

Supply Chain Optimization

Case Metropress

Supplier shortage and inventory strategy adaptation

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Bachelor's thesis

October 2019

Technology, communication and transport

Degree Programme in Logistics Engineering

Author(s) Markelov, Egor	Type of publication Bachelor's thesis	Date October 2019 Language of publication: English
	Number of pages 103	Permission for web publication: x
	Title of publication Supply Chain Optimization Case Metropress	
Degree programme Degree Programme in Logistics Engineering		
Supervisor(s) Aarresola, Eero; Pahlsten, Ville		
Assigned by Metropress LLC		
Abstract <p>Nowadays, companies strive to enhance their competitive edge on the market by means of Supply Chain Optimization. For optimization process, the Supply Chain Network is studied, identifying possible improvement opportunities for the overall business contribution. This thesis was assigned by a logistics company, Metropresss LLC. Metropress LLC is the monopolist Saint Petersburg's company, which distributes and sells goods in the metro and nearby areas. The goal of this study was to assist the host company's project in the supplier shortage and inventory strategy implementation. During the research, the author applied different research methods, including qualitative and quantitative methodologies. For the realization of those techniques, needed data was obtained by means of literature review, focus groups, interviews and observations. Gathered data was processed, allowing the researcher to support the Metropress' project realization and make valuable advices for further steps of its implementation. Supplier selection process, based on the criteria parameters, was run. In addition to that, Inventory management theme was explained. In accordance with the observed Metropress' business principles and operational capabilities, the appropriate inventory strategy plan was offered. As a result, the outcomes, made by the researcher could be used for elaboration on the next stages of the project. Supplier shortage process could be implemented, anticipating new supplier-related risks and with no disruption to the current supplier relationship. In addition, the inventory management quantitative analysis results can be used for fostering correct order size, safety stock and replenishment level parameters for each of the studied SKU according to the changed delivery terms, provided by the possible new supplier. During the next stages of the Metropress' project implementation, guideline and example on inventory-related data calculations could be used for estimation and fostering of the financial strategy in terms of the tobacco product category purchases.</p>		
Keywords/tags (subjects) Supply Chain Management; Supply Chain Integration; Procurement; Inventory Management; JIT		
Miscellaneous (Confidential information)		

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1 Introduction

1.1 Opportunities for business implementation and optimization

Business strategies adaptation and its continuous development are the cornerstones in globalized environment of today. The availability of new technologies and huge amount of data on different forms of research enable companies to develop faster, thereby increasing competition on the market. Since that, companies aim to find unique solutions to increase efficiency and profitability. These solutions are hidden across the supply chain.

Supply Chain Management is a strategical function, which coordinates activity within all business departments across the exact supply chain in order to maintain long-term efficiency of the single company and supply chain as a whole (Mentzer et al. 2001, 9-16). Whereas Supply Chain Integration process requires deep exploring of the whole Supply Chain, applying necessary tools and innovative solutions in order to achieve the success. In today's crucially competitive situation between all business industries, the ultimate advantage of the single company will be the integration of its network activities and relationships. (Bowersox 1997, 181-189.)

1.2 Short explanation of Metropress's business framework

Metropress is a distribution company, which operates on the territory of Saint Petersburg. The company's name already indicates that their business is in close connection with metro zones. Indeed, Metropress rents sales points, which are organized in a kiosk format and located in metro the space or near it. Their range of products can be divided into two categories: paper products (newspapers, magazines and etc.) and beverage/food (including cigarettes). In addition to the sales kiosks, Metropress rents a warehouse, working as a hub for all incoming and outgoing deliveries. All the transport is outsourced.

Since 2010, Metropress has worked according to Just-In-Time principles, with zero inventory level. The warehouse performs the function of a cross-docking location, where inbound products are break-bulked and sorted for further deliveries to sales

kiosks. What concerns suppliers is that most of them are in a strategic partnership with the Metropress. Suppliers deliver products seven days a week, in right time, place and in appropriate quantities, as determined by Metropress.

1.3 Metropress Case explanation

During 2018 Metropress has changed its warehouse location due to the several reasons: the new warehouse location better suits the transportation chain strategy of the company. During the fostering and implementation of the layout, it was discovered that the new warehouse had a lot more space than needed, which is why some areas were not used at all. Nevertheless, the decision for that problem was identified. Metropress decides to use the free space for stock holding. The company conducted research on possible cost-savings ways by implementing an inventory strategy within their business. After the research some opportunities were found. For example, the tobacco product category becomes the target one for the inventory strategy. There are several reasons for this (they will be discussed later in the appropriate chapter).

1.3.1 Supply Chain Matrix of Tobacco in Metropress

As it was mentioned previously, Metropress' JIT business strategy was organized by 7 daily deliveries per week with no stock to be held. All suppliers, which deliver products to Metropress, have a long-term relationship with the company and meet Metropress' delivery requirements. However, the tobacco product category is supplied by the third-tier supplier, which reduces the possibility of greater profit for Metropress. In order to get a better understanding of the problem, the supply chain matrix of the tobacco product category is visualized and explained.

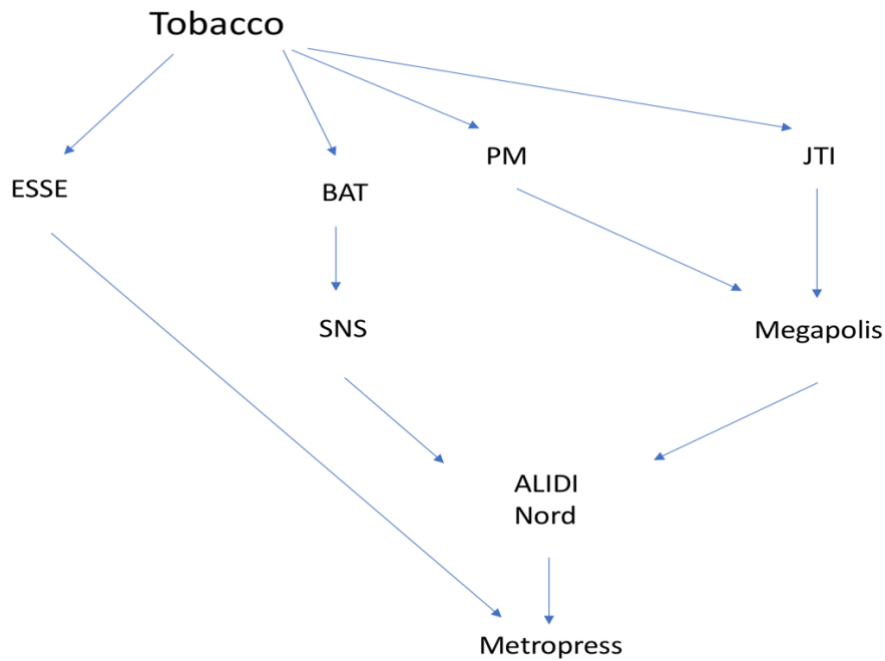


Figure 1. Supply Chain matrix of tobacco in Metropress (Markelov 2019, adapted with permission)

- ESSE and PMI (Philip Morris International) companies distribute their production within Saint-Petersburg without any intermediaries. They are also very flexible suppliers, that have met Metropress' delivery terms (7 days per week deliveries). All this enables Metropress to work directly with them.
- BAT (British American Tobacco), PM (Philip Morris) and JTI (Japan Tobacco International) do not work directly with medium size and small size companies, but work through the official distributor companies, which are SNS and Megapolis respectively.
- As they have an almost monopoly-level position in the tobacco distribution industry, SNS and Megapolis companies are not ready to accept delivery arrangements made by Metropress (7 days per week deliveries). However, Metropress' strategic supplier Alidi Nord offers their service and delivers tobacco products from SNS and Megapolis 7 days per week.
- Alidi Nord delivers tobacco with other products to Metropress.

1.3.2 Alidi Nord as a strategic supplier

Alidi Nord is one of the largest distribution companies in Russia. The company's product line includes household chemicals, personal care products, food, baby food, feed, and pet products. Today Alidi Nord has a wide distribution network, serving more than 100,000 retail outlets. Among them are large retail chains, wholesale companies, private entrepreneurs. Furthermore, Alidi Nord company is one of the leading Russian logistics operators offering its partners a full range of 3PL services: warehouse processing, safekeeping and delivery of goods. (see Alidi Nord, Saint-Petersburg, Company and Services.)

The first contracts with the Metropress were signed back in 2011. Since then, Alidi Nord has become the distributor of Wringley and Mars products. In 2014, Alidi Nord and Metropress signed the memorandum (see Appendix 1).

Nowadays, Alidi Nord and Metropress have 19 signed contracts with the amount of 150 SKU. According to the Alidi Nord presentation prepared for Metropress and presented on the 4th of June 2019, they are delivering 50 SKU in the tobacco product category. That makes tobacco contracts the most beneficial for Alidi Nord, showing the biggest numbers in both the number of pieces sold and the revenue. According to the presentation, contracts in shares show that tobacco products bring 34 percent out of the total revenue (see Appendix 2).

1.3.3 Reasons for tobacco product category inventory implementation

Laws

In 2019, the Ministry of Health implemented an anti-tobacco bill. The implementation of that project had started already in 2011. According to the project, since February, the Federation Council, headed by the President of Russia, signed and approved a radical project aimed at combating a harmful habit among the population of the country. Since that, in the Russian Federation, all tobacco products are subjected to special control (Federal Law "On the protection of the health of citizens from exposure to surrounding tobacco smoke and the consequences of tobacco consumption" of 23.02.2013 N 15-Φ3)

Tobacco distributors and sales companies face a lot of restrictions, regulated on governmental level.

According to the article 13 of the Law, "Price and tax measures aimed at reducing the demand for tobacco products", there are several things to be considered:

- In order to reduce the demand for tobacco products, measures are taken to increase excise taxes on tobacco products in accordance with Russian legislation on taxes and fees, as well as other measures of state influence on the price level of mentioned products.
- Measures of state influence on the price level of tobacco products are carried out by setting minimum retail prices for such products. The minimum retail price for tobacco products is the price below which a unit of consumer packaging (bundle) of tobacco products cannot be sold to consumers by retailers, catering, services, as well as individual entrepreneurs.
- Minimum retail prices are set at the level of seventy-five percent of the maximum retail prices, determined in the manner established by the Tax Code of the Russian Federation.

According to article 19 of the law, "Restrictions on trade of tobacco products", important points should be mentioned:

1. Retail trade in tobacco products is carried out in shops and pavilions. For the purpose of this article, a shop is a building or a part thereof, specially equipped, intended for selling goods and providing services to customers and provided with commercial, utility, administrative and household premises, as well as premises for receiving, storing goods and preparing them for sale; the pavilion refers to a building that has a sales area and is designed for one workplace or several workplaces.

That law eliminates the possibility of trade in tobacco kiosks of a certain format.

Kiosks should have a door and an inner space.

2. The retail sale of tobacco products in the following locations is prohibited:
 - in territories and premises intended for the provision of educational services, services by cultural institutions, institutions for youth affairs, services in the

field of physical culture and sports, medical, rehabilitation and sanatorium resort services, on all types of public transport (public transport) urban and commuter traffic (including on ships when passengers are transported on intracity and suburban routes), in premises occupied by state authorities, local authorities;

- at a distance of less than one hundred meters in a straight line without taking into account artificial and natural barriers from the nearest point bordering the territory intended for the provision of educational services;
- in the territories and premises (with the exception of duty-free shops) railway stations, bus stations, airports, seaports, river ports, metro stations intended for the provision of passenger transportation services, premises intended for the provision of housing services, hotel services, services for temporary accommodation and (or) provision of temporary accommodation, personal services.

(Federal Law No15-F3, 2013.)

All aforementioned laws increase the social health care level and overall public health. But for companies, who have cigarettes as a product category, these laws make it difficult to get a profit from the tobacco category, since retail prices are increased and limitations on selling conditions are applied.

Financial aspect

Alidi Nord, being the current distributor of the tobacco product category for Metropress, makes a profit as a markup in the amount of three percent of the original value of the tobacco product. That markup and aforementioned laws make tobacco products low margin for Metropress.

Warehouse space

The new Metropress warehouse area allows to stock allocation. There is enough space for implementation of a tobacco product inventory strategy.

1.4 Research objectives and questions

This thesis work goal is to solve the Metropress' company case in terms of the two problems. The first one is the Supply Chain shortage: the decision to refuse services

provided by a strategic supplier should be weighted and studied, including risk assessment and future development prospects identification. The second objective of the work is the exploration of inventory management strategies and concepts. In that part of the thesis general guidance in terms of the inventory management will be given.

Research questions:

1. How to shorten the supply chain regarding to the tobacco product category?
 - How to decide on the appropriateness of the decision on the supply chain shortage?
 - Which criteria should be considered during the supplier reduction process?
 - How can the relationship with the current supplier be maintained during the process of supply chain shortage?
2. How to carry out the inventory management regarding to the tobacco product category?
 - How to organize a gradual transition of the tobacco product category for further inventory management implementation?
 - Which inventory model is the best suitable one in the case of the host company?
 - Which inventory policy should be applied for the chosen inventory model?

1.5 Research concept

Research is the activity performed for finding solutions to various problems. Since research is a consistent process, it has some steps to be followed. There is huge amount of research techniques, but all of them are dependent on different factors such as research topic, availability of data and similar variables. (Walliman 2011, 7-8.) However, throughout the years, a basic research concept was fostered. It includes five main stages:

1. Research question elaboration
2. Definition of the research tools

3. Data gathering process
4. Data analysis process
5. Conclusion development

(Lehamn et al. 2005, 2-4.)

1.5.1 Source related data types

During the research, a huge amount of data is being used. For the quality and validity of the work, it is important to differentiate the data applied. There are two types of data, which can be used for research implementation.

Primary data is the first type. Primary data is the first-hand information, which is integrated from the initial source. It can be divided into four groups, in accordance of the gathering methods:

- Measurement or collection of statistical data by the researcher on his own. That is, all measurements should be done by the owner of the research.
- Observation or recording of the events experienced by the researcher.
- Interrogation or gaining the data by means of questionnaire conduction.
- Participation or the data gaining by researcher's own experience in this or that field. (Walliman 2011, 69-71.)

Secondary data is the next coming type of data. It can be characterized as an interpreted source of information. As for example, journals and the bigger parts of articles are the sources of the secondary data, which was reused from the initial form. It is important to acknowledge the quality of that type of data before using it within the research work. For the reliability of the research work it is necessary to use secondary data of highly reputed and qualified sources. Another alternative for avoiding irrelevant secondary data sources is a comparison process, which will allow to identify all inaccuracies and errors. (Walliman 2011, 70-71.)

1.5.2 Characteristics related data types

Today two types of research, based on their characteristics, can be highlighted. One type, which is known as quantitative research, is based on numerical figures as a core instrument for the research process. Quantitative data can be measured and explored by using numbers and statistical information. However, some research does not engage in numbers during its implementation. In such a case, qualitative data is used instead. Qualitative data is data expressed in words. (Walliman 2011, 71-73.) For a visualization of the differences between the two aforementioned data types a table such as the following can be used.

	Qualitative	Quantitative
Conceptual	Concerned with understanding human behaviour from the informant's perspective Assumes a dynamic and negotiated reality	Concerned with discovering facts about social phenomena Assumes a fixed and measurable reality
Methodological	Data are collected through participant observation and interviews Data are analysed by themes from descriptions by informants Data are reported in the language of the informant	Data are collected through measuring things Data are analysed through numerical comparisons and statistical inferences Data are reported through statistical analyses

Figure 2. Qualitative and quantitative research distinctions (adapted from Minichiello et al. 1990, 5)

1.5.3 Data gathering methods

Data gathering is the process of collecting needed information, using different sources and methods for its implementation. A proper data gathering strategy is a cornerstone of adequate research, since correct and relevant information enables acquiring research goals and resolving a research problem. The data collection process can be divided into two categories: collection of primary data and collection of secondary data. The researcher must understand this, because during primary

data gathering, the author of the research gains unique information, which is regulated by ethical norms such as objectivity, integrity, confidentiality, legality and etc. (Muhammad Sajjad Kabir 2016, 220-208.)

Interview

Interviewing is a primary data gathering method, which involves asking relevant topical questions. There are different forms of interviewing, including individual, group and face-to-face interviews. However, in a more detailed classification of interview types, interviews are subdivided into three groups: structured, semi-structured and unstructured interviews.

The unstructured interview is one of the best options for research, when the author of the work clearly understands the problem to be solved. An unstructured interview can be organized in many forms, for example, face-to-face individual / group interviews and online e-mail interviews. There are several advantages in using the unstructured interview type. First of all, an unstructured interview considers a scheduled time span to collect information from the respondent, enabling the researcher to foster a timetable. The second reason is that the author of the work, as the interviewer, prepares for the interviews in advance, having already made questions to ask and discuss. Moreover, an unstructured interview is the most efficient way to get the respondent to fully express thoughts regarding certain questions. During an unstructured interview there are no limitations on the types of questions, making topical discussion and the sharing of information easier. The unstructured interview is an extremely useful tool, giving the researcher initiative in the process and letting the respondent to focus on a particular topic. The main goal of this kind of interview is to test the preliminary concept of the problem by means of integration of the respondent's knowledge and optimization of the researcher's own thoughts regarding the topic discussed. (Muhammad Sajjad Kabir 2016, 212-214.)

Focus group

Focus group is a data gathering method, which is achieved by running a semi-structured group interview. A focus group as well as an unstructured interview should be organized in the right manner, preparing the study agenda in advance.

There are several factors to be considered before setting up the focus group. First of all, the initiator of the focus group should establish the appropriate atmosphere, where participants feel themselves comfortable and can express thoughts openly and freely. Secondly, a moderator and an observer (a person who takes notes) for the process should be chosen. There are several skills, that are needed for moderating and observing: facilitating, listening and analyzing.

On the run with the aforementioned information, the following main focus group principles should be taken into account:

- Preparation of questions and selection of the participants. The results of the focus group directly depend on the ability of the participants to take part in the process, understanding the discussed problems at stake.
- Number of focus groups. That factor depends on the research requirements. If the participants are constant, they could be mixed from one focus group to another, making information sharing more efficient.
- Number of focus group participants. According to a rule of thumb, the best number of people in a focus group is 6 to 10 persons. However, that variable will depend on the research topic and conditions that are available for the author.
- Moderator involvement level. This is a critical factor, because group dynamics is managed with the moderator's involvement strategy. The moderator is a person who encourages discussion, which is why the overall results of the focus group depend on the experience and ability of the facilitator to stimulate and support the process.
- Provide and visualize a summary after every focus group session. This is because participants need to understand the result of their work and see their contribution to group work success.

(Muhammad Sajjad Kabir 2016, 221-226.)

Sampling

Sampling is a process of suitable population selection, in order to achieve research goals. There are different forms of sampling nowadays, which vary in accordance to the research type (qualitative or quantitative). For qualitative research, the non-probability sampling form is a commonly used tool. The non-probability sampling is achieved by acquiring specific population for the research implementation. The specific population term can be explained by various types of non-probability sampling methods:

- Convenience sampling: this type of sampling is managed by inviting random people to participate in the study process. The participation is based on convenience of the location, time and respondent's willingness.
- Purposive sampling: the purpose of that non-probability sampling type is to form participation based on the pre-selected criteria. That is, research questions are relevant for participants, matching their knowledge and skills in researched field. That sampling type allows in-depth study of the problem.
- Snowball sampling or "chain referral" sampling: this sampling method is used when the population of the study is small. The researcher relies on previous respondent's experience and ask for other contacts to proceed with the study.
- Theoretical sampling.

(Lopez, Whitehead 2013, 124-127.)

Observation

Observation is a process of information gathering, which is achieved by daily participation in the environment to be discovered. There are two forms of observation: the unstructured, when the researcher has access to the studied field with no limits and schedules, and the structured, when there are special time slots for the researcher to make an observation study.

Important thing to mention about the observation method, is the researcher's role type during the process. There are four roles of the observer, which show the degree of his or her involvement. The figure is used for better comparison of roles.

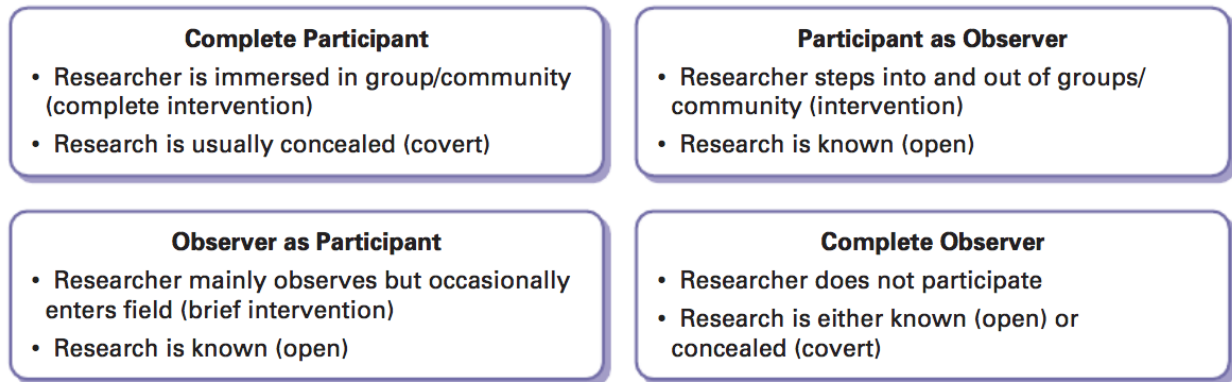


Figure 3. Different roles of the observer in observational research (adapted from Lopez, Whitehead 2013, 133)

The role factor is essential, since the results of the research depends on the amount of data gathered and adaptation of the researcher into working environment. (Lopez, Whitehead 2013, 132-135.)

Document review or historical data usage

Information gathering can be implemented by the internal or external documents about the host company of the research. Moreover, the author may request historical data from the organization of study. Those data can be limited and confidential. (Muhammad Sajjad Kabir 2016, 273-275.)

Secondary data gathering

Secondary data can be collected using different sources:

- Published printed sources
- Books
- Journals
- E-Journals
- Websites
- Government records

It is very important for the author of the research work to keep in mind the credibility factor of the secondary data information. The information should be sorted and used accordingly to the topic of the research. Sources should be trustworthy and contain up-to date information, which is relevant for overall results of the research. (Muhammad Sajjad Kabir 2016, 273-275.)

1.5.4 Data analysis methods

Flow chart

A flow chart is a graphical illustration of a process, identifying every step of it. To visualize the steps and their functions, basic flow chart symbols are used. All steps are connected with lines and arrows accordingly to their procedures.

Basic flow chart symbols:

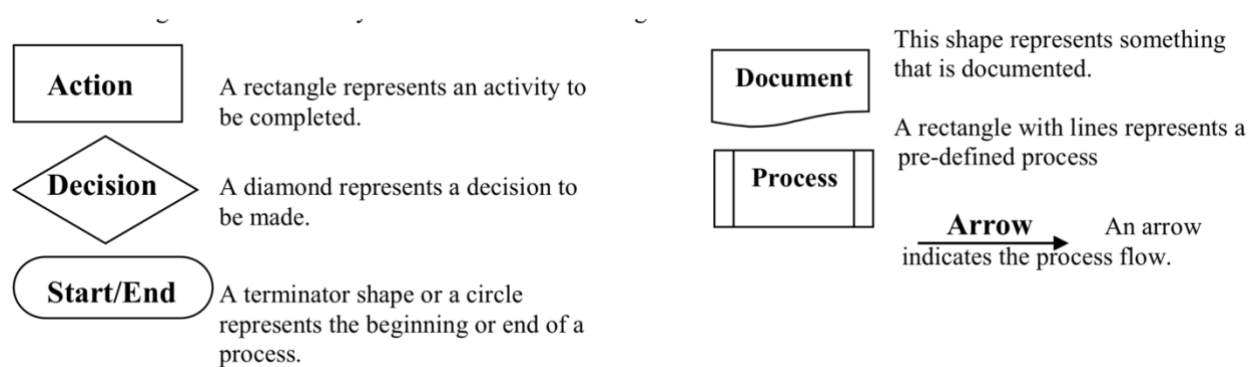


Figure 4. Flow chart symbols (adapted from Cornell University flowcharting guidelines)

Flow chart is an efficient analysis tool, which aims for the process improvement. Right process representation allows to study the interrelationships of the process's steps.

PDCA Cycle

PDCA cycle is a lean management tool, which aim is to ensure continuous improvement. The Plan, Do, Check, Act methodology was found by Br. W. Edwards Deming.

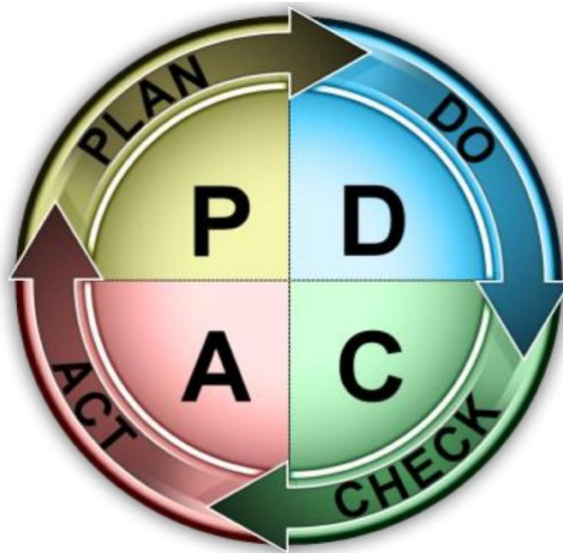


Figure 5. PDCA process (adapted from Qudos Management Pty. Ltd., 1)

This model utilization considers several steps to be followed:

Plan: establish objectives and find the ways for their achievement by means of potential cause analysis and identification of corrective actions to proceed with.

Do: apply prepared plan into practice, observe and collect data.

Check: make the analysis of the current results and compare them to initial objectives stated.

Act: standardize the process and go for further improvement possibilities.

(Sokovic, Pavletic, & Kern Pipan 2010, 477-479.)

KJ methodology

KJ methodology is a brainstorming technique, which is used for qualitative data gathering and analysis in Total Quality Control problem solving. That methodology, introduced by Kawakita Jiro, is also known as Affinity analysis. The main idea of that tool is to collect needed information and then categorized it into logical order.

That tool can be used in different forms, for example in the two-cycle version or more comprehensive six-cycle. The two-cycle version is accomplished by a problem identification and ideas for its solution generation. However, the six-cycle version

includes circumstances consideration as well as working hypotheses and solution activation.

KJ method can be utilized during focus group meetings. To implement it, several steps should be followed:

- Problem of the meeting should be defined and clear for all participants.
- Every participant has his or her own pen with the unlimited amount of paper notes available.
- Ideas of the participants are formulated on paper notes (each idea per note).
- After each question, notes are handed to moderator.
- All the notes are taken together. Information from the notes is visualized, so every participant can see it and analysis.
- Brainstorming the ideas and discuss the results.
- Save results and run the next group meetings.
- Compare the results.

(Scupin 1997, 233-237.)

CTQC diagram

Critical to Quality Criteria diagram is a Six Sigma tool, which enables the measurement solution for customer requirements and prioritization of their needs. With the help of that tool, analysis of the key output characteristics can be achieved. Fully stated needs, drivers and metrics, in terms of customer requirements, illustrate which outputs should be delivered for sustainable business performance. (Zameri et al. 2015.)

SWOT analysis

SWOT analysis is a tool, which is used by strategic planning managers in different companies. That tool allows any business to judge its performance capabilities and foster efficient organizational and competitive strategies. According to Thompson (2007, 97), "SWOT Analysis is a simple but powerful tool for sizing up an organization's resource capabilities and deficiencies, its' market opportunities, and the external threats to its' future". During implementation of the SWOT analysis, several aspects are studied: strengths, weaknesses, opportunities and threats.

However, there are two dimensions in analysis concept, enabling to capture all factors, whether it is external or internal one. To visualize the concept of analysis, figure is used.

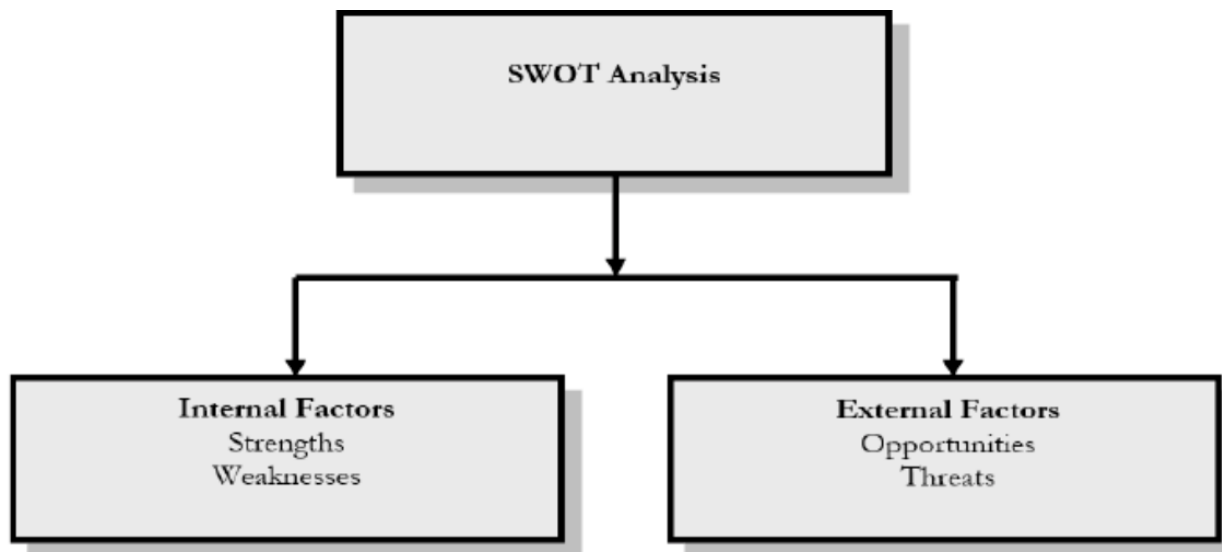


Figure 6. SWOT Analysis (adapted from Gurel, Tat 2017, 995)

With the help of that structure of the analysis process, it is possible to figure out both conditions of the current business environment as well as outside factors, which have an effect on the company's performance. By identifying of strengths, weaknesses, opportunities and threats, organization can easily match the business's resources and capabilities and achieve competitive advantages. (Gurel, Tat 2017, 994-999.)

2 Supply Chain Management

Nowadays most companies try to foster the material flow within the supply chain based on three up-to-date themes, which are Integration, Leanness and Agility. However, each of this theme has its own practices and core objectives. Nevertheless, it is possible to create the best suitable logistics strategy, using all of aforementioned themes together. (Waters 2003, 34.)

2.1 Integration

Supply Chain Integration process requires deep exploring of the whole Supply Chain, applying necessary tools and innovative solutions in order to achieve success. In

today's crucially competitive situation among all business industries, the ultimate advantage of the single company will be the integration of its network activities and relationships (Bowersox 1997, 181-189.) According to Christopher (1996), the overall success of the Supply Chain Network depends on the ability of the participants to collaborate with each other and understand the common objectives of their activities, competing with the companies in other supply chains (47). There are several trends and forces, which drive Supply Chain Integration process and make it a necessity for any business to survive (Waters 2003, 31). They should be mentioned and analyzed for further thesis implementation.

1. Decreased number of suppliers: shortening the number of suppliers enable concentration on the best one, developing long-term commitments, making supply chain shorter and more visible (Waters 2003, 32).
2. Concentration of the ownership: that trend is common for almost every supply chain, as there are always big and small players within the same network, which should benefit from each other (Waters 2003, 32). According to Quinn and Hilmer (1994), relationships should be managed in terms of trade-off, differentiating the necessity for flexibility or the control (43-55).
3. Outsourcing: despite of the first aforementioned trend regarding tightening of alliance relationships, outsourcing is still a common tool in SCI process. Since one of the main advantage of the process is to increase the capital of the network, cost-effective solutions for third-party outsourcing can take place. Moreover, outsourcing some functions can enable concentration on core activities, which can be advantageous. (Waters 2003, 32.)
4. Technologies development: information can be utilized and shared in faster, secure and more accurate manner (Mehta 2004, 841-848).
5. Customer demand fluctuation: with the highly competitive intensity, the demand of the environment can vary significantly. The ability to react to these changes should be achieved as a common goal of the SC. (Hult, Thomas, & Ketchen 2004, 241-250.)

6. Compressed product cycle: product life cycle becomes shorter, while new product development process (NPD) cycle should be faster (National Research Council 2000, 28).

If Supply Chain Integration is achieved and supported continuously, it can respond to the changes in business environment, enhance the product life cycle, increase profitability of SC and reduce shared risks, while meeting all the requirements of final customer. However, integration process necessitates appropriate and comprehensive management skills, technology and processes used for precise identification of main functions and capabilities of the network, in order to benefit from available opportunities. (National Research Council 2000, 26.)

The supply chain integration and the interrelations of the firms within one network is a very common subject, which is discussed in different sources nowadays. Hence that, there is a wide range of various integration level concepts. In that section of the thesis, two concepts will be presented.

According to the study of Fawcett and Magnan (2002) there are four levels of integration:

- Internal cross-functional integration.
- Backward integration: the first-tier supplier integration.
- Forward integration: the customer integration.
- Full backward and forward integration: the integration all tiers of suppliers as well as all customers.

(339-361.)

Other theory, made by Harland (1999), also includes four levels of integration.

However, in his work, levels are classified according to integrated activities between participants of the supply chain:

- Internal level: implies the optimization of the functionality of all the cross-functional links within one organization.
- Dyadic level: activity linkage as a single or two-party relationship, can be achieved in both backward and forward directions.

- Chain level: that is the set of the dyadic connections, which are comprehensive functions, including all tiers suppliers and customers.
- Network level: encompasses fully integrated system of relationships.

(650-673.)

As it can be seen, both approaches identify internal and external levels of integration. Mentzer (et al. 2001, 1-25) argued that internal level should be managed continuously and implemented before the introduction of external levels. The reason for that is the necessity for the firm to create sub-optimized total network, followed by strong linkage between primary and supported activity departments. If there are some weak points in internal structure, serious problems can come up while establishing external. (Sweeney, 1999, 739-744.)

Huge contribution to development of Supply Chain Integration concepts was made by Lambert (1998): he introduced Supply Chain Structure classification method, which strengthens and clarifies integration level concept. Lambert's structure method consists of three points:

- Horizontal structure or the quantity of tiers within the network.
- Vertical structure or the quantity of suppliers and customers, referred to each tier.
- Horizontal position or the focal place of exact firm within network. For example, initial source of raw materials or nearby final customer.

(1-19.)

Nevertheless, Lambert and Cooper (2000) proposed that single organization can achieve success only with the introduction of the right management tools for internal business integration performance and further external relationship development (65).

2.2 Leanness

Lean management is a tool, which aims to get rid of all wastes or useless resources within the operational processes across the supply chain (Waters 2003, 66). More precisely, lean practices can be illustrated on the example of Toyota Corporation management, who highlighted the areas in the supply chain, which are most likely to

be suffering by wastes. Those areas are represented by Waters (2003), based on the study of Monden (1983), who had done a lot of researches in the field of the Toyota Production Systems.

- Quality or the ability to meet customer satisfaction.
- Poor service level or operational capacity: having higher or lower utilization rate of company's assets, which is needed in current conditions.
- Bad processes implementation: running cost or time-consuming processes.
- Waiting for products to be delivered, for processes to be finished.
- Movement unnecessary and expensive material flow within supply chain.
- Stock: overstock the products and costs increase.

(67.)

Indeed, Lean Management provides companies with the huge amount of benefits, for example, inventory level decrease, increased new product development process and overall product quality as well as shortage in lead time (Arkader 2001, 87-94), improved information channels within the network (Carvalho, Duarte, & Cruz-Machado 2011, 151-179). For instance, according to the study of Kiff (2000), car enterprises, who integrated Lean Management into their distribution part of the supply chain, gain profitability increase, customer loyalty, efficient backward information flow and sales forecast optimization (112-126).

According to the Hines (2004), successful adaptation of Lean management can be achieved better on external level of integration, acquiring whole supply network. However, internal level of integration can be developed with Lean Management practices implementation as well: Lean Management should be followed by every person involved in processes, that is why working environment, teamwork, skill enhancement and job-related changes should be taken into account as important things. (994.) Comm and Mathaisel (2008, 183-189) said that in case of logistics and distribution fields of business, Lean Management information and latest technologies should be used as a connection bridges for customer and supplier integration, while relationships to be managed and developed continuously.

2.3 Agility

Agile strategy is based on the idea, which main goal is to be ready to meet any customer changing demand with the highest possible service level. One of the main aspects of the agility “is the ability to tailor logistics to demands from individual customers”. (Waters 2003, 67.) Likewise, with Lean strategy, Agility has the main things to be focused on:

- Make sure customer satisfaction was met or exceeded.
- Make best possible access for final customers to the product.
- Implement logistics to meet all demand for each individual customer.
- Enable flexibility and ability to respond quickly to any changes in demand.
- Analysis the product variations and find the mutual understanding with the customer.
- Run the after-sales researches to understand the customer behavior.
- Study factors, which influence on consumption of this or that product category.
- Be in touch with your final customer, integrating him into supply chain.

(Waters 2003, 67-69.)

Agility practices can be concluded in three main supply chain channels which are procurement, service and distribution. In terms of procurement, the supply capacity as well as the inventory management are the most important things to be managed. From the perspective of service function, order fulfilment processes as well as all other value-added activities arrangements should correspond to demand function. What concerns distribution, transportation and warehousing functions should be aligned and worked interconnectedly. (Waters 2003, 63-70.)

Both Leanness and Agility strategies aim to make business and the whole supply chain performance more efficient and profitable. However, Lean strategy main goal is to lower the costs, making customer service level as a constraint, while Agile strategy is controversial. (Waters 2003, 68.)

Factor	Lean logistics	Agile logistics
Objective	Efficient operations	Flexibility to meet demands
Method	Remove all waste	Customer satisfaction
Constraint	Customer service	Cost
Rate of change	Long-term stability	Fast reaction to changing circumstances
Measures of performance	Productivity, utilisation	Lead time, service level
Work	Uniform, standardised	Variable, more local control
Control	Formal planning cycles	Less structured by empowered staff

Figure 7. Lean and Agile logistics differences (adapted from Waters 2003, 68)

3 Procurement

Nowadays, when severe competition among supply chains of different companies is a common thing, the role of the procurement in the supply chain management has become more important (National Research Council 2000, 24). Procurement is an essential link with the upstream activities, which fosters and supports supplier relations (Waters 2003, 13).

The importance of the procurement in the SCM is increasing on the run with the supply chain integration. Trends like supply chain shortage caused by web popularity increase or avoidance of long tiers suppliers, supplier reduction, core activity concentration and outsourcing, make procurement an important thing to consider in the SC integration process. (Waters 2003, 230.) Already in 2001 Warwick Business School's Operations Management Group had made the research, which goal was to figure out the main concerns in SCM field. According to the results, the largest amount of companies interested in and concerned about the Costs, showing 100%; the Integration of the Supply Chain with the 86% and the Procurement, showing 57%. (Logistics and Transport Focus 2001, 48-49.)

To show the importance of procurement for SCM integration process, figure is used:

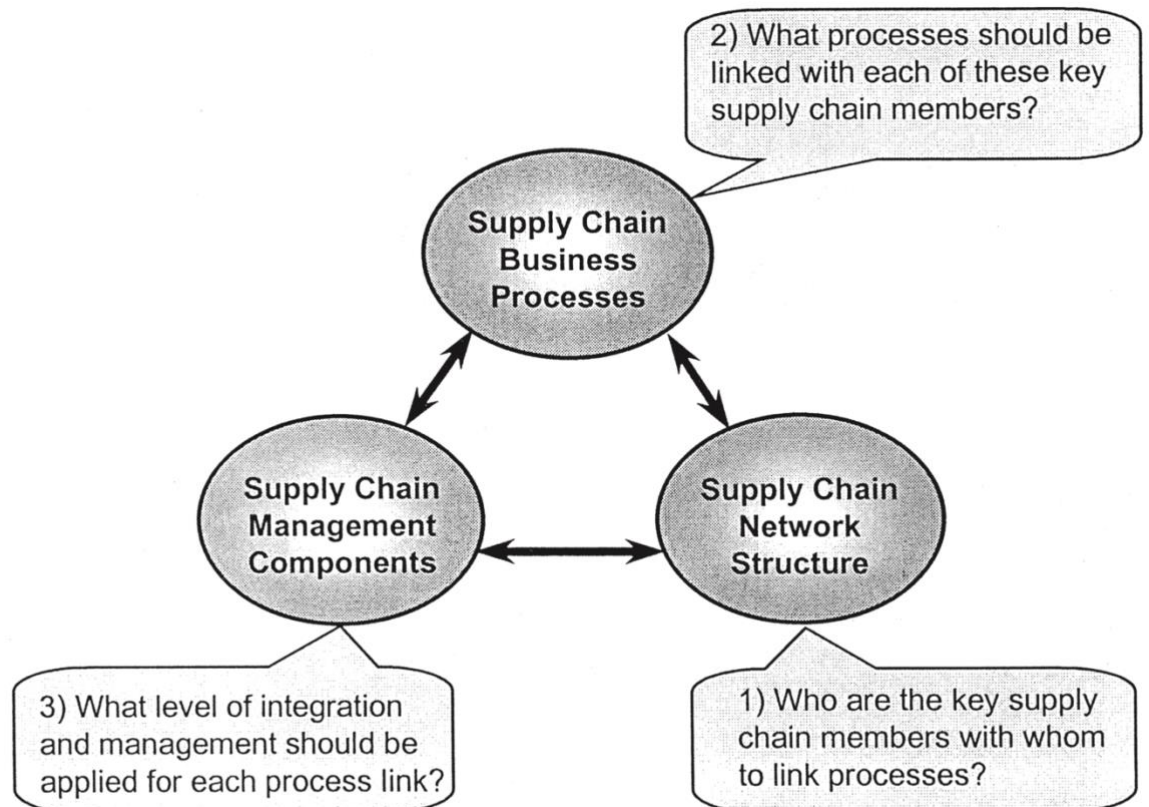


Figure 8. Supply chain management framework: elements and key decisions (adapted from Lambert, Cooper, & Pagh 1997, 7)

Indeed, with the supply chain optimization trend the role of procurement is now strategic. On the run with that, objectives of the procurement are expanded. Procurement function aims not only at cost reductions opportunities, but also at enhancement of the total lifecycle costs, by means of “value-driven orientation with external/ supplier collaboration as a key cornerstone”. That can be explained by exploring the impact of suppliers on the company’s business capabilities. Development of innovative solutions, supply security, CSR optimization, cost savings opportunities and etc., can be achieved only by sustainably and strategically oriented partnering. (Remko van Hoek 2014, 56-63.)

3.1 Procurement activities

One of the vital functions of the procurement for the supply chain integration improvement is an information flow. According to Devonshire (1996), information processing is a cornerstone for every business, because efficiency of the SC performance is interdependent on the information quality and availability. (29-31.)

Waters (2003) highlighted several main procurement activities:

- enabling efficient flow of material within the organization
- fostering user departments relationships
- supplier searching and developing the right relationships
- purchasing right materials with the needed quality, at the right place and time
- negotiating goods prices and conditions
- keeping an appropriate level of stocks, according to the inventory management strategy
- tracking and moving materials and information through the SC
- keeping abreast of conditions, including pending price increases and new products.

(231.)

3.2 Supplier integration

Every supplier, participating in the exact supply chain, should be selected at the right level of partnership. The closeness of the supplier integration at different stages of the SC will vary (Lambert, Emmelhainz, & Gardner 1996, 2-17).

In order to make the supply chain integration process efficient and beneficial for the business, network structure of the company should be stated fully, with the identification of each member. However, with the high amount of the SC participants, which can consist of several tier levels, it can be difficult. Nevertheless, critical members of the network should be sorted for implementation of the managerial attention and assets allocation, enabling long-term relationship. (Cooper et al. 1997, 67-89.)

According to Kraljic's (1983) statement: "purchasing must become supply management", he claims that supply interruptions can have very negative consequences for the entire supply chain performance and company's market stability. For that reasons, Kraljic introduced portfolio matrix, which works as a useful tool for enforcing supply strategies in case of single or group products. (109-117.) However, the portfolio matrix is not only applicable in terms of products, whilst it

allows to differentiate and classify the suppliers of the exact supply chain, in order to create right strategies for relationships and continuous development (Nellore, Soderquist 2000, 245-250). The figure represented below shows the partnering conditions types in terms of profit and supply risk variables.

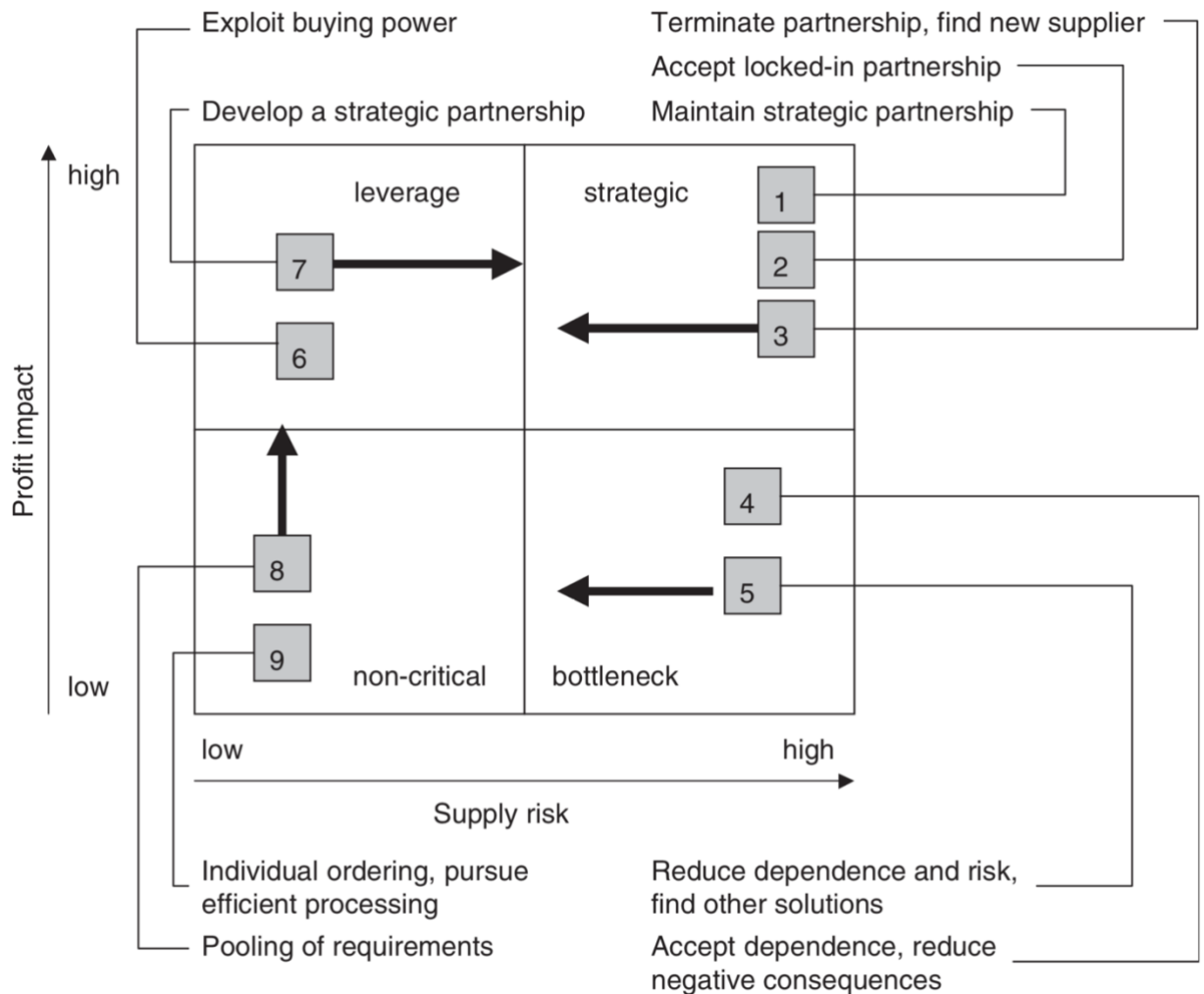


Figure 9. Overview of purchasing strategies for all portfolio quadrants (adapted from Gelderman, Van Weele 2003, 212)

3.2.1 Strategic Partnership

Going ahead, with the SCI process development companies aim to foster strategic alliances or supplier partnering. Ellram and Krause (1997, 21-26) arguing that with that kind of relationship both parties are assured that long-term business relations should be improved with the investments in continuous development, information,

risks and reward sharing, acquiring mutual benefits and enhancing competitive edge of the partnership.

Waters (2003) distinguished main features of strategic alliances:

- all levels of alliances organizations perform closely, maintaining the mutual interests
- collaborative business culture, strategy and objectives
- trustworthy and long-term relationship
- shared attitude for problem solving and planning
- accurate and detailed information exchange
- shared involvement in product development and its realization.

(45.)

3.3 Supply base optimization

When the company is looking for supply base optimization, it starts to examine the quantity and importance of each supplier within their supply chain. That is, company's management should go through all current relationships and decide, whether they should be maintained in long-term perspective or finished. All the decisions according to those questions should be fully developed and weighted.

(Monczka 2009, 316.)

3.3.1 Supplier Measurement Solution

In order to make a correct decision on this or that supplier importance, supplier measurement system needs to be fostered. The idea of the measurement system is identification of what to measure and how to evaluate different performance categories. According to Monczka (2009), performance criteria can be divided into two groups, which are objective (quantitative) and subjective (qualitative).

Objective or quantitative variables can be studied in three categories:

- Delivery performance: every order delivered by a supplier should correspond to delivery and purchase order conditions. According to those conditions, buyer aim is to receive right product quantity at right time. Indeed, delivery

performance can be measured according to ability of the supplier to meet quantity requirements and due-date delivery schedules.

- Quality performance: quality performance is hard to be measured. Nevertheless, it is one of the most important issues considering supply base optimization. In the quality performance category, for example, it is possible to assess the ability of the supplier to share information, provide shared involvement in service and product development, ability to improve continuously, minimizing the amount of damaged product deliveries and etc.
- Cost reduction: financial perspective is crucially important for the implementation of buyer-supplier relationships. Buyers always seek for cost-reduction opportunities and try to measure it. One way to do it is to compare current supplier's cost against other suppliers, operating in the same business sphere.

Subjective or qualitative factors.

There is a huge amount of different qualitative factors available today. Each company can make its own list of those factors, corresponding to their corporate strategy and targets. It is also should be mentioned that qualitative factors are sophisticated in measurement perspective, that is why Monczka (2009) suggests to accurately establish measurement system for them, including the point rating. For instance, each factor can be measured on scale from 1 to 5 and ranked at a percentage of total points at the end of the process. following figure shows possible example of the qualitative service factors for supplier evaluation, including the description. (309-310.)

FACTOR	DESCRIPTION
Problem resolution ability	Supplier's attentiveness to problem resolution
Technical ability	Supplier's manufacturing ability compared with other industry suppliers
Ongoing progress reporting	Supplier's ongoing reporting of existing problems or recognizing and communicating a potential problem
Corrective action response	Supplier's solutions and timely response to requests for corrective actions, including a supplier's response to engineering change requests
Supplier cost-reduction ideas	Supplier's willingness to help find ways to reduce purchase cost
Supplier new-product support	Supplier's ability to help reduce new-product development cycle time or to help with product design
Buyer/seller compatibility	Subjective rating concerning how well a buying firm and a supplier work together

Figure 10. Qualitative service factors (adapted from Monczka 2009, 310)

3.3.2 Supplier reduction

It is evidently true, that supply chain efficiency depends on supplier performance capabilities. Since that, it is undeniable that all the efforts of the company should be directed to the best suppliers within SC. After the first stage (measurement analysis of each supplier) of the supply base optimization process, supplier reduction decisions are available to take place. With the right decision on supplier reduction, remaining relationships will benefit company's performance. With the smaller number of suppliers, the relationship maintaining process will be simplified and more efficient, since all the attitude from managerial departments will be focused on less suppliers. From the perspective of quantitative variables, there will be better results in quality and delivery categories, since relationships become closer and more transparent. (Monczka 2009, 316-318.)

When company runs the supplier reduction process, the relationships with remaining suppliers are strengthened. With the advanced information flow within companies, new opportunities are discovered, making interdependent relationship between parties. For example, for this or that product company can use full-service supplier. According to Monczka (2009), it can turn into value-added services increase as well as supply base visibility. Another benefit of supplier reduction is the decrease of administration costs: as it was mentioned above, relationship maintenance, including

lots of activities (such as contract negotiation, reporting, problem discussion and etc.), has its own associated costs and risks. However, not only administration costs tend to decrease. According to Monczka (2009), “if fewer suppliers received larger-volume contracts, the resulting economies of scale would lower production and distribution costs. Supply base rationalization and optimization provides the opportunity to achieve lower total product costs by awarding larger volumes to fewer suppliers”. (317-318.)

3.3.3 Risk of Supplier Reduction

There are different attitudes and opinions about the Supplier Reduction trend. Some authors as well as experienced managers assume that it is the correct direction to success. However, others believe, that there are more risks for the business disruption with the few active suppliers. Moreover, people suggest, that if big companies will look for the full-service suppliers and long-term relationships, it will stop development and innovation progress provided by suppliers due to the lack of competition. In aforementioned chapter, benefits provided by supplier reduction, were mentioned. Nevertheless, potential risks of the small supply base concept should be discussed. (Monczka 2009, 319.)

There are could be different types of relationships within supply base. For example, it could be the strategic alliance, where relationship is an interdependent figure. In other case, supplier or buyer might have a long-term relationship contract, but operate as a market contractors. In that kind of relations, supplier or buyer dependency can appear. In every relation there is a weak side company and more powerful one. If supplier has more force against buyer, while buyer is fully dependent on that supplier, there are could be some “unhealthy” actions from the possessing side, including overpricing, overaggressive termination of contracts and etc. As far as that, supplier can also undertake some unethical actions in buyer dependence situation. In a single-source situation, supplier understands that new supplier relationship development for buyer will be financially difficult, allowing them to take advantages from their relations. (Monczka 2009, 319-320.)

The main risk of a single sourcing, that has been discussed for ages, is a supplier disruption. Indeed, if the company rely on one supplier with no other possible

reserve sourcing, the disruption of that supplier can guarantee production shutdown. This possible risk can be overcome in different ways. The first possible way is utilized by Dell Computer corporation, which performs multiple-sourcing continuously. In any urgent situation they have a possibility to switch on a new supplier for some period of time, considering that shutdown will be more costly. Other way to manage the situation of the supplier disruption is to run cross-sourcing. Cross-sourcing is a process of supplier selection with the multi-functional capabilities. Those relations are very beneficial, because in case of the main supplier disruption, the already known supplier can take the responsibility of this or that service implementation as soon as possible. (Monczka 2009, 319-321.)

Nevertheless, the supply base optimization should be continuously organized within the company's management departments. This process main target is not a supplier reduction, but a financial well-being and continuous development. Nowadays trends and practices of the biggest corporations suggest that the supply base should be organized the way, which allow to establish the core group of suppliers with the value-adding activities and best possible administrative costs. (Monczka 2009, 288-323.)

3.4 Supplier Relationship Management

After suppliers classification, Supplier Relationship Management can be applied. Because even with the strategic suppliers some issues with priorities, competition, information exchange, skills and etc. can take place. (Waters 2003, 43.) According to Remko van Hoek (2013), SRM is an important tool for a company to use, because "being able to negotiate a deal does not mean a buyer is able to manage a relationship, nor is it possible to ensure premium access to suppliers in a contract". That statement illustrates up-to-date procurement activity, which aims to foster long-term relationships with valuable suppliers, instead of maintaining several non-value adding ones. (6-12.)

SRM is a tool of management techniques, processes and templates, which assists businesses in enhancement of their supplier relationship value, while diminishing risks of the management overhead within the supplier relationship lifecycle (Prokopets, Tabibzadeh 2006, 1-5). Supplier Relationship Management consist of

several elements: In and Out-Supplier Management. With the integration of those elements, business acquires better supplier base. In-Supplier Management operates closely to the suppliers, forecasting the potential perspective and directions for the supplier's effectiveness and operability increase. On the other hand, the Out-Supplier Management coordinates the risks of the supply disruption, running continuous sourcing. (Moeller, Fassnacht, & Klose 2006, 72-84.)

According to the research of Monczka (2009), four objectives of the SRM are described:

1. First of all, it is essential to foster the relationship, which allows joint growth on win-win base. Mutual trust and open communication are the first step to shared responsibility of both supplier and buyer.
2. With the shared focus on values and align strategies of both sides, overall competitiveness on the market can be achieved.
3. Leveraging of the supplier capabilities, including involvement in service or product development and joint problem solving.
4. Long-term view at the business partnering: commitment for continuous development and support of shared efforts.

(125-127.)

Because the structure of supply chains is comprehensive and intersecting, management of each company should recognize their interrelated roles and functions. It should be done, whereas integration and management processes throughout company boundaries will be effective only, if it is worthwhile from each supply chain member's perspective. (Cooper et al. 1997, 67-89.)

4 JIT business principles

Just-In-Time manufacturing is a system, which delivers materials or products to downstream process stations only prior the time when there is a need for those materials at that certain station. In other words, products are delivered straight to the operational area and at strict time, which is coordinated by the information flow within operational areas. (Waters 2003, 178-187.) According to Waters (2003, 178-

180) Lean Management and JIT principles have the same main goal to be solved: elimination of wastes in production/ operational processes and achieving customer satisfaction.

Ohno identified seven manufacturing wastes, which are:

1. Production of the defective parts: the quality control of the JIT system requires zero defect level for quality of the products. This form of waste is also concern overstocking, because in case of the defective product, replenishment is needed. However, JIT attitude is to find out the cause of each defect and make the corrective actions to foster the solution.
2. Overproduction: the lack of information sharing between the working stations and supply chain participants as a whole, enables overproduction. That in turn, affects the additional workforce costs, production costs and etc.
3. Excessive inventories: the inventory cost increases as a consequence of overproduction and other aforementioned wastes. For example, warehousing costs, equipment costs, additional workforce costs to take care of extra inventory and etc.
4. Unnecessary processing steps: that waste has a lot of examples to be described. For example, the process station has a poor design, prompting unnecessary working tools, equipment, safety hazards and etc.
5. Unnecessary people movement: wastes number five and six are correlated and mostly occur for the same reasons. For example, poorly organized working layout, inefficient handling methods, unsuitable equipment for this or that task and etc.
6. Unnecessary transport and handling of materials.
7. Workers waiting. There are several reasons for that waste: late deliveries of the materials, misconduct between downstream and upstream activities, equipment or other assets breakdown and etc.

All the wastes listed above drive the JIT system to find the constructive approach to overcome all waste forms. (El-Namrouty, AbuShaaban 2013, 70-71.)

4.1 JIT Employee involvement

JIT philosophy suggests that employee's attitude to the work is directly depends on their involvement in achieving organizational goals and targets. In case of the Just-In-Time concept, internal integration of labor force goes through all organizational levels from the managerial down to the workers with the limited range of tasks.

According to JIT methodology, all the workers within the company have their strict responsibilities and standards to be met. However, workers are allowed to seek and suggest new opportunities or better solutions considering processes implementation. It is very efficient to make all employees to be involved in a group effort, sharing the ideas and contributing from each other knowledge. Fostering working condition like that, allows to achieve common goals, efficient working behavior among group participants and new opportunities achievement for continuous development of the whole company performance.

To stimulate the behavior of the employees within the organization, it is very important for the management to create conditions, in which employees tend to continue working in one organization for the long-term period. The reason for that is the skills and processes understanding knowledge enhancement during the working period. That kind of working labor is much more valuable, offering know-how ideas and showing better results in fulfilment of organizational targets. There are several things to be considered:

- Rewarding system should be implemented
- Management support and their direct involvement in the working processes
- Maintenance of constant communication, constant trainings, new tasks opportunities offers and etc.

(Kootanaee, Babu, & Talari 2013, 9-12.)

4.2 Kanban system

Kanban system was introduced back in 1950's. This system appeared after adaptation of the Lean Manufacturing principles within different industries around

the world. One of the first users of the kanban system were companies, which implemented JIT manufacturing system. Since that, kanban has become the cornerstone for Pull production, being the signal and the control tool for upstream and downstream activities. On the early stages of the development of the kanban system, kanban was a simple card with its own inventory number, including the information of the product and the stage of the process. Those cards fostered the communication flow within operations, making possible to control production schedules, lead time and inventory stock levels.

The kanban card system was a low-cost system, allowing immediate response to changes within supply chain by means of eternal control of production flow as well as stocks. However, with the development of new technologies, the card system was replaced by the computerized one. There were several reasons for that replenishment. First of all, an increase in operations during production, fluctuation in order sizes and etc. made it difficult to control cards movement. Another reason was a mixed production trend: all the kanban cards during processes were collected, checked and replaced. In mixed production, on the run with cards loss, misplacement problems occurred. Since that, the electronic kanban system was introduced. Nowadays, the electronic kanban represents a barcode, including RFID and electronic message. The electronic kanban originally serves the same functions as a traditional kanban, but allows to do it more accurately, minimizing errors and management efforts. Indeed, the electronic kanban enables real-time visibility of demand signals and information of each stage of the process engaged. All needed data can be collected at any time and used for the decision making upon the order batch size, time and place needed. All the quality problems can be analyzed with the help of the data base. Furthermore, the electronic kanban data can be valuable during supplier communication, making it easier for supplier to balance its capacity for the future order fulfilment. (Houti, Abbadi, & Abouabdelillah 2017, 2-6.)

Suprasith (2011) made a graph, showing the right conditions for application of the traditional and the electronic kanban systems. According to the graph, there are two main variables for the right decision on the kanban strategy, which are amount of the parts/ products and demand. (40-44.)

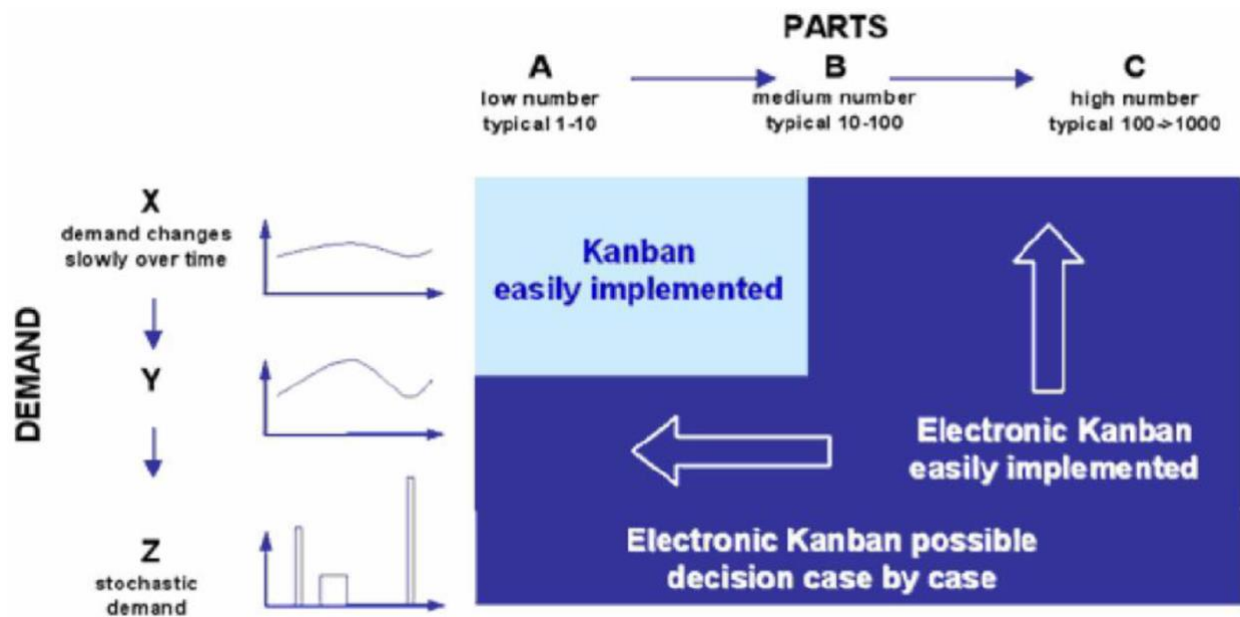


Figure 11. Areas of application of Kanban systems and E-Kanban (adapted from Suprasith et al. 2011, 40-42)

Suprasith (2011) shows that electronic kanban is applicable in any business circumstances. However, he believes that in case of low number of the products engaged in the process and stable demand, there is no need for the electronic kanban implementation, since an adaptation of it needs some big investments. (40-44.)

4.3 Information and communication technologies

Nowadays with the huge amount of functional and affordable ICT options, new opportunities for the supply chain integration process optimization were identified. Companies aim to redesign their supply chain intelligence by enforcing the available communication and information techniques. (Christiaanse, Kumar 2000, 268-285.)

One of the most useful management tools in ICT today is ERP. Enterprise Resource Planning is the coordinator of the resource movements and allocations along the supply chain network. (Waters 2003 ,192.) ERP enables technology infrastructure integration within all departments and activities of the SC. There is a large number of different ERP software available for the use today, however, before integrating them, strategical planning should be made, highlighting all functions needed. There are some examples of software: Microsoft Dynamics, SAP business and Oracle ERP. It

should be mentioned that the ERP interface and ease of use are the essential things to consider. Knowledge basis of the ERP tool usage should be established on both external and internal levels of integration: employees should be taught to use the system in appropriate manner, while relationships with suppliers maintained and improved due to the increase in shared information flow. (Sunbridge 2018.)

On the run with that, some software technologies nowadays have specific business fields cover. For example, Kodiak Rating platform. That software tool is the Supplier Relationship Management enhancer, which enables different functions on supplier selection and supplier evaluation processes. The Kodiak Rating platform can be customized by means of integrating individual company's needs, including business's KPIs, strategic and operational goals. The processed data allow to make supplier performance assessment in real time conditions, with the ratings and analytics functions support. (Kodiak Rating Platform 2019.)

Another useful software tool, expanding internal integration processes, is a Microsoft SQL Server. In supply chain context, that tool is applied for identification and forecasting of variables that have a direct influence on customer satisfaction, demand/ inventory levels and costs. It is perfectly fitted the distribution business field, providing several functions:

- Real-time condition data. For instance, if the inventory levels are depended on seasonal change, the data will be sorted accordingly to months or days, including previous years demand, and overlaid with the current operational situation.
- Predictive reverse supply chain model. For example, the returning product frequency, including product category and amount, can be managed and maintained, which in turn enables possibilities for the customer service enhancement and inventory decrease.
- Demand and inventory forecast enable company gaining the Economic Order Quantity.
- ATP: the available-to-promise function, which correlates the demand forecasts with the real-time customer service level, making the best possible

fulfillment process implementation and matching it to the final distribution strategy.

(SQL Server Tutorial 2019.)

4.4 Warehouse management

Warehouse management plays a crucial part of every supply chain network, especially talking about distribution companies. In that case, the warehouse term is used not only as a place of storing goods, but also as a place, where huge range of other jobs are performed. For example, distribution or transit centers, where materials are sorted and pulled according to the next locations. (Waters 2003, 283.)

Another functional option of the warehouse is a possibility for break bulk. According to Waters (2003), the break bulk warehouse facility is used for sorting large deliveries into smaller quantities shipments, including labelling and special packing for further transportation. This warehouse model is known as a cross-docking, which main goal is an implementation of the most efficient transfer for material, minimizing storing activities as well as non-value adding activities like, for instance, loading and unloading pallets to the warehouse shelves. (288.)

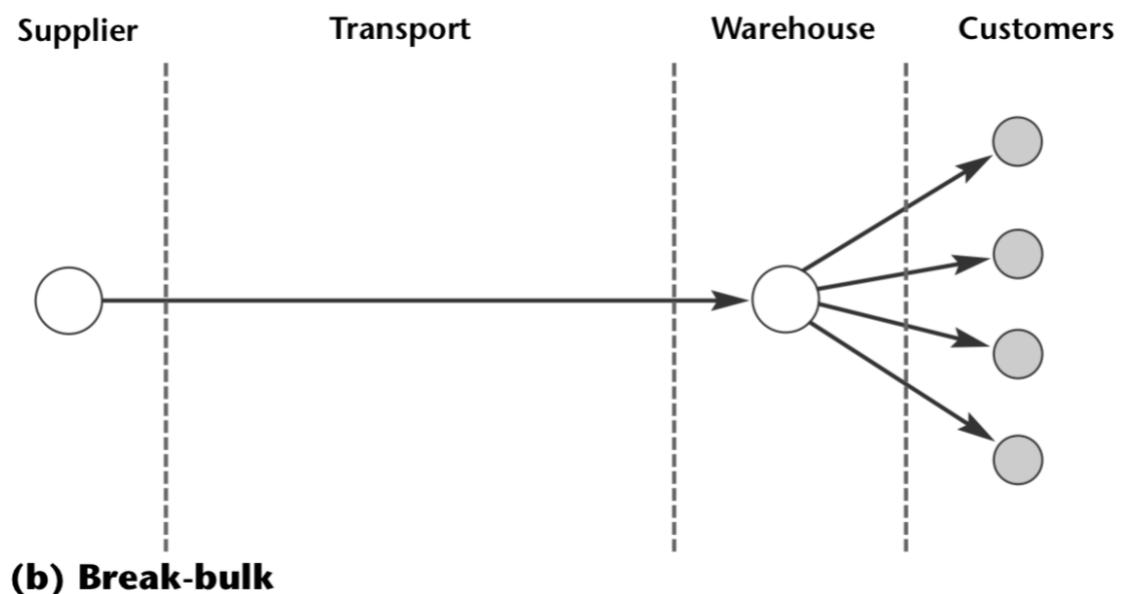


Figure 12. Using warehouses to reduce transport costs (adapted from Waters 2003, 287)

Waters (2003, 282-285) suggests that it is very important for the overall supply chain network to organize warehouse strategy the way, where it is not only the pure cost center, but conversely the place for adding value.

5 Inventory definition

Inventory is a stock of materials or products, stored in specially prepared places, in order to be ready for any anticipated demand situations (Vrat 2014, 21-22). Stock appears after the arrival of materials to company's premises. Those materials are not used immediately, but are managed within the organization, forming inventory buffer. For the common process description of typical usage of stock, figure is used.

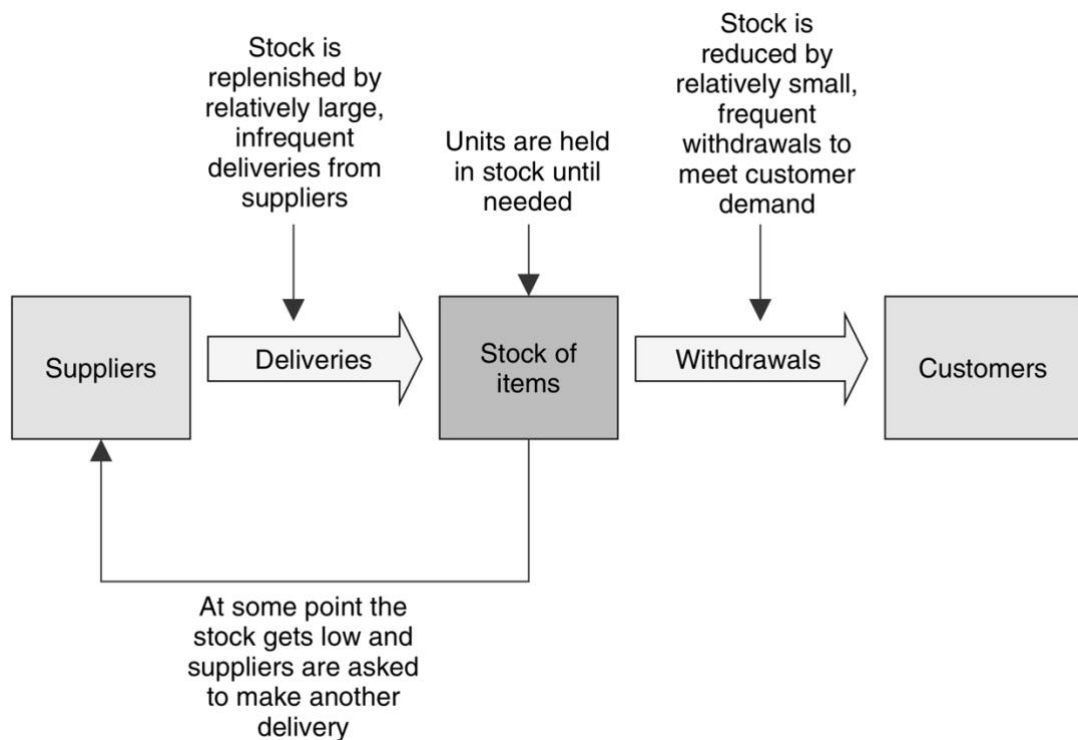


Figure 13. A typical use of stock (adapted from Waters 2003, 5)

Going forward, there are several reasons for having inventories:

- Time span between order placement and delivered supplies at the desirable point for further operations. It is also known as the "replenishment lead time", which in most cases is quite high.

- Demand variability is the next important reason for holding stocks. Variability in demand can be formed due to wrong estimation of the demand or due to demand uncertainties.
- Seasonal inventory: it concerns all goods or materials demand which is cyclic. There is a huge number of goods, showing fluctuation in demand during the year. For that reason, some additional stocks should be kept for meeting the required customer level in peak seasons.
- There are several other reasons to be considered during planning the inventory strategy. For example, the lack of products needed in the markets, inflationary circumstances, quantity price reduction for the bulk purchases, ordering full load deliveries to decrease transportation costs and etc.

(Vrat 2014, 22-23.)

5.1 Classification of stocks

In the previous chapter of the thesis, reasons for holding stocks were discussed. According for those reasons, stocks can be classified. Waters (2003) suggests classification based on the stocks function or the purpose. He highlighted five different types of stocks, which are cycle stock, safety stock, seasonal stock, pipeline stock and stock kept for other reasons. In that chapter two types of stocks will be discussed in detailed way. (9-10.)

Cycle stock

Nowadays companies are looking for the process flexibility and the cost reduction within operations performed. Cutting logistics cost, deliveries of the products and materials are organized in large batches and less frequently. However, customer demand should be met continuously. That is, companies face the problem in stock managing. The most common stock type today is a cycle stock. Cycle stock is simply the stock, which is moved from the company continuously, acquiring the supply demand. In other words, the cycle stock serves from the point of the replenishment till the next replenishment order. This type of stock is common for companies with the minimum lead time in order replenishment process and stable demand of the products. (Waters 2003, 6-12.)

Safety stock

The next coming classification of stock according to its purpose is a safety stock. Today most companies have the cycle stock to be consumed out of inventories during the time period. However, it is obvious, that in case of the demand variability of this or that product, having cycle stock will not be enough. Wild (2002) suggests that stock levels should be adjusted accordingly to the variability of demand. But in case of the safety stock approach, this is not the only thing to be considered. It is also important to foster reliability of supply and dependability of logistics together with that. That is, safety stock is a stock used for any demand fluctuations and unpredictable operational circumstances such as transportation problems, supply failures and etc. (96-100.)

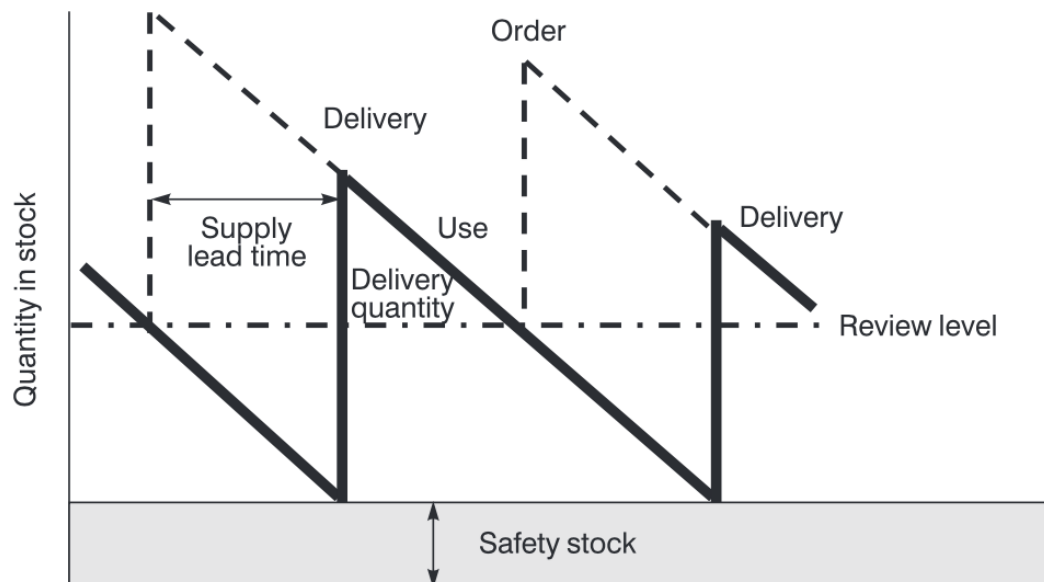


Figure 14. Stock controls (adapted from Wild 2002, 113)

The amount of safety stock is unpredictable and is difficult to be calculated. One of the methods for safety stock calculation is MAD. The MAD or the mean absolute deviation is a “simple assessment of the variability of the demand pattern”. (Wild 2002, 102.) For the MAD calculations, statistical data retrieved from demand history is used. To foster the safety stock accurately, periods of time and the demand amount according to each period are studied.

$$MAD = \frac{\text{Sum of absolute deviations from mean}}{\text{Number of periods included in the sum}} \quad (1)$$

(Wild 2002, 102.)

Other formula for safety stock calculation is

$$\text{Safety stock} = \text{Customer service factor (\%)} \times SD \times \sqrt{\text{lead time}} \quad (2)$$

(Wild 2002, 115)

5.2 Classification of demand

During inventory management strategy implementation, it is important to classify the demand variable. One of the reasons for that is the differences in the study approaches for this or that demand type. (Waters 2003, 58.)

Independent demand

Independent demand is constituted of the units, demand of which is not dependent on each other. That is, “the aggregate demand for an item is made up of many independent demands from separate customers”. (Waters 2003, 57.) In that circumstances, the best solution for managing demand is a historical data study and processing. What concerns stock control, it is implemented by the quantitative models: forecasting, costs and other variables calculations, identification of optimal order quantities and timing values. According to Waters (2003), the stock control models for the independent demand “can be either fixed order quantity or periodic review”. (57.)

Dependent demand

Dependent demand means that the demand for inventory of this or that unit is dependent upon other units in the same system. The dependent demand is more difficult to be controlled. For managing that type of the demand, Material Resource Planning is used. One of the best options for dependent demand control is the JIT model. (Waters 2003, 57.)

5.3 Inventory-related costs

All stocks derive the inventory-related costs. It is obvious that cutting the stock amount can enable some cost saving opportunities for the company. However, that is not true for all the cases. If company reduces the stock or decides on non-stock

way of doing business, most likely it will face shortages and out-of-stock situations. That can lead for much more severe expenses and disruptions in the operational processes. That is why, costs of carrying stocks should be discussed and studied. (Waters 2003, 52.)

Both Vrat (2014) and Waters (2003) suggest several types of costs. However, they classify costs differently. In their books, they mentioned Ordering Cost or Replenishment Cost and Shortage Cost as an independent and separate costs. On the run with that, Waters (2003, 52) highlights other two inventory-related costs, which are Unit Cost and Holding Cost. Nonetheless, Vrat (2014, 26) decides to combine those costs and called it, the Cost of Carrying Inventory, including Capital costs, Storage costs, Service costs and Risks costs in it.

Unit Cost

There are a lot of definitions for the Unit Cost. This is mostly due to the extended meaning of this term. The simplest description of the Unit Cost is the cost for the company of acquiring one product unit. (Waters 2003, 52.) But if we consider the cost for all units purchased, we will be looking for the capital cost. Since the Capital cost is an investment of large amount of money, several related financial calculations are arised. For example, according to Vrat (2014, 26), the Capital Cost involves the capital interest rate and the opportunity cost rate of money being invested into stock at stated period of time. Capital cost can constitute up to 50% of the Total Cost of carrying inventory. The process of calculation of the Capital Cost is difficult and varied according to the organizational circumstances. (Vrat 2014, 26.)

Holding Cost

Holding Cost is the cost of holding one unit within the company premises for the given period of time. Time period can be stated upon the company's needs and amenity in calculations (in most cases period supposed to be a year). Waters (2003) includes six different costs, associated with the holding process:

- Cost of Money: in case company managing stock with its own capital, the money-related costs such as opportunity cost of the capital should be taken into account. If company managing its inventories with the borrowed capital,

interest to be paid from their side should be included in holding cost calculations.

- Storage space: the costs of acquiring or renting storage facility, including heating, lighting, cost of space organization and etc.
- Loss costs: the cost of risk-related situations such as obsolescence of kept inventory, shrinkage of stock during internal warehouse activity, employee theft and etc.
- Handling costs: the inbound logistics costs, cost of storage equipment and other needed facilities such as forklifts, pallets and etc.
- Administration costs: the cost of hiring the personal for managing inventory.
- Insurance costs.

Those costs mentioned above are sophisticated for calculations, but Waters (2003) suggests percentages of the unit cost according to the table. (52-53.)

	% of unit cost
cost of money	10–15
storage space	2–5
loss	4–6
handling	1–2
administration	1–2
insurance	1–5
Total	19–35

Figure 15. Percentages of unit cost (adapted from Waters 2003, 53)

Reorder Cost

Reorder Cost is the cost of processing the replenishment order. According to Vrat (2014), Reorder cost includes communication-related costs during order placement stage, logistics costs during transportation, costs at the point of receiving the order (documentation, handling and inspection), billing costs (labor cost and possible overhead costs). (28.) Waters (2003) notes, that Reorder Costs should be considered

as the cost of the repeated purchases, including the cost of the procurement department, responsible for negotiation of the best conditions for order placement. As well as the Holding Cost, there are different approaches and methods of calculation, but for easy estimation of the Reorder cost, it can be simply calculated by dividing the total annual cost of the procurement department by the number of orders purchased. (52.)

Shortage Cost

When the company cannot meet the customer demand due to the out-of-stock situation, the Shortage Cost appears. Vrat (2014) notes, that Shortage Cost has a tangible effect such as loss of profit and intangible effect such as loss of the permanent or possible customers in the future. Due to that, estimation of the Shortage Cost is a very sophisticated process. From the perspective of the intangible cost component, companies should realize if they can afford the Shortage Cost or should prevent their operations from shortages, being “customer-sensitive company”. For that kind of companies Vrat (2014) suggests not to include the Shortage Cost into their inventory models, ignoring it. (27-28.)

5.4 Inventory control

Inventory control methods or techniques are applied when company wants to adopt the best possible balance “of supply and demand patterns” along their inventory model. (Wild 2002, 43) However, companies have large number of different items in stock, which, in turn, have different personal characteristics. For example, supply lead time, average demand rate, variability of demand, supply frequency can vary for each item in stock. That is why, it is important to understand, which items are significant for the chosen inventory strategy and should be controlled; when and how many items should be ordered for meeting demand with the highest service level and the lowest inventory-related costs?

5.4.1 ABC Analysis

Inventory control is a time consuming and very expensive process. There are different models in achieving inventory control, but this or that model has its own advantages and disadvantages. However, one of the first and the simplest methods,

used throughout century, is a Pareto's Law. The Pareto Law or the 80/20 rule is the tool, which assumes that "80% of the effect is provided by 20% of the cause". From the inventory point of view, as an example, we can say that 80% of the value of the demand are constituted by 20% of the units. Nonetheless, it is not always 80/20 ratio. According to Wild, applying the Pareto analysis can affect current stock reduction, but if we talk about inventory management more precisely, classification of units in stock is required. Since that, ABC model was introduced. (Wild 2002, 33-37.)

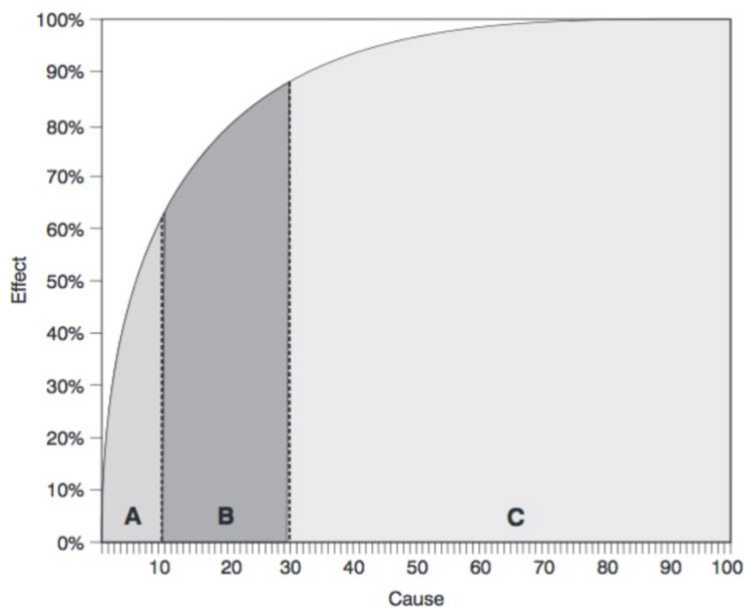


Figure 16. ABC analysis (adapted from Wild 2002, 37)

ABC analysis is the tool for identification of most and less important units within the inventory to be stored. For units ranking, different indicators can be used, but usually it is the annual turnover:

$$\text{Annual turnover} = \text{Annual usage} \times \text{Unit cost} \quad (3)$$

(Wild 2002, 36.)

If the turnover rate is used as a ranking value, then we can classify each class A, B, and C according to it. Wild (2002) suggested its own ABC ranking example:

A class: For the A class items assumed 10% of units from the overall stock numbers, which derive 65% of turnover. These units are strategically important for the company. For the A class items controlling systems or tools should be applied, with the permanent update on inventory level conditions. It is essential to monitor those items frequently in order to follow up the trends of the supply and demand, making accurate records for further forecasts. As far as the A class units constitute the biggest part of the turnover, both tangible and intangible values are considered: there should not be out of stock situations, because the service level for the A category is supposed to be the highest possible. In other words, the Safety stock policy is a right tool to be used for managing the A class items.

B class: The B class consists of 20% of units in stock, giving 25% of the turnover. According to those figures, the B class is supposed to be a cycle stock, with the possible safety stock buffer. For the B class there is no need for efforts from the management side. Indeed, the classic stock control is the best option for the B class treatment. According to Vrat (2014), the B class units should be managed using statistical approach, for better forecast utilization. As far as only 20% of the whole inventory stock relate to the B class, limit order value needs to be stated.

C class: The C class consists of up to 70% of units, with the 10% of the turnover. Items from the group C are low-value items. There is no need for managerial supervision of those items, but automatic computerized system can be a good solution if the number of units is big. The C class can be managed by means of the Optional Replenishment policy since infrequent ordering with minimum stockouts is suggested. (Wild 2002, 36-39.)

5.4.2 EOQ model

Economic Order Quantity is the tool for inventory control implementation. This tool aims to optimize the overall stock level and foster the best suitable order size. First of all, to utilize the EOQ model there are several assumptions to be taken into consideration:

- Demand is known and uncertain.
- Lead time supposed to be a zero value.

- There are no shortages during the process.
- The cost structure is fixed and known in advance.
- Every unit is the single item. Grouping of several units is not allowed.
- Replenishment is done immediately, with the arrival of orders simultaneously.

(Waters 2003, 65-68.)

According to Waters (2003) in the EOQ model six variables are used. First of all, the Order Quantity or Q which is variable, representing the constant order size. The Q is used as a repeated and fixed figure over the process. The goal then is to identify the ideal value for the given order quantity. The second variable, which is the Cycle time or the T shows time between two consistent replenishments. Demand or the D is the third variable, identifying the number of units, which should be left from stock in a fixed time span. According to the assumptions mentioned above, variable D is supposed to be continuous and constant. The other three variables are Reorder Cost (RC), Unit Cost (UC) and Holding Cost (HC) respectively. (69.)

According to aforementioned statements Waters concluded that in terms of the EOQ model, amount entering stock in a cycle equals amount leaving the stock in this cycle or

$$Q = D \times T \quad (4)$$

After fostering the variables of the EOQ model, explanation of the concept continues. Waters (2003) defined three steps to be made for the Economic Order Quantity model derivation. As three of the variables are costs, the total cost of one stock cycle can be calculated.

$$\text{Unit Cost of an item} = UC \times Q \quad (5)$$

$$\text{Reoder Cost of an Item} = RC \times 1 \quad (6)$$

$$\text{Holding Cost of an Item} = HC \times \frac{Q}{2} \times T \quad (7)$$

where $Q/2$ is an average stock level.

Consequently, Total cost of one cycle equals:

$$TC = UC \times Q + RC + \left(HC \times \frac{Q}{2} \times T \right) \quad (8)$$

After that, Total Cost per unit time can be calculated:

$$TC = Q = D \times T \quad (6)$$

Consequently,

$$TC = UC \times D + RC \times \frac{D}{Q} + HC \times \frac{Q}{2} \quad (9)$$

(Waters 2003, 70-71.)

With the equation of the Total Cost per unit time we get only one variable, Q. For better visualization of the cost variation against the order quantity variable, figure is shown.

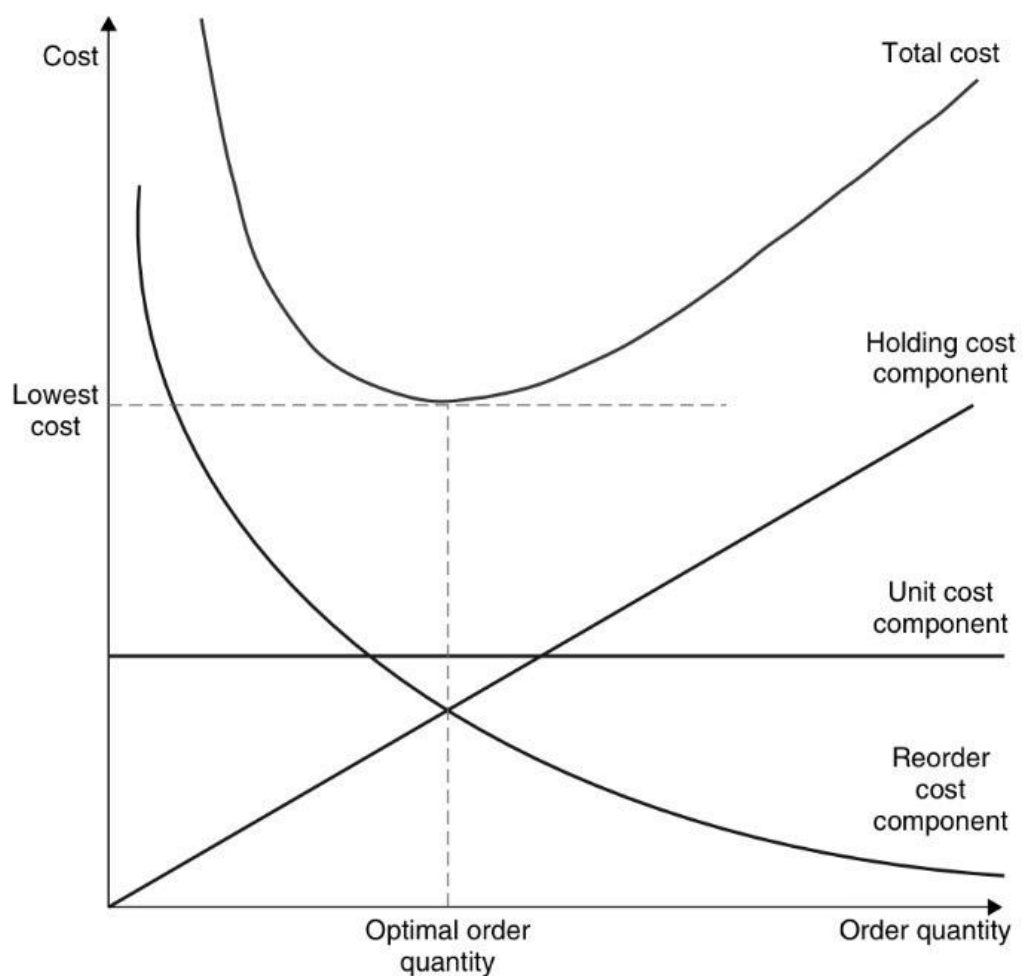


Figure 17. Variation of costs with order quantity (adapted from Waters 2003, 72)

From the graph it can be seen that the Unit Cost is not depended on the Order Quantity variable and it is fixed. The Holding Cost depends on the Order Quantity variable as a linear function. The Holding Cost rises when the Q increases. The Reorder cost conversely decreases with the Order Quantity rise. Adding three cost functions together, we get the Total Cost function with a distinct minimum, which is the Optimal Order Quantity. In other words, we get the amount for the units to match the best suitable order size. (Waters 2003, 71.)

For the last step of the model, the Cost per unit time is minimized. To achieve that, the Total Cost formula is differentiated with the respect to the Order Quantity and adjusted to zero:

$$\frac{d(TC)}{d(Q)} = -RC \times \frac{D}{Q^2} + \frac{HC}{2} = 0 \quad (10)$$

If rearranged that formula, an equation for the optimal order size, which is the EOQ, will be drawn:

$$EOQ = Q_0 = \sqrt{\frac{2 \times RC \times D}{HC}} \quad (11)$$

(Waters 2003, 71-72.)

5.4.3 Q,r model

The EOQ is widely useful model for managing inventory. However, this model not always suits organizational needs. For example, what if the demand is a variable figure, while the lead time is needed to be taken into account? In that case, the EOQ calculations will not be able to solve the given task. In turn, the Q,r model will be suitable option for this conditions.

As well as the EOQ model, the Q,r model has several assumptions:

- Q,r is implemented by continuous review.
- Demand supposed to be a random function, normally distributed with a given mean and standard deviation. Demand is considered for given period of time.

- Lead time is considered as a fixed time slot.
- Demand during lead time is a continuous random variable.
- Service level is defined and used during calculation.

One of the main differences of the Q,r model from the EOQ is that Stockout Cost does not equal zero, since the demand is a variable figure, the out-of-stock situations can appear. Due to that, the safety factor is integrated into the model, making functional dependence with the order quantity variable. That is, the service level is considered to be an important part of the overall model calculations, which enables optimization of the safety stock parameters. (Nahmias 2011, 29-33.)

Since the model has two main variables, which are Q- order size and r- replenishment level, the order size variable can be calculated according to the EOQ formula. However, there are several more variables to consider during the Q,r model implementation. First of all, the expected demand during lead time (time and lead time variables should be measured in the same value):

$$\mu = \frac{D}{t} \times \tau \quad (12)$$

(Keskinocak, Gel 2013)

Where: μ = expected demand during lead time, D = expected annual demand, t = time slot per year, τ = lead time.

Second thing to be calculated for the model is the variance of lead time demand:

$$\sigma = \sqrt{\delta \times \frac{\tau}{t}} \quad (13)$$

(Keskinocak, Gel 2013)

Where: σ = variance of lead time demand, δ = annual squared sample's standard deviation, t = time slot per year, τ = lead time.

The Q,r model service level approach enables to calculate a safety stock amount and fosters right replenishment level. The Safety stock calculations can be achieved with that formula:

$$S = z \times \sigma + \mu \quad (14)$$

(Keskinocak, Gel 2013)

Where: S = safety stock, z = service level factor, σ = variance of lead time demand, μ = expected demand during lead time.

5.5 Inventory policies

Every company, which needs to keep an inventory for some reasons, applies the strategy or a model for managing it. Inventory policies are used for control of the inventory levels during the stated period of time. Another vital role of the inventory policy is the signals for company's procurement department to take actions at the right time. There are three widely used types of the inventory policies suggested by Vrat. (28-29.)

Reorder Point Policy

Reorder Point policy is the first inventory policy, which was used for implementing the inventory control. Considering that policy, the inventory level repeatedly monitored throughout out the process of stock leaving. From the name of the policy, there is a reorder point, which is the minimum permissible level of inventory kept in organization. That is, when inventory level falls to the reorder point value, replenishment should be done immediately. According to the policy, replenishment is managed in a fixed quantities, which are also called EOQ. All in all, the policy is operated with the two variables: the EOQ or the Q and the ROP (R). (Vrat 2014, 29.)

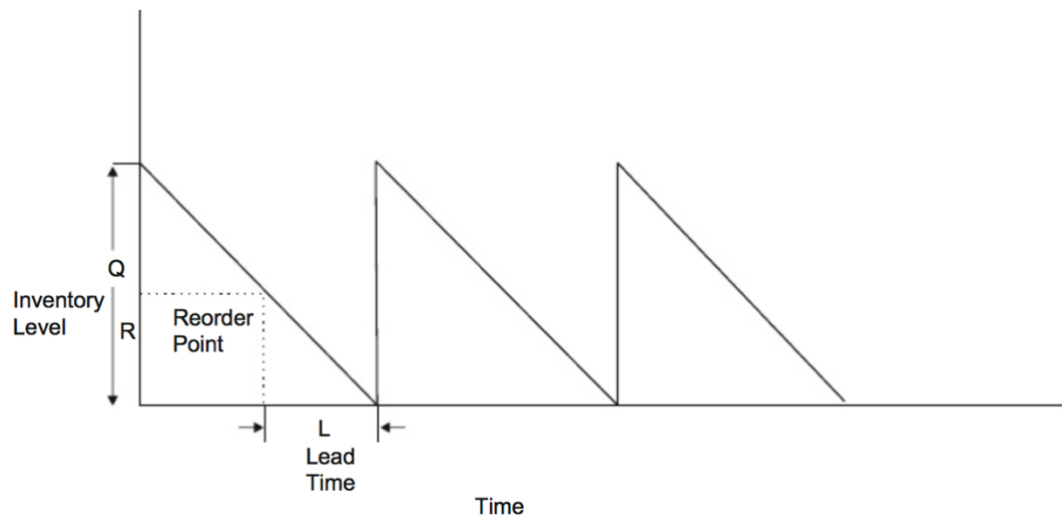


Figure 18. EOQ-ROP policy (adapted from Vrat 2014, 30)

According to Vrat (2014), the ROP policy can be implemented in both manual and computerized forms. If organization has a low inventory level to be stored with the minimum SKUs amount, the manual monitoring can take place. The most suitable way for it is so called “two-bin” method. The “Two-bin” method implies storage of each SKU of inventory in to different bins. The amount in the first bin is used to serve the supply before it reaches the reorder point and been totally finished. The second bin is used to supply inventory during the replenishment process and considered according to the lead time needed. However, nowadays computerized systems are much more useful, because they allow to simplify storage conditions and enable better monitoring of the stocks. (29-30.)

Periodic review Policy

Another way to apply control in inventory management field is to use the Periodic Review Policy. The main difference of this policy from the ROP is that there is no need for a permanent monitoring of the inventory level, whilst it is done periodically, using fixed time interval (T). The explanation of the policy will be showed graphically.

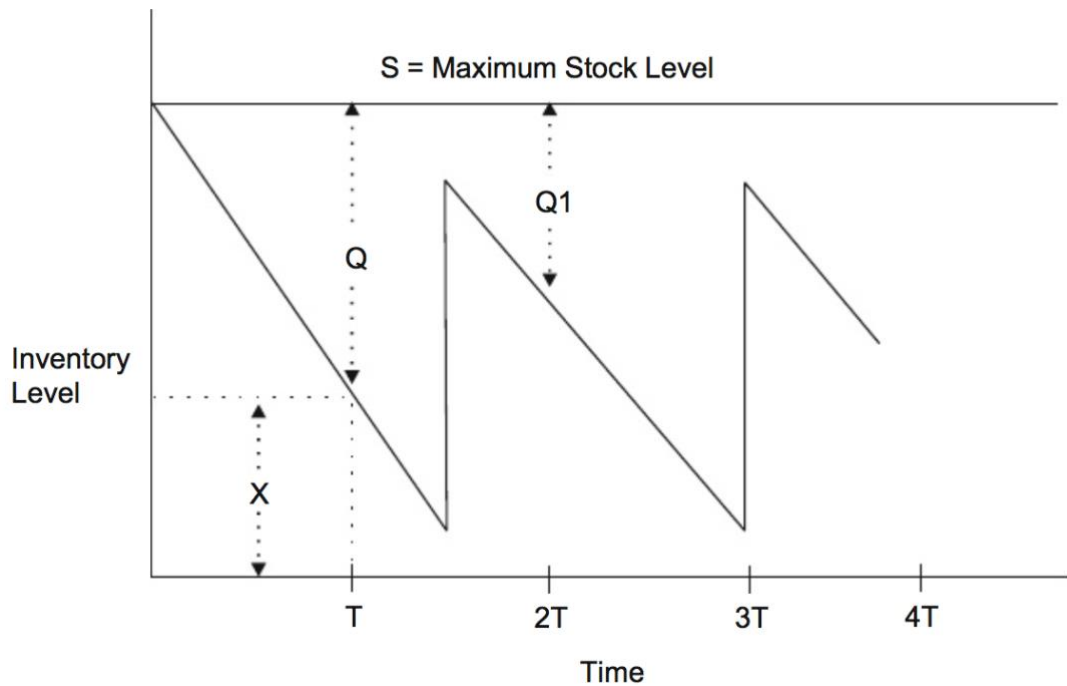


Figure 19. Periodic review inventory policy (adapted from Vrat 2014, 31)

In the graph there are two variables for elaboration, which are the S = maximum stock level and the T = fixed time interval for the status update on the inventory level. According to the graph, the X represents the actual amount of the stock available at the time of the review T . That is, formula for order placement at reviewed period is

$$Q(\text{order quantity}) = (S - X) \quad (15)$$

(Vrat 2014, 31)

The Periodic Review Inventory policy is an accessible and clear in usage. It is not required to much time and managerial efforts as everything is done in fixed time intervals. But under this policy the replenishment orders should be placed on each review cycles. Even if the indicator of the stock rate at the end of the cycle are too high, small quantity replenishment has to be made. (Vrat 2014, 30-31.)

Optional Replenishment Policy

Optional Replenishment policy at some point has a lot of similarities with the Periodic Review policy. Under this model, after every fixed time interval (T), stock amount is checked. During examination of the stock, two indicators, which are

maximum level (S) and minimum level (s) are matching to the stock available. After that, replenishment decision is being made.

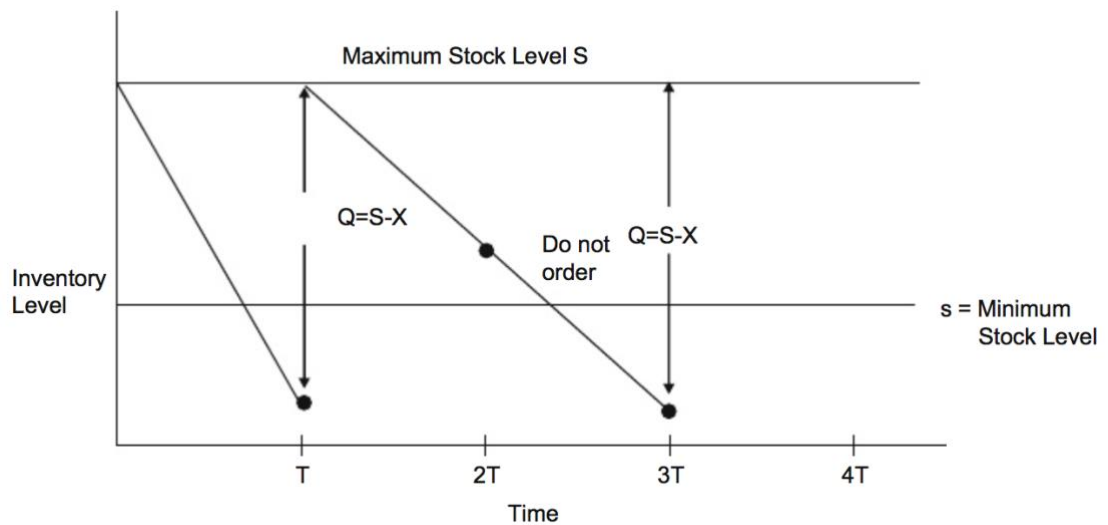


Figure 20. Optional (s, S) inventory policy (adapted from Vrat 2014, 32)

When the inventory level (X) indicators are lower than the minimum stock level (s) or equal to it at the time of the review (T), the order for new stock is placed. However, if the inventory level does not exceed s level, the replenishment is postponed to the next review cycle. (Vrat 2014, 31-32.)

There are several other Inventory Policies available today. Nevertheless, these three aforementioned models are the most commonly and widely used ones nowadays. (Vrat 2014, 29-33.)

6 Research and analysis

To structure this thesis in a logical order, the research and analysis chapter was divided into two parts. The first part was devoted to the study and analysis of supply chain shortage in terms of the tobacco product category. The second part relates to the implementation of an inventory management concept.

During work in the Metropress, the researcher spent two months for information gathering, one month for the first part of the thesis (15.05.19-15.06.19) and one month for the second part (15.06.19-15.07.19) respectively.

6.1 Supply chain shortage

For the supply chain shortage part, the supplier selection framework was used.

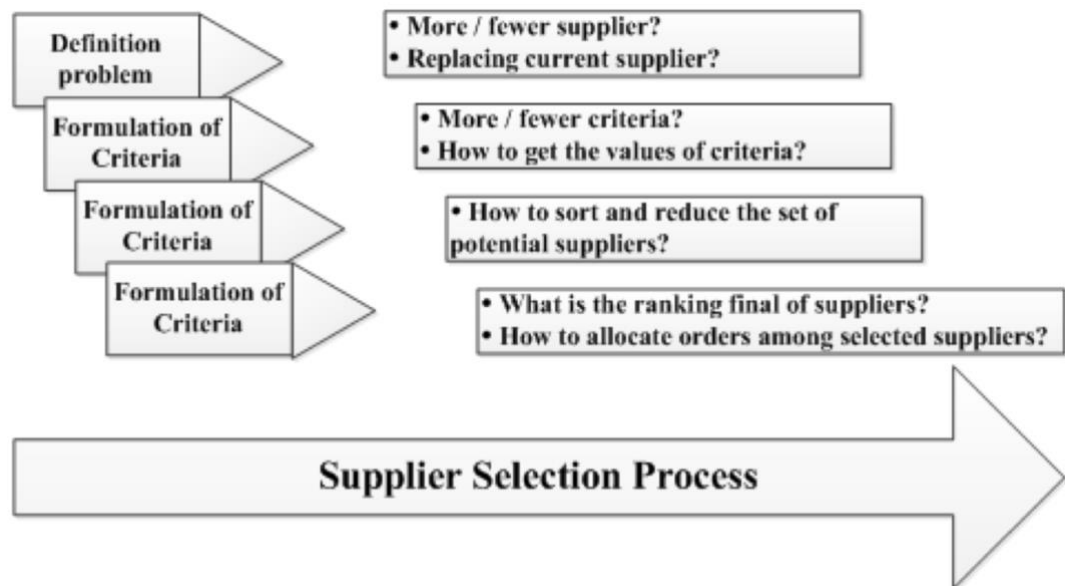


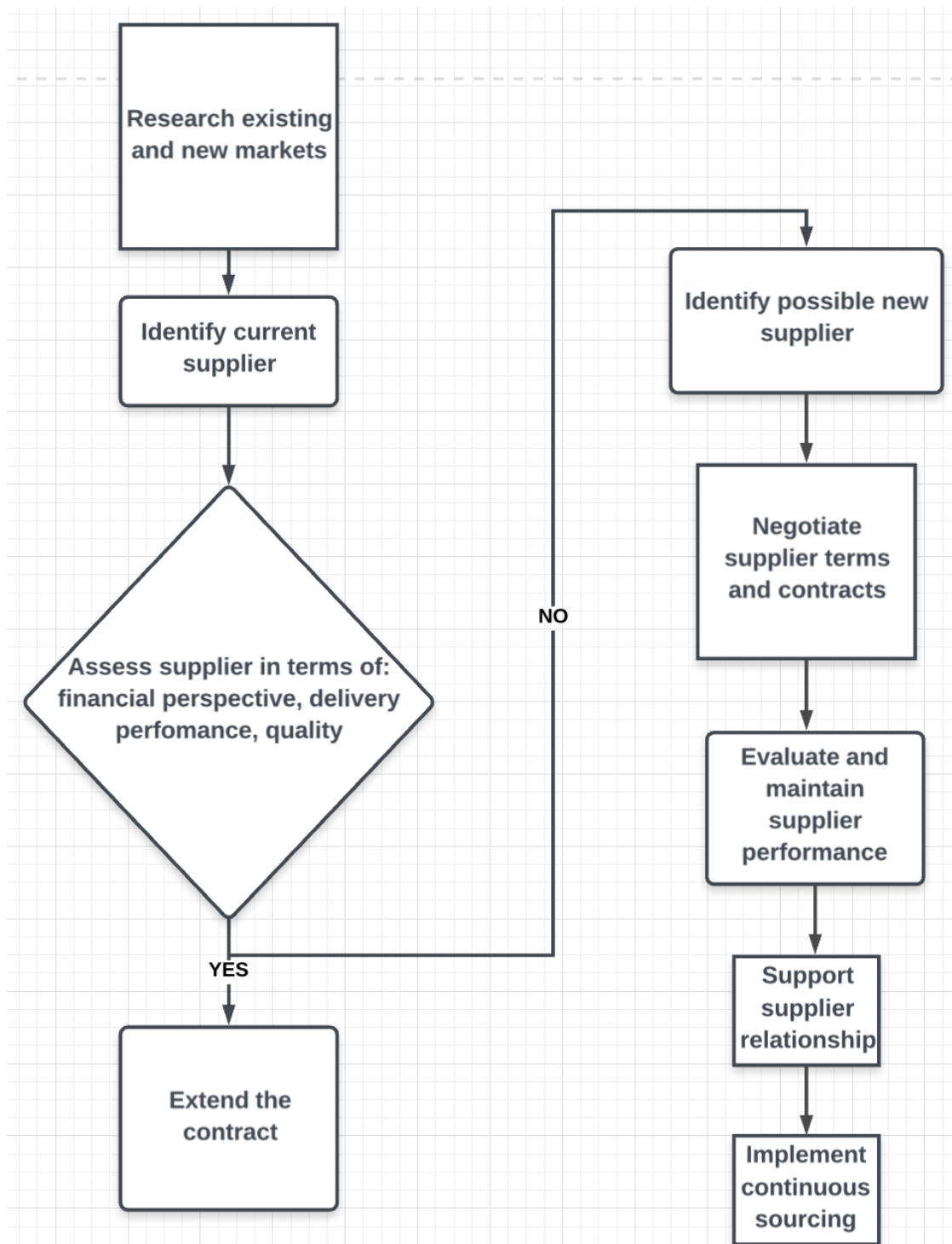
Figure 21. The supplier selection framework (adapted from Pan 2015, 1253)

Each step of the framework was covered and studied using different management tools.

6.1.1 Define phase or Definition of problem

For problem definition of the supply chain shortage, the following process flow chart was used. The flow chart represents the sequences of activities and decisions, which allow for the best suitable process performance.

Table 1. Supplier network analysis process flowchart



In the decision part of the flow chart, three main supplier objective measurement variables were listed (Monczka 2009, 309). Financial perspective or cost reduction opportunities are a target variable for the case company. However, considering the JIT business principles, which are integrated in the host company framework, two

other variables remain of crucial importance for the company. That is why they will be considered in further research implementation.

6.1.2 Measure phase or Formulation of criteria 1

During this step of the research, several analysis tools were applied.

Focus group

During the first three weeks in the Metropress, a focus group was run. The focus group was not the new method for data gathering for the host company. The company's management has used that method previously. Nevertheless, the author has suggested several new features to be applied in the focus group implementation process.

First of all, the number of groups was increased. Previously, participants of focus groups in the Metropress system were mostly top managers. Furthermore, that makes the number of people available for participation limited. Based on the JIT principles, studied in the literature review, every worker within the organization is considered as a valuable part for the overall success of the company. That is, every opinion is important and can derive beneficial opportunities for the business. Subsequently, the number of focus group participants was increased from 5 people to 15, including a different company's departments workers. For implementation of everyday functions without interruptions (it is almost impossible to pause 15 workers at the same time), focus groups were organized several times during the week, to have at least 5 participants in each. Participants were mixed each time, but there were three permanent workers involved in each of the focus group: Aleksandr Nikitin, being the moderator of the groups and the author's project supervisor; Olga Frumkina, being Senior Category Manager and the responsible person for the Alidi Nord supplier and the researcher, implementing observer responsibilities (being a complete participant). The author decided to organize focus groups using a less structured approach, which in turn minimizes the moderator's participation in the discussion. That solution was introduced in order to enhance the group dynamic level and provide everyone with an opportunity to express their opinions.

The plan for focus group organization was implemented according to a permanently used by Metropress template. That template was borrowed from the Hoshin Kanri problem solving techniques. More precisely, the template was developed by Metropress management themselves, but it is based on the principle of the PDCA model (Plan- Do- Check- Act). A focus group was used as a tool for implementation of the Plan part of the process. According to that focus group template, several aspects of the project were discussed:

- Project goal
- Prerequisites
- Expectations
- Problems

The author has suggested several ideas on template development, but it was difficult to put them into practice. The reason for that is the standardized form of the template, which is used in the Metropress as well as its several strategic suppliers (Alidi Nord included) as a form of communication during research and analysis. However, the implementation of the focus group information gathering process was organized under researcher responsibility. For information gathering, the KJ technique was used. The KJ technique was designed by Kawakita Jiro and was developed for building common understanding of discussed issues and the ability to find various decisions for stated questions. During focus groups, every participant has their own pen and an unlimited amount of small paper sheets. For every question during the focus group a time slot was provided, during which participants wrote their ideas for the discussed questions. After that, the paper sheets were given to the moderator, who entered each participant's answer to the template. The template was visualized on a big screen in the room of the focus group meeting. That enables the alignment of the participants' ideas and contributes to the efficient and productive discussion of the stated issues.

Focus group results

During the focus group implementation, the following goal was formulated: Without diminishing of the current relationship (between Alidi Nord and Metropress),

continuously move to direct supply of the tobacco product category, minimizing new supplier-related risks and achieving a marginal increase in level for the stated product category. According to the Supply Chain Shortage framework, criteria should be stated. Criteria were established by means of focus group discussion and literature review acknowledgement. Criteria will be illustrated in the table below. Criteria for further analysis:

Table 2. Main supplier-related criteria in terms of Metropress's KPIs

Flexibility in logistics	Product quality	Unit cost	Relationship experience
Delivery reliability	After sale/warranty	Payment conditions	New business opportunities
Logistics cost	Supplier reputation	Information flow sharing	Technical capabilities

6.1.3 Analysis phase or Formulation of criteria 2

During June, several unstructured interviews with the Alidi Nord supplier were conducted. During these interviews the question about the termination of the tobacco product contract was discussed. All the interviews, whether it was a face-to-face meeting or the electronic information exchange, were implemented in Russian.

Having the strategic partnership with long-term relationship experience, Alidi Nord openly answered all stated questions and provided all the necessary information.

According to the stated goal during the focus group process, the Alidi Nord interviews can be divided in two parts:

1. Problem negotiation considering the current relationship between Metropress and Alidi Nord:

During this part of the interview, possible actions to absorb the process of the tobacco product category contract termination were discussed. Alidi Nord

supplies cigarettes only to Metropress within the Saint Petersburg territory. That fact makes it easier for Alidi Nord to withdraw the tobacco product category from their warehouse inventory system. Nevertheless, tobacco product contracts, including 50 SKUs, derive 34% of total contracts revenue between Alidi Nord and Metropress. Due to this, several steps for problem solving were discussed and confirmed during the interviews.

- Metropress will process the transition to work with another supplier (Megapolis) continuously
- Metropress undertakes a process to buy back the entire stock of tobacco product category from Alidi Nord during the process implementation
- Metropress together with Alidi Nord commits to finding new contract opportunities in order to maintain Alidi Nord's financial perspective
- Alidi Nord openly provides information about the Megapolis supplier

2. Criteria realization in terms of new supplier (Megapolis) evaluation

During this part of the interviews, the current tobacco product supplier, Alidi Nord, was asked several questions considering their relationship experience with Megapolis. Those questions were formulated according to the criteria, which were identified during the second step of the research framework.

To visualize the results of that interview part, the following table was used. The table represents the comparison of Alidi Nord and Megapolis in terms of the given criteria. Alidi Nord's assessment was done by the author and the management of the Metropress. While Megapolis' assessment was done based on the interview results with the Alidi Nord.

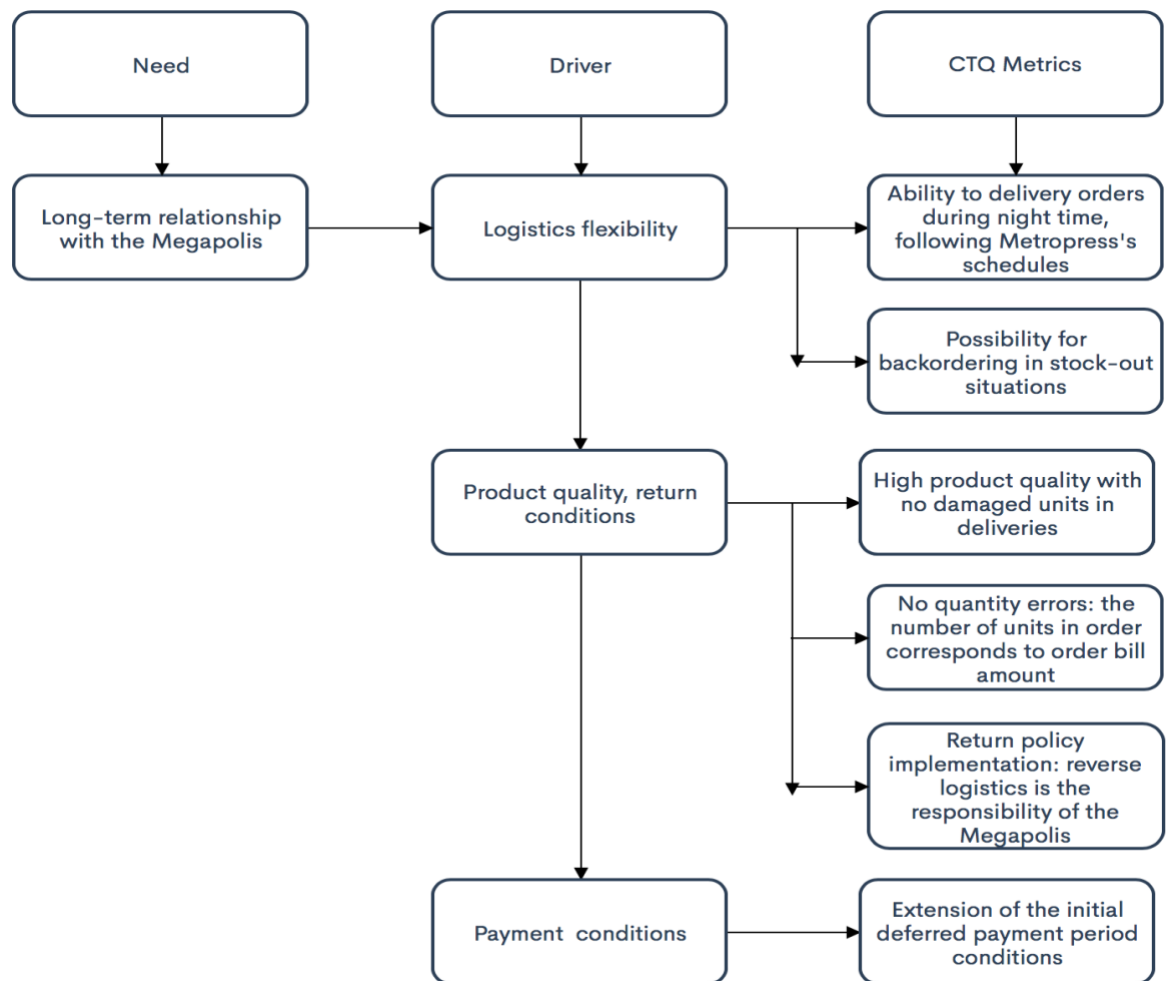
Table 3. Comparison of suppliers according to stated criteria

Criteria	Alidi Nord	Megapolis
Flexibility in logistics	+	-

Delivery reliability	+	+
Logistics cost	-	+
Product quality	+	+
After sale/ warranty	+	-
Supplier reputation	+	+
Unit cost	-	+
Payment conditions	+	-
Information flow sharing	+	+
Relationship experience	+	-
New business opportunities	+	+
Technical capabilities	+	+

As it was said previously, in financial perspective, Megapolis is more preferable supplier for the host company. However, the quality factor is also a vital issue for the Metropress, since the company's business principles. For that reason, the Critical to Quality Characteristics diagram was built. The following diagram represents the most important aspects to be followed by the new supplier in terms of the selected criteria.

Table 4. Critical to Quality Criteria



After illustration of the current supplier (Alidi Nord) and potential (Megapolis) supplier key performance criteria comparison, the analysis and conclusions need to be drawn.

6.1.4 Improve phase or Formulation of criteria 3

To answer the question “What is ranking final of the suppliers?” and make correct decision on the issue of supply chain shortage, the SWOT analysis was conducted, following all the gathered data from previous steps of the framework.

The SWOT analysis of Metropress company’s capabilities in terms of the Supply Chain Shortage process:

Strengths:

- Alidi Nord is the Metropress' strategic business partner with the long-term relationship (2011-2019).
- Metropress operates according to the JIT principles with the zero-inventory strategy. All SKUs are delivered seven days per week to the Metropress' distribution center.
- Metropress' distribution center has some spare area, which is currently not used during company's operations.

Weaknesses:

- Metropress has no working experience with the Megapolis supplier.
- The governmental anti-smoking program stimulates the tobacco price increase. Tobacco product retailers are forced to lower margins, resulting in reduced profits.

Opportunities:

- The supply chain shortage will allow to achieve financial savings due to retail price decrease. Switching to the Megapolis supplier relationship, margin per unit will increase by 3% in comparison to the Alidi Nord rate.
- Metropress will face cost reduction in logistics related expenses considering tobacco products. Megapolis is going to supply Metropress with orders one time per week instead of the Alidi Nord's seven days per week shifts.
- New relationship can derive large amount of opportunities: supply chain expansion can result in a new product development, new contracts and etc.
- If Metropress implements inventory strategy, there will be available stock in the warehouse. Random out-of-stock situations in kiosks sales points will be regulated easier (in current situation, out-of-stock SKUs can be replaced only the next day).

Threats:

- Fostering the relationship with the new supplier is a sophisticated process, which requires time and capital cost investments.
- Payment conditions provided by the Megapolis more severe in comparison to the Alidi Nord ones. Megapolis establishes a deferral of payment for the order to be maximum 4 days after order was received. Alidi Nord's deferral period is two weeks after order delivering.
- Megapolis' conditions of non-reliable quality goods returning system is stricter. According to the conditions, all products should be checked by the buyer within two days after order delivery day. Return can be accepted only during stated time span. That can entail quality control investments from the Metropress' side.
- The inventory management strategy implementation is considered to be a time-consuming and expensive process. That question will be discussed in the second part of the research.

Metropress' supply chain shortage project is difficult to be estimated. There are advantages and disadvantages according to the current research work. However, Metropress still has time to prepare for the contract negotiations with the Megapolis. This work will enable to focus on the critical issues during negotiations.

6.1.5 Suggestions

To conclude the results of the Supply Chain shortage research part, data inventory table is constructed. That table shows the analysis techniques and information on their usage during the research implementation.

Table 5. Data inventory table

Data source	Function	Participants	Topics discussed	Date/ duration	Document name
Observation	-Logistics -Procurement	Different departments employees	-Metropress' business principles -Supply Chain Base	15.05.19- 15.07.19	

	-Warehouse Management -IT department		-Warehouse activities -IT support functions		
Sampling	-HR department	-Financial Director (thesis supervisor) -Researcher -HR, Shift Manager	-Focus group participants number -Focus group duration -Focus group dates	22.05.19- 24.05.19	
Focus group, Part 1	-Supply Chain shortage project -Supply Chain Management -Procurement	-Financial Director (moderator) -Senior Category Manager -Researcher (complete participant observer) -2 Category Managers -2 Warehouse Employees -2 Sourcing Managers	-Project goal: determination of targets. -Prerequisites: reasons for the project implementation -Expectations: positive outcomes of the project -Problems: project-related risks	03.06.19 (30-45 min)	Appendix 2
Focus group, Part 1	-Supply Chain shortage project -Supply Chain Management -Procurement	-Financial Director (moderator) -Senior Category Manager -Researcher (complete participant observer) -2 Category Managers -2 Warehouse employees -2 Sourcing Managers	Same as Focus group, Part 1	04.06.19 (30-45 min)	Appendix 2
Focus group, Part 2	-Supplier Selection Process -Supply Chain Management -Procurement	Same as Focus group, Part 1	-Determination of main supplier criteria in terms of Metropress' KPIs	10.06.19 (30-45 min)	Appendix 3
Focus group, Part 2	-Supplier Selection Process	Same as Focus group, Part 1	Same as Focus group, Part 1	11.06.19 (30-45 min)	Appendix 3

	-Supply Chain Management -Procurement				
Interview (unstructured, face-to-face)	-Supplier Relationship Management -Procurement -Continuous Development	-Alidi Nord Category Manager (responsible for Metropress contracts) -Metropress' Senior Category Manager -Researcher	-Metropress' Project realization and future relationship prospects -Alidi Nord's requirements in terms of the project -Metropress' inquiring for the information sharing	04.06.19	
Interview (computerized , mail)	-Procurement -Risk Management -Information Sharing	-Alidi Nord Category Manager (responsible for Metropress' contracts) -Researcher	-Discussion of the Megapolis supplier (according to research criteria) -Inventory-related issues (tobacco products)	10.06.19- 14.06.19	Appendix 4

The research on supplier selection was explained and implemented according to all stages. The research approach was based on the criteria model. Since Metropress' JIT business principles, the biggest part of the supply chain partners have long-term relationships with the host company. When the research methodology and approach was discussed with the management of the Metropress' company and the supervisor, the author was told that Metropress does not have existing supplier selection process framework.

The model, which was used in the research, can now serve as an example of supplier selection methodology. It can be updated with more sophisticated tools and techniques. On the run with that, it is essential for the company to train its managers in up-to-date management tools: there are huge variety of computerized programs for the supplier selection support, which can be utilized in company's sourcing department. These tools were mentioned during the theoretical part of the thesis.

Another important suggestion for further host company's procurement activity is to implement the supplier evaluation model. With the help of continuous current supplier analysis, Metropress will be able to overcome financial and quality losses.

Since the thesis is just a start of supplier shortage process, Metropress should prepare for further project implementation. It is very important to note, that the Megapolis is a monopolist in several tobacco products SKUs within Saint Petersburg. That is why, the negotiation of contract is crucially important for the host company. That process requires preparation and proper strategy use.

6.2 Inventory management model

Problem definition

The second part of the research study was an exploration of the inventory management theme and implementing the decision on appropriate inventory model solution for the host company. The need for a strategy in the inventory management sector was arised by the supply chain shortage process. Due to the new supplier relationship consideration in the tobacco product category, delivery conditions are changed: instead of seven days per week deliveries, the new conditions consider maximum of one delivery per week, with the lead time being two days. The goal for that part of the research was stated by Olga Frumkina, the Senior Category Manager of the Metropress: "the best possible solution for smooth and continuous movement of the tobacco product category supply from current supplier to the new one should be found and implemented, taking into account the best possible inventory management solutions for the chosen product category". Furthermore, the company's management designated an importance of the inventory management cost identification and possible ways for their calculations.

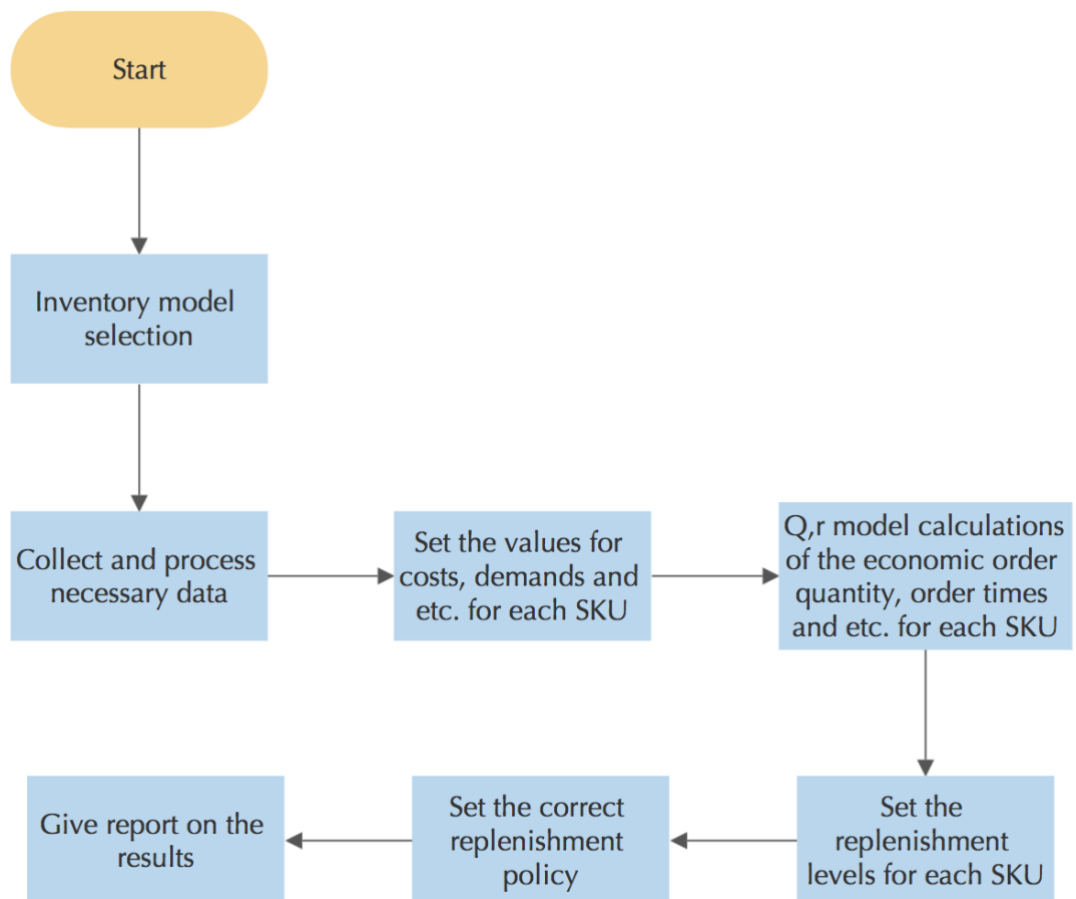
The challenging issue of that research part was the fact that the company had not have any stock holding experience at all. All the operations within Metropress were modeled to be zero-stock one. These issues effect in the data availability limitations and the lack of the professional advices from the Metropress' management side. However, the company allowed the researcher to ask for any needed data available.

It was also decided to enable the author to apply his own ideas into the research implementation.

Implementation of the research

Inventory management is a novelty for the Metropress' management. Since that, the author made a process diagram to illustrate the steps, which should be done for the stated goal implementation. This plan was approved by the management of the host company. During the research, all steps were passed. The results were drawn and all related limitations discussed.

Table 6. Flow chart of the inventory model implementation



6.2.1 Inventory model selection

During the process of an inventory model selection, the researcher have studied two models: the EOQ model and the Q,r model. These two models are the simplest one, being very useful on the early stages of the inventory strategy design. Moreover,

chosen models do not require huge amount of statistical data and information on the previous practices of the company's inventory history.

However, the exploration of the aforementioned models was not enough for a decision on the final model selection. It was important to study the tobacco product category demand and supply variables based on the historical data. Furthermore, delivery conditions of the Megapolis supplier were analyzed and applied in the process of the model selection. For better visualization of the process, table was created.

Table 7. Comparison of EOQ and Q,r model in terms of Metropress requirements

Tobacco product category needs	EOQ model	Q,r model
Order quantity definition	+	+
Replenishment point definition	+	+
Variable demand	-	+
Lead time consideration	-	+
Shortage cost consideration	-	+
Service level consideration	-	+

According to the provided table, final decision on the selected model was made. The Q,r model was chosen for further research implementation. First of all, that model allows to work with variable demand, while the EOQ assumes that the demand is a fixed measurement. The second reason for the Q,r model selection is a need for lead time consideration, which derives from the Megapolis delivery conditions. Another variable in the selection process was a shortage cost. Moreover, following the host company's JIT principles, the service level is an important thing to take into account.

6.2.2 Data collection

In that part of the thesis two types of data were applied: the primary and the secondary data. For the primary data, the author assumes the data, which was gathered from the first-hand sources. Methods for collecting this type of data were meetings, observation and etc. What concerns the secondary data, it is the data collected by someone else. For example, historical or statistical data, information retrieved from the books or journals and etc.

The primary data collection was made by means of the project meetings. During this part of the analysis, two Metropress' employees were involved: Aleksander Nikitin, the Financial Director and Olga Frumkina, the Senior Category Manager. All the necessary data for the project was provided by these workers. During meetings, the researcher studied current processes of the zero-inventory strategy. To achieve that, the researcher interviewed several other employees within Metropress. First of all, several workers of the procurement department were interviewed about processing and order forming techniques used within the company. Secondly, an IT department manager explained the functionality of a specially written program for the Metropress, allowing to form the orders on a daily basis and an e-kanban system, enabling to generate the data on sold products in every kiosk at real time. Thirdly, the Megapolis' requirements, considering the tobacco product supply, were explored. All this information was crucially important for further implementation of the inventory-related solutions.

The secondary data was collected by means of a literature review. Furthermore, the tobacco product category is an excise good controlled by the governance. Due to that, the tobacco related laws were analyzed and taken into account during the research. Apart from that, for the inventory model, some limited amount of the historical and statistical data was enabled for the researcher. Historical and statistical data was retrieved from Metropress' database.

6.2.3 Cost calculation

After selection on the appropriate model for the host company's inventory strategy, cost-related questions appeared. As it was mentioned previously, Metropress

performs a zero-inventory policy, making holding and shortage costs being unknown variables. With the help of the necessary data provided by the management of the company, costs were calculated. At some points, the researcher has made advices for further implementation of the inventory process.

Unit cost

During the work in the host company, the researcher has studied all necessary unit costs for each of the 8 SKUs. However, some relevant information was captured during the process. The Megapolis supplier is a monopolist of the related 8 SKUs of the tobacco products. On the run with that, as it was previously discussed, “MPL” or the maximum retail price is under control by the Russian Federation legislation. During last year, the maximum retail prices were randomly raised several times on each of the studied SKUs. These rises allow Megapolis to increase the retail prices as well. That is, the unit cost of the tobacco category can be changed randomly. It is important to take that fact into consideration and update the model, when those changes are arised.

Holding cost

For the holding cost calculations, the historical data was used. With the help of the Metropress’ management, the researcher got following data: an average monthly rent cost; an average electricity and heating monthly costs; the number of square meters of the total area rented by the Metropress and the storage space area separately; the amount of workers, which is necessary to manage the inventory of the tobacco, including Metropress’ fixed distribution employee salary and social insurance (%) rates based on the Russian Federation legislation; other warehouse-related cost such as maintenance of the equipment and monthly average consumption of other products such as stretch, knives, trash bags and etc. In addition, an approximated rate of the annual interest was integrated during calculations.

Replenishment cost

Replenishment cost was calculated based on the Procurement Department annual cost. Metropress has the category manager responsible for the tobacco product

category order processing. The annual wage of that worker was divided by the amount of orders done throughout the year.

Shortage cost

Shortage cost was an unknown variable for the management of the host company. By means of studying of the historical data, the researcher finds out difficulties for the mentioned cost calculation. Based on the information available, at the last day of each month, Metropress' management monitors the stock-outs and the amount of the stock leftovers of each product category. That information was used for approximation of the shortage cost, considering every stock out points as a possible unsold unit of goods. However, that information is not enough for the implementation of shortage cost calculation. The author has conformed with the Metropress' management the possible approach for further shortage cost exploration. According to that approach, paper blanks should be created and distributed to all sales points of the tobacco product category. Sale points employees should mark the date and time of stock out situations to each tobacco SKU (8 SKUs in total) accordingly (see Appendix 6). That will allow to identify the tangible losses. On the run with that, the backordering term was explained. In further contract negotiations with the Megapolis, the backorder possibilities should be discussed and can be used for shortage rate calculation.

6.2.4 Model implementation

For the Q,r model calculations historical data was used. Metropress holds all information about demand of each SKU in the company's database. However, daily demand figures are available only for the previous three months to the current day of study. That is, during the author's observation, only April, May and June daily demand figures were available. Previous months were transformed to be hold in the database as a monthly demand figures. Due to that, the researcher and the management of the company decided to make calculations based on the May historical data. There were several reasons for this decision to be fostered. First of all, May is the last working month before holidays, making seasonable factor differentiation as smaller as possible. Next coming reason is that May is showing

average demand throughout the year. That was identified by the analysis of monthly demand figures during 2019.

The Q,r calculations were done, using Microsoft Excel program. Calculations were done for each of the SKU individually.

	A	B	C	D	E	F	G	H	I	J	K	L
1	Daily sample data	mean	std.dev.	expected demand during lead time	Variance of demand during lead time	Variance of lead time demand	Expected annual demand	Q,r economic order quantity	Service level (%)	Sevice level factor	Safety stock	Replenishment point
2	xxx cigarettes	x	x	x	x	x	x	x	95 %	1,64	x	x
3	xxx cigarettes								95 %	1,64		
4	xxx cigarettes								95 %	1,64		
5	xxx cigarettes								95 %	1,64		
6	xxx cigarettes								95 %	1,64		
7	xxx cigarettes								95 %	1,64		
8	xxx cigarettes								95 %	1,64		
9	xxx cigarettes								95 %	1,64		
10												
11	Unit Cost, c	x										
12	Holding Cost, h	x										
13	Shortage Cost, s	x										
14	Replenishment Cost, r	x										
15	Lead time, L	x										

Figure 22. Q,r model calculations example

6.2.5 Replenishment policy selection

The replenishment policy decision is a very difficult question, which requires few things to be considered. First of all, the model used for order quantity and replenishment levels calculations should be assessed. The Q,r model is a simple, but very useful technique. That model allows to acquire the decision on the correct amount of the demand during lead time and the safety stock variables. By means of that, the best possible replenishment points can be found for each of the SKUs. The second thing to take into account is the host company needs and requirements. In terms of the research case company, the tobacco product is a very expensive SKU, which require huge investments. Due to that fact, the replenishment policy design should consider the minimization of stock holding. Moreover, the service level variable stated by the host company management is high, making shortages being an unacceptable issue to appear. All the aforementioned requirements are understandable by the author of the work and are taken into consideration during final decision.

For the Metropress' tobacco product category inventory management model, the continuous review reorder point policy is suggested. That policy fully corresponds to the inventory model, chosen for the host company. With the calculated data on reorder levels, demand during lead time and safety stock needs for each SKU, that model is an optimal solution. Based on that policy, each of the 8 SKUs studied, have their own reorder points values. When the stock numbers fall down and reach that order point value, replenishment is processed, considering lead time and safety stock requirements. That model is reviewed continuously due to the variable demand pattern and the service level variable.

Reorder point policy is a suitable decision for the host company study case. One of the advantages of that policy is an ease of use. For low amount of the SKUs that model can be managed manually, with no additional cost for an IT support. In terms of tobacco products, it is even more comfortable, because packing methods for that product category is known and easy to be counted (cigarettes are delivered in the box, which consists of 50 blocks with the 10 packs in each). Furthermore, Metropress' electronic Kanban system will allow data on the daily consumption, making continuous review being simple and time-effective.

6.2.6 Analysis of the model results and limitations

The initial aim of the inventory management part was the explanation of the inventory topic, considering the host company's project goals. The researcher had access to the earlier Category manager's calculations examples of the units amount of each of the 8 SKUs, which were made based on the new supplier delivery conditions (maximum one delivery per week with the order lead time being two days). These calculations were based on an average function, with no use of any inventory calculations tools or techniques. Due to that fact, the author and the management of the company agreed on quantitative explanation of the model, which was reviewed during theoretical part.

The model calculations are practical example of the inventory strategy, which was chosen for the host company. There are still lots of limitations to be overcome and fixed. First of all, the historical data amount and the supported techniques (such as forecasting) for its processing should be integrated. Secondly, the lack of data for

shortage cost calculations is another challenge to be solved. It can be achieved by Metropress' management support (author offered solution during inventory-related calculation step) or by negotiation of the backordering possibilities in further Megapolis contract negotiations. What concerns model calculations, since the shortage cost value was just estimated, the Q,r service level approach was used as a prioritized one (excluding shortage cost variable from overall calculations).

If all limitations will be solved, it is possible to integrate more sophisticated inventory models for managing the stock. In addition, during theoretical part of the thesis, the SQL server tool was described. This tool can be used for computerized inventory control in the next steps of the project realization (for example, when Metropress will transfer all tobacco product SKUs in the inventory system). However, for current situation, the Q,r model is able to manage 8 SKUs (with the 2 days lead time) with no inventory-related losses for the host company.

7 Conclusions

The host company research case shows, that every activity within the supply chain is interdependent. This study case work illustrates the theory in practice: supply chain shortage process caused several problems to be studied and solved.

The author fosters strict frameworks for the research implementation by integrating several data gathering and analysis tools. That frameworks allows to understand the root causes of the supply chain shortage as well as inventory management adaptation. Moreover, the research analysis part of the work enables Metropress' management to go ahead with the project, anticipating mentioned supplier and inventory-related risks.

Since the researcher solves two assigned tasks, conclusions will be drawn separately for better visualization and understanding:

1. Metropress' supply chain shortage project is a justified process, which can benefit the company in terms of the financial perspective as well as the future increase in the number of contracts and new product/service development.
2. Alidi Nord, being the strategic supplier partner with a long-term relationship covered by the signed memorandum of cooperation, shows the correct

behavior and supports the work of the researcher. In connection with this, Alidi Nord understands the reasons and intentions of the Metropress' project, ensuring the company that the future ways of joint development and continued cooperation are developing well.

3. Implementation of the supplier selection plan allows Metropress to focus on the most important factors during future, new supplier relationship adaptation. Those factors were identified during the analysis part of the thesis work and explained to the Metropress' management. The taken actions will facilitate the work of the Metropress in upcoming contract negotiations with the Megapolis.
4. The relevant solution on inventory management strategy is offered and explained to the management. The inventory model allows to estimate stock volumes and make decision on capital costs calculations in further analysis. During model analysis, limitations are found and advice for future improvements of the model are made.

The Metropress' project work is not yet finished. This research work will stimulate the progress of the project in further steps, in order to achieve best possible results for the host company as well as for its suppliers.

8 Discussion

8.1 Acquiring the research objectives and answering questions

During the research work two problems were covered. Every problem has its own objective and was analyzed according to the stated sub-questions.

The first objective was an explanation and organization of the Metropress' supply chain shortage process regarding the tobacco product category. That objective was achieved by answering the supported questions.

The first sub-question was: "How to decide on the appropriateness of the decision on the supply chain shortage?" That question was explained mostly by means of

literature review. In the literature review, the themes of supply chain shortage and supply base optimization were discussed.

The second sub-question was: “Which criteria should be considered during the supplier reduction process?” That sub-question was partly answered during literature review stage, exploring the supplier relationship theme and basic supplier-related performance criteria. Moreover, that sub-question was analyzed during empirical study, while identifying the criteria directly in practice. That was achieved by supplier selection process analysis, supported by qualitative research tools such as focus groups and interviews.

The third sub-question was: “How can the relationship with the current supplier be maintained during the process of supply chain shortage?” That sub-question was also answered with the help of the theory section and qualitative analysis (interviews with the Alidi Nord).

The second objective of the work was to carry out inventory management regarding the tobacco product category. That objective was supported by sub-questions as well.

Answering the first sub-question, which was “How to organize a gradual transition of the tobacco product category for further inventory management implementation?”, inventory management theme was explained. That was acquired by an explanation of basic inventory-related knowledge, which is needed before realizing the inventory strategy. That information was collected during the theory section implementation.

“Which inventory model is the best suitable one in case the of the host company?”, being the second sub-question, was achieved by the theory section utilization as well as the practical phase (quantitative analysis). The researcher gathered needed historical data and studied the Metropress’ overall business principles. That information enables the author to correlate collected data with the possible inventory model option. For a better choice of the model, comparison of studied models was done. One of the main things to mention, is that the researcher made a quantitative analysis of the model, introducing the model calculations with the determined sample size data.

The last sub-question in the inventory part case was: “Which inventory policy should be applied for the chosen inventory model?” To answer that question, the host company’s specific needs were considered. Furthermore, Megapolis’ tobacco supplier requirements were studied and taken into account.

8.2 Research validity and reliability

Validity of the research defines the truthfulness of the overall results, assuming the use of correct research tools, which strictly correlate to the concept of the study (Oluwatayo, Ayodele 2012, 391-398).

During the research work, the author applied both quantitative and qualitative research methods. As the research worker in the host company, the author studied Metropress’ business principles and its supply chain concept. For the quantitative research part, the author made the correct research design, based on a deep study of primary and secondary sources, as well as supervision from the side of the host company managers. All sources were selected based on ethical research principles, including integrity, objectivity and legality. What concerns the qualitative part of the research, analysis of the gathered data was presented. On the run to this, triangulation of analysis methods was used.

Reliability is the consistency and precision of the research. More precisely, the reliability factor indicates the presence of errors in the research (Oluwatayo, Ayodele 2012, 391-398). There are several research-related errors, which should be taken into account during work implementation:

- Conceptual bias: the research work for Metropress was done based on the host company’s specific needs and requirements. The concept of the work was structured to be logical and consistent. It was fostered with the participation of the host company management as well as checked by the thesis supervisor.
- Design bias: all the analysis tools, which were used within the research work, were studied before use in practice. All results are considered as a true value.
- Sampling bias: as the research work requirements consider only the host company case, researcher’s samples in both quantitative and qualitative

analysis were defined correctly. The limitations in sample size during the quantitative analysis part were explained to the management of the company. Those limitations did not result into not achieving the objectives of the research.

- Process bias: during the research work, the author followed all the steps of the research frameworks consistently. Every step was discussed with the host company supervisors before transitioning to the next part of the work.
- Subject bias: subject errors were prevented by analysis of the concepts' structure and the triangulation of methods used. For example, the focus groups method, which had been previously used in Metropress, was reconstructed by the author, increasing the sample size of respondents: when the Senior Category manager said that Alidi Nord's product damage rate is low, the opinion of the Quality Check warehouse employee, who directly checks Alidi Nord deliveries, is also gathered and processed (it was possible to get more precise information and double check its validity).
- Observer bias was limited by every working day meetings with the host company supervisor. Supervision was achieved by both individual and group meetings as well as e-information exchange during the research work.

It should be mentioned that the results of this research work are acquired according to Metropress' individual needs: the host company's supply chain structure, business principles, Alidi Nord supplier and others are the variables that drive the results of the work. In terms of the external validity, those results will not be the same in other company's cases. However, the analysis methods and research techniques covered within the work can be used and applied to other businesses.

8.3 Ideas for future progress for the host company

Since the Metropress' project is not yet finished, there are a lot of suggestions for its possible future steps.

1. During research work, the author organized several interviews with Alidi Nord to discuss the Megapolis supplier. However, the agenda of those discussions was based on defined criteria, following an analysis framework. Now, Metropress is going to negotiate relationship conditions with the Megapolis.

That is why the author's suggestion is to take advantage of the current Alidi Nord supplier and get a valuable information about their contract negotiation experience with the Megapolis. It will help to anticipate a lot of difficulties during the process.

2. Payment conditions during the further contract negotiations with the Megapolis supplier are one of the most important things. Deferred payment terms should be discussed and considered in an inventory model strategy. Since the units' amount in an order will be increased, capital costs should be managed effectively.
3. Since Metropress aims to transfer all tobacco products SKU to the direct deliveries from the Megapolis supplier (the research work takes into account only 8 SKUs), it is important to integrate forecasting tools into the host company's management. The demand varies every day, based on a seasonal factor, a calendar factor and similar variables. That is why, sophisticated forecasting techniques are needed. To discover such techniques, historical data should be gathered on a daily basis and be stored as long as possible.
4. For Procurement and Sourcing departments, the supplier evaluation and selection models should be integrated. That will enable the information on the supplier performance indicators and support the future supply base optimization.
5. An Inventory-related cost calculation process also needs to be enforced with more historical data. As it was mentioned previously, the shortage cost variable was impossible to be calculated during the research work due to the lack of necessary data. This problem can be solved by following the author's aforementioned advices. Moreover, with the larger number of SKUs in inventory system, computerized program will be needed for more efficient management.
6. During the research work, one of the meetings with the Alidi Nord's category manager was held in the company's main Saint Petersburg distribution hub. The author of the research asked for the opportunity and checked the storing methods, that are used for the tobacco products. Since tobacco is an

expensive product, storing conditions require 24 hours worth of secure procedures such as camera control, individual and secure access to the storage place, and similar preparations (see Appendix 7). That should be assumed by the management of Metropress in advance.

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Appendices

Appendix 1. Metropress and Alidi Nord Memorandum (Russian version)

Меморандум между компаниями Алиди и Метропресс*

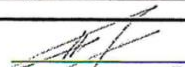
*то о чём должны полнить сотрудники Компаний

Тема:	Принципы сотрудничества между компаниями Алиди и Метропресс Достижение гармонии в отношениях между Компаниями для получения долгосрочного конкурентного преимущества на рынке и ежегодном приросте бизнеса не менее 10 % при уменьшении затрат на 5-10 % по всей логистической цепочке
Конечная цель:	Единая культура ведения бизнеса Единый для обеих компаний приоритет - оптимизация затрат по всей цепочке поставки Постоянное совершенствование внутренних и совместных бизнес процессов Взаимная гибкость в работе Стремление удовлетворять спрос и оказывать высокий уровень сервиса конечному потребителю по всей географии присутствия Метропресс и Алиди
Предпосылки:	

Принципы сотрудничества:

Общественная деятельность компаний	Совместное разработка инициатив и удержание влияния на принятие стратегических решений органами власти и управления города, касающихся планов стратегического развития Компаний
Приоритетность	Осознание сотрудниками стратегического партнёрства В ситуации принятия многовариантных решений выбор в пользу стратегического партнёра
Уважение	Ценить (ценить работу, достижения, взгляды) Стремление понять партнёра Равноправие Забота о будущем партнера Соблюдение совместно установленных правил Оперативность в ответ на запросы, нужды партнера "Не принимай, не делай, не передавай брак" партнёру
Доверие	Уверенность в партнере (делать максимально возможное во благо наших отношений) Прозрачность / Открытость Выполнение обязательств (соблюдение договоренностей) Отсутствие контроля, присутствие самоконтроля Понимание того, что мы вместе на десятилетия Видеть сильные стороны и правильно их использовать
Взаимная поддержка	Помогать друг другу (знать сильные и слабые стороны друг друга, видеть проблемы наперед) Выступать как одно целое (совместное решение проблем, не думать только о себе) Продвигать друг друга (при любой возможности рекламировать) Не идти на компромисс, выбирать одну из альтернатив
Совершенствование	Маленькие улучшения, но каждый день Точно вовремя 100% времени / 100% стока Постоянный обмен опытом Создать совместную мультифункциональную команду (рабочую группу): логистика, финансы, маркетинг и т.п. Принимать критику Предлагать идеи Совместное развитие Совместное инвестирование Совместный поиск возможностей снижения затрат Не бояться (отсутствие страха и опасений, пробовать что-то новое) Самосовершенствование
Чего точно нужно избегать в партнёрстве :	Недоверие Гордыня Безразличие Давление Тянуть время Обман Отсутствие общей цели Использовать слабые стороны друг друга Односторонние решение проблем Погоня за прибылью

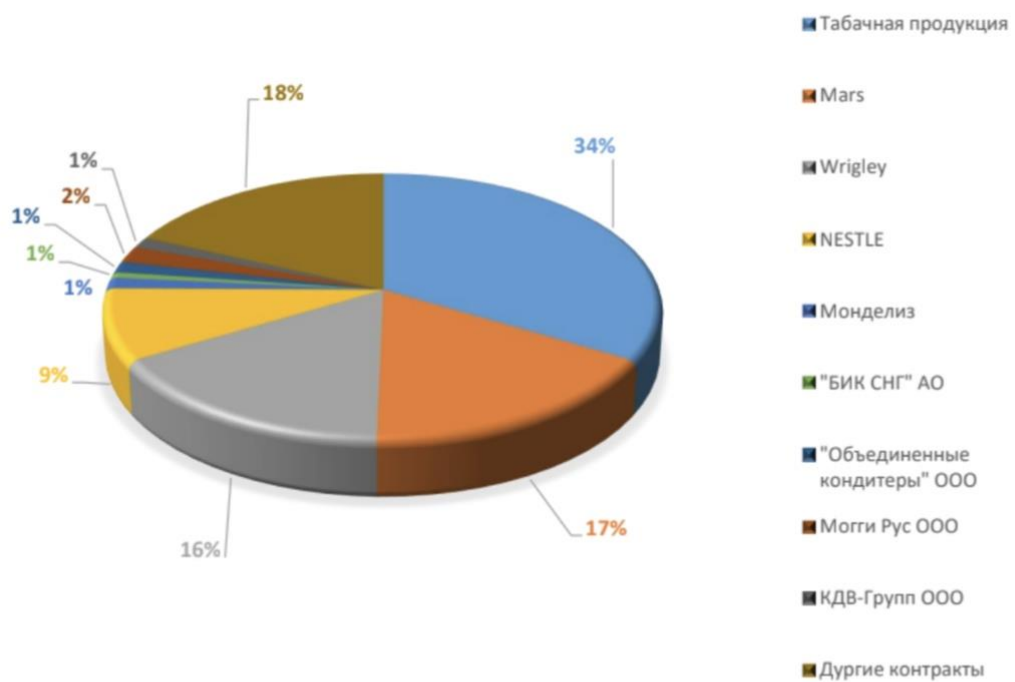
Генеральный директор ООО Алиди

 /Демченков П.В./

Appendix 2. Sales share contracts Pie Chart (Between Alidi Nord and Metropress,
Russian version)



КОНТРАКТЫ В ДОЛЯХ ПРОДАЖ



19 контрактов 150 СКЮ

Appendix 3. Focus group, Part 1 topics (English version)

Theme: Supply Chain Shortage: termination of the tobacco product (PM) contract with the Alidi Nord. Organization of the direct supply of the (PM) tobacco category from the new supplier (Megapolis).

Topic 1: Goal

Question: What is the goal of the Metropress' Supply Chain Shortage project?

Topic 2: Prerequisites

Question: What are the reasons for the Supply Chain Shortage project implementation? (Internal and external factors)?

Topic 3: Expectations

Question: What should be achieved under the Supply Chain Shortage project? How can Metropress and its suppliers benefit from the project.

Topic 4: Problems

Question: Which risks can Metropress face during the Supply Chain Shortage project?

Appendix 4. Focus group, Part 2 questions (English version)

Theme: Supplier selection process.

Question 1.

Which requirements should be met by the Metropress' supplier in the tobacco product category?

Question 2.

Which criteria determine the best supplier, considering Metropress' KPIs?

Question 3.

How can we rate the current supplier Alidi Nord according to stated criteria?

Appendix 5. Unstructured interview with the Alidi Nord (English version)

Questions:

1. Which problems did the company face during the relationship experience with the Megapolis?
2. How can Alidi Nord rate the Megapolis supplier in terms of given criteria:
 - Product quality
 - After sale conditions
 - Supplier reputation
 - Payment conditions
 - Information flow sharing
 - New business opportunities
 - Technical capabilities

Appendix 7. Alidi Nord's tobacco product category storing methods



Appendix 8. Inventory-related costs calculations. Excel document (Not available for public access)

Appendix 9. Q,r model calculations. Excel document. (Not available for public access)