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TASK

FOR COMPLETION THE BACHELOR THESIS OF STUDENT

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1. Theme of the Bachelor thesis: «Customization of warehouse services of logistics provider» was approved by the Rector Directive №553/CT. of May 4, 2020.
2. Term performance of thesis: from May 25, 2020 to June 21, 2020.
3. Date of submission work to graduation department: June 05, 2020.
4. Initial data required for writing the thesis: general and statistical information of the company «Denka Logistics», production and financial indicators of the company «Denka Logistics», literary sources on logistics and customer service process, Internet sources.
5. Content of the explanatory notes: introduction; main terms of warehouse logistics; the specifics of processes' construction in accordance with mass customization requirements; macroeconomic conditions in the Ukrainian market of logistical and warehouse services; analysis of activities of the company «Denka Logistics»; identification of disadvantages in the warehouse services; application of business process reengineering in the logistical company; construction of time-function map and process chart of labeling process; calculation of the economic effect of the proposed measures; conclusions and appendices.
6. List of obligatory graphical materials: tables, charts, pictures, figures.

7. Calendar schedule:

Passing training on work safety on the basis of practice and familiarization with the code of corporate ethics Denka Logistics Ukraine	04/05
Getting to know the history of the base and its practice areas of activity, territory	06/05
Working at reclamation department	08/05
Working at the SRT department, marking of returned goods	09/05
Getting to know the activities of the domestic transportation department	10/05
Learn the activities of product assembly and distribution department	12/05
Getting to know the Sales and work with clients department	14/05
Learning about work with a narrow pass stacker	15/05
Registration, submission and report writing	16,17/05

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8. Consultants of difference chapters of work:

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Chapter 1	Senior lecturer, Volovyk O.I.	25.05.20	25.05.20
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ABSTRACT

The explanatory notes to the Bachelor thesis «Customization of warehouse services of logistics provider» comprises of 79 pages, 12 figures, 11 tables, 2 appendixes, 50 references.

KEY WORDS: MASS CUSTOMIZATION, WAREHOUSE PROCESSES' REENGINEERING, EMPLOYEES' WORK PROCESS MANAGEMENT, LABELING SERVICE

The purpose of the research is to study the theoretical foundations and problems of mass customization approach in warehouse services and to develop recommendations for conducting reengineering of warehouse processes in order to achieve competitive advantage.

The subject of the investigation is the reengineering of warehouse processes in order to achieve high level of performance and quality of services in «Denka Logistics».

The object of the research is the warehouse of company «Denka Logistics».

Methods of research are scientific inquiry, empirical observations, analysis and synthesis, modeling, expert assessments.

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NOTATIONS

AI – Artificial Intelligence

DL – Denka Logistics

ERP – Enterprise Resource Planning

MC – Mass Customization

MEZ – Mezzanine

RC – Responsibility Center

RFID – Radio Frequency Identification

SCM – Supply Chain Management

TMS – Transport Management System

WMS – Warehouse Management System

INTRODUCTION

Nowadays it is impossible to imagine a modern business without logistics. If earlier the word “logistics” was associated only with warehousing and transportation of goods, today it covers information flows, tourism, trade and much more. Each business involves a complex scheme of processes, which in one way or another intersect and depend on each other. Failure in any element leads to a cascade of violations in the whole system. For this purpose, it is necessary to clearly understand the concept of a process and its behavior while interacting with other processes, master tools of process design and develop several fallback options for actions in case of violations and discrepancies.

One of the most popular areas is warehouse logistics. Every year, more and more stores open both new outlets and online platforms. Despite one trading network, these are two completely different types of logistics services. Shops try to retain their own storage facilities in order to optimize their costs, which increases the load on logistical enterprises. Products for stores and online sites undergo completely different processing. For on-site stores, warehouses handle seasonal bulk deliveries. Whereas for on-line stores, a stream of a wide variety of orders arrives daily and requires immediate processing and execution. Besides, there are about ten most popular delivery services in Ukraine and it is important for the client to choose the most suitable one.

Moreover, different products have different storage requirements. Even if it is not about food products or others that require a strict temperature or humidity. Since the goods can be stored on pallets, in boxes, in plastic containers of different sizes, each type has its own type of transport and equipment. Accordingly, for different types of shipping and moving around the warehouse, different distances between the racks, height, marking and more are required. The number of storage locations and rational zoning is directly proportional to the cash and time costs of the warehouse.

The number of customers and the type of their products also depend on the capacity of warehouse.

Mass customization is the kind of process which has taken over repetitive, product focused and process focused ones. Most of the goods that can be seen in stores, from products and household chemicals to clothing and appliances, came off the assembly line. The task of mass customization is to satisfy the needs of all segments of the market with the maximum variety of products in the required quantity. Such factories produce goods instantly and, respectively, goods turnover in warehouses occurs 24/7.

Despite the fact that most modern warehouses have a high level of automation of processes, warehouse human jobs are still important.

Artificial intelligence (AI) has reached a high level, but is still not able to control processes at the human level. Unfortunately, a large number of warehouses in Ukraine do not have the financial ability to automate their warehouses completely. From this, human responsibility increases. Storekeepers must have a high level of skill for uniform, but extremely important tasks. The speed of quality order processing often plays a key role. For this, each employee must have the appropriate conditions: a well-equipped workplace, clear instructions, regular training, daily routines taking into account breaks, financial motivation. Only a combination of all factors without exception will help achieve the desired performance.

CHAPTER 1

THEORETICAL FOUNDATIONS FOR WAREHOUSE LOGISTICS IN TERMS OF MASS CUSTOMIZATION

1.1 Main terms of warehouse logistics

The topic of this thesis requires careful immersion in all kinds of scientific sources regarding all further research. After analyzing my enterprise, it is necessary to concentrate on a number of concepts that are mandatory for understanding in further work.

To begin with it is necessary to understand one of the main terms, which is logistics. After long theoretical research I have understood that the most accurate definition is given by Merriam-Webster dictionary [1] which defines logistics as the planning framework utilized by the management of a company to assist the allocation of capital flows, data, service, material, and personnel. As a process, logistics becomes more complicated due to high demand for multifaceted information and coordination system of modern business environment.

A well-organized logistics process inside a company will apply different tools to study and foresee a lot of challenges. These implementations should merge data, packaging, materials, personnel, warehousing, production, inventory, transport and final products' distribution [37].

The term “logistics” has a long history. Developed logistic methods can be found in various cultures of different eras. For example, in 1572, a Spanish lawyer and economist of the 16th century, Juan Polo de Ondegardo, reported that in the Inca Empire, Kipukamayoki officials kept records of the current necessary products for the Inca court, taking into account the place of dispatch, delivered products, delivery

time, and, possibly , distance [34]. The birth of logistics can be traced back to the Greek and Roman empires when military officers titled ‘Logistikas’ were assigned the duties of providing services related to supply and distribution of resources. This was done to enable soldiers to move from their base position to a new forward position efficiently, which could be a crucial factor in determining the outcome of wars [38].

The term “logistics” was introduced into the Russian language at the beginning of the 19th century by the French military specialist Antoine Jomini [35]. In Soviet times, in a planned economy, it was replaced by the term "supply." According to works of Ukrainian scientists Akmaldinova O.M. and Mazurenko Z.U. the term received written definition in 1905 as a branch of war art pertaining to the movement and supply of armies [2]. During World War II logistics dealt with military forces and hospitals support, as well as sorting of troops.

Logistics’ start in business terminology begun in 1960s. Considering the development of logistics, economist Donald Bowersox noted that it arose as the implementation of a number of marketing problems in the 50-60s. He was one of the fathers of the new logistics’ history and covered it in his works, like “Logistical Management” 1974 [3], “Strategic marketing channel management” 1992 [4], “Supply chain logistics management” 2001 [5] and other publications.

Each component of logistics supply chain is an integral part of it. The organization of the supply chain is gaining momentum every year. Modern companies are increasingly trying to switch to outsourcing, which significantly increases the load on the logistics department. Warehouses should be able to adapt to growing and seasonal demand and so on. Each part of this incredibly complicated system can fail, which will entail a number of others. But for a clear control of the situation, it is necessary to know every detail of this mechanism.

Firstly, we have to understand definition of Supply Chain Management (SCM), given by Association of Employment and Learning Providers' Supply Chain Management [6] and Harland C.M. [7], which are quite similar. They suggest that SCM is the management of goods’ and services’ flow, that involves the movement

and storage of raw materials, work-in-process inventory, and finished goods from point of origin to point of consumption. Interconnected networks, channels and node businesses combine in the provision of products and services wanted or needed by end customers in a supply chain.

After defining the concept of SCM we can study its details. One of the most important sections of the system is warehousing. As we see from information, given by Electronic Business Encyclopedia Shopyfy [39] warehousing is the act of storing goods that will be sold or distributed later. While a small, home-based business might be warehousing products in a spare room, basement, or garage, larger businesses typically own or rent space in a building that is specifically designed for storage.

1.2 Components and structure of warehouse

Since modern warehouses are mostly intended for storing a wide variety of goods, from children's toys to electronics, they need serious software support and technical equipment to control a variety of flows. The main components of the warehouse are:

- Shelving and rack systems that offer maximum storage capacity and easy product access.
- A climate control system. This is particularly important for frozen products or those requiring refrigeration. This list also includes pharmaceutical or laboratory products, and others that may be spoiled.
- Inventory control software that tells the product owner where all individual units are in the system at all times, how to get it from shelves, when it should be delivered to the shop, etc.
- Equipment that can move products from point A to point B – forklifts, pallet jacks, narrow aisle stacker, and conveyor belts, for example.
- Shipping supplies for order fulfillment.

- People who load products into a warehouse and others (“pickers”) who fill orders in a distribution center, plus those who manage and control operations.

- Security system.

- Access to cost-effective transportation for product delivery or pick-up as orders are received. Easy access to fleets, railway lines or airports is required. All these processes are connected by well-aligned and well-maintained processes.

But despite the need for powerful technical equipment of the warehouse, the well-established processes are the main component of this business. The ability to correctly distribute tasks and rationally use equipment is the key to achieving enterprise competitiveness. In this regard, it is quite advisable to carefully analyze the concept of processes in a business environment, their types and strategy.

1.3 Process and its classification

The only precise definition of a process is given by Merriam-Webster dictionary, defining a process as a series of actions or operations conducting to an end or a continuous operation or treatment especially in manufacture [40].

A process (or transformation) strategy - is an organization’s approach to transforming resources into goods and services.

Before classifying different types of processes, the nature of product needs to be considered. After all, creating a unique item, such as a bridge over the river, is different from producing a million of candy packages or a cistern of chemicals. Here are process classifications, arranged according to fixed costs (lowest to highest) [8]:

- Job shops: This type of process produces small batches of many different products. Each batch is typically created to a specific customer order, and each product may require different stages and processing time. Examples are men's tailoring studios, producing suits for each client individually.

– Batch shops: Produce periodic batches of the same product. Batch shops can produce different products, but each product follows the same process flow. A facility producing drinks of different flavors and different bottles. Batch shops usually require some setup time — deadline to prepare resources for production different types of product.

– Assembly lines: These produce discrete parts flowing at controlled rates through a well-defined process. The line moves the parts to the resources, and each resource must complete its task before the line moves on. This requires a balanced line, meaning that each operation completes its task in a similar amount of time. The line moves at the speed of the slowest operation, or bottleneck. For example production of automobiles or household equipment.

– Continuous flow processes: As the name implies, these processes produce items continuously, usually in a highly automated process. Examples include chemical plants, refineries, and electric generation facilities. A continuous flow process may have to run 24/7 because starting and stopping it is often difficult. Food industry may be referred to this type (juice, bread, ice-cream production).

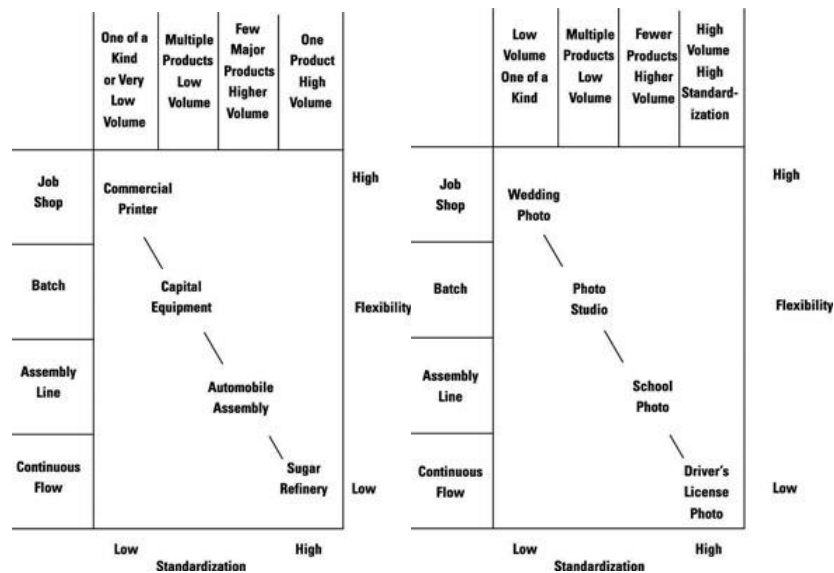


Figure 1.1 – Process on volume dependence graph

The objective of a process strategy is to build a production process that meets customer requirements and product specification within cost and other managerial constraints.

Selected process will have a long term effect on efficiency and flexibility of production as well as on cost and quality of the goods produced. Therefore, limitations of a process strategy are at the time of the process decision.

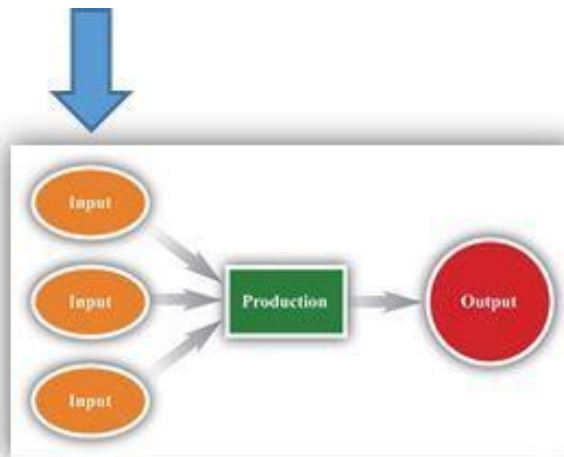


Figure 1.2 – Production process

According to the information given by Jay Heizer in his “Operations management” [9] there are four process strategies and each production enterprise will have one of them:

- Process Focus: these processes might be departments dealing with welding, grinding, and painting. Hairdressing is also a good example. The process focuses on low volume and high variety.

- Repetitive focus: between the product and process focus. The repetitive process is a product-oriented production process that uses modules prepared in advance, which are components of a future product. Fast-food restaurants and motorbike production are examples of repetitive process using modules.

- Product focus: high volume, low variety processes; also called continuous processes. Products such as light bulbs, rolls of paper, beer, and bolts are examples of product process. This type of facility requires a high fixed cost, but low variable

costs. Facility utilization is high. Production (growing) of corn or potatoes may be example.

– Mass customizations focus: is rapid, low-cost production that caters to constantly changing unique customer desires. High volume, high variety. Not everyone can afford to buy shoes of expensive brand. But mass-market shops can offer a good choice of similar shoes, but at a lower price.

1.4 Mass customization approach

Mass Customization is extremely important direction in our time. Many specialists worked and continue working on this topic to stabilize and enhance it. There are many scientists, who worked on involvement of mass-customization principles into different spheres of production. For example, Gang Xiong (for mobile phone production); Juliana Hsuan Mikkola & Tage Skjøtt-Larsen; F. Salvador, M. Rungtusanatham & C. Forza; Frank T. Piller, Kathrin Moeslein & Christof M. Stotko [41,10,11].

Before 1996 year assembly line was the best that production enterprises could offer. Low variety and deficit of goods – that was the past of our parents. Demand significantly exceeded supply and something needed to be done. Socio-cultural changes, foreign trends have led us to create mass customization. However, this system is very difficult to install and expensive, so payback is possible only due to mass production and sale. Nowadays, we can afford to choose from a variety of products, choosing priority in terms of quality, material, price, design, brand, country of production, which makes it possible to meet the needs of representatives of all social classes.

Since MC has become the most relevant strategy of our time, it has several branches. There are four unique approaches to mass customization in manufacturing:

– Collaborative Customization: manufacturers work with individuals to create a product from the beginning of the manufacturing process to the end. The Custom Foot shoe company uses this model and it involves consultations, digital imagery of the customer's foot, and measurements taken by hand rather than the usual practice of trying on different pair of shoes.

– Adaptive Customization: The manufacturer offers customers one standard product and several custom options. For example, O-bag company provides a selection of different designs of parts for creating bags (basics, cases, straps, accessories), but in a standard modification. So you can collect the bag yourself from any ingredients you like.

– Cosmetic Customization: designing of product packages for different peoples' desires. For example, YSL may put your name on your lipstick.

– Transparent Customization: providing customized products to individual customers without informing the customer that the product has been customized. This sort of customization is made possible when companies have the ability to monitor and analyze their customers' needs without directly asking the customer.

There are three main advantages of Mass Customization:

- Customized products give customers possibility to make a choice.
- There are huge savings to be made by eradicating inventories of unsold goods and raw materials as nothing is produced until an order is received.
- Customer relationships are strengthened through customization ability.

1.5 Graphical tools for process display

As previously mentioned, the main key to a company's success is well-established processes. And the process, in turn, is a complex network of many steps and actions tied together. Failure in one step can fill up all subsequent dominoes, in connection with which alternative options for the development of events should

always be provided. This applies to both the technical and the human component of the enterprise. In both cases, a clear understanding of actions in each individual structure and its interaction with others is necessary. It is important to convey the tasks to the staff as clear as possible and calculate the execution time of each specific operation and the process as a whole. For centuries, the simplest method of delivering information has been visualization, which inspired people to create many different types of schematic descriptions of processes. Here we consider the most popular ones.

According to the “Software System Engineering Vocabulary” [12], flowchart is a type of diagram that represents a workflow or process. A flowchart can also be defined as a diagrammatic representation of an algorithm, a step-by-step approach to solving a task.

The flowchart shows the steps as boxes of various kinds, and their order by connecting the boxes with arrows. This representation illustrates a solution model to a given problem. Flowcharts are used in analyzing, designing, documenting or managing a process or program in various fields.

The same resource gives us definition of another special form of the flow chart, which is the time function map. It consists of a flowchart with responsible parties on the vertical axis (deployment flowchart) and a time line on the horizontal axis. It is especially useful in identifying time consuming steps in a process and where most time is lost in waiting and movement. With a time function map you can address the same questions as with a flowchart but in addition ask: Why does each step take so long to complete?

Process Charts are one of the simpler forms of workflow charting and are still in regular usage but are less common than they once were. This is unfortunate since it was the ubiquitous nature of the process chart that made it a common “language” between different groups of people and across different industries.

Juan Ignacio Camino explains that a variety of process charts has been designed to meet the needs of a particular level or stage of analysis; they can be used at a

detailed level (recording activity at a specific work station or workplace), but also at the wider system, process or procedure level [13-15].

Rother Mike gave the most precise definition of value-stream mapping, also known as "material- and information-flow mapping". It is a lean-management method for analyzing the current state and designing a future state for the series of events that take a product or service from the very beginning of the specific process until it reaches the customer. A value stream map is a visual tool that displays all critical steps in a specific process and quantifies easily the time and volume taken at each stage. Value stream maps show the flow of both materials and information as they progress through the process. The difference between a value stream and a value chain is that a value stream focuses only on areas of a firm that add value to a product or service, whereas a value chain refers to all of the activities within a company [42-44].

A service blueprint (according to the definition of Nielsen Norman Group) [45] is a diagram that visualizes the relationships between different service components — people, props (physical or digital evidence), and processes — that are directly tied to touch points in a specific customer journey.

Actually, for the same service, you may have multiple blueprints if there are several different scenarios that it can accommodate. For example, there differences between serving the dinner in café and preparing an order for pickup or delivery.

1.6 Management theories

Historically, managers have always tried to make processes more efficient and cost-effective. For this, it was necessary to learn not only to investigate them, but also to measure, give them numerical forms. The first publications of studies on this topic were presented at the beginning of the 19th century, but the work described below laid the foundation for modern trends.

Frederick Winslow Taylor (March 20, 1856 – March 21, 1915) was an American mechanical engineer who sought to improve industrial efficiency, as written in New York Times. March 22, 1915 [16]. *The Wall Street Journal in June 13, 1997* [17] described him as one of the first management consultants. Taylor was one of the most powerful intellectual leaders of the Efficiency Movement and his ideas, broadly conceived, were highly influential in the Progressive Era (1890s–1920s). In 1911, Taylor summed up his efficiency techniques in his book *The Principles of Scientific Management* [18] which, in 2001, Fellows of the Academy of Management voted the most influential management book of the twentieth century [19].

According to Taylor, rather than scolding employees for every minor mistake, employers should reward workers for increased productivity. Although the theory contributes to the efficiency of workers, it is not without drawbacks. Many of these subtasks make employees feel part of the assembly line, not creative individuals.

However, productivity is still a valuable result of this practice; and depending on the industry, the theory could be a great addition to businesses today. In his work, he derived the basic requirements for achieving maximum efficiency from employees. Key principles include:

- Break down assignments into subtasks
- Instead of entrusting the entire project to one person, managers break it into pieces and pass it on to several people. Thus, the attention is not scattered and the quality of work done increases significantly.
- Delegate responsibilities and train workers
- Managers measure the most effective way to accomplish a specific task, and then train employees in these methods.

The roles of workers, as a rule, are distributed strictly according to skills and level of professionalism. Often, employees underestimate their contribution, because the tasks often do not differ from the previous ones, but for Taylor, each employee plays a decisive role in company's success. The main principles are:

- Monitor performance: heads of the department ensure that each of their employees performs their work efficiently and if best practice is discovered, workers take additional courses to apply it in their work.
- Establish motivation and rewards: tangible and intangible incentives for high level of employees' performance. Good work positively affect wages and every employee should know this!
- Allocate work between managers and employees: Taylor believed in a hierarchy of three levels with the most educated and active workers at the top. At each level, precise responsibilities and detailed instructions are given corresponding to their role. Subordinates should trust those who are above them and fully perform only what is entrusted to them. [46].

Another revolutionary breakthrough in management was done by the marriage couple of Frank and Lillian Gilbreth, who believed in regulation and consistency in the workplace. Instead of giving preference to a company consisting of many working parts, they above all appreciated the effectiveness of each of them. The couple believed that there was one best way to do any job, and one specific process that would be as efficient as possible and most beneficial.

The couple placed great responsibility on efficiency in managing the organization. In their control theory, three main points are the following ones:

- Reduce the number of motions in a task: Frank and Lillian coined the term "therbligs," or elemental motions required for tasks in the workplace. They used these 18 units to analyze how tasks were completed – searching for an object with eyes or hands, grasping an object with hands, ways of assembling several parts, etc. From there, they could figure out which motions were necessary, and which ones should be eliminated to save time and energy of employee.
- Focus on the incremental study of motions and time: as engineers, they closely studied motion and time to calculate the most efficient way to complete a given task. Taking the scientific approach, they measured time and motion to 1/2000 of a second to understand what works best. Their insight was unlike that of most other theorists, as they channeled physical science rather than psychology.

– Increase efficiency to increase profit and worker satisfaction: your main goal as a leader should be increasing efficiency in each individual employee, and in the organization as a whole. Not only will this method save time, it will also afford you a higher profit and happier workers [20].

A time and motion study (or time-motion study) is a business efficiency technique combining the Time Study work of Frederick Winslow Taylor with the Motion Study work of Frank and Lillian. Both methods were combined and improved into one, which is applicable to improvement and modernization of working systems. This is a kind of foundation for building an effective management system, for application both for manufacturing enterprises, and for hospitals, schools and banks. [21-22].

1.7 Artificial intelligence and its use in modern logistics

Despite the foundation, which for many years has served faithfully, the main content of companies is rapidly modernizing. If earlier automatic sorting of goods was considered a miracle, then after a couple of years it became an integral part for any modern warehouse. We live in a world where stopping is equal to degradation, so we pay special attention to innovative departments in companies. “Transmetrics” has identified the Top 10 important trends in logistics technology that the company should follow in 2020 [23]. This list is based on works of modern scientists, such as Beth Gutelius and Nik Theodore, described in “The Future of Warehouse Work: Technological Change in the U.S. Logistics Industry”; Michael Schoenfeld in his article “4 ways technology is revolutionizing warehouse”; Georgia Wilson, working at “Future of logistics warehouses” [47, 24-25]. It includes such points as:

- Artificial and Augmented Intelligence
- Digital Twins
- Real-Time Supply Chain Visibility

- Blockchain
- Data Standardization and Advanced Analytics
- The Growing Importance of Industry Newcomers
- Increasing Investment into Logistics Startups from VCs and Enterprises
- Sustainability Powered by Technology
- Autonomous Vehicles
- Warehouse Robotics

In computer science, Artificial Intelligence (AI), sometimes referred to as machine intelligence, is intelligence demonstrated by machines, in contrast to the natural intelligence displayed by humans and animals. Leading AI textbooks define the field as the study of "intelligent agents": any device that perceives its environment and takes actions that maximize its chance of successfully achieving its goals. Colloquially, the term "artificial intelligence" is often used to describe machines (or computers) that mimic "cognitive" functions that humans associate with the human mind, such as "learning" and "problem solving" [26, 48].

Artificial intelligence has started to impact the logistics industry, along with the supply chain. We are seeing innovations such as smart roads and autonomous vehicles. In this article, we'll look at five promising AI use cases in logistics. The potential value to be gained is huge. Research shows it can generate from \$1.3 trillion to \$2 trillion per year.

The primary purpose of many AI implementations in the logistics industry is to automate time-consuming actions and save money. Many tech enterprises (e.g. Google, Amazon) are heavily invested in this technology and leading the field.

Automated Warehouses: artificial intelligence technology greatly simplifies the process of collecting data, their analysis and problem solving, which allows you to increase company revenue. The AI collects data on the demand for the product and transfers them to the warehouse in advance. This helps to significantly optimize processes by properly distributing goods in a warehouse, delivering them on time or changing them. Transport costs in this case are also significantly reduced.

Warehouse automation systems make it possible to remove a certain number of routine tasks from a person. According to the work of famous psychologists, such as Cal Newport [27], Malcolm Gladwell [28], Charles Duhigg [29], Stephen R. Covey [30], Greg McKeown [31], Daniel Goleman [32] and Timothy Ferriss [33] maximum productivity time with continuous monotonous operation reaches only three hours. Further attention is scattered and mistakes are made, it is becoming more and more difficult to motivate a person and the process is significantly delayed. It is also proved that industrial noise negatively affects the human psyche, which further leads to depression, alcoholism and other disorders.

Too small and painstaking work requiring perseverance is also difficult for humans. AI helps to solve this problem with the help of artificial vision. A high-precision laser reads information from barcodes and other surfaces in a short time.

Autonomous Vehicles: cars with automatic control have won great respect not only from ordinary drivers, but also from logistics carriers. They are designed to reduce risks for the driver and allow round-the-clock transportation. Unfortunately, to date, roads and cars are not adapted enough for drones, but after a few decades we will be able to observe a completely different picture.

Automation is not only ground, but also air and underground transport. The use of drones has already been actively tested by several courier services, and in Britain unmanned trains have been successfully operating for several years. The use of robots in warehouses is also not news, but soon there will be many more.

Smart Roads: another example of the use of AI in logistics. Motorway solar panels help generate electricity, and LED lights are used to alert drivers of road conditions. In addition, solar panels are less slippery during rain and snow. Another application is fiber-optic sensors, which can determine volumes and patterns of traffic and notify drivers about road conditions. They can also determine when vehicles overload exits or have an accident, timely informing the necessary rescue services.

Integrated Roadways company has created the Smart Pavement system. The Colorado Department of Transportation began actively testing the system in 2018.

Back Office: artificial Intelligence in combination with Robotic Process Automation (RPA) provides the workers with an opportunity to increase their quality of work. For instance, everyday repetitive tasks can be automated. This lowers costs and improves the accuracy and timeliness of data for logistics companies.

UIPath works on robotic equipment. They have developed a robot that is able to conquer approximately 99% of back office tasks since the robot can “see” screen elements. The company’s IRR has grown to more than \$206 million.

Demand Prediction: one of the most important business needs affecting most enterprises is the need to predict the quantity of supplies and goods that he will need in the future. Lack of inventory leads to loss of sales, excess means extra costs for transportation and storage.

AI provides various algorithms that can predict trends. According to Deloitte, in many cases, these algorithms can calculate the flow better than human experts.

Despite the incredible number of logistics operations taking place at the warehouse, the task of the developers is to make each operation as clear and simple as possible. Nowadays, AI can track and measure all input data and variables, increasing the accuracy of forecasts.

AI can also improve the quality of customer service through personalization, tracking their preferences in products and offering similar products or new products [49].

1.8 Warehouse safety norms

Warehouse businesses thrive where there is orderliness. They also do well when employees are safe. Unfortunately, accidents can happen in a matter of seconds leading to injuries and even fatalities. The US Bureau of Labor Statistics reports that there is an average of 16 fatalities yearly in the warehousing and storage industry and

an injury and illness rate of 5 out of every 100 staff employed in this sector. Below is an actionable list of warehouse safety tips.

Regular warehouse safety awareness training: to ensure safety remains a top priority, frequent training (of every employee), followed by enforcement and review is essential. Without this vital step, every other tip listed below is merely a palliative measure. A common mistake is to regard safety training as a one-time event whereas it should be a recurring practice.

Therefore, all employees no matter how experienced must renew their training to keep them abreast of any changes. Of course, new employees should go through this training before even their first task. After training comes enforcement to ensure the agreed procedures become part of the work culture.

Equipment maintenance: workers can forget that a warehouse is a potentially dangerous work environment and complacency quickly sets in. They forget that they are in the midst of complex equipment performing a variety of tasks, often at a hectic pace.

All it takes is one machine malfunctioning or releasing hazardous energy because a maintenance technician skipped some specific safety steps when they last serviced the machine. Frequent inspections that are a part of a preventive maintenance plan will help reduce equipment-related injuries, but for larger facilities trying to manage maintenance manually can turn into an administrative nightmare.

Imagine using a spreadsheet to plan maintenance on a large warehouse. Chances are very high that time will be wasted manually plotting and correcting activities and that the planned maintenance tasks will clash at some points.

A more efficient route would be to use automated resources like a computerized maintenance management system. CMMS will help with cost reductions, speed up service delivery, allow for better coordination, and much more. These are just a few of several reasons to use computerized maintenance management system.

Organization of space and equipment in the warehouse: in large and busy warehouses, inventory items could be moved in and out all day long. This can quickly deteriorate into a messy environment where workers have to carefully

navigate around empty packages and associated materials tangled all over the floor like wires, ropes, adhesive tape, etc.

This is often overlooked because workers are usually more focused on filling one order after another as quickly as possible. But it poses a danger – falling, slipping, and tripping which are all common sources of workplace injury. Minimize this risk by having measures in place to quickly remove unwanted items.

Other sources of trips and falls are spilled liquids from punctured packaging. This can be controlled by ordering items in sturdy packaging and adhering strictly to the manufacturers handling instructions.

These days, warehouses are designed more and more with workers' safety and convenience in mind. But that may not be the case with older facilities. In that case, modifications can be done to make the working conditions more tolerable.

Warehouse layout includes the following:

- Bright lighting positioned all over the the warehouse.
- Separated aisles of forklift traffic must be separated or barricaded from pedestrian traffic in order to avoid collisions, especially around blind corners.
- Clear and comprehensive safety signs (if possible illuminated)
- Automated ergonomic workstations, which minimize manual lifting.
- Stairs of sturdy guardrails made of non-slip material.

Regular safety audits of facilities should be conducted and include: putting warehouse safety tips in place is one thing, but maintaining these procedures long-term requires commitment from all parties and perseverance.

A best practice for keeping up with safety requirements is to conduct frequent safety audits covering all buildings and machinery in the entire facility. Employees too should be audited as this is an ideal opportunity to check what they know and are doing to conform with safety procedures.

The goal here is to proactively catch any unsafe conditions such as:

- Non-PPE staff
- Damaged equipment
- Cluttered walkways

- Illegible safety signs
- Invisible or blocked emergency exits
- Loose wires on the floor and walls
- Bare wires
- Cracked surfaces

While the above list covers the most problematic areas, there are additional standards in place to monitor working conditions and prevent accidents. Here is a simple workplace safety checklist that can be modified to suit specific organizations and used as part of a general safety audit.



Figure 1.3 – OSHA 2018 Top 10 most frequently cited violations

Unfortunately, ignorance of the law is not an excuse and violators can be fined tens of thousands of dollars. To make things easier for business owners, over the years, OSHA has gathered a list of its top ten most frequently cited standards that businesses usually violate.

Keeping warehouses as safe as possible offers many benefits to the business owner and creates an environment where the staff feel safe and are empowered to work quickly, efficiently, and confidently. It also helps to avoid crippling fines and lawsuits.

1.9 RFID protection

Radio Frequency Identification (RFID) is a short-distance electro-magnetic method for transmitting small bits of data. It was initially used primarily for inventory tracking, but morphed into all sorts of uses, including authentication, passports, identification cards and credit cards. It's the latter use that has driven a billion-dollar defense industry offering specially designed RFID-blocking accessories. You can even buy RFID-blocking totes, fanny packs, and backpacks.

Soon after the introduction of RFID technology, they were attacked by hackers. RFID skimming, as you know, involves the use of an RFID reader, usually equipped with a strong directional antenna, which can supply power and read other transmitting RFID devices. RFID skimmers were able not only to intercept and read RFID data streams, but also to do it from great distances. For several years, RFID skimmers have enjoyed a reputation for reliability by showing how far they can carry out attacks. Distances increase by tens of meters, and some skimming attacks are possible at a distance of more than one hundred meters, especially for newer "active" RFID attacks, which had their own energy sources.

Radio frequency identification (RFID) technology has become popular in global supply chains, but not without risk. Pairing long-range readers with scanned RFID tags enables unauthorized scanning by cybercriminals and various other attacks, including cloning. In addition, many of the tags remain with the products after they reach customers, presenting security risks to consumers.

Several security measures have been implemented to reduce the risk of attacks in global supply chains and to combat the issue of consumers' increasing privacy concerns. Some of these security measures include XOR Operation, mutual authentication protocol, random hash-lock protocol, and RIPTA-DA RFID authentication protocol.

There are basically two types of RFID tags: active tags and passive tags.

An active tag is driven by a power source and broadcasts its own signal. The signal's reach differs based on some variables.

A passive tag does not have a power source and is not capable of broadcasting its own signal.

Both types of tags provide benefits and challenges, such as cost, size, range, security risks and applications. In the case of passive tags (mainly in consumer goods), tags are inactive until activated with a scanner at the time of sale. This condition is called residual RFID, and it is here that many privacy issues begin.

Currently, the issue of confidentiality is human knowledge. The average consumer will quickly require protection from perceived risks, but few know how the technology works to process data. This includes consumer awareness of the privacy risks associated with RFID technology.

Organizations should provide consumers with facts about some of the perceived security risks, as well as what is being done to mitigate those risks. Organizations should take a proactive approach so that consumers are aware of the potential threat.

As RFID technology continues to evolve and its use grows in global supply chains, security risks will need to continue to be addressed. While supply chain organizers and technology developers are taking steps to reduce overall risks, organization leaders should give the maximum benefit to the benefits and errors of such protection [50].

1.10 Conclusions to Chapter 1

For further project work and analysis of the enterprise, it was necessary to review the accompanying terminology. In this part, such concepts as logistics, supply chain, their types and origin were defined.

It was also necessary to identify the main components of the logistics warehouse, such as storage equipment, climate control system, inland transport and others.

A process is a series of actions or operations aimed at the result or further continuation of actions. There is also a process classification: job shops, batch shop, assembly line, continuous process. In manufacturing and SCM there are four types of process strategies: process focus, product focus, repetitive focus, and mass customization.

Mass customization is the one which will be implemented in this project. There are collaborative, adaptive, cosmetic and transparent customizations.

Each process at the warehouse should be correctly explained by creators and clearly understood by employees. For that reason graphical tools for process display were created. Verbal explanation may not be enough, while visualization is usually more effective. The main graphical tools for process description are flowcharts, time-function maps, process charts, value-stream maps and service blueprints.

Management theories of Frederick Taylor and Frank and Lillian Gilbreth had a great impact on management and became solid background for future generation. They were the first to begin a phased analysis of the workflow and developed the basics of building a work system. Its essence was the most efficient use of labor, a system of motivation and encouragement, competent and equal distribution of responsibilities.

It is impossible to imagine a modern warehouse without new developments, the key of which is artificial intelligence. It helps to replace a person in many processes, increasing the accuracy of indicators and the speed of operations. AI also helps in collecting and processing data, warehousing and much more.

But despite the high level of automation, people in the warehouse are still present and they need to follow safety rules. This applies both to the rules of conduct and to the standards of the organization of the warehouse. In addition to general familiarization, it is necessary to conduct regular trainings in order to reduce accidents at logistics enterprises.

Goods in stock require the safety of no less than people. Creation of RFID significantly simplified this task. This type of labeling contains all the necessary information about the product and its location, which at any time can be tracked through the system.

CHAPTER 2

ANALYSIS OF DENKA LOGISTICS WAREHOUSE PROCESSES AND THEIR ADAPTATION TO MASS CUSTOMIZATION

2.1 Justification of mass customization in DL

The main purpose of the analytical - computational section of the thesis is to reflect the theory and practice. It contains an analysis of the actual state of the problem in a particular enterprise on the basis of collected data. The following methods of analysis are used: statistical, economic, expert assessments.

The main direction of the experiment are the following indicators:

- research of the basic schemes of distribution of the goods
- characterization of retail and wholesale intermediaries distribution cost analysis
- determining the optimal size of orders and their frequency
- study of the use of warehousing of the enterprise
- research of the technological scheme of warehousing processes
- characteristics of the level of logistics service
- consumer order payment technologies

To prepare the analytical section, factual data were collected during the undergraduate practice.

The source of information is planned and actual indicators of economic activity, statistical and accounting reports, orders, instructions, analytical reviews, job descriptions, results of observations, surveys and surveys and other methods of collecting primary information used by students during undergraduate practice.

All tables, graphs, charts are accompanied by interpretations and conclusions that allow to determine the essence of logistics processes observed in the organization of logistics at the enterprise, their features, trends, to create a basis for identifying unused reserves.

2.2. Description of DL

Denka Logistics is a huge logistics complex with an area of 20,000 m², located on the outskirts of Kiev.

Today it is the best logistics complex in Ukraine, thanks to the use of new technologies. Optimal business processes, personnel motivation systems, adaptability for different types of goods and services allow us to provide services to customers in a wide variety of areas, from household chemicals to luxury shoes.

One of the most significant advantages of Denka Logistics is a modern warehouse complex with a high level of automation, developed taking into account European business processes and 25 years of experience acquired during the holding's existence. DL warehouse equipment was individually developed by leading Austrian engineers, and loading and robotics, manufactured in Germany and tested over the years, ensure the reliability of logistics processes and personnel safety.

All this allows us to offer modern solutions for all types of goods that do not require special temperature storage conditions. The main product groups processed at Denka Logistics enterprises are Fashion products, cosmetics and household chemicals, office and home appliances.

A feature of DL is the piece selection of goods. This allows you to replenish the shelves of customer stores with exclusively relevant products and only in the required quantities. This helps to reduce transportation costs and significantly reduce storage space at points of sale.

Classical schemes for the selection of pallets and boxes, as well as a high level of cross-docking, ensure the quality of the distribution center for wholesale companies. Since the warehouse is located quite close to Kiev, transportation costs in Kiev are minimized. The customer also has the right to pick up the goods from the DL warehouse on their own or to hire any preferred carrier.

Despite its high achievements, DL is considered quite young in the field of logistics. It was created to serve the MTI Group. MTI is responsible for famous brands such as ECCO, Geox, Calvin Klein, Clarks, Samsung, Pandora, Tous and others. However, the speed and quality of services in DL began to attract outside customers. Then the company decided to secede and become an independent link. However, the MTI group Intertop is still the largest customer of the company.



Figure 2.1 – Clients of DL

It all started with three people, but today the company has more than 220 wards. Below is a diagram of the hierarchy in the company DL.

High warehouse efficiency is achieved thanks to the automated warehouse logistics management system from Manhattan Associates Inc. The capabilities of this WMS allow you to make contact with any partner ERP system. In 2014, the execution direction for online stores of any scale was successfully launched. This allowed the company to become not only one of the main players in the e-commerce

logistics market, but also to help its retail chains implement a multi-channel sales strategy by delivering to retail stores, wholesale deliveries to dealers and direct sending of online orders. to customers from one warehouse without disrupting the flow of goods. DL also provides installation of tracking sensors for goods, sorting, repacking and processing returns, if necessary.

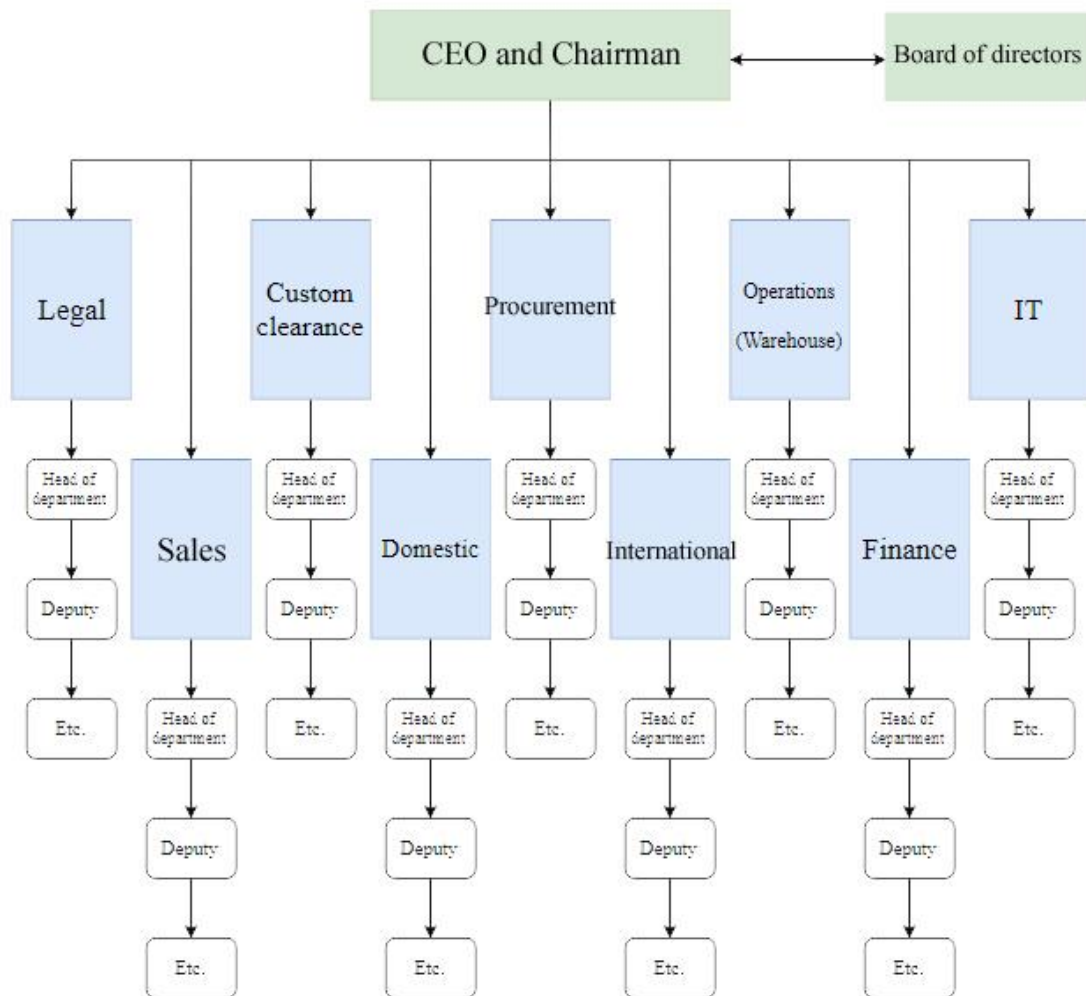


Figure 2.2 – Structure of Denka Logistics

2.3 Organizational structure of DL

As mentioned earlier, before the theories of Gilbert and Taylor, enterprise managers paid very little attention to the zoning and distribution of labor. Because of this, workers had to do the same job several times, parts had to be manually transferred from one end of the warehouse to the other and vice versa. Due to the incorrect location of logistics equipment, the number of injuries and deaths in warehouses was many times higher than today's maximum rates.

However, over time and the systematic study of the issue of zoning, it was possible to develop standards for the placement of warehouse equipment. Of course, each warehouse is unique and has its own specialization and requires individual design. However, the rules for the minimum distance between racks, individual pedestrian and transport lanes, the prohibition of loose wires remain unchanged.

Below is a scheme of the DL warehouse.

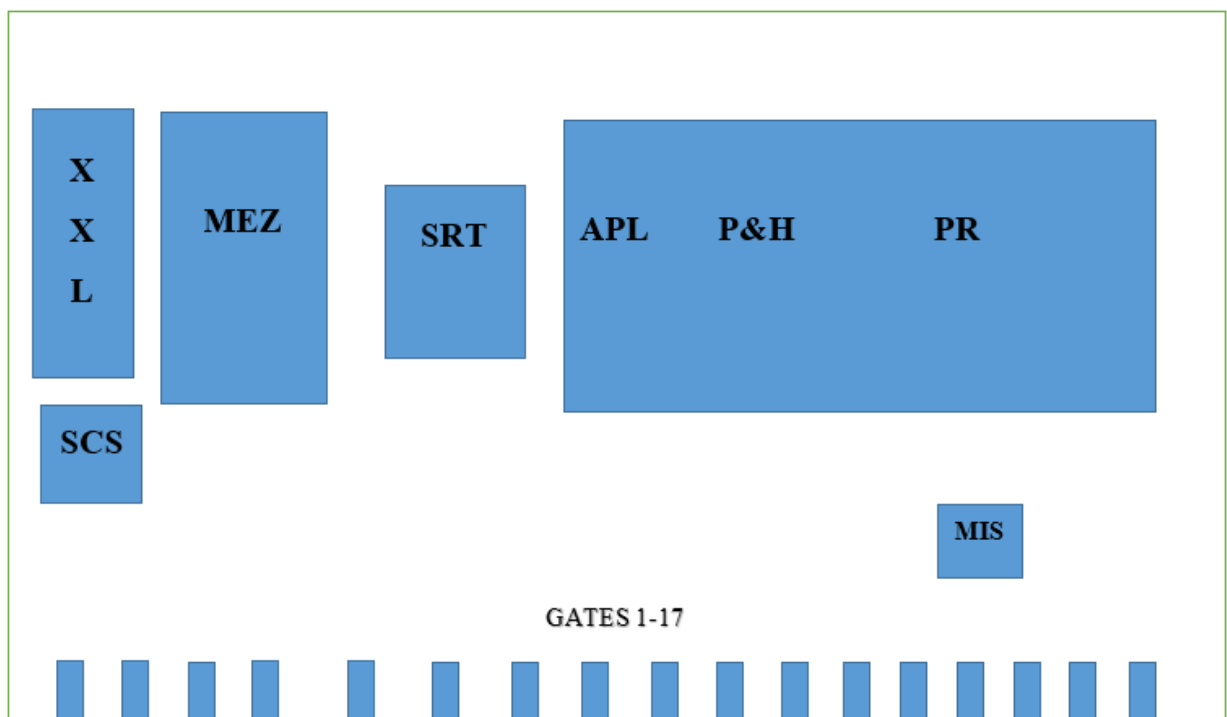


Figure 2.3 – Scheme of DL warehouse

- XXL zone - for goods, that cannot be stored on pallets (plasma screens, bulky equipment, etc).

- SRT - sorting zone. It is located next to the Mezzanine, where the goods are delivered by conveyor belt and where manual selection takes place.

- MEZ (mezzanine) - unit-storage only. It is designed to store relevant seasonal goods, which may soon be transported to the shop or become an online order. Returns are also sent to this area. “Convey” system delivers goods from sorter to mezzanine, after what they are manually sorted and get into racks.

- Pallet storage racks. Pallets are delivered with a narrow aisle stacker. It is considered the most dangerous place in the warehouse.

- APL zone - 4-layer storage racks for pallets repacking. They are mainly supplied with medium-sized equipment, which in the future also goes through piece selection, but is too expensive and fragile for a mezzanine.

- SCS - “carousel”, for expensive goods. Business card of Denka Logistics. An area with increased security. An area with increased security, where goods undergo automatic piece selection. One person standing at the selection performs only the mechanical actions specified by the program and is supervised by cameras installed in the zone. A numbered box with goods comes on the ribbon, and the desired number of units is extracted from the box and the worker transforms the boxes to other containers, highlighted by the program. Next, the box with the selected goods goes to the dispatch, and the remained content of the box returns to the warehouse by the ribbon. The number of errors in this zone is minimal, however, installing such a system on the mezzanine is too expensive.

- MIS - labeling zone, consisting of 3 layers.

- 17 gates (2 of which contain telescopes, gates #4-7 are devoted for clients who prefer to take goods from the warehouse by themselves).

Such zoning assumes the most rational placement of all processing and storage areas of orders, as safe as possible for use.

2.4 DL'S services

Many people mistakenly assume that the task of logistics companies is only transportation, sorting and storage of goods, but this is not so. Each year, the logistics industry takes on more and more responsibilities, adapting individually for each specific client. The following are the main tasks of the DL performed for the customer.

- Reception: automatic station receiving goods -1000 boxes per hour. Reception of goods by pallets, boxes, pieces. Accounting of serial numbers, batch accounting, checking the degree of validity of the goods.

- Storage and shipping: 23,000 pallet places, 100,000 cells for storing small goods. Address storage system. Automated RF terminals. The minimum order is 1 item. Cross - docking. Principles for the selection of goods according to FIFO and FEFO.

- Order Acceptance: receive orders online. Integration with any online store account system.

- Assembly and shipment: cross-docking, piece selection of goods from the stock. Accounting serial numbers. Work with different product groups.

- Additional operations

- Collection of goods from the supplier. Filling warranty cards, gift certificates. Embedding advertising materials, catalogs, packaging according to customer requirements.

- Shipment (shipping)

- Delivery of goods throughout Ukraine (Kyiv on the day of receiving the order, Ukraine the next day). Work with transport companies.

- Collection of goods from the supplier. The service includes the supply of transport to the supplier's warehouse, the piece-by-day reception of goods according to invoices. Delivery of goods to our logistics complex.

- Filling warranty cards: a solution for online stores selling electronics.

- Labeling: production and application of any informational labels on the box or on each unit of production.
- Installing anti-theft sensors and sizing price tags: reduce the time to hit the goods on the shelf! With this service, your product will come to the store already fully ready for display. The price tag is applied at shipment, so the information will always be relevant.
- Formation of promotional kits: planning a promotion or advertising campaign? We will assemble a set of any complexity and carry out pre-sale preparation of goods for your order.
- Cargo transportation in Kiev and Ukraine.
- Cargo insurance.
- Provision of operational information on the location of the cargo throughout the route.
- Delivery of goods to the offices of carriers and directly into the hands of the client (for online stores).
- Considering various schemes for calculating tariff rates (pallet, hourly, per km, per service point).
-

2.5 Mass Customization approach in DL

As mentioned earlier, mass customization is of great importance and potential today. Its main characteristics are large volumes and a wide variety. This approach allows you to cover a large number of products and satisfy more customers by presenting high-quality products at a relatively low price.

However, despite the huge benefits to customers, mass customization has become a real challenge for most companies. The production of a large number of diverse products requires a huge initial investment in technology. The costs are so high that they can be paid off only thanks to the large volumes of sales, the so-called

mass market. To this end, manufacturers pay special attention to advertising and other methods of promoting goods.

DL deals specifically with the mass market. Despite the presence of a large sorting and storage area for luxury brands, the main customers of the company are manufacturers of mass products. Equipment, shoes, accessories, goods for children and home - all this comes to the DL warehouse on a massive scale and requires different types of sorting and storage.

As befits a company of mass customization - warehouse equipment is made individually by order of Austrian and German craftsmen and pays off only thanks to the ability to process a large amount of goods per day. High-precision scanners, a video surveillance system, a clear scheme of the movement of goods, tracking and security sensors allow you to control every unit that arrives at the warehouse with minimal human intervention. Since DL deals with the sorting and consolidation of goods of different groups, such tracking becomes simply necessary. Even in the event of the loss of one unit - it is possible to track it at absolutely any stage and return it to the correct destination.

According to four Mass Customization approaches, described in PART 1, DL mostly refers itself to the Adaptive Customization. Thus, the logistics provider provides a specific set of services to its client, and he, in turn, has the right to choose. For example, a client may refuse to label goods in a warehouse or prefer to transport goods using his own transport. DL, upon request, can also create a list of the most sought-after products of the client, which will help him track the wishes of customers and increase or decrease the production of a certain type of product.

2.6 Graphical description of DL's processes

As mentioned earlier, the importance of logistics processes in the enterprise cannot be overestimated. The creators of such work mechanisms do incredibly

painstaking work, having previously studied and calculated even the smallest deviations and errors. However, this is only the first stage. In the future, this or that process goes under the direct use and supervision of warehouse workers who need to convey its essence as simply and clearly as possible.

The most effective way of teaching processes was recognized as a graphical method. It is a fairly short and extremely accurate explanation of each step with alternative options. Thus, each employee has the opportunity to quickly and clearly master any process. Below is a flowchart description of labeling process at the stage of receiving piece goods.

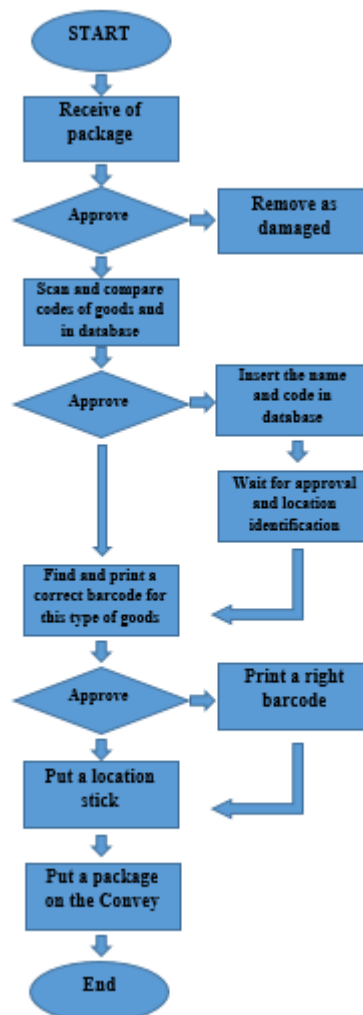


Figure 2.4 – DL’s labeling process flowchart

In this process, everything is equipped in such a way that the worker stands in one place. Goods reach him on the tape, and the computer, scanner and inner tape are no further than outstretched hands, thereby reducing the effort and time of the receiver. On the other hand, scheme reveals high responsibility of one person, requiring additional time to analyze goods' quality. What is more, employee should know all of the codes by hard to control and compare them in a short time, which causes regular violations on the very first stage.

However, often for the process the main thing is not only quality, but also lead time. The salary of 50% of the employees of the DL warehouse directly depends on the number of processed units per shift. It is in the general interest to maximize the speed of a single operation. In the calculation and application scheme of each process, time-function mapping helps, an example of which is presented below.

MEZ	Sort													
Convey		Wait	Deliver											
Labeling zone 1st floor				Scan	Sort	Wait	Deliver							
Labeling zone 3d floor								Scan	Sort	Wait	Put on the shelve	Stick a lable		
Time	10 sec	5min	4 min	5 sec	10 sec	10 min	1 min	5 sec	10 sec	7 min	5 sec	10 sec	27 min 55 sec	

Figure 2.5 – Time-function map for labeling operation at MIS zone of DL

This type of scheme is based on the calculation of the average execution time of each individual step. It allows you to see the longest time of an individual stage, with the ability to speed it up in the future. It also helps to detect unnecessary operation or long waiting for goods, idle storage resources, etc.

According to the Figure 2.5, labeling process at MIS goes longer because of additional waiting time. According to the main features of mass customization, work at the warehouse is 24/7 with the maximum utilization of warehouse equipment. Any delay should be eliminated as much as possible. Thus, there will be time for processing additional units of goods, which will lead to an increase in the profit of the organization.

However, simply creating and explaining a particular process is also not enough; they all need to be managed. More than three hundred diverse processes are recorded daily at the DL warehouse, not counting the main office. Even with a perfectly honed mechanism, operations cannot exist without meticulous control. Dozens of subsequent ones depend on each step, and even the slightest failure can cause a cascade of violations in the whole system. A person is not able to keep track of half of them alone, for which it is necessary to resort to the powerful support of artificial intelligence.

Operating programs:

- ERP (only commands from the main office, warehouse does not have any access to this program).
- WMS (commands for the warehouse, main office does not have any access to this program).
- CONVEY (works only inside the DL warehouse and guides the conveyor lines through the warehouse).
- TMS (transport and transportation control outside of the warehouse).

2.7 Organizational structure of DL in accordance with Responsibility Centers

A considerable influence on the well-being of any business is exerted by its micro and macro environment. While the micro environment has a direct impact on business activity, the macro environment is a common business environment that affects all business groups as a whole. It is important to study the business environment in order to understand the influence of various forces on the business.



Figure 2.6 - DL micro level organization

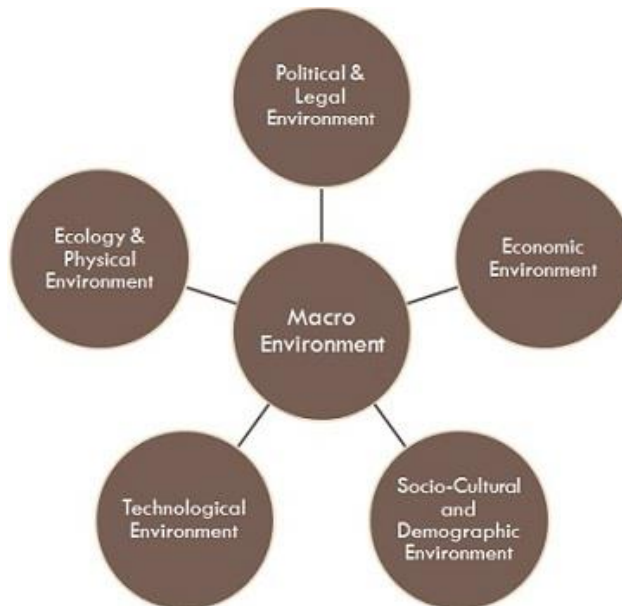


Figure 2.7 DL macro level organization

Responsibility centers are of great importance in the life of any company. The larger the organization, the greater the cost of servicing a large number of departments. However, at the same time, large companies have many sources of revenue that need to be controlled. Over time, it became known that the financial department is not able to take control of all channels of costs and revenues, because both income and costs depend on the work of each department of the company. In

this regard, it was decided to create responsibility centers, which include a list of departments that mainly deal with one of the subtypes of financial control.

Each responsibility center has its Head. This person has a great responsibility for several departments at the same time. Its main task is to control the work of the department, keeping the minimum deviations of the main indicators. It is also the responsibility of the Head to work on improving indicators, if necessary, coordination with other responsibility centers, load balancing, etc. Below is the distribution of 4 responsibility centers in DL company.

Table 2.1 – Responsibility Centers of DL

Responsibility Center	Monitored parameters of Responsibility Center
Cost Center	<p>Warehouse: warehouse turnover; inflow/outflow of deliveries; return processing; receive multiregional goods (or international), maintain and sort them, prepare for further transportation; consolidate and transport domestic goods. receive goods, package and prepare for further delivery; store packages ; receive goods from warehouse or other hubs;</p> <p>Transport department: cargo turnover (t/km); number of vehicles involved (own/rented); statistics of parcels' transportation by road/rail/air/sea; distribute trucks to various destinations; drivers appointment; vehicles control; multiregional transportation.</p> <p>HR department: employees' hiring; seasonal staff attraction; personnel training; department distribution of employees.</p>
Revenue Center	<p>Shops, internet platforms, post offices, courier: income collection from the sale of services: by region, by distribution channels, by customers; customer service; goods' processing; receiving and give out of goods.</p>
Profit Center	<p>Financial department: pricing; financial control and distribution through departments; analyzing reports of other RC.</p> <p>Marketing department: sponsoring; advertising; attraction of new clients; investigation of markets.</p> <p>IT department: information storage and protection; new technologies development; statistic data processing; digital (programming) supply for employees and customers.</p> <p>Innovation department: development, testing and involvement of new technologies.</p> <p>Coordination center: distribution of parcels through different places of destination; parcels' consolidation, completion of boxes, pallets, vehicles, etc.; preparation and filling out of consignment notes, transportation permits, warranty cards.</p> <p>Client service/Call center: client attraction and support.</p>
Investment Center	Quantity of business investments; charity; sponsoring.

2.8 SWOT analysis of DL

One of the best examples for understanding the current state of a company is SWOT analysis. Very often, the management of the enterprise often obsessed about their strengths, forgetting about weaknesses. Or vice versa, they allow maximum resources to eliminate imperfections, missing the potential development opportunities of the company. SWOT analysis helps to concentrate all company indicators in one scheme. Thus, it is possible to clearly compare the pros and cons, prioritize according to current market indicators and social needs and build a plan for further action.

Table 2.2 – SWOT analysis of Denka Logistics

<p>STRENGTH</p> <ul style="list-style-type: none"> ✓ Leading Ukrainian market position ✓ Large operation base ✓ Client - oriented ✓ Open to new technologies ✓ Strong financial performance ✓ Brand/Reputation/Trust 	<p>WEAKNESSES</p> <ul style="list-style-type: none"> ✓ Loss of foreign market share ✓ High dependence on labor at the warehouse ✓ Low transport utilization
<p>OPPORTUNITIES</p> <ul style="list-style-type: none"> ✓ Opening of its trading platform for new brands ✓ Growth in e-commerce services and small businesses ✓ Expanded access to China 	<p>THREATS</p> <ul style="list-style-type: none"> ✓ Rising demand for online shopping ✓ Competition ✓ Business seasonality

According to the SWOT analysis of the enterprise, DL is firmly rooted in the logistics services market. The latest technology, quality and variety of services have helped the company to build a good reputation and get regular customers. However, a great dependence on personnel at key stages of receiving order processing significantly slows down further development. Unpleasant in the future for the company is also a reluctance to enter the international market. A modern consumer

often prefers to order goods of the same brands with which DL operates from Europe or Asia. Ukrainian collections of many brands often differ from each other. Some models presented here come out more expensive than European counterparts. In this regard, Amazon, AliExpress and other international online platforms that provide goods from around the world are gaining immense popularity. DL should be attentive to new consumer preferences and be prepared to soon discover a new stage.

2.9 DL's delivery process

Denka Logistics company, as befitting, has its own fleet with more than 250 vehicles of various types. This is a relatively small amount for a large company, but the goal of most logistics enterprises is to switch to outsourcing, including transport staff. This saves the company from unnecessary costs, and the client is given a choice - to pick up the goods with his own transport or to hire a carrier.

One of the main reasons for this decision was inter-regional delivery. Suppose that a large consignment of shoes for the Intertop network travels from Kiev to Odessa. In one direction the car drives loaded, and back empty. This leads to unnecessary costs that are poorly covered by the customer.

An important solution for DL was the cooperation with Nova Posta. Since inter-regional transportation at the company's expense is not profitable, Nova Poshta has assumed this responsibility. Piece orders are selected and packaged directly at the warehouse and sent to the client anywhere in Ukraine within 24 hours. Since Nova Poshta has a fairly large number of service points, even Kiev customers often prefer this way of delivery to trips to the other end of the city.

However, this sphere was not without its weak side. The Nova Poshta Department at the DL was created in a very short time and is practically not automated. Employees manually select and label packages, which regularly leads to errors or losses.

2.10 Conclusions to CHAPTER 2

The purpose of the analytical part was to conduct a thorough analysis of the enterprise on the basis of the indicators indicated in the theoretical part and to identify areas requiring adjustment. Based on the above information, a number of conclusions can be made.

Digging DL is one of the most successful in the logistics market of Ukraine. A warehouse of 20,000 square meters, the latest Austrian and German equipment, a good location allowed us to win regular customers. The main feature of this company is the provision of piece sorting of goods. Thus, stores can only receive current units of goods, without overloading the warehouse of their store. Recently, DL began to provide labeling services, which significantly reduced customer resources.

The largest client of DL is a network of shoe stores and accessories Intertop. However, soon sellers of books, household chemicals, children's toys, office equipment, dishes, etc. joined him.

DL made a few significant zoning decisions, which increased warehouse effectiveness and made it easier to align additional processes. Today, DL warehouse consists of MEZ, APL, SCS, XXL, Storage racks, 17 gates, MIS and SRT. Process control is carried out by ERP, WMS, TMS, Convey.

In addition to warehousing and labeling services, DL provides documentary support, inter-regional delivery, cargo insurance, technical support and tracking during transportation, courier delivery by Nova Poshta for online stores, customer statistics and more.

DL has the format of mass customization. This means large volumes and a variety of goods and services. The warehouse practically does not stop working, all systems are loaded as much as possible. DL has more than three hundred processes that occur in the warehouse daily. Such volumes and complexity are necessary to recoup the initial investment.

Despite the high level of automation, many processes are still too envious of the person. Marking, reception, sorting of piece goods is mainly done manually, which significantly increases the risk of errors.

DL has a solid foundation in the Ukrainian market, but has no plans to enter the international market yet. In this regard, she has a great risk of losing customers on the background of companies that have access to international trading floors.

CHAPTER 3

PROCESS DESIGN IMPLEMENTATION AND RECCOMENDATIONS

3.1 Task description

The task of the design part of the thesis is to adjust the warehouse processes of the logistics provider in the context of mass customization. As mentioned in Chapter 1 and Chapter 2, the peculiarities of mass customization are large volumes and a wide variety of products. Logistic enterprises of mass customization format operate almost 24/7 with maximum utilization of equipment and shift work of warehouse employees. Mass customization is very difficult to achieve. To build processes at this level, highly qualified specialists and high narrowly focused skills of full-time employees are required. Large volumes of product processing are necessary to cover the initial investment, and a variety of products can satisfy the needs of different segments of customers.

Employees in enterprises of mass customization format mainly perform uniform operations in a certain process chain. To increase the labor efficiency indicators of each employee, his entire area of responsibility should be at arm's length. The task of the employee to perform actions according to the scheme with minimal deviations in time and quality. In this mode, all tasks should be extremely clear and simple. According to psychological studies, productivity with monotonous work of the same type decreases only after forty minutes. In this regard, it is necessary to build an individual schedule taking into account the rest.

Based on the analysis of the logistics company in the format of mass customization, it is impossible to underestimate the importance of the correct

construction of processes. DL has more than 300 different types of processes daily. Most of them are under software control (TMS, WMS, Convey, ERP).

However, a large number of key processes in the DL warehouse are performed by humans, which significantly increases the level of errors and slows down the process. Unfortunately, today it is impossible to fully automate the entire warehouse following the example of the carousel zone. This is too expensive equipment for the warehouse, which DL can afford only in one zone.

In this regard, it is necessary to improve existing processes as much as possible. During the analysis of the enterprise, a number of problems were identified that in one way or another slowed down the process. The design part of the thesis includes such points:

- adjustment of the marking process at the stage of goods acceptance;
- shortening the process of product labeling services for stores;
- provision of clients with alternative delivery service;
- filling the vehicle on the way back from the city of unloading;
- providing methods for solving the problem of sorting and disposal of defective goods.

3.2 Task solution

Labeling process is an integral part of the processes on the DL. This is a key segment of the warehouse, on which there is a great responsibility. The mark placed on each product contain the following information: location on the rack, the contents of the package, the time of arrival and departure, the store where it needs to be distributed. On average, goods in a warehouse pass from two to four markings during their stay in the warehouse. Example of this process will be explained on shoes' labeling.

The shoe items receive the first marking in the area of piece acceptance. There they undergo a visual assessment of the appearance and if a damage is detected, it is sent for utilization. After this stage, the employee scans the barcode on the box, takes out its content (shoes) and analyzes it individually. Example of such barcode is shown in Appendix A. Then he selects the necessary code that corresponds to the storage coordinates of this type of shoe. Then the employee prints a sticker containing information about the product with reference to the storage location and places it back into the box. After that, the shoe box is placed into a larger plastic box with a special bar code, which is tied up to this particular cell on a rack and is carried to the mezzanine. The employee must control the binding of the goods to the box and storage unit. Otherwise, the goods will be lost at the stage of delivery to the mezzanine. Example of labeling process is shown on Figure 2.1.

This process is highly dependent on the decision made by a human, which might cause uncontrollable discrepancies. The main disadvantage of this process is the high dependence on the person. One of the features of mass customization is incorporating very complex processes, which need to be constructed. Managerial and analytical professionals working in the mass customization environment must be highly qualified, while the workers who perform daily routines should be well-trained on constantly repeating actions with little variety. Therefore, the latter should undergo intensive training, which will help to develop a good skill in the list of operations.

The problem of stickers at the stage of receiving the goods is the need for the receiver to remember the codes of a large number of types of goods and their codes in the area of piece storage. On average, these are ten-digit codes with a slight difference in numbers. The employee must independently compare the code on the product and find the appropriate code in the list of shelves, which takes a lot of time and slows down the entire system. Workers with experience certainly do everything faster and the number of processed units is directly proportional to their earnings. However, a huge number of errors accumulate during practice. In the future, even an experienced master prints about 15-25 incorrect stickers per day. Such errors lead to significant financial losses for the company, and associates are subject to penalties.

It is necessary to transfer the scanning program to fully automatic mode, which will almost double the work efficiency and reduce the risk of errors.

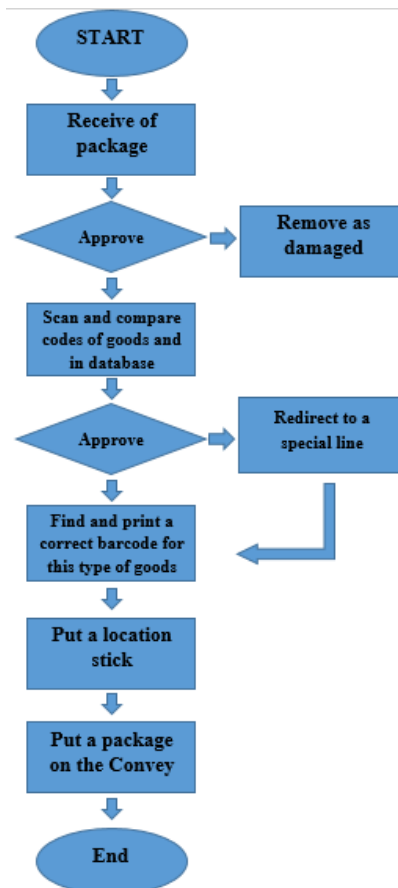


Figure 3.1 – DL’s corrected labeling process flowchart

What is more, working place should be organized in in such a way for employee to remain at one place with minimal deviation. Process chart of labelling process is attached in Appendix B.

One of the weakest points of any company is the disposal of damaged goods. At the stage of receiving the goods, the employee conducts a visual assessment of the package and its contents. If one of them does not meet the standard, the worker puts it as “spoiled”, not paying attention to the level of damage and the cost of the goods.

What happens next with damaged goods is not known for certain. According to the rules of most enterprises, they must be completely destroyed. However, it is the process of decommissioning and disposal of products that serves as a favorite loophole for fraud. Workers can specially damage the packaging during

transportation or shipment, because even this is enough to recognize the unsuitability of even its contents. Further, mainly under the protection of the warehouse management, dozens or hundreds of boxes, for example, with shoes supposedly go to destruction. At the same time, unscrupulous entrepreneurs replace damaged corporate packaging with any other and resell the goods to small multi-brand stores, online platforms, abroad, etc.

Denka Logistics assumes full responsibility for the damages caused to the products at the stage of transportation and warehousing and reimburses their full cost to the customer. If an employee (or a group of employees) is responsible for a damage, then the one (ones) will be indemnified.

Based on a thorough analysis of the importance of the process of disposal of goods and their connection with the company's profit, I propose an alternative solution to the problem.

The very first step should be to create a rating scale for the product, from minor aesthetic damage to the packaging or contents to their complete unsuitability.

Then there should be created a separate zone for the secondary processing of damaged goods. This zone will require only one person out of the workforce who will evaluate a damaged item using the rating scale and sort it according to the "diagnosis". Such type of goods must be labeled on the individual rank and stored separately from non-damaged products.

In the future, completely unusable goods must be destroyed. Goods with significant damage to aesthetics can be transferred to charitable organizations for distribution to the homeless, the poor, etc.

If, during the transportation or shipment, the damage is caused only to the packaging, but the content remains solid or has minor aesthetic harms, such products can be sold on the same trading platforms as ordinary goods of this manufacturer, but with a markdown.

Consider this option on the largest client of Logic Logistics, the Intertop chain of stores. Intertop is a major seller of multi-brand shoes and accessories with its online store. On the website, in the menu, the trader can add a section "markdown",

which will be presented to the model indicating damage and reduced cost. Such a move will help not only reduce the losses of the logistics provider, but also become even more customer-oriented.

Of course, despite all of the benefits of providing a defective product a second life, the company still rejects such solutions to the problem. Reorganization or implementation of an established innovation system always requires considerable costs. The installation of new software or equipment helps companies meet modern standards for the provision of logistics services and allows them to cover a large flow. But in the case of attempts to sell or distribute second-rate goods, companies run the risk of even greater losses.

Like regular products, damaged units require transportation and storage. Their assessment, distribution and repair also take quite a few resources. In this regard, companies, in most cases, destruction is cheaper.

As previously mentioned, the product goes through more than one stage of labeling at the Denka Logistics warehouse. For her largest client, Intertop, she recently provided a new type of service - store marking of shoes and accessories. Previously, each individual store, when receiving products from the warehouse, carried out store labeling independently, which in total involved much more human and financial resources. In addition, it took time before the products could get into the store database and on the shelves. Now the labeling is performed in the centralized manner at DL's warehouse and the points of sale place the labeled products immediately on the shelves for further sale.

Implementation of such process, which comes in line with a mass customization philosophy required updates in both the organizational structure by forming an additional business unit and zone restructuring by organizing additional work area. The problem of space scarcity encouraged to find an optimal solution by arranging a three-level marking area. Since we are talking about piece-wise selection of boxes of shoes, there is no question of transporting a heavy load. The marking department has an elevator that easily lifts up to 70 boxes to the second and third floor. Two or three

boxes a person can also transfer independently. Example of labeling process at MIS zone can be found on Figure 2.2.

However, today this process has its flaws. As shown in the graph, the box goes through many intermediate scans. First, the warehouse barcode is scanned and the boxes are distributed between three floors, depending on the season of relevance. Further, the box rises to the desired floor, where the scan takes place again. Only after that the box gets on the rack and marked.

It is possible to avoid unnecessary scanning and downtime by marking the boxes before getting on the shelves. In this main zone goods are placed, which will be sent to the store in the coming days, so that a large accumulation of goods does not occur. The technique for removing the box from the rack is also not needed, because they are all no more than two meters away and getting any box at any time is not a problem.

MEZ	Sort									Total time 20 min 40 sec
Convey		Wait	Deliver							
Labeling zone										
1st floor				Scan	Sort	Stick	Wait	Deliver		
Labeling zone									Put on the shelve	
3d floor										
Time	10 sec	5min	4 min	5 sec	10 sec	10 sec	10 min	1 min	5 sec	

Figure 3.2 – Corrected time-function map for labeling operation at MIS zone of DL

Intertop online store is also rapidly gaining momentum. The ordered shoes can be picked up at the proposed points of sale, where it is available. However, it is often inconvenient for customers to go to the other end of the city, as there is no courier service at the Internet site. Directly for these purpose Denka Logistics entered into a contract with Nova Posta.

Nova Poshta provides outsourcing services for DL and takes responsibility for labeling, packaging and transportation. A separate area was equipped in a warehouse in a very short time. There until 13.00 daily accumulate orders for the last day. After

this time, they are processed and sent to the nearest branch of Nova Poshta to fulfill the order. Such way of delivery is extremely convenient for customers as they can choose department close to their disposal. Everything they need is to choose an item from the Intertop online platform and make an order. Figure 3.3 shows standart client's order process.

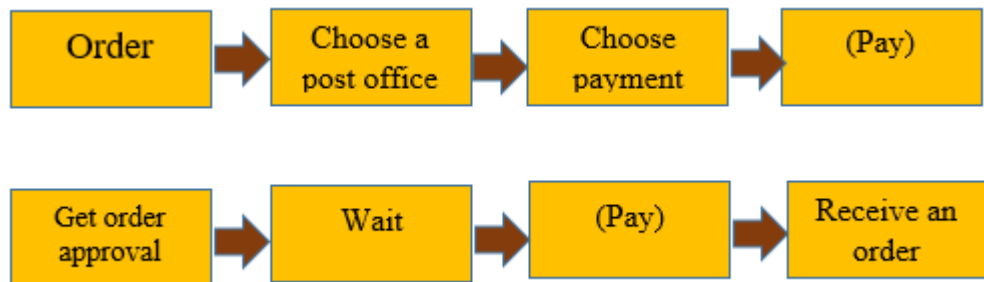


Figure 3.3 – Client's ordering process at Nova Poshta

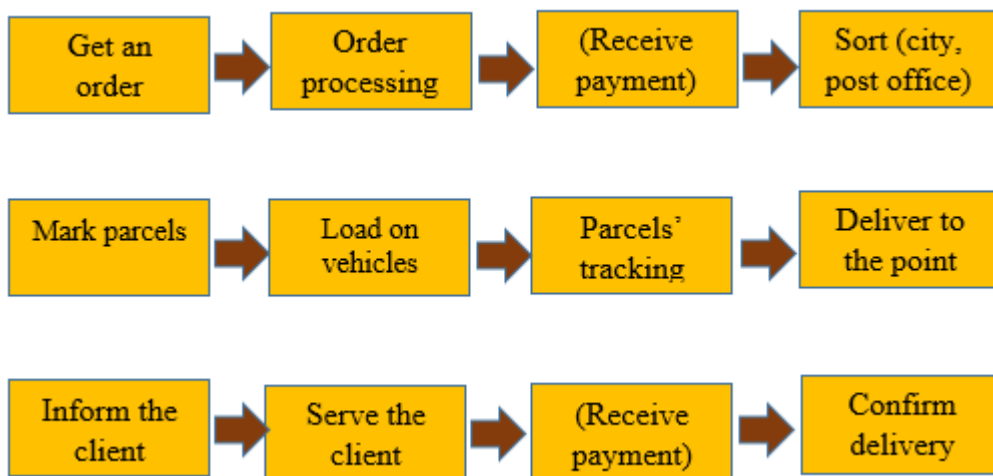


Figure 3.4 – Order processing at Nova Poshta

According to the Figure 3.4, the scheme of order processing provided by Nova Poshta. To get rid of the large flow of calls and letters from customers, Nova Posta has created an application for smartphones and PCs. With it, the customer can independently control the location of the parcel. RFID sensors, installed both on

parcels and on vehicles, allow recipients to track them in any part of the country. Even in the event of a delay, application shows the exact location of the order and delivery time, taking into account deviations.

The main competitor of Nova Poshta in the delivery of small cargo today is Justin. This courier service entered the Ukrainian market several years ago, however, active development fell only at the end of 2018, when distribution points began to appear at shopping centers and supermarkets, which made them even more comfortable for customers. An important bonus was free shipping from major trading platforms, such as Rozetka, Makeup, Prom, etc.

The disadvantage of Justin for customers may be a longer wait. Nova Poshta during its existence has become a logistics giant, having acquired a huge staff of vehicles and personnel. Justin is still a young company and the number of orders is still significantly inferior to its competitor. It is not profitable for him to release an unloaded machine from the warehouse and have to accumulate orders within two to three days. Fulfillment of the order in the city of Nova Poshta performs in one day. Justin does not deliver the goods to the door, but the question of delivery price is often more important than comfort.

However, in 2019, Justin significantly increased his performance in the delivery of parcels in Kiev. Having entered into a partnership with Justin, DL will be able to provide a wider choice of delivery method to its customers, thereby proving its customer focus.

Another problem that causes the company losses is transport. Serving Intertop and other customers in different cities of Ukraine, DL delivers the goods to their destination with their own transport. And if in one direction the truck goes completely full, then the vehicle goes back empty. The road to long distances, even one way, requires large expenses for fuel, driver services and maintenance. In this regard, DL is interested in outsourcing transport services, but a fleet of more than 150 vehicles cannot stand empty.

The solution to the transport problem may be registration on the website for the provision of temporary services for the transportation of goods in one direction. To

do this, vehicle owners must enter in the database all types of vehicles used. Further, the focal point employee makes the information that, for example, 12.05.2020 at 12.15 Euro truck of the Denka Logistics company with body parameters of 60/93 cubic meters and a maximum carrying capacity of 25 tons will arrive in Odessa. The system analyzes the time and offers options for requests for delivery of goods to Kiev. After that, the coordinator evaluates the type of cargo, quantity, loading time and selects the most profitable option. Next, you need to contact the customer and confirm the order. Thus, the DL will be able to partially or even fully recoup the costs of the return trip of the truck.

3.3 Financial report of DL

The main goal of any business is profit generation. In the case of enterprises of mass customization format, we are talking about huge cash flows. Since DL operates primarily with goods that are not of the essential class, it has seasonality. Thus, the company needs to have action scenarios and calculate costs for different periods of work. Mass customization requires high initial investments, which can pay off only if there are a large number of sales of services. Therefore, it is necessary to carefully budget and set prices for services. For this, key aspects of financial stability, such as:

- Prices should be set based on the presence of “active seasons” and “dead seasons”.

- Prices for services should not have large differences depending on season. This will help to maintain customers’ demand and attract companies with a different production schedule.

- It is necessary to take into account the costs of seasonal workers, losses from loss and damage to the goods.

- Depreciation and others.

Since the financial statements of DL are not subject to public access, all calculations below are based on the information from logistics companies having similar business processes and goods turnover.

Table 3.1 – Financial indicators and changes of DL

(In millions, uah)	Financial indicators					Changes, %			
	2015	2016	2017	2018	2019	2015-2016	2016-2017	2017-2018	2018-2019
Revenue	58138	58261	61514	66488	71737	0,23	5,54	8,1	7,88
Operating Expenses	53164	50593	53818	59103	64740	-4,82	6,37	9,52	9,79
Net Income	3029	4841	3419	4899	4784	59,74	-29,33	43,26	-2,39

Based on correlations of indicators, it is necessary to derive the desired (standard) indicators necessary to achieve with minimal deviations.

Table 3.2 – Standards for achieving financial goals

DL goods processing operations	Year Ended December 31,			Delta	
	2017	2018	2019	2017-2018	2018-2019
Average daily goods processing volume (in thousands)	13879	14604	15429	725	825
Average revenue per piece (uah)	7,97	8,12	8,32	0,15	0,2
Total revenue (uah)	110 615,63	118 584,48	128 369,28	7968,85	9784,8

Table 3.3 – Actual performance of financial goals

DL goods processing operations	Year Ended December 31,			Delta	
	2017	2018	2019	2017-2018	2018-2019
Average daily goods processing volume (in thousands)	14940	14623	15430	-317	807
Average revenue per piece (uah)	7,54	7,9	8,32	0,36	0,42
Total revenue (uah)	112 811,85	121 724,41	128 370,12	8912,56	6645,71

On the comparison basis of Table 3.2 to Table 3.3 it is possible to make such conclusions:

– Average daily goods processing volume (in thousands) had to increase by 725 in 2018 and by 825 in 2019. But actual performance showed a decrease by 317 in 2018 and increase by 817 in 2019, which had fixed critical situation.

– Average revenue per piece (uah) had to increase by 0,15 uah/unit in 2018 and by 0,2 uah/unit in 2019. When real indicators increased by 0,36 and 0,42.

– Total revenue of DL had to increase by 7968,85 in 2018 and 9784,8 in 2019. The real values were 8912,56 and 6645,71. There was a decrease in comparison to 2018 of and about 30% deviation from planned value. But there was an overworked value in 2018 that could compensate 2019's indicators.

The application of methods for assessing the financial stability of an organization will help to develop recommendations for improving work efficiency and improving the company's management system. The aim of the work is to study existing methods for assessing financial stability and develop a scheme to improve the financial stability of the enterprise. To achieve this goal it is necessary to determine the following tasks:

- identify indicators of financial stability;
- consider existing methodological approaches to assessing financial stability;
- to analyze the financial stability of the enterprise using the techniques of different authors on a specific example;
- identify factors that negatively affect financial stability;
- offer recommendations to improve the financial stability of the organization [51].

Table 3.4 – Financial indicators of DL

Indicators	2017	2018	2019	Dynamics (absolute deviation)	
				2018/2017	2019/2018
The analysis of logistics assets					
The share of intangible assets	0,75	0,77	0,80	0,02	0,03
The share of tangible assets	0,23	0,21	0,19	-0,02	-0,02
The indicator of investments in logistics infrastructure	1,32	0,98	0,75	-0,34	-0,23
Fixed assets turnover ratio	1,56	1,54	1,52	-0,02	-0,02

(Table 3.4 continued)

The trend of depreciation	0,06	0,03	-0,03	-0,03	-0,06
Return on assets	0,17	0,21	0,19	0,04	-0,02
Liquidity indicators					
Cash ratio	0,53	0,44	0,35	-0,09	-0,09
Quick ratio	1,00	0,92	0,70	-0,08	-0,22
Current ratio	1,17	1,23	1,16	0,06	-0,07
Financial stability (solvency)					
Equity ratio	0,01	0,03	0,06	0,02	0,03
Equity multiplier	1,40	1,38	1,38	-0,02	0,00
The debt to capital ratio	0,96	0,94	0,88	-0,02	-0,06
The debt to equity ratio	28,95	12,95	4,65	-16,00	-8,30
The asset coverage ratio	1,66	1,26	1,43	-0,40	0,17
Debt ratio	0,98	0,97	0,93	-0,01	-0,04
Working Capital to Current Assets Ratio	-0,05	-0,01	0,13	0,04	0,12
The Equity to Total Debt ratio	1,77	1,34	1,57	-0,43	0,23
Business activity indicators					
Receivable Turnover	0,43	0,55	0,52	0,12	-0,03
Days Sales Outstanding	573,40	454,29	473,04	-119,11	18,75
Inventory Turnover	151,69	144,76	143,92	-6,93	-0,84
Days Inventory Outstanding	1,67	1,74	1,75	0,07	0,00
Accounts Payable Turnover	1,04	1,14	1,09	0,10	-0,05
Days Payable Outstanding	242,85	220,86	229,99	-21,99	9,13
Operating Cycle	575,09	456,04	474,80	-119,04	18,75
Cash Conversion Cycle	332,23	235,18	244,80	-97,05	9,62
Total Asset Turnover	1,56	1,54	1,52	-0,02	-0,02
Profitability indicators					
Return on Sales	2,24	1,53	1,46	-0,70	-0,07
Return on Equity	8,69	11,40	10,59	2,71	-0,81
EBITDA Margin	16,08	14,72	12,89	-1,36	-1,83

Analysis of indicators of logistics assets showed, in the majority, negative results over a three-year period. This means that the company does not manage its assets efficiently enough, however this dynamics does not have significant jumps in value. Apparently, the company has interruptions in the logistics infrastructure. The increase in the share of intangible assets in the structure in fixed assets by 0.81 by 2018 indicates the innovative activity of the enterprise.

Problem: The trend of depreciation.

According to the company's liquidity analysis, DL has a low ability to repay its current payments with current assets. There is an increase only in 2019.

Problem: Current ratio.

After calculations of indicators of solvency of the UPS, it is possible to conclude that:

- According to the Equity ratio, investors almost do not own the assets of the company and are not involved in its financing, it is also clear that the amount of borrowed funds is minimal, although over the years it has slightly increased;
- Equity multiplier is has minimal deviation from norm, so DL is not under threat of credit risks;
- The debt to capital ratio shows positive dynamics with decrease of indicators, so DL is sustainable for loans;
- The debt to equity ratio shows that by 2018 it decreased by almost seven times, which significantly increased total capital;
- The asset coverage ratio has slight fluctuations company tries to increase the amount of loan;
- According to the debt ratio, DL can repay liabilities with its assets while not being highly borrowed or more risky;
- Working capital to current assets ratio – in 2017 and 2018, the expense of working capital was too low, but in 2019 the indicator grew up to the norm, which means the increase in working capital;
- According to the equity to total debt ratio it is clear that DL has just enough equity to cover its debt;

Problem: Equity multiplier.

After analyzing business activity of DL, we can say that It is effective in managing stock and payments undergo rational distribution. On the other hand, enterprise has too long duty cycle and long cash conversion cycle.

Problem: Days sales outstanding, operating cycle, cash conversion cycle.

Calculations of DL profitability indicators show a rational use of financial equity to improve business operations and increase the level of company's effectiveness.

Problem: EBITDA margin.

Calculation of bankruptcy threat is highly important. A company of mass customization format has a huge number and variety of financing sectors. Due to business seasonality, payback periods are unevenly distributed. However, the payment of the initial investment must follow the schedule. Warehouse equipment also has a warranty period and requires timely repair. All of these factors in the chain can lead to inability of the company to continue its work. Calculation of possible bankruptcy risk can be done according to the formula:

$$Z\text{-score} = 0.717T1 + 0.847T2 + 3.107T3 + 0.42T4 + 0.998T5.$$

where,

T1 = Net working capital/ Assets;

NWC = Total Current Assets – Total Current Liabilities;

T2 = Retained earnings/ Assets;

T3 = EBIT / Assets;

T4 = Equity/ Liabilities;

T5 = Revenue / Assets.

Table 3.5 – Initial data

	2017	2018	2019
Total current assets	13848	15717	16209
Total currents liabilities	11729	12885	14086
Assets	40376	45573	50015
Retained earnings	4878	5851	8005
EBIT	7687	7528	7023
Equity	404	998	3019
Liabilities	39947	44549	46978
Revenue	61609	66584	71859

Table 3.3.6 – Calculations of T-indicators and Z-score

	2017	2018	2019
NWC	2119	2831	2123
T1	0,050	0,060	0,040
T2	0,121	0,126	0,159
T3	0,189	0,163	0,140
T4	0,010	0,021	0,064
T5	1,524	1,459	1,438
Z-score	2,257	2,131	2,062

Table 3.3.7 - Scale of bankruptcy probability assessment

Value of the Z- score	Bankruptcy probability
$Z < 1,23$	“Red zone” there is a possibility of bankruptcy
$1,23 < Z < 2,9$	“Gray Zone”, border zone, bankruptcy probability not high but not excluded
$Z > 2,9$	“Green Zone”, low bankruptcy rate

According to the calculations during 2017, 2018 and 2019, Denka Logistics is in “Gray Zone”.

Table 3.8 – Expert diagnostic of financial and economic state of Denka Logistics

	Risk zone	Danger zone	Stability zone	Well - being zone	Value for 2017	Estimation for the year 2017	Value for 2018	Estimation for the year 2018	Value for 2019	Estimation for the year 2019
1. Indicators of financial stability										
Equity ratio	<0,5	0,5-0,65	0,65-0,8	>0,8	0,01	0	0,02	0	0,06	0
Debt to equity ratio	>0,8	0,8-0,5	0,5-0,2	<0,2	28,96	0	12,96	0	4,66	0
Debt ratio	>0,7	0,7-0,5	0,5-0,2	<0,2	0,99	0	0,98	0	0,94	0
2. Indicators of liquidity										
Cash ratio	<0,2	0,2-0,3	0,3-0,4	>0,4	0,54	5	0,45	5	0,35	3
Quick ratio	<0,7	0,7-0,85	0,85-1	>1	1	3	0,92	3	0,71	1

(Table 3.8 continued)

1	2	3	4	5	6	7	8	9	10	11
Accounts payable to receivable ratio	>2	2-1,5	1,5-1,3	<1,3	1,05	5	1,15	5	1,1	5
3. Indicators of business activity										
Total asset turnover	<0,4	0,4-0,6	0,6-0,8	>0,8	1,57	1	1,55	1	1,53	1
Inventory turnover	<2	2..3	3..4	>4	151,7	5	144,77	5	143,93	5
Receivable tunover	>0,15	0,15-0,1	0,1-0,05	<0,05	0,44	0	0,56	0	0,53	0
4. Indicators for assessing the balance sheet structure										
Current ratio	<2	2,0-2,2	2,2-2,4	>2,4	1,18	0	1,22	0	1,15	0
Working capital to current assets ratio	<0,1	0,1-0,4	0,4-0,6	>0,6	-0,05	0	-0,01	0	0,12	1
The equity to total debt ratio	<0,8	0,8-1	1-1,5	>1,5	1,78	5	1,35	3	1,58	5
5. Indicators of profitability										
EBIT margin	<0,15	0,15-0,2	0,2-0,25	>0,25	16,09	5	14,73	5	12,9	5
Return on equity	<0,07	0,07-0,1	0,1-0,15	>0,15	8,7	5	11,41	5	10,6	5
Return on assets	<0,2	0,2-0,4	0,4-0,8	>0,8	0,17	0	0,22	1	0,19	0

After analyzing the indicators of the enterprise, it is necessary to evaluate these indicators. Such type of assessment clearly shows weaknesses and strengths of the company explored. The indicator estimation rating table is shown below.

Table 3.9 – Estimation indicators

Indicators	2017	2018	2019
Financial stability	0	0	0
Liquidity	4,33	4,33	3
Business activity	2	2	2
Assessing the balance sheet structure	1,67	1	2
Profitability	3,33	3,67	3,33
Sustainable	Relatively stable	Unstable	Crisis

In accordance with calculations, the company's situation of financial instability should be emergently improved. We can also monitor unstable position of business activity and assessing balance sheet structure of the company for both 3 years. Despite troubles occurred with financial stability, profitability of UPS remains

relatively stable. Liquidity of the year of 2019 decreased in comparison with 2018 and 2019 years, which were literally perfect, but is still in affordable risk zone.

According to the financial screening model of the company, we should totally change indicators of financial stability for the next year. Equity ratio should be increased to at least 0,65, debt to equity and debt to ratio decreased to not less than 0,5.

It is also necessary to improve Business activity and Assessing the balance sheet structure indicators. In first case, there are critical indicators of receivable turnover, that must be decreased min to 0,1 and increase total asset turnover to 0,6. What about second case, Current ratio and Working capital to current assets ratio indicators should be raised to 2,2 and 0,4 respectively. In summary, average values of improved indicators, if other remain stable, will give us positive results in next years.

3.4 Conclusions to CHAPTER 3

DL is an enterprise of mass customization format. This is of great importance for the zoning of the warehouse, the distribution of duties of workers, work schedules, etc. The main objective of the design part of the bachelor's thesis was to identify the shortcomings of the organization of the company's warehouse processes and propose a solution. For a better understanding, the design part was divided into two parts. The first part determines the main shortcomings of the warehouse processes, the second - analyzes the financial performance of the company. All calculations were made on the basis of data obtained during pre-diploma practice at the DL enterprise.

The main DL processes that were considered for potential improvement are:

- marking upon receipt of goods
- labeling of goods to be sent to the store
- sorting of defective products

- offer customers an alternative delivery method
- solution of the problem of low vehicles' utilization

The main task of the financial part of the work is to determine the economic condition of the DL company and the shortcomings for further adjustment. Based on the financial reports of DL for 2017, 2018 and 2019, the following indicators were calculated:

- financial stability
- liquidity
- business activity
- balance sheet
- profitability
- bankruptcy risk evaluation

CONCLUSIONS AND RECOMMENDATIONS

Denka Logistics (DL) is one of the most successful warehouse providers in the market of logistical services in Ukraine. It owns a warehouse of 20,000 square meters, with the latest piece-of-art Austrian and German equipment, located in a beneficial place, which is accessible to a variety of regular customers. Its major client is Intertop (a distribution network of shoes and accessories), though currently it serves a large number of distributors of books, office appliances, toys, chemicals, etc.

Organization of processes at the enterprise is of paramount importance for its success. During the introduction stage of the DL's life cycle, it mostly implemented repetitive-focused process strategy. However, as the time passes, the market demands a large variety and large volumes of warehouse services. Therefore, after turning to mass customization format, DL has to concentrate on individual customers' needs, which significantly differ from each other. The tasks distribution, space zoning, shipment and loads schedules, operation time - these are the key points in performing warehouse services. Since the production, storage, sorting and other processes become more complicated with the increase in quantity and variety of goods, the organization of a logistical company requires highly qualified specialists and essential financing.

Workers in a logistics company in a mass customization format must have a high level of skills. Since there is still a variety of manual operations at the warehouse and the flow of goods is growing rapidly, employees must be able to perform fast and accurate actions throughout the day while minimizing errors. For this, according to the theories of Gilbert and Taylor, regular trainings, competent organization of the workplace, work schedule and motivation are necessary.

The major client of DL is Intertop (a distribution network of shoes and accessories), though currently the company serves a large number of distributors of books, office appliances, toys, chemicals, etc. One of the services which ensures competitive advantage of the company is the provision of piece sorting of goods.

Thus, clients' stores can receive only current units of goods, without overloading their storage areas in an individual outlet. Recently, DL has begun to provide labeling services, which significantly reduced the customers' resources, though increased the number of operations performed by the warehouse that, in turn, introduced new processes within the same area size.

Despite the technologies purchased from German and Austrian developers used at the DL stock, the company has a number of processes that require restructuring. They are:

- adjusting of the marking process at the stage of goods acceptance;
- shortening the process of product labeling services for stores;
- providing clients with alternative delivery service;
- filling a vehicle on the way back from the city of unloading;
- sorting and disposing of defective goods.

Each warehouse process should be clearly specified, and its designers must make sure that every process is clearly understood by employees. For that reason, graphical tools for process design were applied. Verbal explanation may not be enough, while visualization is usually more effective. The main graphical tools for process description are flowcharts, time-function maps, process charts, value-stream maps and service blueprints.

This diploma thesis analyzes the labeling of piece goods at two stages using graphical methods for constructing processes. The flowchart, showing the process of primary labeling of goods, revealed two unnecessary operations that the storekeeper must perform when processing one unit. They include manual search for a barcode in the database and processing of damaged goods, which leads to delays and errors due to human factors. In this regard, there was a decision to automate the primary marking process with the use of scanners. It is also necessary to create a separate department for processing damaged goods and channels for their sale, depending on the degree of damage (high, medium, low).

This paper performs time-function mapping, describing labeling process for Intertop at DL. This graphical method identified two product downtimes, which can be eliminated. Thus, it is possible to reduce the marking time of one unit from 27 minutes to 20.

Damage to the integrity of the factory packaging or its contents during single-piece shipment has become a quite big problem. By the standards of many European enterprises, any defective product is a subject to complete liquidation. This is done to reduce the risk of goods entering the black markets, however, the client company and the logistics provider incur losses from each unit. To avoid total liquidation, the level of damage should be classified as low, medium and completely unsuitable. It is also necessary to create an additional department to work with this segment of the product. Thus, part of the damaged goods will be sold at a discount, transferred to the needy and only a small part will be eliminated.

The problem of an empty vehicle on the way back to Kiev can also be fixed. Many companies often require one-way delivery of goods, but paying carriers for the double distance is not affordable. In such case, they place an application with information about the cargo on a special site. The carrier similarly enters information about its vehicle and time of arrival at the place of shipment. Further, on the basis of these data, the program selects the most suitable vehicle for the type of cargo, its quantity, loading time and destination. Thus, the carrier partially or fully covers the cost of the return trip, and the customer delivers the goods at a lower price.

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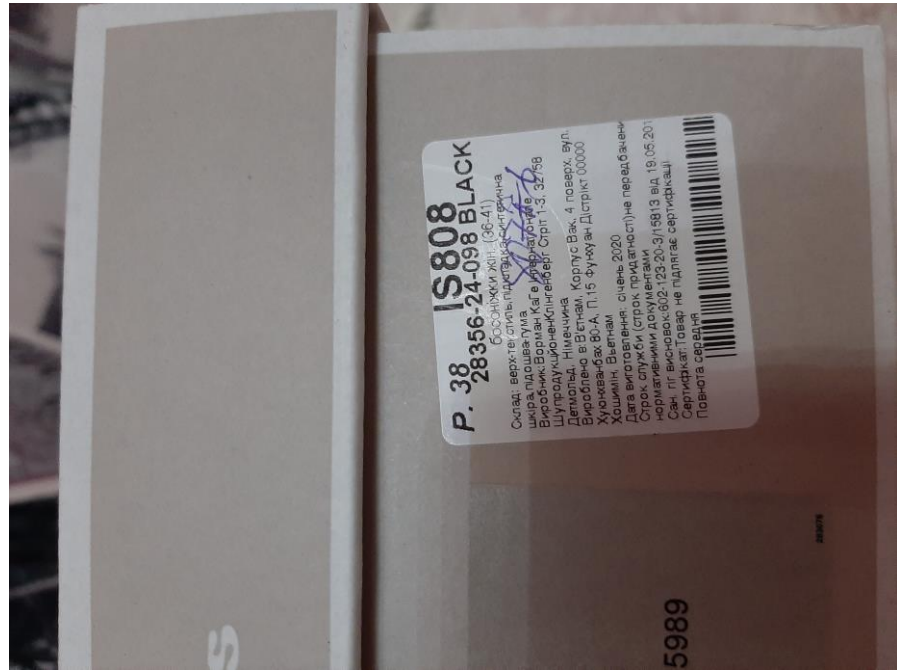
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APPENDIX A



Intertop barcode label

APPENDIX B

Step no	Time (sec)	Distance (m)	Operation	Sort	Wait	Deliver	Scan	mark	Put on shelf
1.	10	2	Take from ME2	Δ	0	→	✓	0	▽
2.	300		Wait	Δ	0	→	✓	0	▽
3.	240		Delivery by Convey to M1S	Δ	0	→	✓	0	▽
4.	5	1,5	Scan at the 1st floor M1S	Δ	0	→	✓	0	▽
5.	10	2	Sort packages	Δ	0	→	✓	0	▽
6.	10	1	Put a label	Δ	0	→	✓	0	▽
7.	600		Wait	Δ	0	→	✓	0	▽
8.	60		Delivery to the 2d floor (M1S)	Δ	0	→	✓	0	▽
9.	5	1,5	Put on the shelf	Δ	0	→	✓	0	▽

Process chart for labeling process in DL