level and keep the wide assortment of items offered only by themselves. Moreover, expenses, caused by losses due to the spoilage of items, would not accrue in some certain cases if there was an interaction and exchange of products among parties of the same firm.

### 5.3.3 Sales strategy imperfection

Due to the fact that flowers are products that have a short storage time and spoil quickly, most clients dispatch their packed orders at the warehouse to conform the order to goods provided and check the quality of items. On the one hand, it avoids the possibility of unexpected returns after the client dispatches his order after the delivery to the store. On the other hand, this is the third criteria that has a large influence on the volume of spoiled goods in stock.

Usually, each variety is distributed and sold in sheaves of 20 or 25 flowers per pack. This package is called "a bunch". There is no doubt that each retailer wants to receive

the freshest flowers from the last distribution. For this reason, they might change the bunch, which was placed into the box, with another one of the same category, but left in the fridge as it was supplied later than the given one. Sometimes this situation may lead to an ultimate condition: the customer either wants to take the bunch of the last supply or does not want to take any at all. In considerable cases, the company has to compromise with such clients, as they are important retailers with a wide chain of stores and their purchases from the company are always in a large volume. From time to time, it is possible to sell the rest of items from the previous supply in smaller amounts to private customers. However, ultimate rejections lead to some products to be left at the warehouse until their storage period ends and they spoil.

Summing up the problem described above and relevant obstacles, in order to decrease the level of product spoilages and cancellations, the company needs to reconsider its sales strategy and the order of items provision. Possible adjustments and improvements regarding this issue are furtherly established.

#### 5.3.4 Impact on the Purchasing Performance

As the section 3.3 describes, purchasing process and the overall purchasing performance can be examined according to two core aspects: effectiveness and efficiency. Effectiveness refers to a correct purchasing functioning. In other words, it is evaluated according to three key areas: price/costs, product/quality and logistics. Meanwhile, efficiency is observed in terms of organizational operations. Thus, purchasing performance assessment evaluates operations of the purchasing department, which plays a significant role in firm's activities especially if company's operations are connected with distribution and sales of goods with a high level of damage and spoilage. (Van Weele 2010, 306-308.) A small reduction in logistics services or inventory costs may have a significant influence on company's performance, its competitiveness and purchasing development, which is defined as "the level of professionalism in purchasing functioning" (Rozemeijer, van Weele, Weggman 2003, 7; van Poucke, van Weele, Matthyssens 2014; Murray 2016b). These factors are principally important for the flower industry in Russia, where the level of the competition in the market is very high.

The model of purchasing performance assessment and five dimensions of the measurement in particular are used as a core of the questionnaire, which was responded by the purchasing department of OOO "Million Roses". The survey reflects the self-evaluation of purchasing department's operations and gives an overview on strengths and weaknesses of the purchasing processes with the focus on the last year. Average results of the mentioned questionnaire are presented below (table 6). Topics



that scored 4-5 point according to the scale are considered to be in a good condition. The lower scored aspects of each dimension are marked red within the table. In addition to this data, a part from the customer's satisfaction survey is also added. It has the same structure and scores of evaluation as the purchasing department's questionnaire. A necessity to adjust this part to the purchasing performance assessment is justified by a motivation to acquire more objective and detailed results regarding the efficiency of purchases:

TABLE 6. OOO "Million Roses" Purchasing Performance Assessment

Dimension	Criteria	Scale	Score
	<i>Effectiveness</i>		
Price/Cost	Budget	Best=5 Worst=1	3
	Price fluctuation control	Best=5 Worst=1	2
	Costs reduction	Best=5 Worst=1	3
	<i>Dimension average</i>		2,6
Product/Quality	Average rate of rejected/written-off items supplied	Lowest=5 Highest=1	4
	Average rate of discounted items supplied	Lowest=5 Highest=1	3
	Average rate of assortment range fulfillment	Highest=5 Lowest=1	5
	<i>Dimension average</i>		4
Logistics	Delivery punctuality	Best=5 Worst=1	3
	Average rate of goods damaged during delivery	Lowest=5 Highest=1	4
	Inventory turnover	Highest=5 Lowest=1	4

		<i>Dimension average</i>	3,6
<b><i>Efficiency</i></b>			
Organization	Staff	Best=5 Worst=1	4
	Management	Best=5 Worst=1	4
	IT & WMS	Best=5 Worst=1	3
		<i>Dimension average</i>	3,6
Customers' satisfaction	Number of quality complains to suppliers from final customers	Lowest=5 Highest=1	4
	Average rate of rejected/written-off items supplied	Lowest=5 Highest=1	4
	Average rate of discounted items supplies	Lowest=5 Highest=1	3
	Average rate of assortment range fulfillment	Highest=5 Lowest=1	5
	Servicing time frames	Best=5 Worst=1	2
		<i>Dimension average</i>	3,6
<b>Total</b>		85	<b>60</b>

According to results of the examination, OOO "Million Roses" has obtained 60 points out of 85, what is 70,6%. This result can be considered as a good one. However, several cases of the purchasing process require reconsideration and further development.

Such a low score in "Price/Cost" (2,6 points), first of all, is defined by a low result in "Price fluctuation control". However, the rate of only two points acquired in this aspect is justified by the current economic situation in Russia. Due to lately constant fluctuations in currency exchange rates, decrease and weakness of ruble (*in comparison with currency exchange rates of 2013 - 1€≈43RUR; 1\$≈32RUR*), the price per item of

inventories supplied from countries of the European Union and South America shifts accordingly as well. Therefore, purchasing price and costs of the same product may vary from a purchase to a purchase independently from the company's internal condition. This aspect usually leads to deviations in selling price to compensate the currency conversion.

In terms of the "Product/Quality" dimension, the company demonstrates significantly good results. The amount of products, which are sold at a discount due to a partial loss in quality, is at the medium level and is not critical.

An examination regarding logistics processes of the firm also represents stable and positive results. Nevertheless, a transporting company that delivers inventories from the supplier/producer to OOO "Million Roses" cannot be characterized as an undoubtedly reliable one due to frequent delays in delivery. For the reason that flowers and plants are products with a high level of damage and a short expiration period, the process of transportation should be accomplished as quickly as it is possible. (Khmelnitsky 2016.) That is why, the firm needs to reconsider terms of delivery with the carrier company and possibly find alternative ways of transportation.

The weakest criteria within the organizational efficiency is the aspect of information technology and warehouse management system. Sections 5.3.1 and 5.3.2 have these issues observed more specifically and accurately. Therefore, despite that the WMS is mostly adopted to the purchasing department, the company still has complains and troubles regarding communication among branches and automatized system of inventories tracking.

Finally, the problem of customers' satisfaction is an essential concern for the organization, which is customers oriented. It means that dissatisfaction and claims from retail clients regarding purchase proceeding, dispatching or billing might be crucial (see *section 5.3.1*). If the process of the goods receive is too long, clients may reconsider the possibility of purchases at this particular organization and leave to a competitor, who has the higher speed of proceeding. Hence, the company needs to undertake several measures, which are directed for further improvements of this obstacle.

Concluding factors mentioned above, weaker components of purchasing process are closely connected with the current WMS imperfection, which is caused by several non-accurate strategies in inventory and purchasing management.

## 6 PERFORMANCE IMPROVEMENTS

According to issues mentioned in the chapter 5, several improvements to the current situation of the company are provided. The new policy established is based on the theoretical knowledge of warehouse management systems for the inventory management optimization, inventory management common strategies and purchasing process assessment. Further, these adjustments are presented for a consideration and evaluation by the management of the company.

### 6.1 Price Fluctuation Control

Surveys conducted with the company's staff and customers are used as the basis of the evaluation established in the previous chapter. The current purchasing practice obtained the low score in the performance assessment. It refers to "*Price fluctuation control*". This is the issue, which effects on customers' satisfaction level in terms of the Price/Quality combination and services provided by the company. Thus, to increase the effectiveness, which further influences on efficiency and customer's satisfaction in particular, the organization needs to define alternate approaches of maintenance, adaption or control of appealing circumstances.

The general reason of occasional flowers' price fluctuations is the season. Additionally, there are other several factors that may have a significant impact on products' prices, such as supply and demand situations, quality, grading and etc. (Lakshman, Pathak & Rao 2015, 286.)

When it comes to the Russian market, price fluctuations are mostly caused by shifts of the currency exchange rates. To increase the level of the price control, several modification in purchasing system can be adjusted.

First of all, several plants such as roses, chrysanthemums and dianthus are widely produced in Russia as well. Supply from domestic greenhouses helps to avoid currency exchange rates and mostly focuses on appropriate logistics chain. Additionally, several countries, which are closely located to Russia, apparently generate lower transportation costs in a comparison with the EU or South America. One of the examples is Armenia. The country rapidly expands its domestic flower plantations and exports to Russia. Such a close allocation of the country significantly decreases the purchasing price. However, it should be noted that the quality of Armenian items is relatively lower than the same products' of the EU. Thus, this strategy of the price control can be implied in smaller purchased volumes or urgent situations.

Another approach that helps to control prices is widely known flower auctions in the Netherlands. Currently the company accomplishes purchases on auctions platforms. Nevertheless, when the currency rate is unstable, this is the most effective way to maintain the price in rubbles at the same level.

Unfortunately, in most of the cases, the price per item cannot be controlled as it is effected by external factors, which do not depend on the company. Thus, the firm needs to adopt to the situation. However, most of the retailers, who have a long experience in the industry, know the specification of the field. To compensate such fluctuations, the company may establish a discount policy for larger volume retailers. It will lead to the higher consumption because of the larger purchase benefits as well as due to a psychological effect caused by the lower price per item.

On the other hand, the company may try to reduce total costs by establishing stronger relationship with producers. They have an opportunity to provide a beneficial pricing policy, which is flexible towards currency fluctuations. However, such method is applicable only in terms of a geographical and production concentration. Nevertheless, this idea might be not realistic due to a wide spread of producers around the world and firm's relatively small size of a business.

## 6.2 Classification and Master Data Improvements

The ABC classification conducted is dedicated to simplify the inventory management process. In this report in particular it is used to determine improvements that are necessary to be made to increase the productivity, to decrease loses caused by the goods spoilage, to establish the most effective approach of the inventories purchasing, accounting, tracking and dispatching. However, it should be mentioned that the ABC-analysis is only a tool to improve and to direct the process of an assortment and inventories maintenance. However, it is not a tool of assortment formation in general.

The systematization of items, which the company currently uses, seems to be sufficient in terms of their popularity among customers and generated revenues. Due to the fact that the company distributes not only cut flowers, but also pot and garden plants, the wider classification for the inventory can be established as follows (table 7):

TABLE 7. General Classification of Products of OOO "Million Roses" (LLC) (%)

<b>Class</b>	<b>Percentage of the Sales</b>	<b>Wider Product Category</b>
A	65	Cut Flowers
B	25	Pot Flowers and Plants
C	10	Garden Plants
<b>Total</b>	100	

Hence, the most important category of products, which generates the highest level of revenues, is "*Cut Flowers*" (65%). In addition, this is the division with the highest level of damage and spoilage due to the short life cycle.

Products of the C group are usually the ones with the highest price as well as with the lower percentage of consumption. For this reason, the specific type of products is always purchased only according to the JIT strategy. In other words, it is distributed only if the customer has placed the order beforehand. This strategy is principal for this category due to specificity of products. In comparison with pot plants and cut flowers, garden greenery is the category that catches the least attention of retailers in the region. Thus, an implementation of any other strategy than the JIT is impossible. Garden plants are distributed in pots as well. That is why, they can be stored for a longer time. However, storing purchased goods of this category in large quantities has a significant influence on holding costs. (Terekhin 2016a.)

The group B represents potted products. The company uses a mixed system of purchasing frequency: re-order point and JIT approaches. This strategy is dictated by the fact that these are plants and flowers with the low level of spoilage as well due to their long life cycle (*almost unlimited if terms of care are followed*). With deeper overview on the process, the re-order strategy is used on most of the products of this category. They are ordered in smaller amounts such as 5-7 pots of each variety per order. Such methods provide a wider assortment with the less holding costs per each variety item. On the other hand, the JIT approach is used in terms of exotic pot plants, which have the lower level of popularity among customers due to their specificity and, usually,

higher price per item. Thus, these products are distributed only according to placed orders as well as garden plants.

For the established reasons, these two classes of products (*B and C*) are excluded from the further consideration as they do not require any practical adjustments or changes in the current process of inventory and purchasing management.

### Cut Flowers ABC-analysis & Classification

A detailed analysis, based on yearly sales volumes has defined a standard classification of items in the “Cut Flowers” category. Due to the fact that the assortment of cut flowers is counted in thousands of items, the ABC classification requires to be done in a more detailed way and standard items should be sub-classified (figure 3). Thus, the highest level of attention in policy improvements is applied to frequently purchased products. These are the ones distributed periodically but according to different conditions (*category A*). Categories B and C include products that are rarely and/or almost never purchased with 16% and 4% of sales contribution accordingly. However, these items are included in the total company’s assortment.

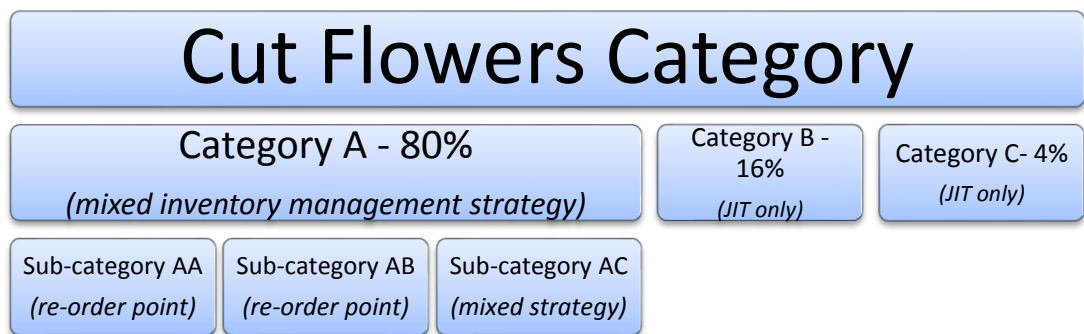


FIGURE 3. Suggested Classification of Items in the Category of “Cut Flowers”

Hence, this report observes the A-category of cut flowers and its sub-classes in particular. These products generate the highest revenues and require the strictest attention in terms of inventory and purchasing processes. The sub-classification was shortened and adopted for the readability and clearness. It is based on the data of the last two years. In this report, it gives a differentiation example and justifies the furtherly

established inventory and purchasing strategies. However, to provide the confidentiality of company's financial processes, exact figures in currency were illuminated. Thus, the results are represented only in percentage shares. The company provided the total turnover data and the sales volume information.

Along these lines, to organize the appropriate classification, it is important to calculate a total cumulative value per each product. This calculation will help to determine products that generate first 50% of the revenue, then the next 30% of the "middle class" and, finally, last 20% - items that bring the less revenue and have the lowest usage volume (Khmelnitsky 2016). Therefore, it is dedicated by adjusting the usage value parameter to the sum of previous values. The first product position does not have the previous one. Thus, its cumulative value is equal to the usage value itself. On the other hand, a cumulative value of the last item equals to 100%, as all usage value results are summed. (Lean Manufacturing 2016.)

The next step is to determine the amount of groups in sub-classification as well as class borders, according to which product groups will be formed. According to the cumulative value, group's limits are defined and products are allocated into sub-classes (A, B or C) of the ABC-analysis matrix. Finally, these sub-classes are adjusted to the classification of the total assortment of the company. Results of this investigation and differentiation are presented in the table 8:



TABLE 8. Brief Sub-classification of Items in the A-Category of “Cut Flowers” (%)

Product	Value		Cumulative value	Sub-class	Full Classification
Rose	13,78		13,78	A	AA
Chrysanthemum	11,84	50%	25,62	A	AA
Lily	9,37		34,99	A	AA
Dianthus	9,01		44	A	AA
Gerbera	6,71		50,71	B	AB
Orchid	6,54	30%	57,25	B	AB
Tulip	6,36		63,61	B	AB
Iris	5,12		68,73	B	AB
Ruskus	4,95		73,68	B	AB
Gypsophila	4,77		78,45	B	AB
Fern	4,59		83,04	C	AC
Monstera	4,59	20%	87,63	C	AC
Freesia	4,42		92,05	C	AC
Eustoma	4,06		96,11	C	AC
Strelitzia	3,89		100	C	AC
<b>Total</b>	100		100		

### Purchase Management Strategy

The mixture of two purchasing practices arranged within the same category of products is the most effective one because it takes the specification, sales contribution and holding costs into a consideration. For this reason, this approach should be implemented on the A-category (“Cut Flowers”) as well. However, it needs to be applied with a regard to values and specifics of items respectively. Depending on the class of items, different approaches of purchasing management as well as inventory accounting can be adjusted.

Thus, according to each sub-class of products, different purchase management strategies should be applied. Due to the fact that products of AA-classification are the ones that generate the highest level of revenues, the stock level of these items should always be maintained at the appropriate and accessible level. In other words, these goods should be controlled more frequently according to different criterions. Currently,

the company uses the equal policy of purchase management to all items of the A-category of “*Cut Flowers*”. It means the bi-weekly delivery with one-week supply. The company purchases 49520 cut flowers items per supply (around 99040 items per week). The average daily usage is calculated approximately to 5000 items per day and the maximum average usage per day is 6000 items. Maximum lead-time according to logistics delays is around 10 day. However, it is necessary to notice, that this calculation refers to typical workdays (not state holidays and etc.) and assumes the consistency of the demand. As a result, according to the current data, the ROP can be calculated as follows:

$$ROP = (5000 \times 7) + ((6000 \times 10) - (5000 \times 7)) = 60000 \quad (4).$$

It means that when the amount of goods in the stock reaches 60000 items in total, the company places a new purchasing order. However, this strategy does not differentiate items according their consumption value, and the purchase is established with the reference to the general scheme of purchases.

This policy generates unnecessary frequent supply of items AB and AC, which become obsolete within a certain time. According to a distribution of the ABC-classification and the Pareto principle, only 10% of total items generate these 50% of the total consumption value (Collignon & Vermorel 2012). The table 9 represents the ABC distribution for the case company:

TABLE 9. Distribution of ABC class (%) (based on Collignon & Vermorel 2012)

Class	No of Items	Total Consumption value
AA	10	50
AB	30	30
AC	60	20
<b>Total</b>	100	100

Due to the fact, that flowers are goods with a high holding costs and a high level of spoilage, the extension in unnecessary volume in goods that are problematic, may have a significant impact on company's expenses. For this reason, it is highly recommended to apply a weighted purchasing policy, which is based on the re-order point and delivery terms modifications.

Firstly, products of the AA-category are purchased bi-weekly with a 4 days re-order point. This organizes the frequent replenishment of goods, what means that the most valuable items that generate the highest level of sales will be constantly renewed. Thus, customers will always receive the freshest products. Secondly, products of the category AB have a weekly delivery with a one week re-order point. Finally, the AC-category is purchased monthly with the re-order of 2 weeks supply.

To provide a general overview on the significant changes in supply and inventory volumes, table 10 was established with the reference to the method suggested by Collignon & Vermorel (2012) and supported by Oxford Brooks University (2016). Nevertheless, it should be noted, that this table assumes the constant volume of each item purchased as well as accuracy in delivery. Additionally, it is necessary to mention, that this table is based on tables 8 and 9. Thus, the assortment list is not full. This observation is dedicated to present the core idea of the offered strategy.

TABLE 10. Comparison of the Current and Offered Purchasing Policies

Class	No of items	Value (%)	Current strategy		Offered Strategy	
			No of items /month	Average supply level	No of items /month	Average supply level
AA	4960	50	39680	1,5 weeks	39680	0,5 weeks ↓
AB	14800	30	118400	1,5 weeks	59200 ↓	1,5 weeks
AC	29760	20	238080	1,5 weeks	29760 ↓	2,5 weeks ↑
Total	49520	100	396160	1,5	128640 ↓	1,2 ↓

Hence, the comparison demonstrates that the offered strategy reduces the inventory value by 20% of the total average. Moreover, the frequency of organized deliveries decreases by 68%. Nevertheless, it is worth mentioning that the inventory value decreases not on account of the AA-items, which are the most popular and profitable ones, but with the help of the AB and AC classes reduction. Moreover, the observation of particular figures of sub-classes demonstrates an obvious reduction in the delivery frequency of the AC-category. This helps to reduce the amount of human resources required. However, it is necessary to pay attention to the AA-class. Due to a decrease in the safety stock from 1,5 weeks to only a half of the week, proceeding with these items demands the highest level of control and maintenance. On the other hand, it provides a flexibility in order placements and shortens the lead-time. (Oxford Brooks University 2016.)

In addition to the above-mentioned purchasing policy, the JIT management applied to AC-products might be used as an alternative. In other words, goods that have the lower level of popularity among customers in this group might be purchased only according to the order placed by a consumer. On the one hand, it reduces unnecessary holding costs, as these goods are provided and distributed only when they are required. Thus, the necessity of holding these items at the warehouse and constant maintenance of the stock level expires.

On the other hand, this strategy decreases the assortment variety in stock that can be provided for a “free sale”. Thus, for items AC, it is recommended to maintain a mixed strategy of the re-order point and the JIT according to the level and the frequency of purchases, items popularity among customers and the statistical data of spoilage.

### 6.3 WMS Interface Adjustments

Interviews, which were conducted with the help of several managers as well as with the CCO, demonstrate that the current WMS is the most important problem that alarms the company due to its current expansion. The complexity of the database system influences on all the spheres of operations and on the sales processes in particular. Customers have a high level of dissatisfaction regarding related delays in billing procedures. Thus, the problem of WMS imperfection is considered as the essential one and is the one to be solved as soon as possible.

After the observation and examination of the sales processes and the database maintenance, two alternatives concerning possible improvements of the situation were established.

### 6.3.1 Human resources expansion

During the personal interview, Mrs. Tatyana Gukasova (2016b) identified the core problem regarding the WMS that the sales department is facing at the moment. The survey conducted among customers have proved that sales managers waste a lot of time on the billing process and the data entry in particular.

Thus, as an immediate solution, an expansion of the personnel might be applied. The company needs to hire two more employees, whose direct duty will be to enter the data into the WMS' database.

#### **Advantages**

This alternative requires sales managers to return to their habitual manual receipt process. Handwritten bills are directed to employees, who adjust them into the system. Thus, the above-mentioned delays are avoided. Moreover, this method does not require the already hired personnel to train regarding the database usage. The new hired personnel with the specific qualification and knowledge adds all the necessary entries.

#### **Disadvantages**

New personnel obviously increases company's expenses on human resources and work placements. Secondly, due to a preliminary manual billing and then the data entry into the database, the problem of repeated actions appears. In other words, different employees need to re-write the same document several times. Such procedure seems unnecessary and non-effective in terms of HR usage.

### 6.3.2 Bar-coding alternative

Another option of the WMS adaptation that can be considered as a solution is an introduction of bar-codes. As it was mentioned previously, the WMS that the company uses is "1C-Logistics". This software supports the usage of bar-codes and radio-terminals, which significantly simplify the process of inventory and warehouse management.

#### **Advantages**

Bar-codes significantly increase the speed of the billing process. On average, the process of the ordinary bill tracking does not take more than a couple of minutes. More than that, the problem of terminological differences is avoided due to the automatized data entry. Additionally, this tool helps the company to reach the goal that it is currently

seeking: management of the database on-line. This opportunity of the real-time maintenance solves also the problem of the stock data exchange between branches.

### **Disadvantages**

Establishment of the bar-codes system requires a high level of initial investments. There are thousands of items varieties in the assortment. Hence, the provision of a bar-code to each variety is expensive in terms of the time value. Furthermore, equipment, such as bar-code scanners, radio-terminals and etc. are not delivered with the software. Thus, additional expenses for these tools and their installation are expected.

#### 6.3.3 Alternatives comparison

Comparing two alternatives offered it is possible to conclude that the first alternative has an immediate influence on the process and is less expensive in the short-term run. However, it does not develop the warehouse management process of the company. Moreover, in the long-term usage it establishes constant additional expenses on human recourses. On the other hand, the second approach requires more immediate expenses to be covered. In addition to this, introduction of the bar-codes reading system takes more time. As a result, the company spends more time on a preparatory stage and has relatively high initial investments. However, an increase in long-term productivity, effectiveness and efficiency is significant. For this reason, the second alternative is considered justified and comprehended.

#### 6.4 Stock Management Improvement

As the management of the company mentioned, one of the most important issues of the company's stock maintenance is the high level of spoilage problems. In some certain cases, these problems are caused by an opportunity of an immediate dispatch of the order provided to the client. Due to the fact that the consumer has the right to always chose among bunches of the same product, several bunches remain to stay in stock. Usually, such problem occurs with the safety stock against just supplied goods. The customer, who has placed the order by the day of supply, wants to obtain the products, which are just delivered, not the ones from the safety stock.

Thus, based on the ABC-analysis presented in the chapter 6.2, it is recommended to apply strict policies of stock management, such as FIFO, FEFO. Nevertheless, it does not mean that this strategy applies to the inventory accounting as well. It is necessary in terms of the warehouse maintenance.

First of all, products of the AA-category are the ones that get to be replenished faster than any other ones. For this reason, it is highly recommended to apply a FIFO approach. According to it, the goods that are provided and placed to the warehouse the first, should be dispatched and sold out the first as well (Arline 2015). Such policy avoids the customer's opportunity to switch bunches among supplies.

Secondly, for items AB and AC, it is advised to implement the FEFO method of the stock management. Therefore, those goods that were supplied the first, and are the first to be expired, should be delivered to the retailer. This method prevents items, which are specific and are the least popular among clients, to be left in stock. Additionally, it excludes occasions due to which the stock is replenished before reaching the re-order level. (Management Mania 2016.) Moreover, the method of BBD (*Best-Before Date*), which is widely used in the food and nutrition industry, can also be applied (Eat by Date 2016). However, plants do not have the exact date of a better usage. Thus, an expiry date prediction is problematic.

Currently the company does not follow any of the above-mentioned methods strictly. Thus, the approach applied to each situation is flexible and, in several cases, is based on the client's volume and importance. However, such strategy is not applicable with such products as flowers and the company has already faced with the troubles of the warehouse and inventory management. That is why, several changes in practices may significantly decrease the level of written-off products and related expenses.

## 6.5 Communication Improvement

Methods that are mentioned in previous sections may have a significant influence on firm's operations in terms of inventory management and losses reduction. However, there is no doubt, that none of the policies works if communication among personnel members and organization's branches is restricted.

In other words, parties of the same company should support each other during the process of sales and purchases and work as a mutual buffer in case of several items expiration in one of the stocks. Thus, joint and opened system of inventory control will help to prevent, for example, customers' dissatisfaction due to the lack of several goods in stock in one of the branches. Additionally, such policy of a cooperation reduces expenses occurred due to the goods spoilage, as the purchased volume of several items can be decreased according to the general volume, which is going to be provided to both parties in total.

Summarizing this idea, the problem of communication and information distribution between branches can be solved with the unification of separated WMS databases.



## 7 SUMMARY & CONCLUSION

Summarizing the core ideas mentioned in this thesis, it concentrates on warehouse management systems as a tool of the inventory management optimization. Approaches defined during the research are useful as they determine techniques that provide either immediate corrections or improvements of the existing scheme of operations that can be recommended through in-depth investigation of the core issues mentioned and may have a significant influence on company's activities in the future.

The most valuable contribution is a consideration of a phenomenon of a tight relationship among the WMS and other fields of an enterprise's operations. The influence of the WMS on all spheres of organization's business processes is consequential. Since the core duties of the WMS are to control, track and optimize the inventory management, purchasing management and logistics system in an automatized manner, sales managers are responsible for keeping sales records entered in the database to insure the correct and up-to-date information. Therefore, this information outlines further purchasing decisions made by the purchasing department according to the current inventory analysis provided by the WMS. Hence, if a small business decides to launch a WMS as a replacement of the manual inventory management procedure, the company should pay a high level of attention to procedures of the software introduction and preparatory stage. It is necessary to evaluate a necessity in complimentary tools or in human resource expansion for an accurate database servicing. However, the study proves that the detailed investigation of the WMS approach and actions accomplished according to duties and volumes that the WMS should cover, a prevailing situation of the inventory management imperfection disappears and the purchasing performance experience satisfaction rapidly increases.

Additionally, the study develops adjustments to the inventory classification optimization and investigation of purchasing process, its effectiveness and efficiency. These corrections have a high impact on the proceeding with the WMS and improves its effective usage. It is dedicated to establish strategies and policies to contribute into improvements of company's operations and the stock maintenance in particular. A differentiation in FEFO, FIFO, BBD warehouse and sales management policies and purchasing strategies according to delivery frequency and inventories value reduction based on deeper and definite ABC-analysis, re-order point and JIT strategy were offered. More than that, practical solutions of the WMS optimization were defined, justified and compared according to costs, long-term and short-term productivity. Finally, the customers' satisfaction survey was conducted. It gives an outline of the clients'

experience and provides an opportunity to increase the level of the offered services in the future.

An association of all the tools mentioned in this thesis enhance the level of the firm's competitiveness, promotes its effective expansion in the market and reduces expenses related with obsolete goods. These solutions and strategies are presented to the company for the further consideration and, in case of the successful accomplishment, can be implemented in the practice of the similar organization as well.

## 8 DISCUSSION

This section is dedicated to provide a reflection regarding the research and the overall working process conducted during the thesis implementation. It observes outcomes of the established investigation according to the results reliability, contribution to the case company's operations, personal and professional growth evaluation.

### **Results Reliability**

A general consideration of the established result is relatively sufficient. However, it still demonstrates uncertainties in particular cases due to assumptions, estimations and approximate calculations caused by inaccessibility of the certain data.

### ABC-Analysis

In order to create the ABC-analysis provided in this report, only certain figures and varieties of the assortment were evaluated. Due to the fact that the total merchandise per each category of items is counted in thousands of products, an in-depth and detailed classification of goods might be a subject of an individual and specific report. Furthermore, calculations of the inventory value and the supply level per single item in particular are not possible in terms of the wide range of the firm's goods collection as well. For this reason, these calculations are developed for subclasses only. Additionally, calculations of purchasing strategies are established according to the assumption that the demand and supply is constant and is not a subject of fluctuations. Moreover, it is estimated that the volume of purchases does not vary a lot as well. However, due to an uncertainty in such market variables, the report considers that the demand, selling price, purchase volume and etc. remain at the statistical average level of previous two years.

### WMS Suggestions

Advices, which are given regarding the WMS, are directed to define adjustments to the already introduced software. It may have a significant influence on proficiency, speed and effectiveness of the company's operations, selling and receipt processes in particular, with the lowered expenses. The offered alternatives give the outline of two different approaches according to several variables, such as required resources, costs, expenses and initial investments, complimentary products required, stages of implementation, duration of effectiveness. This observation provides an opportunity to consider each method of improvements and launch the most appropriate one according to the previously mentioned specifics and characteristics and the estimated budget to be spent.

## **Contribution to the Case Company**

The flower industry in Russia is one of the fields with a very high level of the competition. This complexity and width of the available assortment forces companies to conduct their own researches and investigations regarding the assortment range, classification, price and purchasing processes, inventory and warehouse management. For this reason, it is highly recommended to organize a specific research with an in-depth assortment inspection and differentiation for the future prospects. Meanwhile, the offered strategy, conceivably, will be used as a direction for actions to be implemented.

## **Personal & Professional Growth**

In terms of the personal development, the investigation conducted during the thesis implementation improved the acknowledgement of the data collection and analysis procedures. Additionally, due to an opportunity to combine the thesis project and a mandatory internship, it was possible to apply theoretical knowledge of business operations gained during studies at the university in the practical working environment. More than that, several skills, such as in-depth logistics methodology processing knowledge was obtained during the research acquisition.

Furthermore, several additional professional and personal skills were developed during the internship and thesis accomplishment. First of all, as the internship was conducted at the sales management department and in a cooperation with employees during the thesis research, the author has increased the level of the workplace communication proficiency. Secondly, skills of the qualitative and quantitative analysis and questionnaires conduction were highly developed due to the data collection. Moreover, the ICT intelligence is advanced due to the usage of Excel and 1C-software within the employment and observation processes. Finally, several tasks included communication with international producers and suppliers. Thus, not only the workplace communication skills, but also intercultural communication skills were developed. The summary of the experience obtained during the thesis project implementation concludes that despite several drawbacks and misunderstandings during the process, a provision of a sincere gratitude towards all the parties involved into the research is granted. The client company, employees and staff members, management, clients and supervising teachers of the university have provided a significant contribution and support in the investigation and assessment.

***Note: according to the Confidentiality Agreement, all the company's confidential data regarding values and exact figures in currency is intentionally excluded from this paper.***

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**Abbreviation Glossary**

<i>BBD</i>	<i>Best-Before-Day</i>
<i>EOQ</i>	<i>Economic Order Quantity</i>
<i>FEFO</i>	<i>First-expires First-out</i>
<i>FIFO</i>	<i>First-in First-out</i>
<i>JIT</i>	<i>Just-in-Time Management</i>
<i>KPI</i>	<i>Key Performance Indicator</i>
<i>LIFO</i>	<i>Last-in First-out</i>
<i>ROL</i>	<i>Re-order Level</i>
<i>ROP</i>	<i>Re-order Point</i>
<i>WMS</i>	<i>Warehouse Management System</i>
<i>ООО (rus)</i>	<i>Общество с Ограниченной Ответственностью (Russian equivalent to Limited Liability Company)</i>

## Customers Satisfaction Survey Sample (translation from Russian)

## Customer Satisfaction Survey



Dear Customer!

ООО "Million Roses" implies the maximum effort to provide goods of the highest quality. Currently we are at the stage of an expenditure and would like to know your opinion regarding the services provided. This short questionnaire is dedicated to determine your satisfaction and will not take more than a couple of minutes of your precious time.

We appreciate any comments and recommendations!

*How often do you purchase?*

- Less than once a week    1-2 times a week    3-4 times a week    More than 4 times a week

*How would you rate the quality of products?*

- Very low    Low    Neither low nor high    High    Very high

*How would you evaluate the quality of services?*

- Very low    Low    Neither low nor high    High    Very high

*Evaluate the amount of items purchased, which are furtherly sold at a discount*

- Very Low    Low    Neither low nor high    High    Very high

*Evaluate the level of the assortment range*

- Very low    Low    Neither low nor high    High    Very high

*Evaluate servicing time frames*

- Are significantly longer    Are a bit longer    The same as previously    Did not pay attention

*If you have any comments and recommendations regarding our work, please leave it here. We work for you and do our best! Thank You!*

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**Purchasing Process Assessment Survey Sample (translation from Russian)**

**PURCHASING PERFORMANCE ASSESSMENT**

For each item identified below, tick the number best fits your judgment of the criteria.  
Use the rating scale to select the quality number. ]

<i>Dimension</i>	<i>Criteria</i>	<i>Scale</i>				
<b>Effectiveness</b>						
<b>Price/Cost</b>	Budget	Worst ①	②	③	④	Best ⑤
	Price fluctuation control	Worst ①	②	③	④	Best ⑤
	Cost reduction	Worst ①	②	③	④	Best ⑤
<b>Product/Quality</b>	Average rate of rejected/written-off items supplied	Low ①	②	③	④	High ⑤
	Average rate of discounted items supplied	Low ①	②	③	④	High ⑤
	Average rate of assortment fulfillment	High ①	②	③	④	Low ⑤
<b>Logistics</b>	Delivery punctuality	Worst ①	②	③	④	Best ⑤
	Average rate of goods damaged during delivery	High ①	②	③	④	Low ⑤
	Inventory turnover	Low ①	②	③	④	High ⑤
<b>Efficiency</b>						
<b>Organization</b>	Staff	Worst ①	②	③	④	Best ⑤
	Management	Worst ①	②	③	④	Best ⑤
	IT & WMS	Worst ①	②	③	④	Best ⑤
<b>Customers' satisfaction</b>	Number of quality complaints from customers	High ①	②	③	④	Low ⑤
	Average rate of rejected products	High ①	②	③	④	Low ⑤
	Average rate of discounted items	High ①	②	③	④	Low ⑤
	Average rate of assortment fulfillment	Low ①	②	③	④	High ⑤
	Servicing time frames	Worst ①	②	③	④	Best ⑤

