

Developing purchase planning

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Bachelor's thesis

May 2018

Technology, communication and transport

Degree Programme in Logistics Engineering

Author(s) Anton Rudenko	Type of publication Bachelor's thesis	Date May 2018 Language of publication: English
	Number of pages 95	Permission for web publication: x
Title of publication Developing purchase planning		
Degree programme Logistics Engineering		
Supervisor(s) Minna Kervinen; Ilola Mikko		
Assigned by Company A		
<p>Abstract</p> <p>Global competition gets tougher and more intense forcing companies not only not to slow down but also to conquer new markets, niches, goals in pursuit of greater financial and operational results. There are 2 major ways of striving for such progressive goals: increase of sales indexes (e.g. quantity, margins, frequency) or operations optimization providing a company with additional free capital which may not only be treated as a profit but also re-invested stimulating growth. The key objective of the thesis was to develop a list of practical solutions which can help improve company's operations and efficiency.</p> <p>The imperfections and issues in the operations were examined and analyzed to improve efficiency and sustainability of the operations department. The research questions were "What are the requirements for a well working purchase planning processes?"; "What kind of challenges and benefits do current operations have?"; "What corrections should be made to reduce mistakes and bring cost efficiency?".</p> <p>The research method used was qualitative method focusing rather on the meaning of the collected data than on the quantity. Thus, the interviews conducted were analyzed according to the vast theoretical foundation by implementation of various analysis methods such as brainstorming and SWOT-analysis.</p> <p>The final outputs introduce a great number of new solutions enhancing company's operations and, consequently, verifying the achievement of objectives set. In pursuance of the implementation of the Pareto's rule, proposed development ideas were sorted in accordance with their contribution, easiness of implementation, and the amount of required resources. Ranking points out solutions bringing value faster with less investments and more significant output which may help organizations determine ideas to be implemented primarily.</p>		
Keywords/tags (subjects) Purchasing, Planning, Optimization, Operations Management, Materials Management		
Miscellaneous		

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Terms and Abbreviations

Alc% – alcohol proof (percentage)

BO – Brand Owner

DFC – Days Forward Coverage

EOQ – Economic Order Quantity

ERP – Enterprise Resource Planning

FTL;FCL;LTL;LCL – full/less (than) truck/container load

IT – Information Technology

JIT – “Just In Time” methodology

KANBAN – production improvement methodology

MRP – Material Requirement Planning

NAFTA – North American Free Trade Agreement

OOS – Out of Stock

OPT – Optimized Production Technology

PO – Purchase Order

ROP – Re-Order Point

S&OP – Sales and Operations Planning

SC(M) – Supply Chain (Management)

SIOP – Sales, Inventory, and Operations Planning

SKU – Stock Keeping Unit

SWOT – strengths, weaknesses, opportunities, threats

TQM – Total Quality Management

WMS – Warehouse Management System

1 Introduction

"A penny saved is a penny earned" Benjamin Franklin

As the business competition becomes tougher global companies may face a challenge of increasing sales when the presence of the firms cover most of the markets on the planet. In this case optimizing costs may be a great alternative to boosting sales.

Well planned and optimized purchasing processes may leverage the strengths of a production company and let it lead the market by improving its competitiveness. The less company spends the more free capital it has and the money saved can later be not only accepted as a profit but also reinvested into the company or acquisition of an additional manufacturing plant, or even a potential competitor.

In addition, well-organized and executed purchase planning is vital to developing business and persuing company`s financial goals. Thus, it includes the cooperations between tha number of parties both within and outside the company.

Purchasing can be the responsibility of either a single department within the company or it may be a part of an operations department and play the key role in the company`s overall operations. In the second case-scenario, one should consider not only purchasing but also sales and demand forecasts, inventory in stock, financial figures and targets, process management and control, collaboration with the commercial department, partners, sub-contractors etc.

The output of a profound purchase planning performance can be a list of net requirements that have to be produced and supplied within a particular time period, as well as a purchasing schedule plan including the timeline and every process for fulfilling the requirements. Moreover, the output includes the understanding of the opprotunities of leveraging economies of scale by the allocation of ordered SKUs (stock-keeping unit) among different contract packages. Finally, it includes the possibility of accurate management and control over the processes so that in case of any doubts or an accidental situation plan, the overall company`s operations could be amended to reach the target: predictability of the purchasing process.

2 Company Presentation

Company A is one of the global leaders in manufacturing and distributing alcoholic beverages. The company has more than 30 massive international brands of various types of distilled beverages representing wines, whiskey, vodka, rum etc. Major metrics in the firm are measured in millions of liters sold what, eventually, leads to the significant earnings and financial figures overall. Organization has vast coverage around the globe accumulating a significant number of affiliate and non-affiliate markets under main market of the region. Having had advanced and highly developed supply chain, even small improvements may contribute to considerable savings as well as efficiency enhancements.

3 Research objectives and methods

The main research objective was to map out the issues, imperfections or “bottle-necks” in the purchase planning phase with respect to the company’s overall operations and determine the ways to eliminate or, at least, mitigate those problems. All the problems and “bottlenecks” may cause additional costs to be arisen and require additional resources (time, efforts, labor force and/or money). Hence even tiny improvements can boost the company’s operations efficiency and, as a result, decrease expenses. Although the company has established itself to be very efficient and innovative there is always a room for development and one of the keys to adaptability and growth is continuous improvement. The plan was to generate development ideas directed to boosting operations efficiency, not to dramatically readjust or rearrange processes.

The thesis looked for the answers to the following research questions:

What are the requirements for a well working purchase planning processes?

What kind of challenges and benefits do current operations have?

What corrections should be made to reduce mistakes and bring cost efficiency?

The following Figure 1. Research plan introduces the scheme of the research plan of the thesis, which consists of the 6 major consecutive steps.

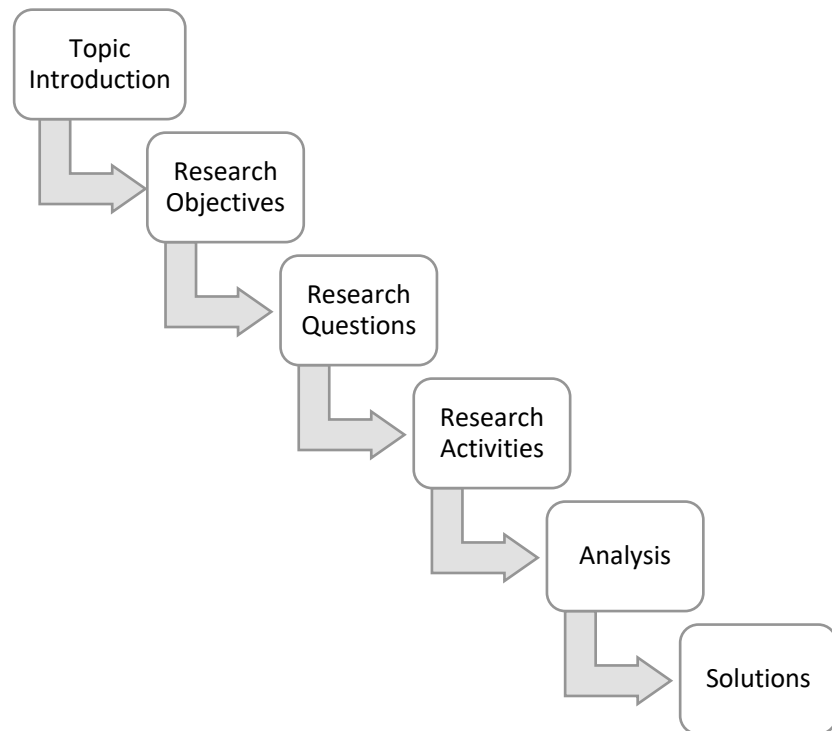


Figure 1. Research Plan

Research began with the familiarization with the topic, company, and its working environment. The idea was not only to understand the niche but also to see the bigger picture and understand the fundamentals of the company's supply chain.

The next steps were research objectives and questions. They helped to determine the focus area of the project work as well as the targets and expected outputs.

After the research questions stage, there was the research activities stage, which consists of familiarization with the theoretical basis built, conducting interviews and discussions, and recording personal observations and ideas. The key takeaways from the research section were to be recorded and structured.

The following step implied analyzing the interviews and discussions as well as personal development suggestions, and examining current state situation in the company. Such analysis was to be conducted with the help of the theoretical foundation supporting the research.

The last but not least was to generate development ideas based on theory, interviews, observations etc. In addition, the section was to include answers to the research questions which have been identified.

Qualitative method was the priority for the project and was based on analysing the topic by interviews, observations, calculations, documentations, theories.

Qualitative research was an approach for methodical collection, analysis, and interpretation of textual information (e.g. interview transcripts, documents) and for the most part the opposite to quantitative method.

Qualitative research method often includes the following practices :

- Interviews
- Focus group interviews
- Case study
- Discourse analysis
- Grounded theory
- Content or textual analysis
- Root cause analysis
- Observations
- Participation/individual experience

The bigger part of the research included multiple interviews and group discussions, observations and knowledge gathered by solving challenges faced on the working place. The research outputs also referred to the theoretical foundation (e.g. ABC classification) supporting the improvent ideas.

4 Operations Management

Operations Management has existed since the beginning of the production of products and services. Professional development of the topic started in the beginning of the 20th century with the introduction of the concept of scientific management. A few key principles were introduced by Frederick W. Taylor:

- Worker`s everyday yield has to be determined in accordance with scientific laws.
- Management employees` function is to develop such laws and implement them in the production process.
- Worker`s function is the unquestioning compliance with the requirements set by the management employees. The main focus is production process and control over it. (Vincenzo Sandrone; Frederick Taylor and Scientific Management Understanding Taylorism and Early Management Theory; Sammi Caramela 2018; Operations Management; Wild 2003.)

In the second part of the 20th century operations management began its own development as a management science. At that time it was known as “Production Management”. Later scientists noticed similarities in problems and patterns in the production systems and as a result production operations considered as components of an organization system as a whole. (Poonia 2010; Wild 2003; Fabio De Felice, Monfreda, Petrillo, Nenni, Iannone, Introna, Giuiusa & De Carlo 2013; Introduction to Operations Management.)

The key breakthroughs in the field in the 20th century were the use of computer technologies in solving operations problems which lead to the invention of MRP (Material Requirements Planning) systems and the JIT (Just in Time) management method. The following development of the TQM (Total Quality Management) brought significant improvements in the operations management and in the management as a whole. (What does 'Just In Time - JIT' mean; Kaynak 1997; Poonia 2010; Wild 2003.)

In addition to that, the production strategy model, called, 5P was introduced. It enabled management employees to use production facilities as a strategic competitive advantage development tool. According to the 5Ps model operations management includes:

- Organizations manufacturing goods or providing services (Plants)

- Designing of business processes (Processes)
- Products and services (Parts)
- Personnel recruitment for particular operations and business processes (People)
- Management functions execution, namely, planning, analysis, control and other (Planning and Control Systems) (Fabio De Felice, Monfreda, Petrillo, Nenni, Iannone, Introna, Giuiusa & De Carlo 2013; Introduction to Operations Management; Gupta 2012; Lewis; Kashyap; Mahadevan 2010.)

Based on the 5Ps model, there can be some of the operations manager's responsibilities identified:

- Calculation and placement of production capacities
- Designing of goods and services
- Decision-making about outsourcing of individual business processes
- Inventors management
- Organization of production
- Procurement Planning
- Development of schedules for the supply of raw materials and products
- Determining the level of centralization of production or operational activities and others (Fabio De Felice, Monfreda, Petrillo, Nenni, Iannone, Introna, Giuiusa & De Carlo 2013; Introduction to Operations Management; Gupta 2012; Lewis; Kashyap; Mahadevan 2010.)

Some of the operations management questions may be taken into account on all of the management levels in a company. Centralization of operations management functions in the directorates or operations departments enables elimination of duplication of functions in various departments and increase management reliability.

(Farnen 2018; Fabio De Felice, Monfreda, Petrillo, Nenni, Iannone, Introna, Giuiusa & De Carlo 2013; Wild 2003.)

Numerous operations manager`s responsibilities can be divided into 3 major groups (Figure 2. Responsibilities):

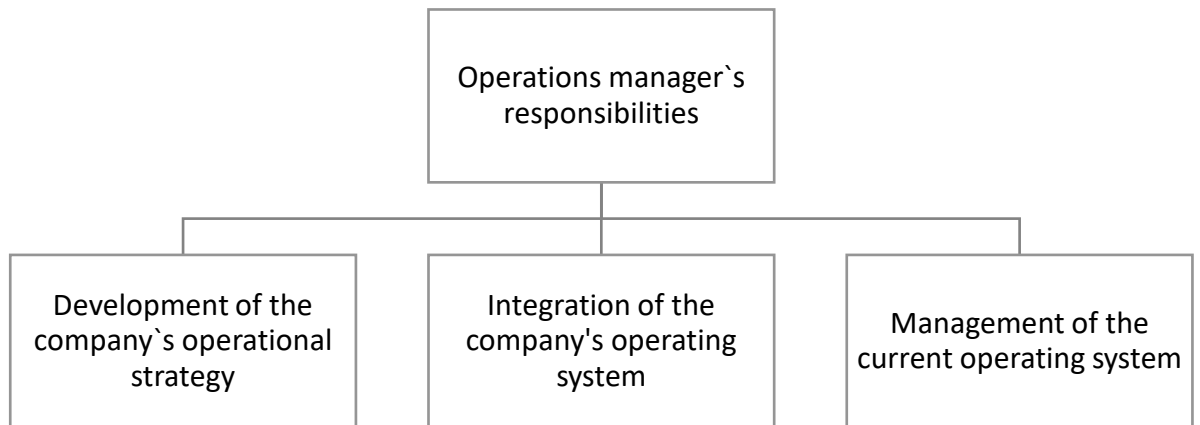


Figure 2. Responsibilities (Farnen 2018; Fabio De Felice, Monfreda, Petrillo, Nenni, Iannone, Introna, Giuiusa & De Carlo 2013; Wild 2003.)

Operations managers` responsibilities cover strategic, tactical and operational tasks that operational managers must perform at all levels of management. This requires the formation of a directorate for operations (or an operational department) directly subordinated to the top executive. (Farnen 2018; Fabio De Felice, Monfreda, Petrillo, Nenni, Iannone, Introna, Giuiusa & De Carlo 2013; Wild 2003.)

Scientific and practical results obtained with the accumulation of material and the identification of basic laws and laws governing the management of operations in the production field, began to be applied not only in production but also in the field of services sector. In the business processes of any industry or field, production and services are detached, resulting in the development of an integrated approach to the management of operations - operational management. Its main objectives are operations and processes. (Production and Operations Management; Gupta 2012.)

In order to determine the content of the operational management objective, it is necessary to focus on the meaning of the following terms: production, operations, operating system, business process (Table 1). These terms are often used as interchangeable, however, production is referred to manufacturing or fabrication whereas term "operations" has a broader interpretation. (Production and Operations

Management; Gupta 2012; Fabio De Felice, Monfreda, Petrillo, Nenni, Iannone, Introna, Giuiusa & De Carlo 2013.)

Term	Definition
Production	Manufacturing, fabrication, activity of transforming raw materials and/or information into products and/or services
Operations	Single activities in the series of other similar activities
Operating system	System which uses raw materials, informational or financial resources (inputs) on order to transform them into resulting products and/or services (outputs)
Business process	Sustainable, purposeful set of interrelated activities transforming "inputs" into "outputs" with the value added to the end consumer

Table 1. Definitions (Production and Operations Management; Gupta 2012; Fabio De Felice, Monfreda, Petrillo, Nenni, Iannone, Introna, Giuiusa & De Carlo 2013.)

All functions, executed in the organization's departments are operations, consequently, any type of management is associated with operations management. (Production and Operations Management; Gupta 2012; Fabio De Felice, Monfreda, Petrillo, Nenni, Iannone, Introna, Giuiusa & De Carlo 2013.)

Various operations and business processes describe the following disciplines:

- organization and planning of production;
- organization and planning of material and technical supply;
- organization and management of demand and supply;

- purchase planning;
- project management;
- management of services;
- general management;
- human resource management;
- quality management;
- marketing;
- IT management;
- strategic management;
- change management;
- investment management;
- financial management;
- innovations management;
- economic-mathematical modeling;
- scientific organization of labor;
- reengineering of business processes, etc.

Every type of management represents specific control area or zone (Table 2) but utilizes operations and processes and therefore utilizes operations management as a tool for realization of decision implementation. In spite of the difference between control areas, in all of the management types there is a factor of context activity and the need in managing it. (Production and Operations Management; Gupta 2012; Fabio De Felice, Monfreda, Petrillo, Nenni, Iannone, Introna, Giuiusa & De Carlo 2013; Pivovarov, Maksimtsev, Rogova & Hutieva 2011.)

Type of Management	Control Area
Operations Management	Operations and Processes

General Management	Groups of people
Human Resource management	Personnel
Project Management	Project
Quality Management	Quality
Marketing	Market
IT Management	Information and communication processes
Strategic Management	Development of the company
Change Management	Processes of the transition periods
Investment Management	Investments
Financial Management	Finances
Innovations Management	Innovations
Logistics	Flows
Supply Chain Management	Processes between supply chains

Table 2. Type of Management (Production and Operations Management; Gupta 2012; Fabio De Felice, Monfreda, Petrillo, Nenni, Iannone, Introna, Giuiusa & De Carlo 2013; Pivovarov 2011.)

5 Materials Management

5.1 Introduction to Materials Management

A modern organization operating on the market is simultaneously a provider of resources for its customers, and a consumer in relation to organizations that purchase resources for productive activities. As a result of such interactions supply chains are formed - a set of interdependent organizations supplying materials, goods and services to the customer. Each link in the supply chain, transferring the products to the next, increases the cost of the final product, so sometimes it is called a value chain. Value chain includes multiple, constituents however with the focus on operations

there can be 3 main components emphasized, between which there can arise different kinds of intermediaries: physical distribution, material technical support of production, and supply. (Figure 3. Modern Value Chain) (Supply Chain Performance: Achieving Strategic Fit and Scope; Manktelow, Jackson, Swift, Edwards, Bishop, Pearcey, Mugridge, Bell, Robinson & Bruce; Value Chain; Operations Management.)

Information flows can be very diverse: it is information about the volumes of products purchased by consumers, and their feedback on its quality, user properties, etc. The information received by the organization after comprehensive processing is put into production plans, on the basis of which plans are made for purchases of material resources. The latter, in turn, form stock flows, the movement of which in the process of processing is completed by the transfer of finished products to consumers. (Zhang, Wang, 2; Chibba, Rundquist, 3; Flows in Supply Chain Management 2017.)

Modern organizations, regardless of the sphere of activity, try to unite (integrate) all the elements of the value chain, considering this as a guarantee of successful activity.

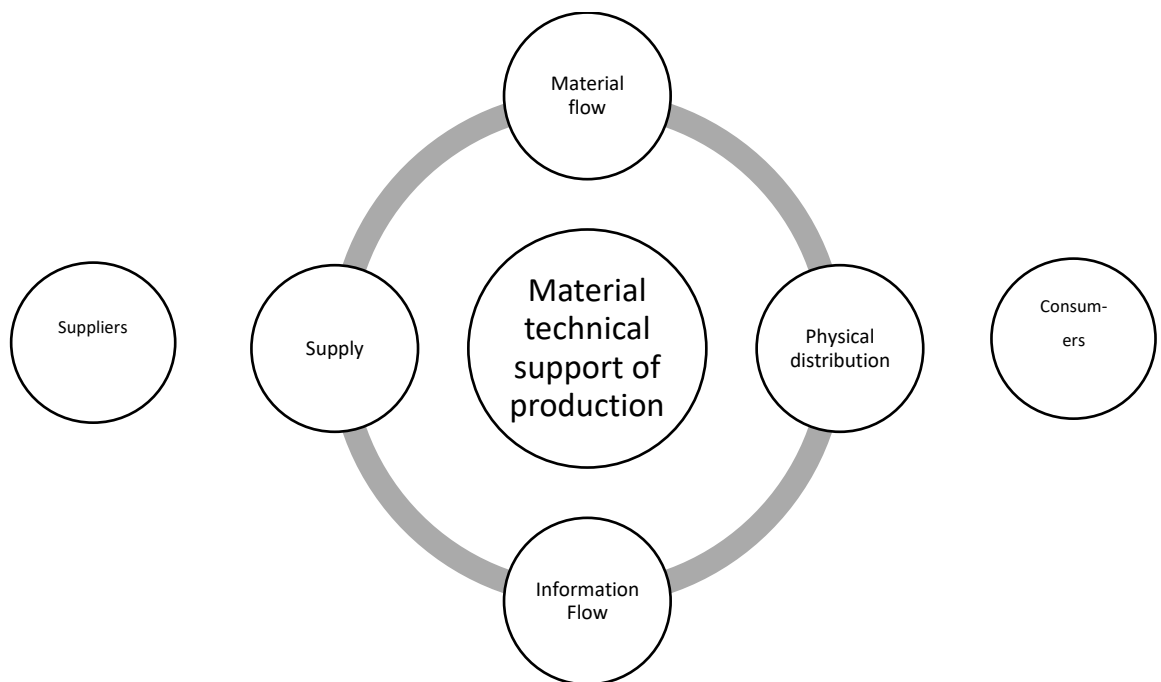


Figure 3. Modern Value Chain (Flows in Supply Chain Management 2017; Redefining Productivity in the Value Chain; Technology: The Insurance Industry's Pivot Point 2011.)

The flow of stocks is essentially the storage and movement of materials and finished products. To simplify the use, the concept of raw materials, materials and components is combined with the term materials. Operational management of the flow of stocks begins with the receipt of materials from the supplier (formation of the supply chain) and ends with the delivery of the final product to the consumer. The task of logistics is to move semi-finished products along the technological route for further processing, which is accompanied by an increase in value added in production. With the physical distribution, the finished products are promoted to consumers through marketing channels. An important condition in this case is to ensure the availability of the product to all interested groups. (Operations Management; Arnold, Chapman, Clive 2008, 360-361; Gupta & Chitale 2014; Pivovarov, Maksimtsev, Rogova & Hutieva 2011.)

5.2 Supply Chain Management Creates Value

The clear definition of the terminology used in this field contributes to the definition of the objectives and tasks of supply management. Depending on the national characteristics of the economy, as well as industry, there are different approaches to the application of concepts. In the international practice of supplying the production process with the necessary material resources, the term "procurement management" or "supply" is most often used. (Pohja 2004; Introduction to supply chain management.)

Modern theoretical approaches the procurement process is defined as logistics at the entrance or internal logistics, and the terms purchase, supply, supply, supply of raw materials and materials are considered synonymous. From the effectiveness of organization of supply chain management depends on ensuring the process of creating values in the organization, timely quality and full satisfaction of the needs of consumers, which as a result leads to a reduction in unproductive costs for the production of products in the organization. Any organization is part of at least one supply chain, since it has its own consumers and suppliers of goods and services. But in most cases, organizations are part of a number of supply chains. (Introduction to Supply Chains, 8; Introduction to Supply Chain Management; Monczka, Handfield, Giunipero & Patterson 2009, 191; Kraljic 1983.)

As an example, one can consider any organization for food trade: it buys products from many manufacturers and delivers them to various points of sale. From the literacy of the choice of the supplier of material resources, very much depends on the activities of the organization: the level of production costs of its products, competitive position in the market and the ability to timely meet the needs of consumers, etc.

One of the goals of supply chain management is to reduce the level of uncertainty and risks, and, consequently, to positively influence the level of inventories, cycle rhythm, processes and service level of the end user (The Importance of Supply Chain Management; Introduction to Supply Chain Management, 3).

The task of managing the supply chain is to plan and coordinate actions aimed at achieving a high level of customer service, taking into account the minimization of costs. At the same time, practice shows that the more integrated the network of suppliers, the sooner the task is achieved, because intermediate intermediaries, winding their own allowances, are excluded from the network, and, in addition, the pace of customer service is accelerated. (Introduction to Supply Chain Management; The Importance of Supply Chain Management.)

Relationships with suppliers of material resources are determined by the concept used in the organization. For example, long-term partnerships with a small number of suppliers capable of making frequent deliveries of small batches of material resources under the order are applied with the use of concepts or use of subcontractors. (Monczka, Handfield, Giunipero & Patterson 2009.)

Creation of significant buffer stocks of material resources in the production and channels of the value chain leads to the use of resource requirements planning systems (MRP, MRPII, RCCP, CRP, CPOF). Used accounting systems KANBAN, MRP or their combination require the constant synchronization of their data with the main production schedule of finished products, as well as with the accounting systems of the purchased products. (Monczka, Handfield, Giunipero & Patterson 2009; Buffer Stock; Arnold, Chapman & Clive 2008, 78-79.)

To perform the tasks of managing material resources, it is necessary to answer a number of questions that determine the entire activity of the organization: what, from whom, how much and on what terms to purchase. Depending on the answer to

the questions posed, company management chooses between own production and procurement., Outsourcing, determines the policy of selecting suppliers, of modern software to manage the information flows in the organization. (Arnold, Chapman & Clive 2008, 79.)

5.3 Make or Buy Decision

When deciding on the choice between own production and purchasing the required products, the management of the organization needs to evaluate a number of factors. In particular, it is necessary to take into account:

- availability of own production capacities that can be used to produce the necessary components and components;
- skill level and competence of employees;
- The cost of such production compared to the cost of production from suppliers;
- the possibility of purchasing from another organization in order to increase the volume of purchased products and reduce the cost of supplies;
- guarantee of availability of necessary components;
- the ability to control the quality of both resources and final products;
- the desire not to disclose the composition of the components of the final products;
- Possibility of saving on transaction costs. (Make-Or-Buy Decision; Schwarting & Weissbarth 2011; Martin 2015)

Acquisition of products from third parties enables the organization to use its own space for other needs, concentrate on the implementation of core activities, use the competence of suppliers in their own production. Sometimes organizations can enter into contracts for the full production cycle for the production of finished products. The successful functioning of the organization in the value chain for the consumer requires the presence of effective, optimally coordinated internal relationships between the units to ensure the full range of services and an uninterrupted production process. The variety of material flows in the organization is related to the sphere of activity which it is engaged in. Thus, retailers do not need to perform all the actions

to create values for the consumer in the production process, at the same time it is important for them to purchase the goods in a timely manner and place them in the trading floor at suitable places that are convenient for the buyer. (Venkatesan 1992; Schwarting & Weissbarth 2011; Jakomin & Bajec 2010; Monczka, Handfield, Giunipero & Patterson 2009.)

The functions of other organizations include the procurement and delivery of appropriate material resources to the places of their further use and provision of services. To perform a full range of operations for managing the material flow, many units of the organization are involved. (Schwarting & Weissbarth 2011; Jakomin & Bajec 2010; Monczka, Handfield, Giunipero & Patterson 2009; Arnold, Chapman & Clive 2008.)

Production management begins with the development of plans that coordinate the movement of material resources between the stages of the production process, as well as control over the progress of work. Production plans differ in the types of production. Thus, in organizations with mass production of production plans, the production needs are taken into account volumes of inventories and sales volumes of products. In organizations that perform work on the order, an important criterion in drawing up the plans are the deadlines for the work performed by the customer, and data on the volume of production demanded by the customer. The schedules of work execution reflect the needs for material resources and the speed at which they enter production. (Arnold, Chapman & Clive 2008, 21-32; Introduction To Production And Operation Management, 7-8; Cheng & Xiao-Bing 2013, 816-818.)

The main purpose of production schedules is to provide the organization with timely customer service, taking into account the uniform loading of production capacities and the distribution of work between production sites.

Flow of material resources within the organization is associated with the performance of functions such as procurement, transportation, warehousing, inventory management, and so on. All these operations are planned, implemented, regulated, controlled by the relevant services in large organizations or specialists in small and medium enterprises. (Arnold, Chapman & Clive 2008; Master production schedule.)

The supply activity of any organization has two main functions:

- internal - establishing relationships with units inside

organization;

- external - establishing relations with suppliers, supply-marketing

organizations, government bodies, etc. (The Importance of Supply Chain Management; Supply Chain Activities - scm activities determine its purpose.)

The purchasing activity of the organization is influenced by a number of factors:

- profile of productions
- output volume
- strategic development goals of the organization (Van Weele 2010, 75-78; Linman 2010.)

The production profile determines the composition, volume and rhythm of consumption of material resources. As a result, purchasing processes become heterogeneous, which complicates the competent management of them. (Monczka, Handfield, Giunipero & Patterson 2009, 38-41; Arnold, Chapman & Clive 2008, 191-195; Corina; Bedey, Eklund, Najaf, Wahrén & Westerlund 2008.)

Procurement operations within the organization should include: quantitative and qualitative acceptance of material resources for warehouses, storage, storage, transportation to production sites, preparation for processing, shipment, repair, shipment of packaging, etc. The timeliness of the implementation of these and other specific operations in the organization is facilitated by the availability of a material and technical base, which is warehouses, special loading and unloading and other specialized equipment. Management of the internal supply chain in the organization is carried out in stages: market analysis, planning, organization, accounting, control. (Bedey, Eklund, Najaf, Wahrén & Westerlund 2008, 11; Kidd 2005, 5; Moore, Baldwin, Camm & Cook 2002, 27; Monczka, Handfield, Giunipero & Patterson 2009, 41-44; Rogers, Croxton, García-Dastugue & Lambert 2001.)

Distribution of work between specialized units within the organization occurs by dividing the entire process, carried out within the supply chain, into separate stages with further integration with other managerial processes. The established work of

the supply chain is facilitated by a functioning system of coordination of activities between various units within the organization. Coordination of the supply department is carried out through the planning bureau, which is constantly connected with the planning and economic department of the whole organization. Through the service of Deputy General Director in the planning and economic department must arrive in time control figures on the market situation, its trends, prices for products and other information. Through the establishment of such relations, the supply department receives information on the needs of production in material resources on a timely basis, on the basis of which a procurement plan is drawn up. It takes into account such parameters as the nomenclature of material resources necessary for production, its volume, delivery time, available storage facilities, costs that the organization can incur, and others. (Figure 4. Example of a hierarchy) (Rogers, Croxton, García-Dastugue & Lambert 2001; Supply Chain Management Hierarchy; The Hierarchy of Supply Chain Metrics 2009; Oliver, Chung & Samanich 2001; Monczka, Handfield, Giunipero & Patterson 2009.)

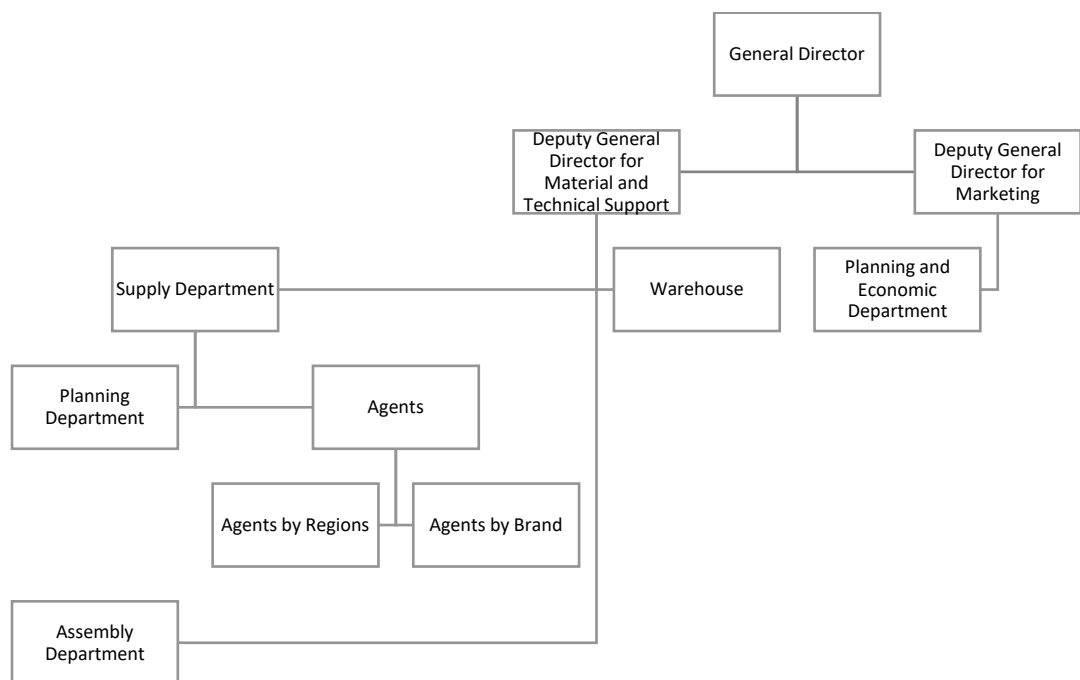


Figure 4. Example of a hierarchy

Responsibility for maintaining relations with suppliers of material resources is borne by the supply department. The effectiveness of its work depends on the parameters of the final product, including its quality, cost, consumer characteristics. (What is the

Role of Supply Chain Management?; Oliver, Chung & Samanich 2001; Monczka, Handfield, Giunipero & Patterson 2009; Chopra & Meindl 2013.)

The duties of the supply department include:

- selection of suppliers and competent redistribution of costs of the organization;
- search, evaluation and development of new sources of material resources to meet production needs;
- development and implementation of a joint policy with suppliers in the field of quality of products, timeliness of delivery, terms of payment, exchange, etc.;
- search for new materials and sources of their supply, evaluation of the possibilities for long-term cooperation with suppliers;
- Determination of the optimal price for the goods purchased based on the evaluation of the purchased material resources, taking into account their operational characteristics, expected life cycle, maintenance costs;
- initiation of cost reduction programs, active participation in them, performance of functional analysis, participation in long-term planning;
- Tracking the availability of the necessary initial resources to ensure the continuity of the production process;
- ensuring the effectiveness of interaction between various units within the organization and its suppliers;
- informing the management of the organization about the costs of ensuring the purchasing activity of the organization, changes in market conditions that may affect the size of the organization's profits and the potential for its economic growth. (What is the Role of Supply Chain Management?; Oliver, Chung & Samanich 2001; Monczka, Handfield, Giunipero & Patterson 2009; Chopra & Meindl 2013.)

Regardless of the industry to which the organization belongs, transport costs, the time spent on delivering products from suppliers is of great importance. Therefore, they are taken into account first of all when choosing the location of production capacities of the organization. However, they are also subjects to constant monitoring and adjustment by the relevant services of the organization. Their duties include:

- choosing the mode of transportation (own transport, specialized organization, etc.);
- Definition of rules for transportation of finished products;
- determination of the routes of transportation of products, etc. (Introduction To Production And Operation Management, 9; Introduction to Operations Management; Skripak, Parsons, Cortes & Walz 2016, 203-207; Felice, Monfreda, Petrillo, Nenni, Iannone, Introna, Giuiusa & Carlo 2013.)

The duties of the assembly department include unloading and unpacking of lots of goods; checking the compliance of the received goods with the documents declared; tracking the placement of goods in the relevant cells of storage facilities. The representative of the picking department checks the received goods for compliance with the required level of specifications. Modern organizations instead of expanding their own personnel engaged in determining the level of quality produced by suppliers of products after the delivery of products to the organization, carry out certification of suppliers. Thus, there may be created a program for certification of suppliers. Certification not only simplifies relations with suppliers for quality, payment for delivered products and for delivery itself, but also reduces a number of other costs of the organization. (Production Management, 2-3; Introduction To Production And Operation Management; Skripak, Parsons, Cortes & Walz 2016.)

The duties of the warehouse department include:

- creating a structure for the allocation of stocks;
- placement of stocks, which helps to minimize the cost of internal and external orders;
- definition and accounting of the stock of products stored in the warehouse;
- inventory of commodity items;
- warehousing and storage of products for the purpose of equalization: in time - for smoothening the fluctuations in demand, in quantity - to ensure a reduction in production costs, for the assortment - in the case of a wide range of products, with different intervals of use;

- timely processing of documentation coming with goods;
- Defining the objectives of creating and maintaining stocks;
- participation in the compilation of routing and technological maps of the movement of goods;
- performance of operations to ensure the safety of storage of goods. (Gupta 2012; Keller 2014; Ramaa, Subramanya & Rangaswamy 2012, 16; Rajgopal 2016.)

Any lost product in the warehouse has its value, and therefore it is very important to work with warehouse employees to explain to them the importance of their work in the value chain of the whole organization. In practice, the value of the lost goods in the warehouse can be calculated by the following formula:

$$(\text{Cost of lost products}) / (\text{profit on taxes}) = (\text{sales revenue needed to recover the cost of lost products})$$

The cost of lost products consists of the value of all goods purchased by the organization that cannot be sold by the consumer or used in their own production, including: lost and stolen goods, broken and damaged products, worn products, the sizes of which do not allow to sell or use them. In this case, the damage for loss of production must be covered from the revenue of the organization, and it includes the payment of an additional supply, labor costs for the search for goods within the warehouse, as well as the disappointment of consumers waiting for the promised goods that are not in stock. (Pivovarov, Maksimtsev, Rogova & Hutieva 2011.)

The use of routing and technological maps in loading and unloading operations contributes to the timely delivery of material resources to the relevant production sites. So, in cases of using massively-flow conveyor production, materials and components are transported to the appropriate sites, and finished products to storage or shipping sites. (Gupta 2012, Arnold, Chapman & Clive 2008.)

The efficiency of these operations depends on the speed of movement of the material flow in the organization, the responsiveness of the supply chain response to changes in demand. The availability of inventories essentially stops the material flow in the organization, but in some cases this is justified: with uneven fluctuations in the

demand of final consumers for the product produced by the organization, inventories allow the production capacity to be rapidly increased, and dependence on suppliers reduced. The significant stocks cause the formation of additional costs, moving material flow between production sites. (Gupta 2012; Arnold, Chapman & Clive 2008; Felice, Monfreda, Petrillo, Nenni, Iannone, Introna, Giuiusa & Carlo 2013.)

In modern organizations, the following practice is very common: focusing its own capabilities on the main lines of production and transferring a part of the non-main components of production to other industries. Such a system of transferring some of its non-core functions to contractors is called outsourcing. (Harap 2010; Monczka, Handfield, Giunipero & Patterson 2009, 749.)

An example of this is the car manufacturing organization, which purchases mirrors, windshields, dashboards and even engine air filters for small-sized organizations specializing in this production.

The reasons for using outsourcing in order of decreasing importance:

- Reduction of the volume of own production costs; The analysis should be carried out at the relevant costs, using the concept of disposable costs, i.e. costs that are minimized or reduced in the case of discontinuation of production - this is the direct cost of labor, the cost of managing production, the support costs per unit of output, its support, the cost of maintaining production capacity, etc.;
- profitable use of the technical competence of suppliers;
- the ability to meet demand in the event of an unforeseen increase;
- the opportunity to do without major investments in the renewal and expansion of fixed assets;
- Reducing the time to market products (Monczka, Handfield, Giunipero & Patterson 2009; Felice, Monfreda, Petrillo, Nenni, Iannone, Introna, Giuiusa & Carlo 2013, 36; Top Ten Reasons Companies Outsource 2004.)

The formation of modern outsourcing is facilitated by the development of industry, as well as transport and telecommunications technologies in countries located in different regions. Promote the expansion of the prospects for organizations to use new

sources of supply and international agreements. An example of this is the NAFTA-North American Free Trade Agreement, as well as the European Union. (Monczka, Handfield, Giunipero & Patterson 2009; Madison, Sandweiss & Ann 2014, 286; Gervais 2006, 35-36.)

5.4 Material Management with Independent Demand

Often organizations after the end of the production process carry out storage of finished products in their own warehouses. A sufficient amount of these stocks is a reliable source of rapid delivery of products to consumers immediately after the need arises. Effective inventory management with independent demand helps prevent the storage of excess goods. As a result, the costs for their storage are minimized and the level of customer service is raised at reasonable prices for products. (Arnold, Chapman & Clive 2008; Gupta 2012; Inventory Management, 359.)

There are two main models of material management: one-period and multi-period. Differences in the application of these models arise from the way in which material resources are procured. (Arnold, Chapman & Clive 2008; Gupta 2012.)

For random purchases of products which are most likely not to be re-purchased at all or soon a one-period model is used. For periodically purchased products, when a certain level of stock is created in accordance with the production need, a multi-period model is used. There are two main types of multi-period models: 1) with a fixed order quantity and 2) with a fixed refill interval. (Arnold, Chapman & Clive 2008; Gupta 2012.)

In the first case, each time questions arise about the replenishment of stocks, the management of the organization determines the quantity of products subject to either procurement from external sources or production in its own areas. When using this management system, the volume of replenishable stock is calculated taking into account the provision of a minimum of costs through the determination of their nature. Such a technique is called the economic order quantity (EOQ). An effective inventory management system allows one to establish a rational volume of products to be ordered; determine the time of the need to replenish the stock (i.e., the level of

pre-order, or the pre-order point). (Arnold, Chapman & Clive 2008; Gupta 2012; Schwarz.)

5.5 Cost Management of Storing Material

A concept of the cost of maintaining stocks includes costs associated with obtaining, accumulating, storing, issuing and processing of inventories. To account for these costs, different approaches are applied: from assigning costs to overhead costs to allocating them to target costs. However, hidden costs can arise even in the absence of stocks. Therefore, each time the formation of inventories should take into account the options for increasing the cost of stockpiling and the reason for their reduction. (Arnold, Chapman & Clive 2008, 261-262; Gupta 2012; Inventory Classification - ABC Classification, Advantages & Disadvantages.)

In a number of cases there is an increase in costs in connection with the accumulation of inventories:

- By investing a certain amount of capital in the creation of inventories, the organization bears both explicit and hidden costs.
- When using warehouses (for finished products, inputs or intermediate products), there are costs for their maintenance, as well as equipment and technical means used to move inventory stocks.
- With the accumulation of inventories, an additional tax burden arises for organizations, as well as an increase in insurance premiums.
- When storing products in warehouses, there are additional costs to ensure the quality of stocks, as well as to control the preservation of their useful properties; while the higher the level of stocks, the greater the costs involved.
- The longer the technological route for the products in production, the higher the requirements for the control system for inventory control and for their quantity, quality, and coordination of activities between the various services of the organization with the aim of timely delivery of stocks to the next assembly site or their updates.

- With a very high level of inventories, organizations are slow to respond to changing market needs; as a result, there may arise both hidden and obvious costs that directly affect the competitive status of the firm.
- Large amount of inventories can lead to obsolescence of stored products, which can not be used in the future (for example, the expiry date of medicines, after which they are forbidden to use) or because of obsolescence - the products are no longer of interest to the market. However, the accumulation of inventories can lead not only to increased costs, but also to their reduction:
- When an organization is compelled to apply to suppliers for processing orders for the production of a part of the product, it incurs additional costs to find a supplier, establish contacts with it, evaluate its activities, deliver goods, unpack them, store them, etc.

Of course, modern business relations allow a number of costs to be shifted to suppliers, however in any case it increases the cost of final products. Therefore, the availability of material stocks purchased in advance by a large batch can lead to a reduction of all listed costs, as well as savings in the cost of purchased products.

- Each time, restructuring to release new types of goods, the organization bears the cost of commissioning, but these works themselves increase the overhead costs, because during the period of their equipment the equipment is actually idle. In addition, there are costs for labor, materials that will be spent on the manufacture of products at the time carrying out of adjustment works. (Inventory Management, 9-8; Inventory management costs 2009; Hong-Mo Yeh; Inventory Management; Caplice 2006; Arnold, Chapman & Clive 2008.)

Previously, to save commissioning, the method of establishing a fixed amount of costs for them was widely used. However, now the approach is being applied more and more precisely in time, consisting in the parallel production of products in small series with simultaneous search for variants of low-cost commissioning. In this case, it is very important to reduce the cost of maintaining inventories instead of their excess storage. In addition, more and more flexible automation is used, allowing on one equipment produce several types of products instead of using a single powerful machine, with a high cost of adjustment;

- The increase in the size of batches of purchased products makes it possible to make real savings on their cost.
- The availability of inventories can meet unforeseen demand from consumers, and respond quickly to its change, put products on the market in time, and shorten the lead time for the order. (Arnold, Chapman & Clive 2008; Inventory Management; Gupta 2012; Waters 2003, 48-50.)

To ensure the successful operation of the organization, it is necessary to keep the costs of inventory management operations to a minimum, while maintaining the quality of their performance. For this, organizations maintain relationships with trusted suppliers that are able not only to produce products qualitatively, but also to respond quickly to emerging needs. This allows one to reduce the level of inventories. (Monczka, Handfield, Giunipero & Patterson 2009, 416-418; Arnold, Chapman & Clive 2008; Inventory Management; Gupta 2012; Waters 2003, 48-50.)

Establishing a close partnership with the main customers, one can get information on the purchases they are planning, which as a result affects the processes of own planning of production volumes in organizations and specifies the volumes of insurance stocks. Competent management of costs for placing orders and commissioning is most often limited to switching to the production of small quantities of products, which entails a reduction in inventories. (Monczka, Handfield, Giunipero & Patterson 2009; Arnold, Chapman & Clive 2008; Inventory Management; Gupta 2012; Waters 2003.)

Successful work of organizations is facilitated by the establishment of flexibility of production processes, which allows to produce products at the level of demand for it. As a result, customer satisfaction is achieved without accumulating inventories. In addition, more frequent delivery of goods in small batches is considered as another saving option, since in this case lower costs are required to pay for products, store them, etc. (Monczka, Handfield, Giunipero & Patterson 2009; Arnold, Chapman & Clive 2008; Inventory Management; Gupta 2012; Waters 2003, 48-50.)

5.6 One-period Material Management Model

Proper management of inventories is an important tool for implementing a competitive strategy of the organization, contributing to the rapid satisfaction of the needs of consumers. Presence of such stocks allows to protect interests of the organization at unforeseen fluctuations both demand for final production of the organization, and offers of the resources necessary for duly fulfillment of production processes. Recent trends indicate an increasing consolidation of organizations by their actions by creating sustainable consumer chains oriented for the end user, purchasing resources jointly with other organizations, which leads to a significant reduction in their cost per unit of output. (Arnold, Chapman & Clive 2008; Waters 2003.)

On the other hand, purchases of larger quantities of resources lead to an increase in costs associated with their content, which, in turn, may entail a decrease in the flexibility of production processes of organization. In order to reduce the costs of maintaining inventories in organizations, the actions related to the commissioning and the establishment of partnerships with suppliers must be constantly adjusted. Such actions increase the flexibility of production processes. The disposal of stocks is associated with high risk and has a serious impact on logistics. (Arnold, Chapman & Clive 2008; Waters 2003; Monczka, Handfield, Giunipero & Patterson 2009.)

Selecting a certain range of stocks and then sending them to the market or to the region in the expectation of future sales predetermines a number of logistics operations. The lack of the right assortment of goods can cause a reduction in sales and frustration of consumers. Inventory planning is also vital for production. Shortage of raw materials may entail the closure of the enterprise or a change in the production schedule, which in turn may result in additional costs or a deficit in the finished product. (Arnold, Chapman & Clive 2008; Noche; Inventory Management.)

If the deficit of production threatens with the disruption of production and marketing plans, the excess amount of stocks is fraught with problems too. Because of excessive stocks, there is a growing demand for warehouses, working capital, insurance and tax payments, besides the products stored in the warehouse may become obsolete and lose some of the cost: in short, costs are rising and profitability

is falling. (Arnold, Chapman & Clive 2008; Noche; Inventory Management; Waters 2003.)

5.7 The role of stock

In order to formulate a policy of inventory management, it is very important to understand the role of stock in production and marketing, as many companies account for the lion's share of all assets. The appearance of new products leads to a further buildup of stocks. Taking into account the size of the assets represented by the stocks, especially in relation to the total amount of resources used, it can be confidently said that stocks are a major cost center. Reducing inventories by only a few percentage points can significantly improve profitability. (Muller 2011; Walle & Esper 2014.)

To date, there are significant unused stock to improve inventory management. They lie in the further integration of the logistics chain, which would allow, thanks to active information exchange and purposeful joint efforts, to reduce the uncertainty of economic activity and, accordingly, to reduce insurance stocks. Such a reorganization of the supply chain requires a clear understanding of the structure of stocks and their dynamics. (Muller 2011; Walle & Esper 2014.)

5.8 Stock Types and Their Characteristics

Storing inventory is always risky, because it freezes the capital, which can eventually become unsuitable for distribution:

- 1) money invested in stocks cannot be used to purchase other assets or goods capable of increasing the efficiency of the enterprise;
- 2) If, however, not own resources are invested in the stock, but borrowed funds, it increases the interest expenses of the enterprise. The risk of the second type is related to the fact that the stored products can be stolen or become unusable. (Stock Handling and Inventory Control; Davis 2013; Waters 2003.)

In combination with a significant amount of investment in stocks, these factors constitute an essential part of the risk for any enterprise.

It is important to understand that the nature and degree of risk depend on the position of the firm in the distribution channel:

Production

Stocks are a source of long-term risk to manufacturing companies. Their stocks include raw materials and parts, incomplete and finished products. Before the finished product is sold, it is often necessary to move it to distribution warehouses located near the wholesale and retail trade. Production companies tend to deal with a narrower range of products than wholesale and retail traders, but their need for inventories is more pressing and time-consuming.

Wholesale

For wholesalers, a narrower range of risks is characteristic than for retailers, but their risks are deeper and longer. Wholesalers buy large quantities of goods from manufacturers, and sell them to retail trade in small lots. The economic role of wholesalers is to supply retailers with a specially selected assortment of products from different manufacturers and small lots. If the products are seasonal, the wholesaler must form stocks long before they are sold, which increases the depth and duration of the risk.

Retail trade

For a retailer, inventory management is reduced to buying and selling. A retailer purchases a lot of different goods and takes a considerable risk of selling. Because of the high cost of retail space, the main thing for retailers is inventory turnover (calculated by dividing the annual sales volume by the average amount of stocks) and the direct profitability of each product. Although retailers take on multiple risks specific to each type of product, but any of them individually is small. In a typical supermarket, the risk is distributed among more than 10 thousand commodity items (or units of storage). In self-service stores selling discount goods, the number of storage units often exceeds 25 thousand, and in large department stores it often reaches up to 50 thousand. In dealing with such a wide range of goods, retailers are trying to shift more and more of the responsibility for stocks to stocks manufacturers and wholesalers. "Pushing" stocks to the previous levels of the marketing channel,

retailers also require manufacturers and wholesalers to quickly deliver mixed lots of goods. Specialty stores, due to the narrow range, are exposed to risks in a less wide range than those that sell consumer goods, but their risks are deeper and longer. If an enterprise plans to operate at more than one distribution channel level, it should be prepared to accept additional risk associated with the inventory. For example, a chain of grocery stores that owns a regional warehouse, assumes, together with the usual, a wholesale risk. To the extent that the enterprise is vertically integrated, it must manage stocks at all levels of the marketing channel. (Stock Handling and Inventory Control; Davis 2013; Waters 2003; Richards 2018; Rushton, Croucher & Baker 2017.)

The ideal situation with stocks occurs when the manufacturer produces products only for a specific customer request. In particular, it is this custom-made production that meets the requirements for non-typical equipment. There is no need for stocks of raw materials or waiting for the sale of finished products. Although a production and distribution system with zero stock is not always practical, it is important to remember that in any case, every penny invested in stocks needs to be correlated with other logistics resources in order to be convinced of their effective impact on total costs. (Muller 2011; Inventory Management; Waters 2003.)

Stocks are the largest area of "employment" of assets, which at the same time brings a minimum return on invested capital. On average, the stock of most firms exceed their basic needs.

Stock functions:

1. Geographical specialization (stocks ensure the geographical specialization of individual economic units):

Because production needs energy, raw materials, water and labor, it often has to be placed quite far from the main markets. Technological and other capacities in order to reduce transportation costs are usually located near the sources of material resources. This strategy of geographical isolation ensures the economy of production. However, geographical isolation requires the

transportation of stocks of components to the assembly line. (Waller & Esper 2014; Gupta 2012; Rushton, Croucher & Baker 2017.)

- Geographical isolation creates a need for inventories from which a certain assortment of products for sale could be formed (Production of finished products in different places is collected in a warehouse and mixed batches are selected for shipment, this is an example of how stock allow combining geographical isolation and integrated distribution) (Rushton, Croucher & Baker 2017; Arnold, Chapman & Clive 2008; Inventory Management.)
 - Geographical isolation makes it possible to specialize the company's production and sales units (Rushton, Croucher & Baker 2017; Arnold, Chapman & Clive 2008; Inventory Management.)
2. Consolidation of resources (realized by accumulating stocks of unfinished products "on the border" between different stages of the production process and thereby ensuring maximum production efficiency in a separate enterprise. This function allows producing and transporting each type of product in economically viable lots) (Rushton, Croucher & Baker 2017; Arnold, Chapman & Clive 2008; Inventory Management; Waters 2003.)
 3. Balancing Demand and Supply (Associated with the existence of a time gap between production and consumption: The most obvious example is the seasonal production of products consumed throughout the year, for example orange juice. Antifreeze is a counterexample: this product is produced all year round, but consumes only for only one season. The main problem of planning is to determine what volume of stock will ensure maximum sales with a minimum risk of transferring balances to another season) (Chopra & Meindl

2013; Van Weele 2010; Waller & Esper 2014; Rushton, Croucher & Baker 2017.)

4. Protection against uncertainty (The most important task of planning is to determine the proper volume of insurance stocks.) The function of insurance, or buffer, stocks is to smooth out fluctuations in demand and supply, a significant part of excessive stock is the result of incorrect planning.) (Arnold, Chapman & Clive 2008; Inventory Management; Gupta 2012.)

MID STOCK

Average stocks include raw materials and materials, parts and components, unfinished and finished products, which are usually stored at different objects of the logistics infrastructure. (Buxton 1975, 105-106; Borad 2018; Waters 2003.)

The average stocks include:

1. stocks current (or basic);
2. insurance stocks;
3. stock in transit.

CURRENT STOCK

Current stocks, or base stock, are that part of the average stock that is subject to regular replenishment (the average amount of stock that results from replenishment).

At the beginning of the functional cycle, the amount of stock is maximal. Daily orders deplete stock until their level reaches 0. Before this happens, it is necessary to place an order for replenishment of stocks, that they managed to arrive until the warehouses were emptied at all. An order for replenishment of stocks should be sent when their volume exceeds (or, at least, is equal) the needs of customers within a specific functional cycle. The size of the order - the number of goods ordered for replenishment. (Buxton 1975, 105-106; Borad 2018; Waters 2003.)

BUFFER STOCK

An element of the average stock, maintained to protect against uncertainty. Insurance stocks are used only at the end of the replenishment cycle, when uncertainty appears in the form of increased (against the planned level) demand or a longer than expected functional cycle.

The purpose of insurance stocks is to cover the needs caused by short-term fluctuations in supply or demand. Taking into account this part of the stock, the average stock can be expressed as the sum of half the size of the order and insurance stocks. (Buxton 1975, 105-106; Borad 2018; Waters 2003.)

TRANSIT STOCK

Stocks that are already shipped or are awaiting transportation. This is a necessary element of replenishment. From the point of view of management, stock in transit are a source of two complex circumstances in the supply chain:

1. stocks in transit are real assets that must be paid, although they are not yet available for use;
2. Some uncertainties are associated with the supplies in transit, as it is difficult to establish where the vehicle with the load is at a particular moment of time and when it arrives at the destination.

Depending on the terms of procurement, companies may or may not be lawful owners of stocks on the way. Such stocks do not belong to the buyer, if the property rights are transferred only at the destination and they are the property of the recipient, when the property rights are transferred at the point of departure. If ownership rights are transferred at the point of departure, stocks in transit should be considered part of the average stock. (Buxton 1975, 105-106; Borad 2018; Waters 2003.)

DYNAMICS OF MID STOCK WITHIN THE FUNCTIONAL CYCLE.

Formulating the policy of inventory management, one need to determine how much and when to order (Monczka, Handfield, Giunipero & Patterson 2009, 81-82; Arnold, Chapman & Clive 2008; Snapp 2014).

Example: the duration of the replenishment cycle is constant and is equal to 20 days. The sales volume is also constant and is equal to 10 units per day. The enterprise becomes the owner of stocks only upon the delivery. The order size is 200 units.

These relationship is shown in Fig. 5, which depicts the graph, consisting of a sequence of rectangular triangles resembling the saw's teeth (spikes).

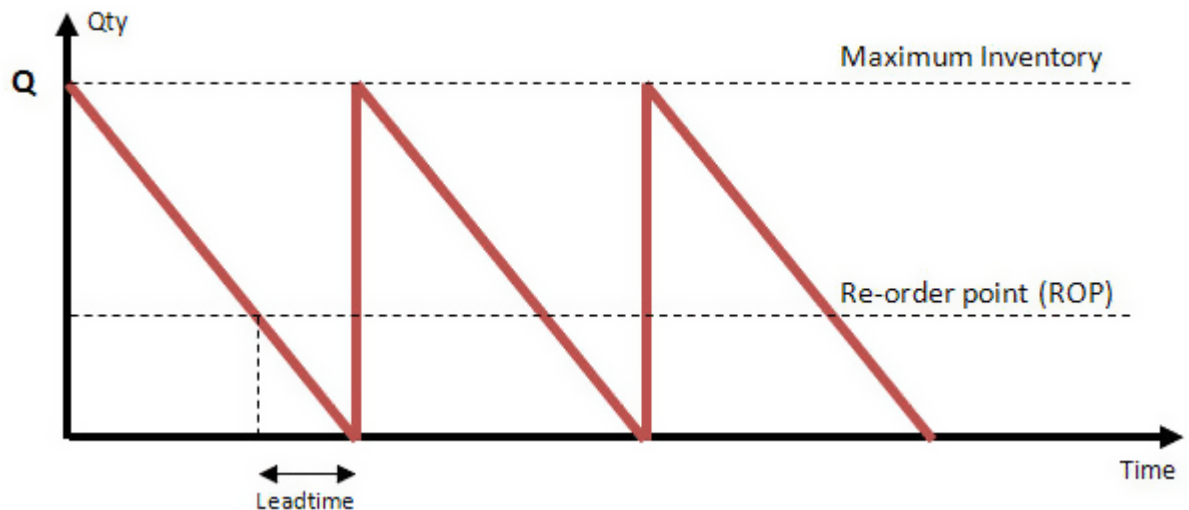


Figure 5. Order placement

Since in the conditions of replenishment and use of stock there is full certainty, the schedule of orders is drawn up in such a way that deliveries arrive just at the moment when the last unit of stocks is sold. Therefore, in this situation, all the elements of the average stock are missing, except for the basic ones, or current ones. In the example, 10 units of stocks are sold daily and it takes 20 days to fully restore them, so a reliable policy would be to order 200 units every 20 days.

The order point is set at 200 inventory units. The point of the order is the level of stocks at which the order is placed for their replenishment. In the example, the next order is placed, as soon as the amount of cash stocks plus the size of the order for replenishment falls below the level of 200 units. Since the order point is equal to the size of the order, the stock level during the functional cycle changes from a maximum of 200 units (delivery arrival) to zero. The average stock is equal to 100 units, since in the first half of the functional cycle (10 days) the value of the stock exceeds 100 units, and in the second case there are less than 100 units. In fact, the average

volume of stock is half the size of the order, but we do not take into account the stock on the way. (Inventory Management; Waters 2003; Muller 2011.)

If we assume that there are 240 working days per year, 12 purchases for replenishment will be required for the year. Hence, for the year will be bought 12 times for 200 units and only 2,400 units of stocks. In each of 240 working days of the year, sales are expected in the volume of 10 units and total - 2400 units. As already mentioned, the average stock are 100 units. Thus, inventory turnover is 24 (2400 units of annual sales / 100 units of average stock).

Managing such routine operations is boring, so managers sometimes have a desire to revise the conditions. What happens if one places orders more than once every 20 days? Why not order 100 units every 10 days? Where did this periodicity of orders come about - every 20 days? Why not order 600 units every 60 days? If the duration of the replenishment functional cycle remains constant (20 days), how will each such change in the order policy affect the order point, the average volume of inventory, and the inventory turnover? (Inventory Management; Waters 2003; Muller 2011.)

If we order 100 units every 10 days, at any time we will have two orders placed. The ordering point remains at the level of 200 units of cash or already ordered stocks, which ensures the daily sale of 10 units within a 20-day functional cycle. However, the average volume of cash stock will be reduced to 50 units, and inventory turnover will grow to 48 times a year. If one orders 600 units every 60 days, the average base stocks will be 300 units, and turnover will be about 8 times a year. (Inventory Management; Waters 2003; Muller 2011.)

When determining the optimal size of the order, it is necessary to maintain a balance between the costs of an order and the costs of storing mid stock. In order to solve this task one can leverage economic order quantity tool (model EOQ). Having determined the economical size of the order and dividing it by the predicted value of the annual demand, we will obtain those frequency values and the sizes of deliveries that minimize the total cost of maintaining the stocks. (Inventory Management; Waters 2003; Muller 2011.)

MATERIAL HANDLING COSTS

The costs of maintaining (forming and storing) stocks form the main element of logistics costs. We have already noted that in a typical production company, the cost of maintaining stocks is 37% of all logistics costs. Usually the value of this indicator is calculated by multiplying the share of these costs in value in the value of stocks by the average value of the stocks. (Inventory Management; Waters 2003; Muller 2011.)

MAINTAINING STOCKS COST SHARE

Typically, the value of the cost of maintaining stocks is estimated as the proportion of the corresponding costs in the average cost of stocks.

For example, the share of costs for maintaining stocks is 20%, then the corresponding annual costs for an enterprise, the average cost of which is 1 million EUR, will be 200 thousand EUR. ($20\% * 1 \text{ million EUR}$). But if the calculation of the absolute value is quite obvious, with the determination of the share of these costs in the cost of these stocks, the situation is not so simple.

The finding of a share of costs for the maintenance of stock depends on the subjective judgment of the company's management, on the estimation of the average value of the stock, on which items the corresponding expenses are written off, and on the extent to which they are directly measurable.

The costs of maintaining stocks are traditionally attributed to the following articles:

- 1) capital expenditures;
- 2) insurance costs;
- 3) expenses for depreciation and write-off;
- 4) storage costs;
- 5) expenses for taxes. (Inventory Management; Waters 2003; Richards 2018; Gupta 2012.)

5.9 Classification

Classification of stock by function is necessary due to a different approach to managing each class of stock. In this case, each particular product stored in the stock

can simultaneously perform several functions. (Techniques Of Inventory Management; Shawal.)

Management in logistics is characterized by a large nomenclature of managed objects: a wide range of goods, a large number of buyers, suppliers, etc. In the process of working with each individual object, the entrepreneur receives some part of the intended result. In this case, from the point of view of the contribution to the overall result, the controlled objects are not equivalent. (Waters 2003; Techniques Of Inventory Management; Shawal.)

The economy is well aware of the Pareto rule (rule 20/80), according to which only one fifth (20%) of the total number of objects that the company has to deal with provides about 80% of the results of the activity. The contribution of the remaining 80% of the objects is only 20% of the total result. For example, in trade, 20% of goods names provide 80% of the enterprise's profit, the remaining 80% of the names are just a necessary addition, an obligatory assortment. It should be noted that to measure the contribution to the overall result, it is the profit from the sale of a particular product that is analyzed. The volume of sales (income) unilaterally characterizes the share of the assortment position in profits, as the costs associated with the purchase, storage, sale are not taken into account. (Arnold, Chapman & Clive 2008; Techniques Of Inventory Management; Waters 2003.)

The Pareto rule acts not only in the economy. Work with 20% of students is 80% of all time spent by the administration of the school to work with students. Of the total number of suppliers, only 20% create 80% of the total risk of loss from communication with an unfair partner. The essence of the Pareto principle is that in the process of achieving any goal it is irrational to give objects that form a small part of the contribution, the same attention as to objects of primary importance. (Relph & Milner 2015, 133; Arnold, Chapman & Clive 2008; Techniques Of Inventory Management; Waters 2003.)

ABC-analysis

According to the Pareto method, the set of controllable objects is divided into two unequal parts. In logistics, the ABC method is widely used, which involves a deeper division of the analyzed objects into three parts. In this case, preliminary all the

managed objects must be evaluated according to the degree of contribution to the result of the activity. (Arnold, Chapman & Clive 2008; Techniques Of Inventory Management; Waters 2003.)

Let's consider an example. In Table 3 there are 20 objects, the contribution (input) of each object to the overall result (output) is estimated in units and is given in column 2. Column 3 shows the percentage of each of the objects in the total result in percentage. If one arranges the objects in descending order of the contribution share (Table 4), it becomes obvious that the first two positions (10% of the list objects) provide 75% of the result. The next 5 positions (25% of the objects) - 20% of the result, and the remaining 13 positions (65% of the objects) yielded only 5% of the result. (Arnold, Chapman & Clive 2008; Techniques Of Inventory Management; Waters 2003.)

1	10	0,1
2	200	2,0
3	30	0,3
4	5200	52,0
5	30	0,3
6	90	0,9
7	10	0,1
8	100	1,0
9	800	8,0
10	300	3,0
11	10	0,1
12	20	0,2
13	2300	23,0
14	300	3,0
15	40	0,4
16	70	0,7
17	50	0,5
18	20	0,2
19	400	4,0
20	20	0,2
	10000	100,0

Table 3. Objects by contribution

№	input	Share %	Accumulative total	Class and output%
4	5200	52,0	52,0	Class A, 75%
13	2300	23,0	75,0	
9	800	8,0	83,0	Class B, 20%
19	400	4,0	87,0	
10	300	3,0	90,0	
14	300	3,0	93,0	
2	200	2,0	95,0	
8	100	1,0	96,0	
6	90	0,9	96,9	Class C, 5%
16	70	0,7	97,6	
17	50	0,5	98,1	
15	40	0,4	98,5	
3	30	0,3	98,8	
5	30	0,3	99,1	
12	20	0,2	99,3	
18	20	0,2	99,5	
20	20	0,2	99,7	
1	10	0,1	99,8	
7	10	0,1	99,9	
11	10	0,1	100,0	

Table 4. ABC

Suppose that initially the costs of managing these objects (for example, advertising of sold goods) were distributed among all objects evenly, regardless of the contribution of the object to the final result, while the management cost of one object was 5 conventional units. In this case, the total cost of management was 100 conventional units. We will increase the cost of managing objects of Group A by 2 times and reduce the cost of managing Group C objects by 2 times. The cost of managing the objects of Group B will remain unchanged. A simple calculation shows that the total cost will be reduced by 22.5 conventional units: $2 * 10 + 5 * 5 + 13 * 2.5 = 77.5$.

The deterioration in the management of group C is unlikely to have a significant impact on the overall result due to the insignificant role of the group. At the same time, improving the management of group A can significantly improve this result. Thus, the redistribution of funds for management, performed in accordance with the

results of the analysis of the ABC, will reduce management costs and increase the efficiency of activities. This example can illustrate the effective management of the advertising budget of the enterprise or the solution of the task of strengthening the company's position in the market. To do this, it is necessary to expand the trading assortment without attracting additional financial resources and using additional storage facilities. Before the logistics service the task is to reduce the total amount of stock in order to reduce the cost of their maintenance and release resources to expand the range. (Arnold, Chapman & Clive 2008; Techniques Of Inventory Management; Waters 2003.)

In logistics ABC-analysis is used, setting the goal of reducing the size of stocks, reducing the number of movements in the warehouse. The idea of the ABC method is to distinguish the most significant inventory from other. There are usually a lesser part of the A-class items, which one should mainly focus on. (Waters 2003, 207-210; Techniques Of Inventory Management.)

XYZ-analysis

The principle of assortment differentiation in the process of XYZ analysis differs from the ABC method. In the analysis of XYZ, all objects (resources, assortment) are divided into three groups, depending on the degree of uniformity of demand and the accuracy of forecasting. (Techniques Of Inventory Management, 75; Ahmed 2017; Zrilic.)

In group X, goods are included, the demand for which is uniform, or subject to minor fluctuations. The volume of sales for goods included in this group is well predicted.

The group Y includes goods that are consumed in fluctuating volumes. In particular, this group may include products with a seasonal nature of demand. Possibilities of demand forecasting for the goods of group Y are average. In group Z include goods, the demand for which occurs sporadically. (Zrilic.)

It is difficult to forecast sales volumes of Group Z goods. A sign on the basis of which a specific object is referred to the group X, Y or Z is the coefficient of demand variation for the given object. The value of the coefficient of variation varies from zero to infinity. Algorithm for differentiating managed objects (Table 5):

Group	Interval
X	$0 < v < 10\%$
Y	$10\% < v < 25\%$
Z	$25\% < v <$

Table 5. XYZ (Ahmed 2017; Scholz-Reiter, Heger, Meinecke & Bergmann 2011; Zrilic.)

5.10 Automated Production with Indirect Application of Computer Facilities

Automated production with the indirect use of computer technology is reduced to the practical use of computers in the following areas of the enterprise: capacity utilization planning; compilation of a calendar implementation schedule works; organization of procurement activities; inventory management; Planning the needs of the enterprise in the materials; management of work shops and production sites; preparation of reports on the quality of products; shipment and distribution of products, as well as in many other activities. (Weatherall 1992, 13-17; Introduction to Computer Integrated Manufacturing (CIM); Abdulghafour; Pivovarov, Maksimtsev, Rogova & Hutieva 2011.)

Automation of services with the indirect use of computers involves the collection of data on the movement of items in retail stores (through barcode scanners or other automated data collection tools) and the use of this information in the planning of the company as a whole and scheduling in particular. Besides, a similar type of monitoring can be used in the process of updating information on the state of inventories, as well as to determine the number of rejected goods and to obtain information on other issues of product quality assurance. (Weatherall 1992, 13-17; Introduction to Computer Integrated Manufacturing (CIM); Abdulghafour; Pivovarov, Maksimtsev, Rogova & Hutieva 2011.)

5.11 General Principles of Improving the Company`s work

The formal scheme for finding ways to improve the work of the company in many cases begins with a generalized analysis, during which areas of work that require more detailed study can be found. For example, during the initial research, the

design of the product can be analyzed for possible reduction in the number of parts or simplification of technological operations for their processing. One can consider the general scheme of moving the material flow, placing capacities, planning the premises in terms of obtaining additional benefits. As a result of such an analysis, places that require more careful study can be identified. For example, the central point for finding ways to can become a very good place. production process, availability of new technology. The execution of a part of the work may require the modernization of some of the work assignments that are part of the technological operations. (Rushton, Croucher & Baker 2017; Arnold, Chapman & Chapman 2008; Gupta 2012.)

The general procedure for improving the methods of work is to implement five main stages:

1. Observation of the existing method and understanding of the principles of its application. (Rushton, Croucher & Baker 2017; Arnold, Chapman & Chapman 2008; Gupta 2012.)
2. Documentation of the method used. A detailed description of the method being analyzed is very useful. In addition, the creation of flowcharts of the working methods used (such as, for example, the cards for performing operations or performing the technological process) is of considerable assistance. (Rushton, Croucher & Baker 2017; Arnold, Chapman & Chapman 2008; Gupta 2012.)
3. Critical evaluation of the existing method and each change that is proposed to be made to this method. This is the most important stage in the analysis of the methods of work, since it is at this stage that ideas for finding ways to improve are generated. An important role can be played by creativity, ingenuity and perseverance. Substantial assistance at this stage can be provided by a systematic approach to solving the problem, implying a thorough analysis of all factors - the location of production capacities, the training and retraining of workers, the required investments and any others that may affect the efficiency of the company. (Rushton, Croucher & Baker 2017; Arnold, Chapman & Chapman 2008; Gupta 2012.)
4. Implementation of the improvement. The specialist, whose job it is to find and implement ways to improve working methods, should determine the plan of action,

distribute responsibilities for the implementation of this plan among the other employees, and follow the application of the updated method of work. Any new method undergoing the implementation phase should demonstrate the potential to reduce the cost of production or improve its quality to a level sufficient to cover the cost of quality assurance. (Rushton, Croucher & Baker 2017; Arnold, Chapman & Chapman 2008; Gupta 2012.)

5. Reassess the method after a sufficiently long period of time, in order to assess whether the method works as planned. (Rushton, Croucher & Baker 2017; Arnold, Chapman & Chapman 2008; Gupta 2012.)

6 Supply Management

6.1 Supply Management in Business

The work of any enterprise depends on the availability of raw materials, materials of goods and services that are supplied to it by other organizations. Even the smallest office needs space, heat, light, communications and office equipment, furniture and various other items to perform its functions. No organization, enterprise, institution is self-sufficient. (Monczka, Handfield, Giunipero & Patterson 2009, 8-15; Lu 2011; Chopra & Meindl 2013.)

Procurement management is an area of activity, as a result of which a firm acquires the necessary goods and services. The procurement process is an organized purchase of products for further processing or for resale. Products purchased for industrial enterprises are mainly material resources necessary for production, and for trading companies - finished products for subsequent sale. (Monczka, Handfield, Giunipero & Patterson 2009; Chopra & Meindl 2013.)

Activity on the organization and management of purchases is aimed at meeting the needs of the enterprise in raw materials, materials, goods and services. The task of the supply service of the enterprise is to organize the receipt by the company of the necessary in quality and quantity of raw materials, goods and services at the right time, in the right place, from a reliable supplier that timely fulfills its obligations, with

good service (both before and after sales) and at a bargain price. (Monczka, Handfield, Giunipero & Patterson 2009; Chopra & Meindl 2013.)

Activity on the organization and management of purchases can be considered in two aspects - operational and strategic (Bower 2003; Sollish & Semanik 2012; Monczka, Handfield, Giunipero & Patterson 2009).

Supply in the operational plan - regular operations aimed at avoiding shortages, lack of material resources or finished product. Lack of the necessary quantity and quality of goods, its untimely delivery can create a problem for the end user of products or services, lead to an increase in costs. (Bower 2003; Sollish & Semanik 2012; Monczka, Handfield, Giunipero & Patterson 2009; Gupta 2012.)

The strategic side of supply is the procurement management process itself, interaction with external suppliers in accordance with the needs and requirements of the end user, planning and development of procurement schemes and methods (Bower 2003; Sollish & Semanik 2012; Monczka, Handfield, Giunipero & Patterson 2009).

The notion of supply management is understood as planning and control over all incoming material flow (material resources and finished products) entering the company (Bower 2003; Sollish & Semanik 2012; Monczka, Handfield, Giunipero & Patterson 2009).

The following activities are considered to supply the enterprise:

- planning of the receipt of material resources and (or) finished products;
- establishing economic links with suppliers;
- organization of delivery;
- monitoring of delivery;
- acceptance and quality control;
- disposal of unclaimed or substandard remnants. (Bower 2003; Sollish & Semanik 2012; Monczka, Handfield, Giunipero & Patterson 2009; Gupta 2012.)

The scope of activities related to procurement implies all the functions that are necessary for the continuous provision of the company. Therefore, the activities of the purchasing manager include the following tasks:

- definition of the need for material resources;
- search for a potential supplier;
- evaluation of the possibility of purchasing in several alternative sources;
- selection of the procurement method;
- establishing an acceptable price and terms of delivery;
- monitoring of delivery;
- evaluation of the supplier's products and the quality of the supplier's services.

(Bower 2003; Sollish & Semanik 2012; Monczka, Handfield, Giunipero & Patterson 2009; Gupta 2012.)

If the functions of supply are expanded, then they will include inventory control, transportation, acceptance of purchased products (Bower 2003; Sollish & Semanik 2012; Monczka, Handfield, Giunipero & Patterson 2009; Gupta 2012; Waters 2003).

6.2 Objectives of the Supply Management

The main goal of supply logistics is to meet the needs of the enterprise in raw materials, materials, goods and services with the maximum possible economic efficiency (Monczka, Handfield, Giunipero & Patterson 2009; Rushton, Croucher & Baker 2017).

Procurement management should be based on the following principles:

- purchase the goods at the best price;
- maintain a high turnover of inventory;
- guarantee the delivery of goods to the company;
- purchase the best quality goods;

- interact only with reliable suppliers;
- maintain friendly partnerships with reliable suppliers;
- To derive the maximum benefit for the firm (for example, through discounts);
- cooperate with other parts of the firm;
- Reduce the share of procurement costs in total logistics costs;
- to conduct an effective automated accounting of the purchased goods and to support other information systems of the company. (Monczka, Handfield, Giunipero & Patterson 2009; Rushton, Croucher & Baker 2017; Sollish & Semanik 2012.)

Activities in the field of procurement management and management should be guided by the following criteria:

1. Optimal terms for the supply of material resources, finished products and services. Delay in purchases can disrupt the production schedule, which will entail large overhead costs, and materials purchased earlier than planned will be an additional burden on the working capital and warehouse facilities of the enterprise. For example, an airline will not be able to transport passengers if it is not provided with fuel in time, but storing extra tons of fuel is also unprofitable for the company. (Monczka, Handfield, Giunipero & Patterson 2009; Rushton, Croucher & Baker 2017; Arnold, Chapman & Clive 2008; Gupta 2012.)
2. Optimal size of the schedule line, i.e. compliance with the exact correspondence between the volume of supplies and the needs for them. Excess or insufficient volume of supplied products adversely affects the balance of circulating funds and the stability of output and, in addition, can cause additional costs when restoring the optimal balance. (Monczka, Handfield, Giunipero & Patterson 2009; Rushton, Croucher & Baker 2017; Arnold, Chapman & Clive 2008; Gupta 2012.)
3. Maintain and improve quality. Products, materials or services must be supplied with the required level of quality, otherwise the end product will not comply with accepted standards, which will lead to an increase in logistics costs. The cost of

bringing the quality to a standard level can be very significant. It is necessary to constantly improve the quality of supply and ensure the competitiveness of goods and services at the world level, which requires attention to the quality of the materials purchased. Undoubtedly, the objectives of procurement management differ depending on the specialization firms (industrial, commercial, service). The main purpose of logistics management of purchases, for example, in a production company is reliable provision of production units of the company with the material resources necessary to implement the production schedule. The production schedule at the same time should be formed in accordance with the marketing and logistics strategy of the company in the market of sales of finished products. (Monczka, Handfield, Giunipero & Patterson 2009; Rushton, Croucher & Baker 2017; Arnold, Chapman & Clive 2008; Gupta 2012.)

6.3 Forecast types

Demand Forecasting

Forecasting is the basis of the entire system of planning and management of the enterprise and allows the company's specialists to anticipate changes in consumer demand for products, which, in turn, provides the company the opportunity to respond by changing the characteristics of the product in accordance with the wishes of consumers. Forecasting the demand allows the company to provide so many production capacities and materials that would be sufficient to promptly and reliably respond to changing customer needs. Forecasting demand can prevent underproduction, which in most cases leads to poor customer service. In addition, demand forecasting avoids overproduction, which may result in an increase in the cost of production and a decrease in the company's flexibility. Carefully drawn up long-term forecasts of the need to expand production activities eliminate the possibility of excessive capital investment, which can lead to an increase in the cost of production and the inability of the company to offer consumers products at lower prices. This, in turn, can add value to consumers. (Chopra & Meindl 2013, 178-179; Monczka, Handfield, Giunipero & Patterson 2009.)

It is the responsibility of managers to make a number of well-considered decisions on the following issues:

- to issue what goods or services (standard or custom-made), it is advisable to orient the company's activities;
- What set of properties should these products or services possess?
- In which areas should the products be planned;
- In what areas should the company work to achieve the required level of efficiency of its activities, etc.? (Saint-Leger; Chopra & Meindl 2013; Sollish & Semanik 2012; Bandyopadhyay 2016.)

The acceptability of a particular solution depends to a large extent on what impact this decision will have on the level of demand for the products or services of the company (Arnold, Chapman & Clive 2008; Bandyopadhyay 2016; Sollish & Semanik 2012; Gupta 2012).

The forecast is an assumption about the likely course of events in the future, it can not be an absolutely accurate description of possible events, but the results of forecasting should strive for the most accurate vision of the future of the company. Any strategic medium-term, and even more so long-term plan is inherently prognosis. A prerequisite for the company's success is forecasting the level of demand which the company seeks to satisfy. The forecast formulated (adopted) in the form of a strategic plan, becomes the basis for the formation of current plans, including for their coordination at the level of SBU (strategic business units). (Arnold, Chapman & Clive 2008; Bandyopadhyay 2016; Sollish & Semanik 2012; Gupta 2012; Chopra & Meindl 2013.)

It is important to present an analysis of various aspects of forecasting. In particular, a number of the most common methods and models used in the forecasting process are considered. The greatest attention is paid to forecasting demand, as the demand for goods and services has a direct impact on plans and decisions made within the operational function of the enterprise. (Arnold, Chapman & Clive 2008; Bandyopadhyay 2016; Sollish & Semanik 2012; Gupta 2012; Chopra & Meindl 2013.)

Demand forecasting goals

Demand is the intention of buyers to purchase a product or service, backed up by a monetary opportunity. The quantity of demand means the quantity of the goods that consumers want and, most importantly, buyers can buy at this price and at this time. The level of demand, in turn, is defined as the total number of products or services that can be purchased by all market participants for a certain period at a certain price. (Arnold, Chapman & Clive 2008; Bandyopadhyay 2016; Sollish & Semanik 2012; Gupta 2012; Chopra & Meindl 2013.)

When talking about demand forecasting, it is assumed that the company aims to achieve a level of sales that corresponds to the level of demand. Satisfaction of aggregate demand is limited by the company's production capabilities. Thus, there is an internal limitation of demand, which is a characteristic of production opportunities; most often it is the subject of the forecast. (Arnold, Chapman & Clive 2008; Bandyopadhyay 2016; Sollish & Semanik 2012; Gupta 2012; Chopra & Meindl 2013.)

The first task of the management of a production enterprise is to determine which goods, in what quantities and for how long, can be sold on the market. Based on the factors of economic activity, available equipment, capacities, technologies, sources of supply of raw materials and materials, location, qualifications of employees, peculiarities of transport links, management of the enterprise must decide whether to produce the product or service that consumers use or will be in demand. (Arnold, Chapman & Clive 2008; Bandyopadhyay 2016; Sollish & Semanik 2012; Gupta 2012; Chopra & Meindl 2013.)

On the basis of sales forecasts, the planning of production and financial activities is built: decisions are made on whether and to what extent investments are to be directed; When and what additional production capacity will be required by the enterprise; what new sources of supply should be found; what design developments or technical innovations to launch in production, etc. The role of accidental or simply unaccounted factors, their impact on the position of enterprises of different industries in the market conditions is quite high. The forecast is always probabilistic. (Arnold, Chapman & Clive 2008; Bandyopadhyay 2016; Sollish & Semanik 2012; Gupta 2012; Chopra & Meindl 2013.)

The activities of manufacturing enterprises depend to a large extent on how reliably their management can foresee the prospects for development, how to predict future developments or the conditions for their emergence with the aim of foreseeing possible business development options. Taking decisions that determine the company's future activities, managers need to make assumptions about the future development of events in several subject areas. There are three main types of forecasts. (Rushton, Croucher & Baker 2017; Gupts 2012; Arnold, Chapman & Clive 2008.)

6.3.1 Technological forecasts

Technological forecasts are an assessment of the rates of technical progress. With full certainty it can be asserted that energy companies are interested in improving technologies in the sphere of using solar and atomic energy. Improvement of the processes of obtaining a fuel suitable for use from oil shale is of great interest for chemical and oil refineries. Application of new technologies allows companies to offer the market new products and materials and thus gain a competitive advantage, while other companies that do not make proper efforts in terms of improving technology are in a highly competitive environment. Even when the product manufactured by the company remains unchanged, a new process of its production can be developed that allows to restructure the investment scheme and thus to save financial resources. That is why the forecasting of technology development, which has a great impact on operational management, is not among the tasks of operations management and is not considered in the framework of operational management. (Firat, Woon & Madnick 2008; Quinn 1967; Martino 1972; Gupta 2012.)

Technological forecasts cover the level of technological development in areas directly influencing the production in which the forecast is made. For example, an enterprise that produces computers is interested in the prospects of expanding the amount of memory on disks, since they are additional products for the use of computers, and an enterprise that uses harmful, toxic substances in its production is interested in developing technologies for cleaning and recycling waste. (Firat, Woon & Madnick 2008; Quinn 1967; Martino 1972; Gupts 2012.)

The development of scientific and technical progress leads to the emergence of new goods and services, and those, in turn, constitute a serious competition to existing enterprises (Firat, Woon & Madnick 2008; Quinn 1967; Martino 1972; Gupts 2012).

6.3.2 Economic forecasts

Economic forecasts. Government bodies and other organizations regularly publish economic forecasts, or official reports on expected business conditions. Forecasting the general state of business activity is of great interest for government agencies in terms of determining expected revenues from tax collection, employment level, the need for the economy in monetary resources, and also in terms of obtaining data on other issues. It is from the forecasts of this type that commercial companies can draw ideas about plans for expansion of business, calculated for both a long and a shorter period. (Hendry & Ericsson 2001, 2-3; Economic Forecasting; Pivovarov, Maksimtsev, Rogova & Hutieva 2011.)

The economic forecast allows to envisage the future state of the economy, interest rates and other factors affecting the development of any enterprise. Depending on the results of the economic forecast, such decisions as expansion or reduction of production capacities depend; concluding new contracts; dismissal or hiring of workers, etc. (Hendry & Ericsson 2001; Economic Forecasting; Pivovarov, Maksimtsev, Rogova & Hutieva 2011.)

6.3.3 Demand forecasts

Demand forecasts give an idea of the expected level of demand for goods or services of the company within a certain period and in most cases are the main decision-making tool both during the planning of the company's activities and in the process of managing this activity. Since the operational function of the enterprise is responsible for the creation of goods and services of the company, demand forecasting has a significant influence on the decision-making regarding the organization of operations for the production of goods or the provision of services. Considering the condition is accepted that the company sets a goal and successfully achieves it - achieving a level of sales that corresponds to demand. Therefore, for the sake of simplicity, it can be assumed that the forecast of the demand level can be

compiled on the basis of data on the previous sales volume without taking into account the amendments for any reduction in the level of sales. (Chopra & Meindl 2013; Monczka, Handfield, Giunipero & Patterson 2009; Rushton, Croucher & Baker 2017.)

The forecast of sales volume gives an idea of the real level of demand for the enterprise's products in a particular period in the future. Such a forecast is the basis for planning and conducting economic calculations. The demand is influenced by many factors, which can be accounted for by making a forecast of the volume of sales (demand). Such indicators as the level of demand in the previous period, demographic changes, changes in the market shares of branch organizations, dynamics of the political situation, the intensity of advertising, competition, etc., are used as the basis for the future forecast. (Chopra & Meindl 2013; Monczka, Handfield, Giunipero & Patterson 2009; Rushton, Croucher & Baker 2017.)

6.4 Factors affecting the level of demand

Demand, which is used by the goods or services of an individual company, is formed as a result of the interaction of many factors acting on the market. In most cases, the demand for the company's products depends on the total size of the market for the product or service of this type, as well as on the company's share in the market turnover. The level of demand for the company's products is formed under the influence of a number of different factors, including both circumstances outside the control of the company, and circumstances that the company can at least to some extent influence. (Monczka, Handfield, Giunipero & Patterson 2009; Singh; Factors affecting demand.)

The economic cycle

The volume of sales depends on the demand for products, and demand, in turn, depends on a number of other indicators. One of the most important factors affecting the level of demand is the state of the economy during the passage through various stages of the business cycle, namely, the rise of business activity, inflation, recession and economic stagnation. The actions of the government in response to the changes taking place in the economy, as well as its counteraction to the negative

consequences of these changes, are aimed at mitigating the rigidity of the processes taking place in the economy. Nevertheless, changes in the economic conditions of doing business represent the realities of life for most of the business world.

(Economic Cycle; Monczka, Handfield, Giunipero & Patterson 2009; Singh; Factors affecting demand.)

Product life cycle

The products produced by the company, be it goods or services, are purchased at different stages of their existence by a different number of target consumers. As a rule, every successful product, as shown in Fig. 6, there are five stages of the life cycle where timeline is horizontal and the sales level index is vertical (1-product development, 2- product examination and introduction to the market, rapid growth of product demand, stage of the sustainable demand, the stage of the withdrawal of the from the consumer market). (Product Life Cycle; Gray 2017; Gupta 2014.)

If the product has a certain appeal to consumers and the stage of stabilizing the demand for this product comes, in many cases it is at this point that competing firms start producing similar products, trying to seize a part of the market for this type of product. As a result, there is a bitter competition, which reduces the growth rate of demand for the company's products. A product with a sufficiently long life cycle eventually reaches the point of this cycle in which virtually every consumer who wants to purchase this product and has the necessary means to do so has already done so. At this point in the life cycle, demand is reduced to a minimum. Consumed products (toothpaste, clothes), as well as some services (hairdressing, car washing) do not fall into this point of the life cycle, as they are consumed, and then bought again. To prolong the product life cycle, the level of consumption of which has fallen dramatically, certain actions should be taken within the company aimed at modifying this product in order to preserve its attractiveness in the perception of consumers. These activities include measures to study the market and improve product characteristics. Meanwhile, within the framework of the company, research and development work should be carried out to create and introduce new products or services to the market, which will allow the company to remain competitive even after the demand for existing products has fallen and its output is subsequently curtailed. (Product Life Cycle; Gray 2017; Gupta 2014.)

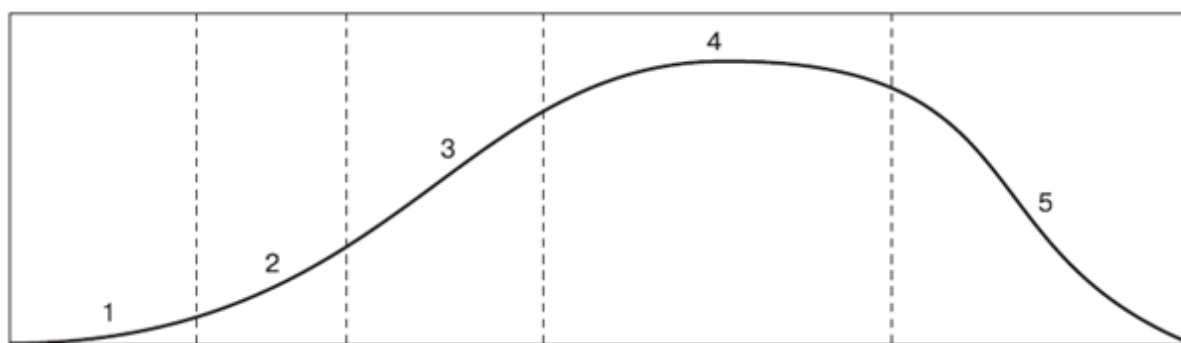


Figure 6. Stages of life cycle

Very rarely the situation develops so that the conditions that influence the formation of a high level of demand for a particular product stabilize for several years. As can be seen, there is a danger of too deep extrapolation of the trend throughout the life cycle of the product. (Product Life Cycle; Gray 2017; Gupta 2014; Claessens 2017.)

Other factors

There is a number of other factors that affect the level of demand. Especially many such factors can be detected when considering secondary effects on the formation of demand. In other words, there are factors that influence the consumer's requirements for goods and services, which, in turn, form the demand for a product or service of the company. In Fig. 7 is a schematic representation of some factors influencing the formation of demand for the company's products. Factors affecting demand - demographic, social, financial, professional, social processes, political phenomena. Another management task is to catch the changes and even better - to anticipate them. Information on demand forecasts (sales) is needed for all units of the enterprise. Production and technological services, in order to determine the range of products, it is necessary to prepare equipment, equipment and devices accordingly. The logistics services in accordance with the forecasts of demand (sales) determine the schedules of supplies of raw materials and materials, the size of the parts of the components. Financial services calculate the size of working capital, labor costs and other costs in the forthcoming period. (Monczka, Handfield, Giunipero & Patterson 2009; Singh; Factors affecting demand; Gupta 2014.)

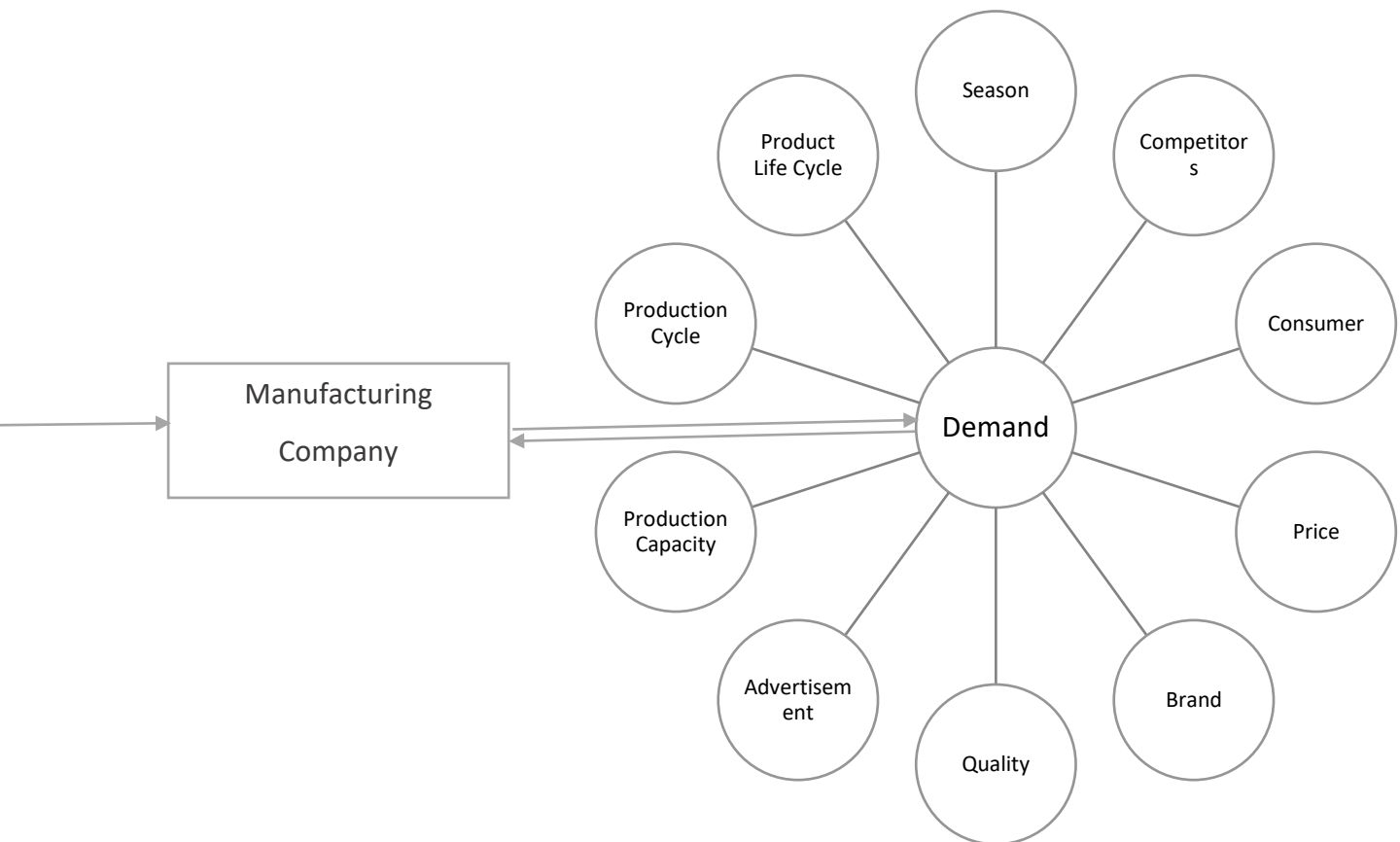


Figure 7. Demand (Monczka, Handfield, Giunipero & Patterson 2009; Singh; Factors affecting demand; Gupta 2014.)

6.5 Sales and Operations Planning

6.5.1 S&OP process

Next process which is essential for the further understanding and analysis is called Sales and Operational Planning. (Donald H. Sheldon, 2006) S&OP process enables ensuring the synchronization between polar parties (sales and supply) by conducting regular meetings and/or discussions about the progress, amendments, plans and strategy. It also helps align the interdependent functions for the company's well-being. Since the Sales and Operations Planning process is also known as Sales, Inventory, and Operations Planning (SIOP) it may not only include demand forecast review but also inventory and production plan, customer lead, transit, and delay time plan and updates, financial targets updates, new product development plan etc. (Wallace 2004, 3-4; Palmatier & Crum 2003; The Process for SIOP (Sales Inventory Operations Planning 2017)).

The diagram presented by the Figure 8.S&OP depicts the various corporate and supply chain planning and the place where an S&OP process fits in the scheme. Cross-functional S&OP meetings are held throughout a year to resolve any conflicts between functional plans with the goal being that all departments have the common understanding of what products will be made available to meet customer demand in coming months. The individual functions participating in the meetings come prepared with projections and information regarding factors which may impact the demand of a particular products. During the meetings the demand requirements and the ability of a supply chain to meet projections are reviewed. (Brown)

The diagrams presented on the Figure 9 and 10 depict S&OP with respect to Sales and Supply accordingly.

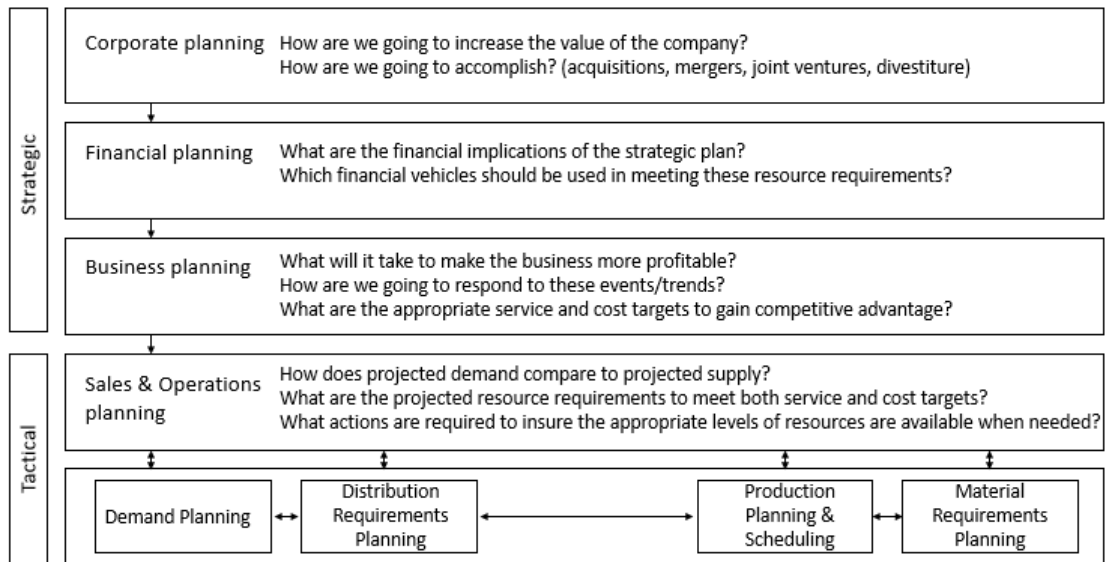


Figure 8. S&OP (Brown)



Figure 9. S&OP sales (Arnold, Chapman & Clive 2008, 26-28; Wallace 2004).

As well as any other process Sales and Operations Planning has its inputs and outputs.

Outputs:

- Planning processes are synchronized
- All processes work for the mutual goal
- Maximum return
- Reducing the cost of production due to the flexibility of processes
- Reducing uncertainty and conflict minimization
- Structured communication process
- Defined responsibilities (Hawkes, Malhotra & Mueller 2007; Wallace 2004;

Chopra & Meindl 2013; Wallace; Palmatier & Crum 2003.)

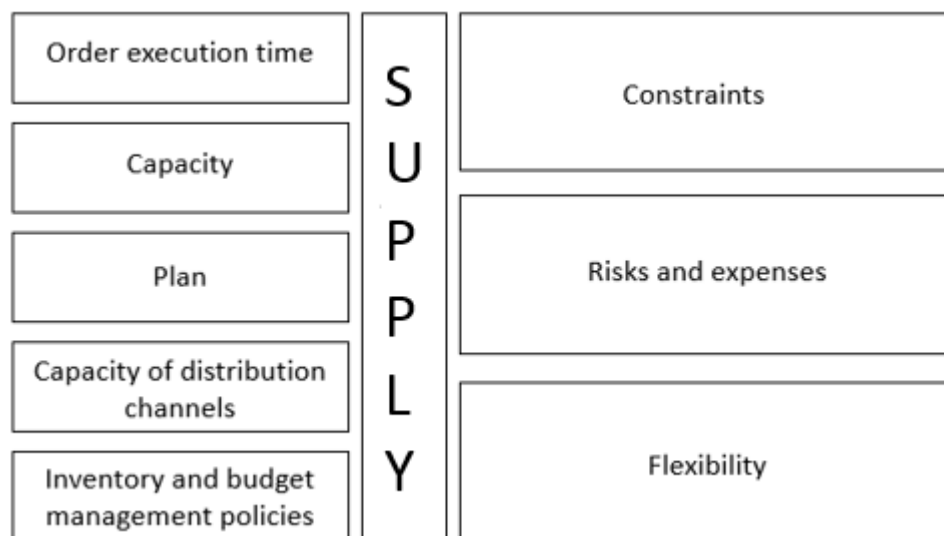


Figure 10. S&OP supply (Hawkes, Malhotra & Mueller 2007; Wallace 2004; Chopra & Meindl 2013; Wallace; Palmatier & Crum 2003).

Outputs:

- Increase in asset turnover at the same level of customer service
- Lower management costs due to well-established communication
- Improved customer service

- Growth of total profit
- Higher inventory turnover rate (Hawkes, Malhotra & Mueller 2007; Wallace 2004; Chopra & Meindl 2013; Wallace; Palmatier & Crum 2003).

S&OP Objectives:

- Increase the level of customer service
- Improved inventory management
- Ensuring the realism of business plans
- Management by quality criteria
- Building staff work (Hawkes, Malhotra & Mueller 2007; Wallace 2004; Chopra & Meindl 2013; Wallace; Palmatier & Crum 2003).

Benefits:

- Synchronization of sales, supply and product life cycle with business plans
- Identifying performance criteria for the continuous improvement of business processes (Hawkes, Malhotra & Mueller 2007; Wallace 2004; Chopra & Meindl 2013; Wallace; Palmatier & Crum 2003).

Increases (targets) of:

- Customer Service Level
- Quality of communication and teamwork (Hawkes, Malhotra & Mueller 2007; Wallace 2004; Chopra & Meindl 2013; Wallace; Palmatier & Crum 2003).

Reduction (targets) of:

- Level of stocks
- Order execution time (Hawkes, Malhotra & Mueller 2007; Wallace 2004; Chopra & Meindl 2013; Wallace; Palmatier & Crum 2003).

An example of responsibilities between participants in the S&OP process:

Project Manager`s responsibilities in S&OP:

Conducting S&OP meetings

Preparation of meeting materials

Documentation of issues discussed at the meetings

Outlining the production plan, sales plan and product standards (Hawkes, Malhotra & Mueller 2007; Wallace 2004; Chopra & Meindl 2013; Wallace; Palmatier & Crum 2003).

Responsibilities of a sales department in S&OP:

Preparation of initial data for calculating the forecast

Preparing the data of the past sales (Hawkes, Malhotra & Mueller 2007; Wallace 2004; Chopra & Meindl 2013; Wallace; Palmatier & Crum 2003).

Responsibilities of a production department in S&OP:

Preparation of the input data for production planning, as well as formalization of technological and resource constraints

Interaction with the procurement department for raw materials and supplies, as well as the delivery terms (Hawkes, Malhotra & Mueller 2007; Wallace 2004; Chopra & Meindl 2013; Wallace; Palmatier & Crum 2003).

Responsibilities of a financial department in S&OP:

Preparation of the data regarding company's finances for the S&OP process

Correcting the results of the S&OP process in accordance with financial constraints (Hawkes, Malhotra & Mueller 2007; Wallace 2004; Chopra & Meindl 2013; Wallace; Palmatier & Crum 2003).

Responsibilities of a marketing department in S&OP:

Preparation of the data of market trends and customer service levels

Preparation of the data of the dynamics of market share

Competitive analysis and economic intelligence (Hawkes, Malhotra & Mueller 2007; Wallace 2004; Chopra & Meindl 2013; Wallace; Palmatier & Crum 2003).

Responsibilities of a new products department in S&OP:

Preparation of the data of the new products brought to the market

Preparation of data of the marketing plans for the new products promotions (Hawkes, Malhotra & Mueller 2007; Wallace 2004; Chopra & Meindl 2013; Wallace; Palmatier & Crum 2003).

General Responsibilities:

Evaluation of the S&OP process according to the quality criteria

Determining the reasons for the divergence of the plan and the fact

Estimation of optimal values for quality criteria

(CEO Consulting, Operations Planning)

6.5.2 Purchase Planning

Planning is the main management function. It includes the processes of formulating the goals of the organization, the formation of action plans, timeframes, as well as the sequence of actions and directions of the distribution of all types of resources necessary to achieve the goals (Monczka, Handfield, Giunipero & Giunipero 2009; Van Weele 2010; Katsiolouides & Abouhanian 2006; Purchase Planning).

Principles of purchase planning are to be introduced. Planning phase is often considered as one of the most critical especially in the operational planning where we pass most of the supplier relationship processes due to either long-term contracts or ownership of the brand companies. Over the last 10 years there has been a number of definitions of purchasing introduced what makes it considerably more complicated to find the universal meaning that could satisfy everybody. (Monczka, Handfield, Giunipero & Giunipero 2009; Van Weele 2010; Katsiolouides & Abouhanian 2006; Day 2002.)

Nevertheless, in this thesis the following definition by Arjan J. van Weele will be used as a reference point: "The management of the company's external resources in such

a way that the supply of all goods, services, capabilities and knowledge which are necessary for running, maintaining and managing the company's primary and support activities is secured at the most favourable conditions."(van Weele, 2010).

Purchase planning in the big corporations with massive supply chains implies far more activities than it is traditionally considered in small and medium sized enterprises where the main goal may seem to be obtaining goods and/or services with respect to the requirements. In order to understand the difference and the original role of the process we should firstly understand what purchase planning is. (Van Weele 2010, 69.)

Purchase planning implies stock monitoring, purchase order management (order quantity, receipt date, delivery date, delivery means etc.), demand forecasting and other activities. It also takes into consideration adherence to financial goals and budget, work with electronic systems such as ERP or other procure-to-pay software optimizing invoicing, payment and control processes. According to (Daniel Fritsch, 2017) there are two main approaches to the purchasing: reactive and proactive. Reactive approach implies the use of Just In Time method meaning that the demand completely covers the purchase order and the stock available. Proactive approach to procurement implies having safety (buffer) stock available to meet demand and unplanned enlargement in demand however proactive approach requires additional focus on avoiding overstocking. In reality, components of both tactics are used to boost competitiveness and overall purchasing operations. (Day 2002; Van Weele 2010.)

One can consider 4 key points when developing purchase planning phase:

- clients' requirements
- company's requirements
- facilities available
- financial constraints (Day 2002; Van Weele 2010; Monczka, Handfield, Giunipero & Giunipero 2009).

Clients' requirements are universally important for any commercial organization because without clients, there is no sales. When planning purchasing one has to make

sure that stock is available and will be available to the customers whenever needed at least within period of time which the planning is made for if proactive research is used. (Day 2002; Van Weele 2010; Monczka, Handfield, Giunipero & Giunipero 2009.)

Although establishing availability of the products is essential, company's requirements should be taken into consideration too because overstocking raises costs and may lead to the product obsolescence. Thus, there should be a harmony between clients' and company's requirements. (Day 2002; Van Weele 2010; Monczka, Handfield, Giunipero & Giunipero 2009.)

Facilities such as warehouses or distribution centers should be take into consideration due to its decentralized economy meaning their individual costs and expenses which are extrinsic (unaccustomed/unwonted) to the pivotal operations. It is preferable for the firm to leverage the available facilities to their maximum - reducing empty space with the respect to demand and/or allocate fast-moving goods to the place which may hardly be having a lot of storage space. (Day 2002; Van Weele 2010; Monczka, Handfield, Giunipero & Giunipero 2009; Gupta 2014.)

Last but not least is to ensure concurrence between purchase expenses and the company's financial targets by optimizing inventory levels and balance between demand and supply (Day 2002; Van Weele 2010; Monczka, Handfield, Giunipero & Giunipero 2009; Branch 2000).

7 Research, implementation and analyzing

This chapter is to introduce the reader with the research work which has been executed, describe the steps taken, knowledge gathered. Additionally, section contains the outputs from the research activities executed and the analysis of them.

7.1 Defining and observing current process

7.1.1 Current situation

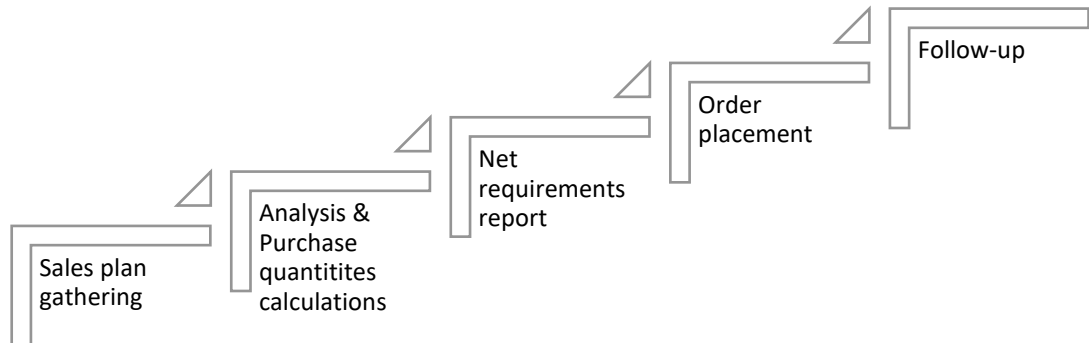


Figure 11. Generalized process

In order to improve any process, one should firstly identify the current state by determining every stage of the process. By describing the current situation, bottlenecks may become visible as well as other limitations and opportunities.

The first step (shown on the Figure 11) to be made is the acquisition of all the demand plans (also known as rolling estimates) from every single affiliate market and allocation of the demand into accumulative form where one can not only monitor the total demand but also have access to plan of each market. Despite it is the first step to be taken, it usually requires a lot of time to be spent in order to amend the plan according to the demand considering possible mistakes in the plan such as wrong SKU forecast allocation (e.g. demand for dead or delisted SKU).

Having had a ready purchase plan allows one to start analyzing the situation with respect to the stocks available, lead times and other constraints. When determining the numbers, it is crucial to take DFC (Days Forward Coverage) into account as well as possible demand fluctuations especially concerning both very popular and well-selling SKUs and not very popular and frequently demanded SKUs. It is quite often a case that blockbuster SKUs are experiencing additional demand by the affiliate markets in the middle of the financial year and, ideally, we should be ready to supply them and not run out of stock. On the contrary, the purchases of the less popular SKUs should

not make the company to overstock its warehouses with huge amount of slow-moving stock.

The next step is to create a net requirements report and send it to the Brand Owners to let them estimate our volumes in order to purchase enough dry goods needed for final product manufacture. Otherwise we would be less flexible with demand fluctuations and may not fully satisfy the market companies.

Once we are done with the report we can revert to the planning file and recheck the quantities, DFC and other metrics for a particular month that we create a plan for. If the plan requires some adjustments we should record them and discuss about them when confirming the overall monthly situation with a supervisor.

The following step is to place orders. The difficulty here is the frequent amendments from the BOs` sides such as design change, harvesting year and others that require amendments in the ERP and WMS (Warehouse Management System) systems for the correct bookkeeping and satisfaction of the orders placed by MCs.

The last but not least step in the planning process is the follow-up, maintaining the process, and control over orders placed. Such activities are follow-up adjustments (if needed), record keeping, and ensuring the orders are executed, delivered, and everything is conducted in the right place, time and, quantity.

7.1.2 Methods of analysis

Before executing on interviews possible solution proposals were considered and evaluated based on the variables used in SWOT-analysis (strengths, weaknesses, opportunities, threats). If the idea had more strengths and opportunities points than weaknesses and threats it was included into the agendas of the meetings. An example of the idea, which was evaluated based on SWOT-analysis and, eventually, included into the agendas of the meetings is presented in the table 6. SWOT-analysis.

Double checking by multiple additional e-mails and calls with the consignor			
Strengths	Weaknesses	Opportunities	Threats
<ol style="list-style-type: none"> 1. Easiness of implementation 2. Amount of resources needed 3. Satisfactory efficiency 	<ol style="list-style-type: none"> 1. Human factor 2. Additional workload 	<ol style="list-style-type: none"> 1. Avoidance of significant investments (of time) 2. Sustainability of the operations (the lack of interruptions) 	<ol style="list-style-type: none"> 1. Possibility of late detection of the mismatching SKUs

Table 6. SWOT-analysis

The key analysis method has also been deliberation and brainstorming over interviews, interviews takeaways, personal observation and conclusions with respect to the theoretical foundation. There has also been used personal experience gathered on the working place and lessons learned by facing and solving challenges occurred when dealing with different projects and tasks.

Apart from interviews there have been a few additional supportive research activities and information sources and various activities organized for new employees. One of them was induction, the annual 2 day intensive programme introducing every single department of the company, its functions and responsibilities, giving a chance to listen to the head of each department and ask questions. Other activities have been targeted presentations of specific projects and “in-field” trips to warehouses.

7.2 Research steps

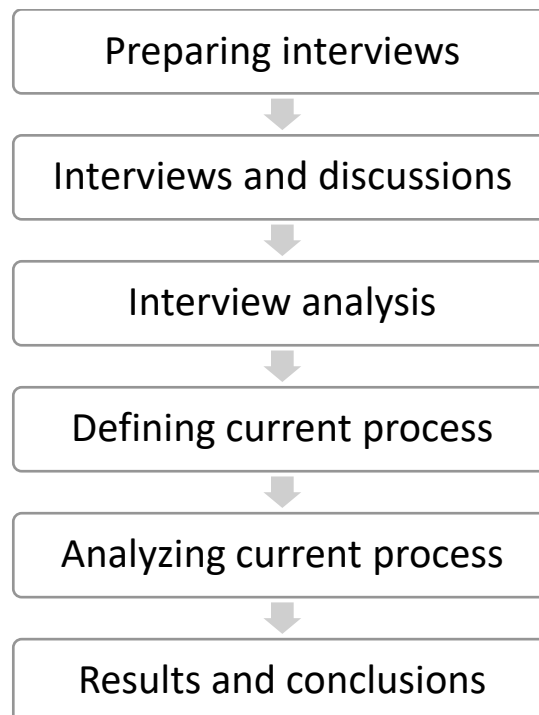


Figure 12. Actual Research Steps

The first step (shown on the Figure 12) has been to prepare for the interviews. There has been a number of elements to prepare such as objectives of conducting each interview, questions to be asked, expected outputs of each interview etc. Prerequisites have been understanding of the fundamental concepts, general knowledge of the overall operations, and practical understanding of the role and responsibilities of main sub-departments within main operations department of the company.

The next step has been to conduct interviews and participate in discussions. The target was to gather intelligence, data, and information which may not seem obvious but plays a significant role in the sustainability of company's operations.

The following steps have been to study and analyze the data and information acquired, structure it and understand the interdependence and correlation between different factors and results they may cause. Such method is also known as root-cause analysis and it has been used for participant's understanding of the outputs of every single decision made.

The next steps have been defining current process and analyzing it. Having gathered intelligence and structured the data and information acquired one has been able to determine the current state situation and analyzed it with respect to both research activities and theoretical basis.

The last but not the least is to sum the findings up and develop reasonable improvement ideas. It has also been important to list the proposals/ideas by 2 indexes, enabling to identify the most crucial ones to be the first to consider and/or implement.

7.3 Preparing interviews

The research interviews have been arranged in the way to avoid prejudice and preconceived notion which could be extracted from the context. There has been a list of predetermined questions for every participant with respect to the sub-department he/she worked eliminating chances of guesses and assumptions (caused by the lack of responsibilities and/or experience in the other sub departments` routine). There have been two types of questions:

1. Yes/no questions playing a role of confirmation and agreement on particular points;
2. Open questions focused on extracting broad explanatory answers and/or discussions over particular issues and/or solutions.

The only questions which did not change at all from interview to interview were research questions. The rest of the questions were tailored upon person`s role and sub-department to eliminate guesses.

The need in the list of the predetermined questions has arisen from idea of erasing any not specific, preconceived, and consciously or unconsciously polar responses. The goal has been to avoid contextual effect when a respondent or interviewer get lead to the specific empirical point of view by a sequence of answers and/or questions. The list of prepared questions diminishes emotional contrast of answers and reduces the possibility of influencing or not giving a specific concrete answer.

Three major questions included into every single interview were research questions:

What are the requirements for a well working purchase planning processes?

What kind of challenges and benefits do current operations have?

What corrections should be made to reduce mistakes and bring cost efficiency?

The decision of including research questions into every single interview has been made to follow the main objective of the thesis, stimulate the process of finding imperfections and solutions for them as well as positive features, tools and elements in the current process.

All in all, there have been 11 meetings organized, 8 respondents have been interviewed (1 of them has been interviewed 3 times and 1 respondent has been interviewed twice). The repeated sessions with 2 people have been initiated to clarify a few issues which arose in some time after first meeting with those people and after additional information has appeared. All the respondents have been from operations department but from multiple sub departments to acquire a broader picture of the workflow and operations, some of them have occupied managerial positions. All the participants have been given the opportunity to remain anonymous in order to provide the interviewer with the honest and open answers and stimulate discussion and possible solution ideas generation.

7.4 Interviews and interviews analysis

The interviews have consisted of number of predetermined questions with the intention to specify issues or the solutions to the particular issues. Thus, in this section, there are key takeaways mainly from the interviews discussing about specific issue and specific solution for the issue. Thus, one will be able to familiarize himself/herself with the operational challenges which may occur in the organization and gain necessary information for both understanding of the overall operations and the exact solutions which are to be proposed further.

During the work planning sub department often faces actual demand fluctuations comparing to the forecast sent. When being asked by an affiliate for supply increases one may be questioned what the bigger priority is whether the forecasts planned and being matched completely with actual demand or increases by one of the markets. Such questions of arbitrage is a part of regular process and there are always

pros and cons of every decision. Thus, one should, firstly, analyze the situation carefully and make sure the market company satisfies planned forecasts for every party (affiliates/markets). After that the company may start considering fulfilling demand increases. There is a number of options to do so: firstly, one can contact BO and request extra supply in case they happen to have some stock available, one can ask other affiliates to share their metrics and, perhaps, some of the orders and last but not the least is to consider this increase and order more of the SKU which an affiliate is experiencing shortage with and try to postpone the supply. The resolution of such situation is important because the key business goal is to sell and if the company faces sales increases, generally, it is a positive growth factor however the purchase planning sub department role is not only to ensure supplies but also avoid OOS (out of stock).

Another matter is the process bottleneck, such as the difference in alc% (alcohol proof/percentage) between actually delivered products and products ordered through ERP (Enterprise Resource Planning) system. This case not only does require immediate solution but also does require elimination of prerequisites for such an issue to arise. Similar situation happens with the difference in design but not vintage (year of harvesting).

First thing first, one should immediately adjust data in the POs placed so that it corresponds with actual products in order to eliminate internal accounting issues as well as bookkeeping and records in WMS and other files and systems. Often it is not very easy to execute because of the lack of responsibilities and access to the system allowing new SKU creation. In this case, one has to contact responsible person, make him/her aware and ask for creation of a particular SKUs. The creation of new SKU also requires logistics data that is initially available for the manufacturer because the manufacturer makes decisions on the volume, material, alc% and other specifications so this eventually adds one more step to take into consideration in the planning sub department, which is requesting the required data and providing person in charge with it. Having done that, the sub department should work on eliminating repetition of such problem by contacting BO and trying to determine the reason for such a situation.

The bottleneck can be eliminated by broadening planning sub department's responsibilities and increasing its area of control both in the system and on the workplace. Additional option is to work on tracing the products and try to predict and eliminate possible mistakes and misunderstandings before the shipment. That may require more reminders, communication, and control of the BO's performance.

The firm has different terms and conditions with different suppliers, as a result, the INCOTERMS differ as well. Such differences cause difficulties with transportation and consolidation of cargo which is under our control because one should not only broaden the planning horizon for the SKUs (if they are slow-moving) but also deal with considerations of FTL, FCL, LCL, LTL (full/less than container/truck load) instructions. In case of poor planning of orders consolidation one may have a number of pending orders waiting for a moment to consolidate them with other orders to reach FCL or FTL.

In order to make this process smoother one should try to fill trucks and/or containers to maximum. If not possible, there are 3 options: 1. Pending orders can be left till the better moment and picked up later; 2. Order amount of some low-moving or poorly sold products can be reduced; 3. Additional container and/or truck can be filled with popular fast-moving product. In addition, one should always keep in mind that the same products of the same volume but of the different labels (labels issued to meet different markets' requirements and often are on different language) are to be allocated in different trucks/containers in order to reduce the human factor and ensure correct processing when unloading at the warehouses.

Sometimes issues arise from the BOs' side. One of them is the rule that does not allow BO to issue one single invoice for different SKUs even if they are in one PO. In other words, a purchase order consisting of multiple products (which are restricted by company's policy) will be accompanied by 2 invoices. Such situation may not only lead to the record keeping confusion but also to the impossibility of accepting multiple invoices to one single PO in the accounting and financial departments causing potential problems with bookkeeping and, as a result, additional expenses.

Similar issue caused by BO's policy is the different warehouses for different types of products (often caused by the difference of production plants). When having an

INCOTERMS obligating the company to take care of almost all of the logistics matters regularly charged additional 150 EUR may be considered as extra objectionable costs.

The solution for both of the situations described is the planning for longer “horizon” (period of time) taking into consideration not only the restrictions caused by BOs but also internal policy regarding amount of stock on hand, lead times, and sales forecasts. Trying to avoid extra costs the purchases should be done for bigger batches covering longer period of time than it used to do as well as storing greater amount of products on company`s warehouse.

The disadvantage of the solution is reduced flexibility, storing stock enlargements, the division of a single order into multiple small orders (consolidated in one truck/container). To summarize, the optimal solution is to estimate costs of both options separately and pick the one which is better from the economical point of view.

One of the goals has been to identify the issues and discuss about possible solutions. Having determined problems and possible solutions there has been an opportunity to think them over, compare to personal observations, leverage theory, and, finally, compose a list of issues and solutions.

8 Analyzing results and development ideas

8.1 Advanced ABC classification

Since one of the company`s daily routine is dealing with a huge number of SKUs regardless of the type of activity (planning, order placement, supply review etc.) it is important to keep in mind Pareto`s rule and identify 20% of input bringing 80% of output. One should also put attention to the top 20% of fast moving SKUs as well as 20% of slow moving SKUs. In order to execute such tasks an employee can use ABC-analysis. Here are the possible improvement ideas to consider for each of the ABC classifications.

A-class

Execute regular stocktaking for such SKUs at least 4 times a year.

Execute selective stock taking for 20% of the A-class SKUs every month.

Immediately eliminate deviation (if it was found) between actual stock and stock data among the planning team members.

Monthly demand update as well as safety stock level.

Careful tracking and shortening of the turnover of goods. The shorter the cycle time, the lower the need for working capital.

B-class

Check and control batch sizes and minimum order quantity of the orders placed and to be placed.

C-class

Execute regular stocktaking for such SKUs at least once a year.

Break C-class items into C1 and C2 groups where C1 items are items with turnover share less than 1% and C2 with turnover share less or equal to 0.1%. It may help identify “dead” stock however it does not mean that such items should be removed from the portfolio because they may have just entered the market or they are strategic SKUs playing the role of increasing assortment etc.

In addition, it may be a good idea to break SKUs into more classes according to

1. Turnover
2. Profit

These are the main metrics of the company’s success which may help determine the leader SKUs with A-class turnover index and A-class profit index whereas some items bring less profit than turnover and, therefore, company should sell, consequently, supply and distribute a greater number of such items than items with higher margin. Turnover as a metric may also let an organization to track the performance of new products and focus on them more (if the turnover level is not high enough) or less (when they constantly show growth tendency).

Such division can be done by different item groups, categories, brands, brand companies, type of drinks and it may let the company classify items in more detail and give more data for decision making. In the figure 13 there are 9 groups (or more if initial ABC-analysis includes C1 and C2 groups) which can compose an updated analysis.

The lowest row represents convenient categories, the middle row represents basic categories, and the highest row represents priority categories.

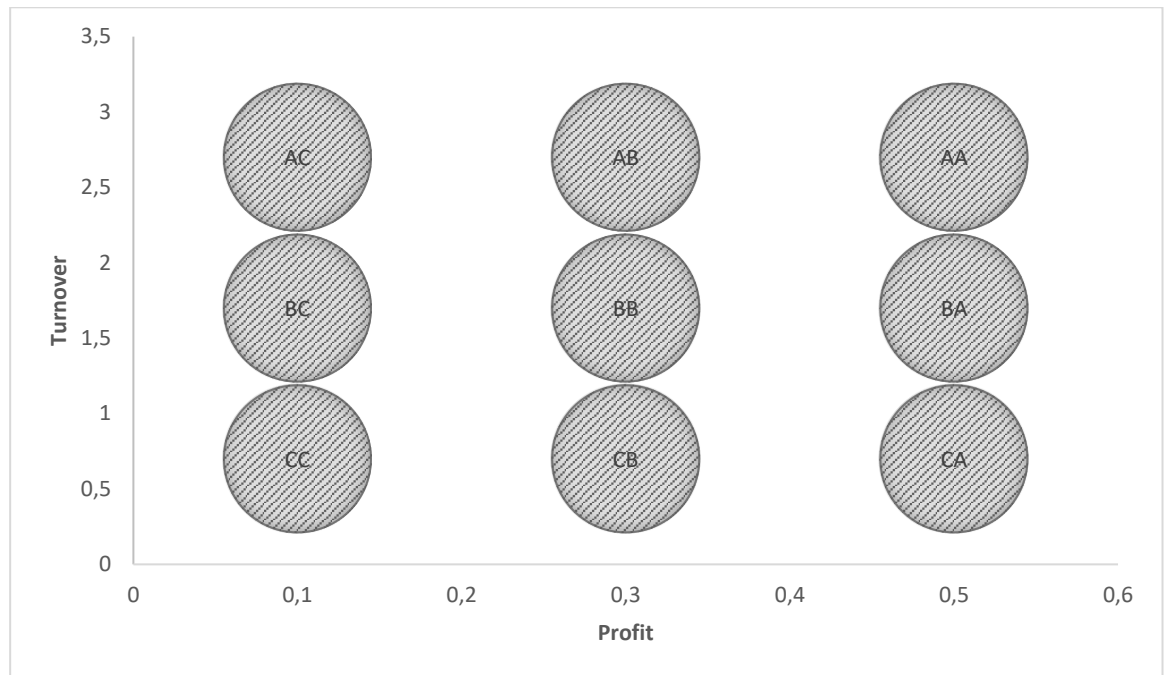


Figure 13. Combination of parameters according to turnover and profit

CC-all the positions that do not make a significant contribution. They are outsiders for both profit and turnover. Before these goods are removed from the assortment, it is necessary to carefully analyze what role they play in the overall assortment and why they show such results. It should be remembered that their thoughtless withdrawal can lead to a general decline in results, since the total mass of goods is immediately distributed in the same proportion from AA to CC.

BC-low-profitable goods, but having an average level of turnover. In order to prevent these goods from entering the CC group, it is necessary to increase profitability by them - perhaps, giving these goods a higher status in the client's eyes. A simple price increase without additional promotional activities will lead to a loss of momentum.

CB-products with low turnover, but average profitability. It is a good idea to sustain sales of the products by giving the products new attractive properties in the customer's and consumer's eyes.

BB-products with stable performance and balance between turnover and profitability. For them one can leave everything as it is or think about them after other groups.

CA-products with low turnover, but high profitability. Perhaps, these are unique or rare goods, exclusive or collectible items. Perhaps, this is a new product, with a strategic plan of getting the most out of a single transaction. For such a product, one should focus on increasing the volume of sales, by an “on trade” activation or advertising campaigns.

AC-goods with low profit, but high turnover. Most likely, these are "flow generators" also known as “lead/customer magnets”, i.e. goods that attract a great number of prospects. Usually such products do not bring a lot of profit due to very small margin or even the lack of it but they play roles of creating the customer flow and arousing interest. It is important to keep an eye on this group in order not to lose the momentum and, as a result, move products to the BC group.

AB and BA-products with either high level of profit or turnover and average level for the remaining one. For these groups, it is crucial to make sure products stay in their niche and do not reduce the performance. It requires constant monitoring of competitors.

AA is the leader of the assortment, the most valuable commodity. It should be carefully monitored and supported by promotions and advertising events. It requires careful monitoring of the competitive environment and fluctuations of demand.

8.2 Improved Inventory and Materials Management

One of the key metrics in planning purchases is safety stock and the time period which can be covered by the current stock supplies. Both of them help an employee analyze the situation and adjust it according to the stock or coverage levels policy.

On the other hand, demand fluctuations both in forecasts and gathered by observations make the planning work more difficult and may lead to out of stocks or excessive stock levels. Thus, the indexes of buffer stock and the coverage should be tailored to each SKUs based on the statistics available, forecasts by markets (clients), and predictable patterns which planning department may face.

The issue is recognized by the majority of respondents however not everybody finds it to be the first thing to implement (Figure 14. Quiz results). Most of the respondents (62.5 %) realize the problem but would rather keep the time, efforts, and other resources either for the solution of a different problem or until the lower season or holidays due to significant workload the calculation and rearrangements require.

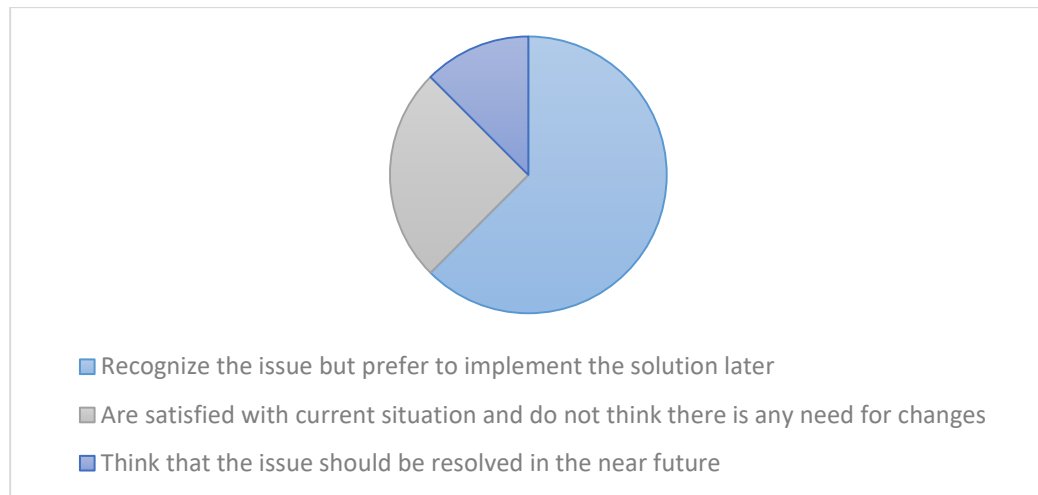


Figure 14. Quiz results

Such precise calculations require a lot of time, efforts, and the involvement of a number of parties not only from the parent company but also from the markets and brand owners to make sure production capabilities can meet customers` expectations. Thence, a compromise between the resources needed for task execution and the goals set (stock optimization, planning precision, money saved) may be the focus on A-class SKUs showing consistent growth and/or superior sales performance. By implementing this, the company may not only accomplish greater planning accuracy, more working capital that may be reinvested for further company`s development, and more efficient inventory management but also be able to sell for items by improved availability of the best sellers and reduce human factor mistakes.

8.3 Access limitations

One more thing to improve is the additional access to the POs placed with descriptive information on delivery and other transportation terms and conditions for the customer service department. Since they often need such information to be accessible for controlling shipments to our clients (affiliates/markets) additional access or

completely unified single ERP system without intermediary services sustaining the work of the main system could help significantly optimize human resources and bring more transparency to the whole operations.

Unlike vintage (harvesting year), design and change of alc% brings difficulties in processing POs consisting of SKUs with such changes in electronic systems, documentation, and warehouses. A solution could be a programmatic rule that either announces parties involved about the description change or create a single variable to input when creating a new SKU so that whenever the variable is modified not only do all parties get announced but they do they get requested to accept such a modification. Thus, everyone can track the changes, time of changes and leverage information for correct order placement, accounting and records both in the warehouses and the mutual system.

8.4 Ranking

There has already been a number of improvement initiatives introduced in the previous research sections however now it may be a good idea to mention them all and focus on 3 major ideas (the first to implement) which will be the leaders of the ranking with 3 major variable: weight of the issue, easiness of implementation, and the index of expected amount of investment needed. The grades for each variable have been identified by the mean number of all the respondents with respect to personal observations and experience to consider potential pitfalls.

Firstly, let`s list (in Table 7) main issues and improvement proposals which have been introduced earlier:

Issues	Solutions
<p>New SKU creation bottleneck due to, for example, mismatching SKUs in the order placed and the delivered cargo.</p>	<ol style="list-style-type: none"> <li data-bbox="946 237 1517 398">1. Broadening employees` facing the need in new SKU creation frequently responsibilities (including electronic access). <li data-bbox="946 432 1517 593">2. Alternative is double checking by multiple additional e-mails and calls with the consignor, however it still does not eliminate human factor. <li data-bbox="946 627 1517 1176">3. Third option is to create a separate section for the BO to fill when executing on any changes related to the SKU and programmatically link modifications to all the parties which may be concerned and/or dependent so that not only did everyone get notified about the changes but also did the accumulating market company get power to either accept the modification or decline.
<p>Orders placement with respect to orders consolidation.</p>	<ol style="list-style-type: none"> <li data-bbox="946 1211 1517 2022">4. Avoiding generalized recommendations and trying to bring more valuable and useful proposals, the optimal solution would be handing every employee working in the department (especially the new comers) out instructions with the description of common challenges which he or she may face as well as the exact steps to take so that the person could cross out and make sure there is nothing left. Such guidelines will not only ensure operations sustainability but also help new employees adapt faster. Moreover, such guidelines with the described situation and steps to be taken are applicable to any business

	process and let the supervisor automate the work, reduce human factor influence, and more fairly assess his or her subordinates performance.
Arbitrage of the stock available (between initial markets with initial forecasts and markets asking for additional quantities).	5. Although the decision is to be made by an employee, the main priorities are good to be described in the instructions mentioned in the point 4.
Meeting safety stock requirements	6. The implementation and use of ABC analysis with respect to slow-moving and fast-moving items.
The information processing bottleneck (some basic logistics data and reports are unavailable to other departments, which sometimes need the specific piece of information much more often than the planning employee).	7. An extended access (at least as a visitor with no permission to edit the data). 8. A unified ERP system where everyone has the same position to observe the current situation but different permission to edit.

Table 7. Results

No	Weight (10-0)	Easiness of implementation (10-very easy – 0-very difficult)	Amount of investments needed (10-very little – 0-a lot)	Total
1	8	6	8	22
2	5	7	9	21
3	10	4	3	17
4	8	7	8	23
5	8	7	8	23
6	9	6	8	23
7	6	8	9	23
8	7	5	4	16

Table 8. Total

To sum up, we have 4 leaders (table 8. Total) which should be the first ones to be implemented or at least considered due to their mediocre index of the investment needed and high level of the expected output what perfectly correlates the Pareto's rule where 20% of inputs bring 80% of outputs. These solutions are instructions providing employee with useful guidelines on the processes and the exact steps on executing any challenges which he or she can one day meet, the leverage of ABC-analysis in purchase planning and stock management followed by the extended access in the software guaranteeing transparency and optimized operations.

9 Discussion

The main objective of the thesis was to bring value to the company's operations by proposing development ideas based in the theoretical foundation and the conducted research. The special focus was on operations and purchase planning due to their crucial role in the company's life. In order to propose improvement ideas the areas of research should be identified by research questions in the chapter 3. The reason for such segregation was not only to avoid overwhelming by the excessive amount of workload one would have to deal with in this case but also to identify the focus areas and, since the qualitative method was priority, to enhance the quality of the overall outputs of the work done.

Unlike for the operations management there has not been a lot of theoretical materials available for the purchase planning. Hence the material has been accumulated from a great number of sources in order to provide the reader with sufficient amount of theoretical background to support the research and let the reader gather intelligence and acquire the understanding of the concepts discussed about in the chapter 5.

Research was conducted by using qualitative method, primarily, interviews and observations. All in all, there were 11 interview sessions organized, 8 people participated (one of them has been interviewed 3 times and one of them has been interviewed twice). All the respondents have been from operations department but various sub departments in order to have people with different point of view and provide the reader with as reliable takeaways as possible.

There has been an opportunity to participate both in the annual “induction” (2 days long intensive programme introducing new employees with every single part of the company, their functions and responsibilities, giving a chance to listen to the head of each department and ask questions) and in targeted presentations of specific projects and “in-field” trips to warehouses conducted specially for particular sub-department employees. Such activities and events not only helped to adapt faster but also to gather a lot of understanding and knowledge about company’s operations which enriched my research work and the thesis project overall.

The variety of references supported thesis work plays a critical role in validating project work’s authenticity. The materials sustaining theoretical basis harmonically balance with research data gathered as well as the significant amount of practical information introduced during intensive sessions for employees. The combination of strong academic theory sources used with the firsthand knowledge based on the accumulated experiences of people working in the field for many years brings unique value to the reader enabling familiarize himself/herself with diverse knowledge and multiple points of view.

The authenticity of the interview results has been acquired by the list of predetermined questions eliminating respondent’s bias. To avoid dubious answers or impacts on the conversation (during interview) there has been a rule of not diving into details unless the predetermined question has been answered and the answer has been accounted.

The repetition of the research may lead to faintly different outputs because of the possible volatilities in the tendencies of business line and growth of the department, innovations and multiple other factors. Supply chain is the field which pervades the company from the top to the bottom and, as a result, very flexible but responsive to amendments and adjustments which are often implemented within it because even a tiny novation may bring significant savings and contribute to the whole company’s operations. Nonetheless, the research objective and goals would be achieved as well as the research questions answered.

I found the research work to be very gratifying and worthwhile because I had a chance not only to gather enormous amount of intelligence by the theoretical materials but also to gain skills, practical understanding and vision towards what the perfect operations may look like. I also found it very rewarding due to opportunity of manifest creativity and create original solutions for the issues the company, individual or department could face. Thesis work required a lot of consistency and tenacity which reinforced my competence and expertise to improve company's operations towards even greater efficiency, productivity, sustainability, and continuous development.

References

2004. *Top Ten Reasons Companies Outsource*. Horizontech. Horizontech.com

2009. *The Hierarchy of Supply Chain Metrics*. sourcinginnovation.com

Abdulghafour, A. B. *Computer Integrated Manufacturing*. Industrial Engineering. University of Technology

Ahmed, M. 2017. *The ABC-XYZ Inventory Management Model – Align Planning Parameter with Business Goals*. muddassirism.com/

Arnold, T. J. R., Chapman, S.N., Clive L. M. 2008. *Introduction to Materials Management*. 6th ed., Pearson Education, Inc., Upper Saddle River, New Jersey 07458.

BAJEC, P., JAKOMIN, I. 2010. *A Make-Or-Buy Decision Process For Outsourcing*. Distribution Logistics Review. University of Ljubljana, Faculty of Maritime Studies and Transportation Pot pomorščakov 4, SI-6320 Portorož, Republic of Slovenia

Bandyopadhyay, J. K. 2016. *Basics of Supply Chain Management*. CRC Press. Taylor & Francis group

Barrar, P., Gervais, R. 2006. *Global Outsourcing Strategies: An International Reference on Effective Outsourcing Relationships*. Gower Publishing Limited. Gower house, Croft Road, Aldershot, Hampshire, GU11 3HR, England

Beasley, J. E. *Master production schedule*. OR-Notes. people.brunel.ac.uk/~mastjib/jeb/or/masprod.html

Bedey, L., Eklund, S., Najafi, N., Wahrén, W., Westerlund, K. 2008. *Purchasing Management*. Chalmers. Department Of Technology Management And Economics

Borad, S. B. 2018. *Types of Inventory / Stock*. eFinanceManagement.com

Bower, D. 2003. *Management of Procurement*. D. Bower and Thomas Telford Limited

Branch, A. E. 2000. *International Purchasing and Management*. Thomson Learning

Buxton, G. 1975, *Effective Marketing Logistics: The Analysis, Planning and Control of Distribution Operations*. The Macmillan Press Ltd.

Caplice, C. 2006. *Inventory Management Material Requirements Planning*. Massachusetts Institute of Technology

Caramela, S. 2018. *Management Theory of Frederick Taylor*. www.business.com

CEO Consulting, *Operations Planning*

Cheng, W., Xiao-Bing, L. 2013. Dalian University of Technology, Quiqubar University (China). *Integrated production planning and control: A multi-objective optimization model*. Journal of Industrial Engineering and Management JIEM, 2013 – 6(4): 815-830 – Online ISSN: 2013-0953 – Print ISSN: 2013-8423
<http://dx.doi.org/10.3926/jiem.771>

Chibba, A., Rundquist, J. *Mapping flows - An analysis of the information flows within the integrated supply chain*. Proceedings of the 16th Annual Conference for Nordic Researchers in Logistics. University of Halmstad. School of Business and Engineering.

Chitale, A. K., Gupta, R. C. 2014. *Materials Management A Supply Chain Perspective: Text And Cases*. 3rd ed., Asoke K. Ghosh, PHI Learning Private Limited, Rimjhim House, 111, Patparganj Industrial Estate, Delhi – 110092

Corina, S. P. *Purchasing Management And Its Important Role In Providing Value Added To Organizations*, Scholar of Romanian Academy, Iasi Subsidiary

Croxton, K. L., García-Dastugue, S. J., Lambert, D. M., Rogers, D. S. 2001. *The Supply Chain Management Processes*. The International Journal of Logistics Management, 12, 2

CTL.SC1x -Supply Chain & Logistics Fundamentals. *Introduction to Logistics & Supply Chain Management*. MIT Center for Transportation & Logistics.

<https://courses.edx.org/asset->

v1:MITx%2BCTL.SC1x_1%2B2T2015%2Btype%40asset%2Bblock/w111_IntroSCM_AN NOTATED_v4.pdf

Daniel Fritsch. *Purchase Planning: Basics, Considerations, & Best Practices*. March 9 2017, eazystock Blog

Davis, R. A. 2015. *Demand-Driven Inventory Optimization and Replenishment: Creating a More Efficient Supply Chain*. 2nd ed., SAS Institute. John Wiley & Sons, Inc. Hoboken, New Jersey

- Day, M. 2002. Gower. *Handbook of Purchasing Management*. Gower Publishing Limited, Gower House, Croft Road, Aldershot, Hants GU11 3HR, England
- Donald H. Sheldon. 2006. *World Class Sales & Operations Planning: A Guide to Successful Implementation and Robust Execution*. APICS-The Educational. Co-published with APICS
- Economic Cycle*. 2018, Investopedia, LLC. www.investopedia.com
- Economic Forecasting*. Investopedia, LLC. 2018. www.investopedia.com
- Factors affecting demand*. EconomicsHelp.org 2016
- Farnen, K. 2018. *The Role of an Operations Manager*. Small Business - Chron.com. Hearst Newspapers, LLC
- Gray, R. 2017. *What Is the Product Life Cycle, and How Does it Impact Pricing Strategies?* Accounting Blog. Patriot Software
- Gupta, R. 2012. *5P's Framework for Supply Chain Transformation*. Supply Chain Management Review. Peerless Media LLC, a division of EH Publishing, Inc. <http://www.scmr.com>
- Gupta, S. Starr, M. 2014. *Production and Operations Management Systems*. CRC Press Taylor & Francis Group 6000 Broken Sound Parkway NW, Suite 300 Boca Raton, FL 33487-2742.
- Harap, J. 2010, *Production Perspectives: 6 Keys to Successful Outsourcing*, Publishing Executive. www.pubexec.com
- Hawkes, H., Malhotra, A., Mueller, C. 2007. *A Fresh Look At Sales and Operations Planning*. Booz & Company Inc.
- Hendry, D. F., Ericsson, N. R. 2003. *Understanding Economic Forecasts*. The MIT Press
- Hong-Mo Yeh, D. *Inventory Management*. University of Toronto
- How to Best Figure Out Ordering Quantity and Ordering Frequency*. Supply Planning Article Listing. Brightwork research & Analysis
- Introduction to Computer Integrated Manufacturing (CIM)*. www.me.nchu.edu.tw/lab/CIM/www/courses/Computer%20Integrated%20Manufacturing/Chapter2%20-CIM-introduction.pdf

Introduction to Operations Management, <https://www.mheducation.co.uk/he/chapters/9780077133016.pdf>

Introduction To Production And Operation Management. <https://www.newagepublishers.com/samplechapter/001233.pdf>

Introduction to Supply Chain Management. Chapter 1. Designing And Managing The Supply Chain

Inventory Classification - ABC Classification, Advantages & Disadvantages. MSG Management Study Guide. www.managementstudyguide.com

Inventory management costs. www.leanmanufacture.net

Inventory Management. Chapter 11. Section 3. Supply Chain Processes And Analytics

Inventory Management. mba.teipir.gr/files/Chapter_9.pdf

Just In Time - JIT. 2018, Investopedia, LLC. www.investopedia.com

Kashyap, D. *5 P's of Production Management – Explained!* www.yourarticlelibrary.com/

Katsioloudes, M. I., Abouhanian. A. K. 2017. *The Strategic Planning Process: Understanding Strategy in Global Markets*. 2nd ed., Routledge, Taylor & Francis Group

Kaynak, H. edited by Bruchey, S. 1997. *Total Quality Management and Just-in-Time Purchasing: Their Effects on Performance of Firms Operating in the U.S.* Garland Publishing, Inc. New York & London/1997

Kidd, A. *The Definition of Procurement*. CIPS Australia

Kraljic, P. 1983. *Purchasing Must Become Supply Management*. Harvard Business Review. Harvard Business Publishing.

Lewis, J. *What Is the 5 P's Model of Lean Manufacturing?* Small Business - Chron.com. 2018. Hearst Newspapers

Linman, D. 2010. *Organizing Procurement And Purchasing Activities In A Project*.

MyMG. An Essential Guide to Project Management Best Practices. MyManagement-Guide.com

Lu, D. 2011. *Fundamentals of Supply Chain Management*. Dr. Dawei Lu & Ventus Publishing ApS

Madison, James H., Sandweiss, Lee Ann, 2014. *Hoosiers and the American Story*. Indiana Historican Sociaty Press

Madnick, S., Woon, W. L., Firat, A. K. 2008. *Technological Forecasting – A Review*. Composite Information Systems Laboratory (CISL) Sloan School of Management, Room E53-320 Massachusetts Institute of Technology Cambridge, MA 02142

Mahadevan, B. 2010. *Operations Management: Theory and Practice*. 2nd ed., Indian Institute of Management Bangalore. Dorling Kindersley (India) Pvt. Ltd. Licensees of Pearson Education in South Asia

Make-Or-Buy Decision. Investopedia, LLC. 2018. www.investopedia.com

Manktelow J., Keith J., Swift C., Edwards S., Bishop L., Pearcey E., Mugridge T., Bell S., Robison R., Bruce E. *Frederick Taylor and Scientific Management Understanding Taylorism and Early Management Theory*. MindTools. www.mindtools.com

Manktelow J., Keith J., Swift C., Edwards S., Bishop L., Pearcey E., Mugridge T., Bell S., Robison R., Bruce E. *Porter's Value Chain Understanding How Value Is Created Within Organizations*. MindTools. www.mindtools.com

Martin. 2015. *Step-by-step guide to Make or Buy Decision*. cleverism. www.cleverism.com

Martino, J. P. 1972. *An Introduction to Technological Forecasting*. Routledge Library Editions: The Economics and Business of Technology. GORDON AND BREACH, Science Publishers. Inc. 440 Park Avenue South, New York, N.Y. 10016, U.S.A.

Milner, C., Relph, G. 2015. *Inventory Management: Advanced Methods for Managing Inventory within business systems*, Kogan Page Limited

Monczka, R. M., Handfield, R. B., Giunipero, L. C., Patterson, J. L. 2009. *Purchasing And Supply Chain Management*. 4th ed., South-Western Cengage Learning, 5191 Natorp Boulevard, Mason, OH 45040, USA

Monczka, R. M., Handfield, R. B., Giunipero, L. C., Patterson, J. L. 2009. *Purchasing And Supply Chain Management*. 4th ed., South-Western, a part of Cengage Learning

Moore, N. Y., Balwin, L. H., Camm, F., Cook, C. R. 2002. *Implementing Best Purchasing and Supply Management Practices Lessons from Innovative Commercial Firms*. Documented Briefing. Project Air Force. Rand 1700 Main Street, P.O. Box 2138, Santa Monica, CA 90407-2138 1200 South Hayes Street, Arlington, VA 22202-5050 201 North Craig Street, Suite 102, Pittsburgh, PA 15213 RAND www.rand.org

Muller, M. 2011. *Essentials of Inventory Management*. AMACOM American Management Association

Noche, B. I. *Inventory planning*. Universitat Duisburg essen

Oliver, K., Chung, A., Samanich, N., 2001. *Beyond Utopia: The Realist's Guide to Internet-Enabled Supply Chain Management*. Booz & Company. www.strategy-business.com

Operations Management, IBS Center for Management Research, www.icmrindia.org/courseware/Operations%20Management%202nd%20Edition/Materials%20Management.htm

Operations Management. 2018. Investopedia, LLC. www.investopedia.com

Palmatier, G. E., Crum, C. 2003. *Enterprise Sales and Operations Planning: Synchronizing Demand, Supply and Resources for Peak Performance*. APICS, The Educational Society For Resource Management. J.Ross Publishing

Pivovarov, S. Maksimtsev, I. Rogova, I. Khutieva, E. 2011. *Operations Management*. Publishing "Piter" Ltd.

Pohja, T. 2004. *Some theoretical foundations of Supply Chain Management and Supply Networks: the role of social networks in selecting partners*. 20th IMP Group Conference Copenhagen 2-4.9.2004 - Work-in-progress paper -Åbo Akademi University Henriksgatan. 7 20500 Åbo Finland

Poonia, S. V. 2010. *Production And Operations Management*. Gennext Publication. 23 Main Ansari Road, Darya Ganj

Product Life Cycle. 2018, Investopedia, LLC. www.investopedia.com

Production and Operations Management. Rai Technology University. Dhodballapur Nelamangala Road, SH -74, Off Highway 207, Dhodballapur Taluk, Bangalore – 561204

Production Management. www.elibrarywcl.files.wordpress.com/2015/02/production_management.pdf

Prof. Fabio De Felice, Dr. Stanislao Monfreda, Dr. Antonella Petrillo, Dr. Ing. Maria Elena Nenni, Prof. Raffaele Iannone, Prof. Vito Introna, Dr. Alessio Giuiusa, Dr. Filippo De Carlo. Edited by Massimiliano Schiraldi. 2013. *Operations Management*. University of Roma "Tor Vergata", Italy. The Open University of Hong Kong.

Purchase Planning. Interim Internal Purchasing Guidelines. United States Postal Service. about.usps.com/manuals/ipm/html/ipmc2_001.html

Quinn, J. B. 1967. *Technological Forecasting*. Harvard Business Review. Harvard Business School Publishing.

Rajgopal, J. *Supply Chains: Distribution, Warehousing Transportation*. Department of Industrial Engineering. University of Pittsburgh

Ramaa, A., Subramanya, K. N., Rangaswamy, T. M. 2012. *Impact of Warehouse Management System in a Supply Chain*. International Journal of Computer Applications, 54, 1.

Richards, G. 2018. *Warehouse Management: A Complete Guide to Improving Efficiency and Minimizing Costs in the Modern Warehouse*. 3rd ed., The Chartered Institute of Logistics and transport. Kogan Page Limited

Rushton, A., Croucher, P., Baker, P. *The Handbook of Logistics and Distribution Management*. Kogan Page Limited

Saint-Leger, R. *Importance of Forecasting in Supply Chain Management*. 2018. Small Business - Chron.com, <http://smallbusiness.chron.com>

Sandrone, V. F. W. *Taylor & Scientific Management*. SkyMark Corporation. 2018. www.skymark.com

Scholz-Reiter, B., Hefer, J., Meinecke, C., Bergmann, J. 2012. *Integration of demand forecasts in ABC-XYZ analysis: practical investigation at an industrial company*. International Journal of Productivity and Performance Management.

Schwarting, D., Weissbarth, R. 2011. *Make or buy. Three pillars of sound decision making*. strategy& Formerly Booz & Company. PwC. www.strategyand.pwc.com

Schwarz, B. *The Economic Order-Quantity (EOQ) Model*. Purdue University

Shawal, M. *Inventories: Features, Functions, Classification and Types*. Materials Management. www.yourarticlelibrary.com

Singh, J. *6 Important Factors That Influence the Demand of Goods*. www.economicsdiscussion.net

Skripak, S. J., Parsons, R., Cortes, A., Walz, A. 2016. *Chapter 9: Operations Management*. Pamplin College of Business and Virginia Tech Libraries July 2016. Saylor Foundation's

Sollish, F., Semanik, J. *The Procurement and Supply Manager's Desk Reference*. 2nd edition. John Wiley & Sons, Inc.

Stock Handling and Inventory Control, Marketing Essentials Chapter 24, Section 24.1. <https://pdfs.semanticscholar.org/presentation/2ec1/da32d36528d2076efb2608b475fb665676dd.pdf>

Supply Chain Activities - scm activities determine its purpose. Comprehensive guide on Materials & Supply Chain Management. www.supplychainmanagement.in

Supply Chain Management Hierarchy. Hierarchy structure. www.hierarchystructure.com

Supply Chain Performance: Achieving Strategic Fit and Scope. www.gezabottlik.com/310/Chopra/Chapter_02.pdf

Supply Chain Solution. 2017. *Flows in Supply Chain Management*. www.tpsynergy.com

The Importance of Supply Chain Management. Council of Supply Chain Management Professionals (CSCMP). 2018. www.cscmp.org

Timothy M Brown. *Sales and Operations Planning*. Georgia Institute of Technology. Supply Chain Principles. www.coursera.org

Value Chain. Investopedia, LLC. 2018. www.investopedia.com

Van Weele, A. J. 2010. *Purchasing & Supply Chain Management: Analysis, Strategy, Planning and Practice*. 5th ed., Eindhoven University of Technology, The Netherlands. Cengage Learning EMEA

- Venkatesan, R. 1992. *Strategic Sourcing: To Make or Not To Make*. Harvard Business Review. Harvard Business School Publishing
- Wallace, T. F. 2004. *Sales & Operations Planning: The "how-to" Handbook*. T.F. Wallace & Company, 453 Stanley Avenue, Cincinnati, Ohio 45226
- Wallace, T. *Sales & Operations Planning*. www.tfwallace.com
- Waller, A. M., Esper, T. L. 2014. *The Definitive Guide to Inventory Management: Principles and Strategies for the Efficient Flow of Inventory across the Supply Chain*. Council of Supply Chain Management Professionals. Pearson Education, Inc. Upper Saddle River, New Jersey 07458
- Waters, D. 2003. *Inventory Control and Management*. John Wiley & Sons Ltd, the Atrium, Southern Gate, Shishester, West Sussex PO19 8SQ, England
- Weatherall, A. 1992. *Computer Integrated Manufacturing: A Total Company Competitive Strategy*. 2nd ed., Butterworth-Heinemann Ltd. Linacre House, Jordan Hill, Oxford OX2 8DP
- What is the Role of Supply Chain Management?* Academy for International Modern Studies (AIMS), 21 Wenlock Road, London N1 7GU United Kingdom. www.aims.education
- Wild, R. 2003. *Operations Management*. 6th. ed., Thomson Learning 2003. High Holborn House; 50-51 Bedford Row, London WC1R 4LR. www.thomsonlearning.co.uk
- Zhang, Y. Wang, X. *A Web-enabled Agile Manufacturing System for SMEs in Supply Chain Management*. Report. The University of Liverpool Management School.
- Zrilic, A. *Six Steps Inventory Optimization*