

Optimization of Business Processes in a Transport Company in The Republic of North Macedonia

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Abstract –The aim of this paper is to show how a service company, whose main activity is transport and storage, finds the bottlenecks in the work, and after that creates changes whose realization takes place through the optimization process. The subjects of the research in this paper are software solution for transport and storage that is not yet presented enough in the competing companies on the North Macedonian market. For this purpose, the work of one of the companies is represented, which is a user of the services regarding the transport company and benefits emanated by implementing such a software. Optimization of transport (transport routes) and storage are areas with strong potential for improvement. The operators in this sector are facing the so-called problem of “empty miles”. By means of the help regarding transport management software, optimization of costs is achieved by finding the most affordable and economical routes.

Keywords – quality system, model, business process optimization, costs of quality, TQM (Total Quality Management) strategy.

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1. Introduction

Process oriented organization devotes the greatest impact on the organization of processes in order to increase efficiency, and thus increase the business results. Good management of business processes provides the best image respecting the quality within company's operations, since the process of realization of business strategy is accelerated, and it enables completion of the business goals at the highest level, and satisfaction of all interested parties, as well.

Optimization of business processes implies finding ways to improve business process performance through the modelling and monitoring phases. Thereby, certain help toward identifying the potential or existing “bottlenecks” in the company, as well as potential opportunities in order to reduce costs or improve the efficiency of business processes, is applied through corrective measures. If the optimization process does not give the desired results, then it passes to the re-engineering of the entire process.

This paper implemented the methodology for the optimization business processes in a company that deals with transport services. Optimization is commonly practiced in mature and grown companies, but it does not exclude its great importance in companies that are in the growth and development phase.

2. Literature review

If we take a view regarding 1950's, when the development of modern approach comprising the quality of products and services began, professional literature brings together scientific papers which foreshadowed the third world revolution due to computer and information technology [1]. North Macedonian companies are area under discussion in the field of ongoing transformation, such as acquisitions, mergers and challenges from global competition that exert constant pressure to change [2]

[3]. Through new trends that are more expensive and riskier, innovation cycles are shorter, precise differentiation on the basis of the product or service is not possible on the market. In times of massive turbulence, consumers have higher expectations, and companies are pushing for improvement in productivity, quality, and at the same time they reduce the costs. For that purpose, companies adopt some of the three approaches in order to improve the quality of business processes, products and services, according to Mitreva [3]:

- Traditional process management.
- Reactive improvement.
- Proactive improvement.

This paper implements the methodology of reactive improvement of business processes through redesign, small improvements or modification of already existing processes. Reactive improvement is the improvement of a weak process. It is a process in which a large part of the control points emerge from the control boundaries, although the employee corrects it in accordance with the instructions, but results are again out of the control limits. In this case, detailed analyzes are required, key causes are being projected, and corrective measures are taken. For such processes, a standard methodology for improving weak processes, is known as nine steps to improve quality, and it is used.

In the application of this methodology, there are two phases: a diagnostic phase, which determines the current situation and the phase of remediation, in which management works to solve the problem and improve the quality [4]. The sense of this methodology is to combine collective talents in a company to create a driving force for improvement. This methodology is based on the Deming Circle - PDCA (Plan, Do, Check, Act), and can be defined as part of an action plan or work philosophy, in which employees are involved at all levels. They contribute building a business culture, in which everyone is involved in the promotion of processes, products and services [5],[6],[7].

3. Methods in the research and analyses of the results

Today, the process of transporting goods is becoming more complex, although models for supply chain organization are constantly being developed, and permanent relationships with suppliers are being built. Organizations are managed according to the needs of service users, taking into account the costs of making additional efforts in order to optimize warehouse operations and reduce transport costs.

The company analyzed in this paper has many years of experience in the International transport. It specialized in performing fast, individual transport of textile, transport of frozen and fresh goods, as well as a collective transport from the Republic of North Macedonia to Europe and vice versa. Besides transport, the company has specialized warehouse storage for products of various types (food, textile, frozen goods, etc.). The company is located in the city of Shtip (known as the city of textile), with a large number of confectionary enterprises, and considerable part of them do not own warehouse space. For that purpose, they use the rental service provided by the research company.

The subject of this research is a transport company, with the intention of diagnosing the problems that it faces in its operation. The transport company decided to adopt the methodology of proactive work comprising small changes to achieve great successes.

The company has adopted principles regarding the way of thinking: to be productive in solving problems, not to accept the status quo, to adapt changes, to seek solutions to problems and to create an environment in which all can feel that they contribute and feel productive. That road never stops. The company has created a database of ideas, evaluation criteria and it reward the best employees. It all works in a way that every employee can give his own idea of where and how the company can improve its operations. In this way, employees are motivated to get involved in every aspect of the work process, that is, think about of the well-being for everyone.

After the conducted analysis of the business processes in the company and detection of anomalies in the work, as well as notices, suggestions and requests by the consumers, a decision was made by management regarding conducting and optimization of the business process in the part of the warehousing of goods, including the transport itself. After the result obtained from the analysis, the company decided to apply the methodology of reactive improvement for business processes. With the help of the previously identified identification, one of which points out problems within process for the successful implementation, the company team decided to implement a software solution for optimizing the transport.

There are steps by which the company has gone through in order to find the best and most optimal solution (Table 1) [3]:

Table 1. Steps for reactive process improvement.

PDCA cycle	Step	Activity
Plan – Planning	1	An initiative to make an improvement project
	2	Defining the object of interest
	3	Measurements, collection and analysis of data
	4	Analyzing the causes of problems
Do - Implementation	5	Choosing a solution for improvement and determining the improvement plan
	6	Implementation of the solution
Check – Control	7	Monitoring and evaluating the results of the improvement plan
Act – Corrective measures	8	Standardize the solution
	9	Closing the project for improvement and reflection of effects

➤ **Step 1: Initiative for making a project for improving the business process.**

In order to offer a better and full service to the final consumers, the need to promote and optimize the business process for providing fast and quality transport, including storage, has been imposed by reducing costs.

➤ **Step 2: Subject of interest or problem to be solved.**

The subject of interest is quality warehousing of goods by reducing errors and shortcomings in order to reduce the lost time, and thus increase the satisfaction of the users of these services. Here it is inevitable to mention the need to increase the warehouse space for better handling of goods.

➤ **Step 3: Determining the severity of the problem.**

In order to determine the severity of the problem, the team performed measurement and analysis of data taking into consideration the reason for its occurrence. All of this is done through a graphic representation of deviations, which, when, why, where, what is wrong. The storage problem occurs as a consequence of the small storage area, preventing speed and making it difficult to manipulate the goods.

➤ **Step 4: Analyze the causes of the problems.**

When forming the diagram of causes and consequences – Ishikawa diagram identified the main causes for problems such as: technology, spatial conditions, and the need for strategy in storage. The problem with inefficient storage of goods is mainly caused by the small capacity of the storage space, as well as the insufficient training of the employees.

➤ **Step 5: Choosing the solution.**

Once the cause of the problem has been discovered, they should be eliminated. In practice, software solutions are often used to optimize business processes, working at the lowest costs. This company, as the most optimal solution, adopted the software system WMS (Warehouse Management System) and TMS (Transport Management System), or the transport management system – SAP (system, applications and products) [8],[9],[10].

The implementation of the software solution will be discussed in detail both for warehouse operations and transport. Warehouse Management System (WMS) is a software solution to control the movement, storage of materials in the warehouse and transport management. WMS creates the opportunity to make storage and transport more efficient [10]. By improving the technology of software applications such as the advanced system, the management of the WMS system and the use of handheld mobile computer, the opportunities are created to make storage and transport more efficient. These technologies transform the traditional warehouses into modern and efficient ones. Based on these technologies, retailers can build long-term logistics strategies for developing their businesses [11]. WMS system software solutions optimize warehouse operations, allowing visibility of order-to-delivery operations in real time. These solutions provide comprehensive tools and resources for managing, controlling and optimizing logistic operations. The WMS system is a part of the supply channel. Through this system, warehousing and relocation of goods, accommodation, picking and their delivery are managed [12]. WMS provides centralized automated procedures for managing inventory, space, equipment and people. The ultimate goal of the system is to minimize costs and shorten the time to complete the activities. The WMS system works on well-prepared logistic data for articles and suppliers, which ensures the automation of functions in the warehouse [13],[14]. The basis of the WMS system is automatic identification, such as bar codes and RFID (radio-frequency identification) tags as information carriers and barcode readers, RFID readers, mobile computers and wireless network on the other hand as devices that manipulate information [15],[16],[17]. The central function of the WMS system is a software application that provides automated standard procedures for carrying out operations in the warehouse. The information received when the information carrier is read and generated in a central database that can provide many useful information and reports, such as the status of goods, space and equipment utilization, single transaction costs, etc. WMS provides, (Figure 1):

- Planning and identifying resources: space, equipment and people.
- Standardization of work procedures.
- Execution of operations through orders directly controlled by software procedures under the work plans and work procedures.
- Monitoring performance through different indicators.



Fig. 1. Display for working with WMS

The implementation of the WMS system in the company helps the following basic operations:

➤ *Reception of goods.*

By using the WMS system, the process is standardized and comes down to simple, pre-defined operations. These includes one-day physical control of the quantity and correctness of the goods received, as well as their adequately standardized barcode or RFID marking, which enables further traceability of the goods (in the warehouse and during delivery). By using this procedure, the time for the receipt of goods is minimized, but also the quality of information about the quantity and their status (LOT and shelf life – as one of the most important elements for the safety of food products and medicines) is improved. An important role in the receipt is the labelling the pallets with a SSCC (Serial Shipment Container Code) barcode, which ensures simple manipulation and traceability of the goods to the level of the pallet.

➤ *Storage.*

The received goods are placed in pre-prepared locations. WMS has the task to help in finding the most optimal location in order to keep the receiving item. If the warehouse is divided into storage zones (thermo-controlled zone of 4 to 8 degrees Celsius, or freezing zone (-18 degrees Celsius), or ambient-food, ambient-chemistry, etc.), then the WMS does not allow the article which has defined one zone to be stored and blended with another articles belonging to another zone (for example, food and detergents).

➤ *Moving-replenishment.*

When one of the picking location (the location from which the goods are taken when the order for delivery comes), the WMS system automatically sets up a replenishment order, taking care of the deadline for the goods to be replenished. In this case the principle of FEFO (First Expired First Out) is followed, that is, the products with the shortest duration are the first choice of goods from the storage part.

➤ *Planning.*

On the basis of incoming orders from the buyers, WMS provides a dive function that enables the operators-pickers to get to the shortest possible path to the picking locations of the items that are in the order list. This also validates by scanning the barcode of the article – whether the dotted item corresponds to the ordered one. Prepared orders are set up at pre-set locations in which they are waiting to be controlled and properly packaged for further loading.

➤ *Stocktaking.*

In the warehouses that do not have a WMS system, this operation creates many headaches, because it lasts for a long time – while the stocktaking lasts. The warehouse does not work (it does not receive or send goods), and the results of the stocktaking are also uncertain, due to possible errors in the identification of the articles. By implementing the WMS system, this operation is time-shortened by days to hours; the accuracy of the data is maximized.

➤ *Returning goods from the buyer (reclamation and complaints).*

This is a very common and complex operation that takes time and resources in classical systems. The WMS system provides an automated procedure in which, in addition to the quantity control, the classification of the status of returned goods is performed on: normal, short-term goods, expired goods and damaged goods. This ensured simplified further manipulation and management of returned goods.

The next step in applying the methodology for proactive work is:

➤ **Step 6: Implementation of the solution.**

When implementing the solution, control was made in relation to the final effects.

➤ **Step 7: Evaluation of the effects.**

The results of the implementation showed that by applying this solution the quality of service, the motivation and dedication of the employees were improved, and thus solving the main problem of the storage of the delivered goods. In this way, the goal

of improving and reducing the costs of the storage process, as well as the overall transport process, has been achieved.

➤ **Step 8: Standardize the solution.**

After the analysis and measurement of the results, it turned out that the solution helped to achieve the goals and expectations and was fully adopted.

➤ **Step 9: Closing the project.**

By implementing the methodology of proactive working, the company has benefited with: enhanced and stimulated control of the processes and reduced errors, the morale of the employees is increased as a sense of value, teamwork has been strengthened and the employees started to think beyond the specific issues of their departments. The number of benefits from implementation of the WMS system for the company and for the companies that use its services is huge.

Some of more important benefits are:

- *Elimination of errors and increased efficiency.*

By introducing automatic identification (barcode or RFID) and software control with the job order, it is ensured the elimination of errors for a wrongly delivered product or a product with expired deadline. With the fact that a centralized system and a single database of well structured logistic data is used, the WMS system provides increased resource efficiency and faster execution time of operations in the warehouse.

- *Optimal space usage.*

Some products are delivered more often than others. They can be grouped at locations which are close to the exit of the warehouse, and speeds up the process of picking, packing and delivery to customers. Also, goods that are less supplied are placed in the outermost locations which optimize the use of space.

- *Traceability.*

Monitoring the stored goods implies monitoring of the supplier, the time when they were procured, who received them, when they are stored in the warehouse, how much time they spend in that location, when they are issued and to which buyers. By analyzing these data, control the level of inventory and utilization of the warehouse space is ensured. This increases the capacity and readiness to respond to the specific requirements of buyers or suppliers, and also to plan for seasonal articles.

Very often WMS is integrated with the TMS (Transport Management System), which provides additional benefits, such as: planning the loading vehicles, planning tours for delivery, merging

delivery orders in one round according to the relation and vehicle, LIFO (the last in first out, comes out first) as a load principle, and therefore the order for picking up the customer from the buyer.

Transport problems, in most cases, are related to the selection of the most favourable variance of transport, which ensures the minimal costs in relation to a particular traffic location and means of transport. Regarding this issue, there are also the tasks for optimal displacement of machines, auxiliary services, energy facilities, etc., in order to achieve better economy of work and time. This software solution is applied to another company which is a manufacturer of car seats, which is a foreign investment in Macedonia and it gave excellent results that showed the multi-application of the solution.

In the Republic of North Macedonia, there are two factories manufacturers of automobile seats located in the cities of Shtip and Strumica. The storage process in these two companies is the same. The two companies operate according to the principles of the WMS system. Entry inspection is in charge for the entrance of each goods. For this purpose, bar code labels and bar code readers are used, and each of the products or raw material is entered into the computer. The same applies to export or loading products, in which a bar code reader is re-used, that is, the computer indicates that the product is ready or has already been sent to the required destination. In this way, employees have a simple record of the type of product, the place it is located, whether it is delivered or when it needs to be delivered. Regarding the product distribution in both companies the focus is on first in the first out, or what comes first, first comes out. In rare and previously logged cases, the LIFO (last in last out) principle is also working, or what went in the last, first comes out. Although such cases are rare, this principle of operation is easier because it facilitates the work for easier manipulation of goods. Figure 2 shows the way of organizing the warehouses with the implementation of the WMS system.

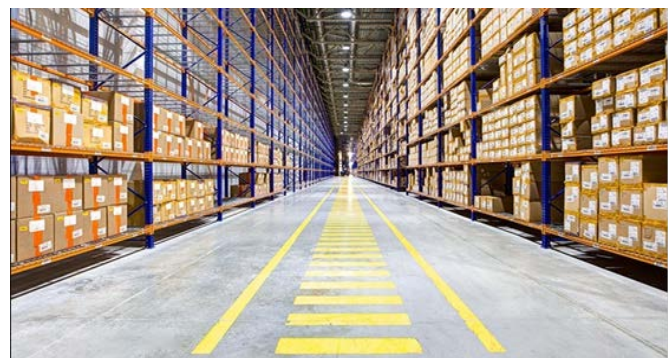


Fig. 2. Implementation of TMS in the company for production of car seats in Shtip and Strumica

The goal of companies is simple: to reduce costs and increase the level of satisfied customers with the services it offers. However, market forces rising fuel prices, and reduced demand has a major impact on reaching this goal. This software program offers:

➤ *Direct association.*

This strategy does not increase the handling costs because they are replaced by distribution costs. The transit time should not and is not affected in this model. Also by placing all orders in one warehouse account, the system creates a possibility to reduce costs.

➤ *Aggregation of shipments.*

Aggregation creates a single shipment of multiple orders, originating from the same sender to the same destination on the same day, which would otherwise be realized as different shipments. Figure 3 shows the model by which two different shipments should be delivered from the same sender to the same destination. Costs will be significantly reduced if shipments are combined in a single vehicle to carry out transport.

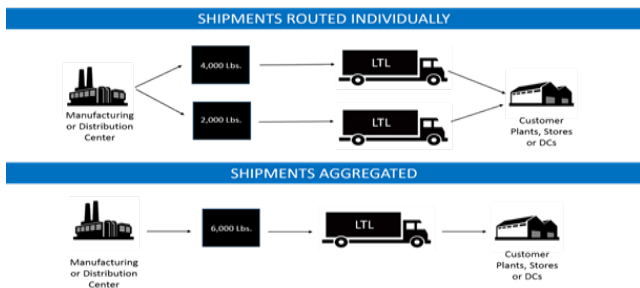


Fig. 3. Example for aggregation of shipments

➤ *Consolidation of shipments.*

Consolidation of shipments is an option by which multiple orders can be combined according to the size of a truck that usually does not fill its capacity. When planning the transport, the kilometres should be taken into account, also the time of delivery, the possible stops of the vehicle, loading of the other goods. Figure 4 is an example of consolidation when two different shipments are transferred in two different destinations, shipped from the same shipper. In this case, the costs will be reduced if shipments are combined in the same truck at full capacity and transferred first to the one, and then to the other destination.

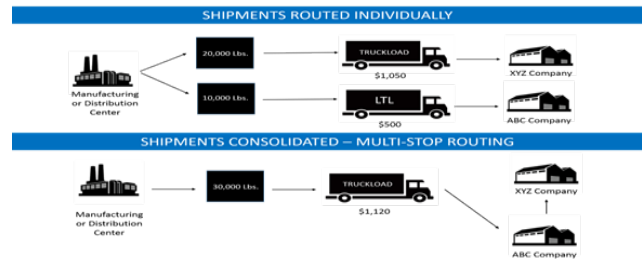


Fig. 4. Example for consolidation of shipments

Figure 5 shows the process of creating a request for shipment. This section contains data about where, what and when the amount and the price are to be sent. Figures 5 and 6 give an example of the testers' delivery in the automotive central office.

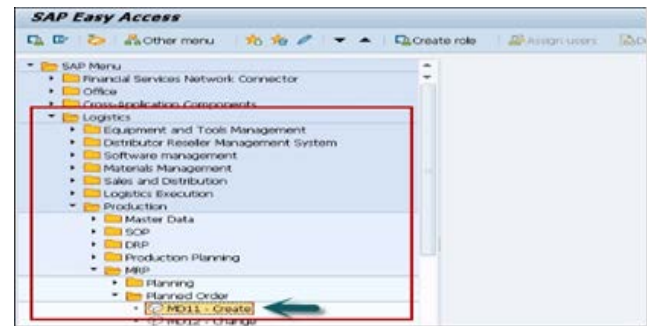


Fig. 5. SAP menu for easy access

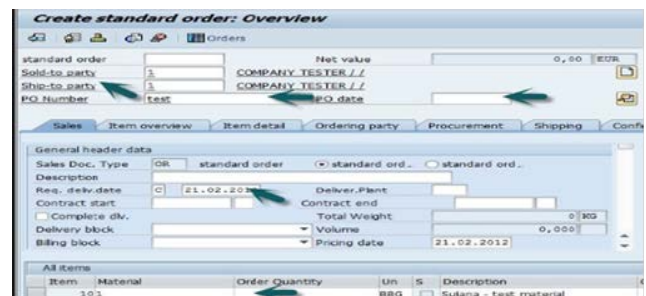


Fig. 6. Create standard order

These data are entered in the system, and it automatically prepares a single administrative document (SAD), thus making it easier for the employees of the company to prepare the necessary documentation. Once this part is completed in the SAP software, the transport company receives a request (Figure 7), in which the number one is marked with red in the part of freight agreements.

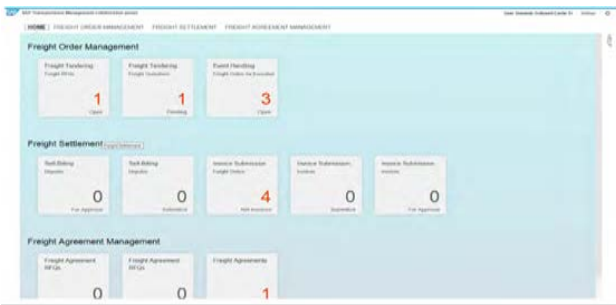


Fig. 7. SAP TMS-collaboration portal

The following after consideration of the request is the preparation or management of the transport, shown in Figure 8.

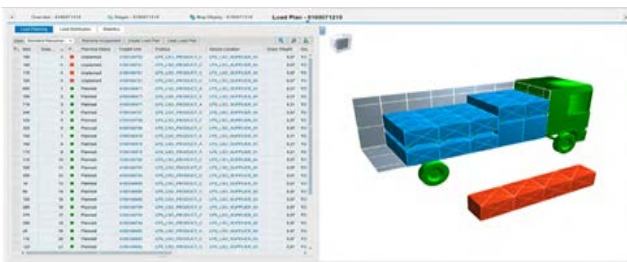


Fig. 8. Load plan

Organizing this process selects which freight vehicle will transport the shipments to a pre-scheduled optimal route, and according to the scope it is planned to fulfill the entire capacity of the vehicle. In this way, shipments that are transferred to the same location in the same period are transmitted together, which saves time, fuel and other travel costs.

Benefits of implementing TMS (Transport Management System)

Large is the number of TMS benefits, some of which are the most significant:

1) Improved customer service.

With the help of this software solution, the users of this company's services receive 100% reliable and fast transport. Shipments arrive on time, in excellent condition with a lower price than the competitive one.

2) Efficiency of the warehouse.

The combination of WMS and TMS systems is managing simultaneously with storage and transport. By reducing the time for transport, it creates the opportunity to work on other projects, such as warehouse managements and storage. It allows reducing errors when entering the data.

3) New delivery capabilities.

This software offers the ability to optimize the delivery process. It can also compile programs for distribution base point, or to place outbound programs between multiple locations within the organization, thus increasing the overall efficiency and cost savings.

4) SAP Software.

The basic TMS (Transport Management System) is used by the company is SAP software. This software enables the consolidation of orders and optimization of transport costs. Improving logistics management increases visibility in real time in global transport and domestic transport, as well as, in all transport modes and industries. To function in the best possible way, the transport company purchased the SAP software installation licenses and the SAP HANA Enterprise Cloud license.

Other benefits of this software are:

- Increasing the productivity of the business. This means managing the transport requirements with greater efficiency and lower redundancy through automation and electronic collaboration from entry to settlement.
- Improved visibility and service from end to end. It means lower costs with electronic tracking, cross-systematic document flow and load consolidation.
- Improvement of cash flow for freight transport. This means that unplanned costs are reduced and the invoice errors are eliminated.
- Standardization of logistics processes and operations. This means that a consistent logistical experience is brought to the fore, centralizing the rate and data management with a common platform that is simple to integrate, extend, deploy and access.
- Accelerate decision making in real time. This means transport intelligence with graphic and interactive management panels that work on SAP HANA.

Key features offered by SAP software

- Strategic load management.

Optimized load delivery for multiple models using a sophisticated transport management system.

- Order management.

Minimizing freight charges and customer service improvements. Improve management efficiency for the purpose of processing and generating optimized, correctly based dynamic routes.

- Transport planning.

Lower transportation costs and achieving delivery on time.

- Execution of transport.

Better handling in order to make the logistics faster, more dynamic and more acceptable.

Reducing the cost of shipping with a streamlined process and maximized efficiency.

- Transport costs.

It guarantees the accuracy and transparency of transport and billing costs. Automated freight calculations and integrated management of transport and payment data.

- Analysis and reporting.

Offers timely decisions with in-depth data. The complexity of the data is reduced, enabling efficient cooperation between the logistics business partners.

- Security of SAP software.

The software guarantees data protection and privacy. It leaves an opportunity for the company to focus on customer relationships, believing that their data is safe and secure. It offers a proactive, predictable approach helping to ensure data compliance and security. The rights of employees, applicants, customers and partners are protected by SAP solutions that maintain the property, security, and privacy of data.

4. Conclusion

More recently, changes in the way transport were managed by companies which were less reliant on traditional transport principles (using Excel as the main tool for transport management) [18], [19]. Instead, they look for models to help them outline their customers' offer, to gain better visibility and take control over the service they provide. Optimization of transport (transport routes) and storage are areas with strong potential for improvement [18]. The operators in this sector are facing the so-called problem of "empty miles". With the help of transport management software, optimization of costs is achieved by finding the most affordable and economical routes. Working with TMS and WMS systems for some companies is an unacceptable idea because there are some limitations. The major limitation is funding. Through the implementation of TMS and WMS systems in the transport company, a quick return on investment is expected, achieving 25% reduced allocation of funds from the transport budget, as well as increased reputation and greater competitiveness on the market.

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