



A MODEL OF IMPLEMENTING LEAN LOGISTICS PRINCIPLES IN LITHUANIAN TRANSPORT ENTERPRISES

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Abstract. Business units worldwide apply Lean logistics principles because it enables to manage complicated business situations effectively. For each enterprise, it is advisable to apply Lean logistics as a business management concept that lowers costs by reducing the amount of unnecessary processes, saving resources, and improving efficiency of business activities. At the same time, a business unit gains a competitive advantage providing a product or service to the customer at reasonable prices. Therefore, application of Lean logistics principles can be a suitable tool for seeking a competitive advantage. The objective of this article is to suggest a potential conceptual model of implementing Lean logistics principles in Lithuanian transport companies.

Keywords: logistics, Lean logistics, DMAIC, Lithuanian transport companies.

JEL classification: L91, M21.

1. Introduction

In the ever-changing business environment, companies are forced to generate more and more new ideas for improving both logistical operations and the entire logistics system that would help minimize costs and increase the product (service) quality as much as possible. In the eighties of the twentieth century, many organizations had to carry out essential activity re-arrangements in order to survive in the global markets. During this period, a saving system of optimizing processes and forcing them to be more efficient flourished (Krafcik 1988). Business realized that effective logistics planning and efficient management was extremely important when seeking advantage in the ever-changing and expanding markets.

A saving system is usually referred to as a philosophy that explains a flexible, efficient, and effective management of business processes (Womack, Jones 2003).

A saving system or Lean logistics system is a complex of concepts, principles, and tools used to create and provide the greatest value in terms of consumer's perspective using minimum resources (Lean Enterprise Institute 2008).

World scientists identify the Lean logistics system as a method of encouraging organizations

to change and improve the processes, thus reducing operating costs (Bicheno, Holweg 2004; Achanga 2006). Lithuanian scientists call the Lean logistics concept an enterprise management paradigm, which at the right time in the right place at the right quantities at minimal cost helps manage the asset and, at the same time, remains flexible and open to innovation and ever-changing (business) environment (Womack, Jones 2003; Flinchbaugh 2012). Lithuanian Lean logistics pioneers and consultants describe it as an organization management mode that enables the organization to increase the value for the customers and reduce operating costs (George *et al.* 2003; Balle, Balle 2005, Lean Enterprise Institute 2008).

The Lean logistics concept is based on the idea of a constant process improvement aimed at identifying and removing all the unnecessary waste in each process by team efforts. The Lean logistics goal is to reduce that part of the activity, which does not create value (i.e., to reduce costs). So, in order to remove any potential process that does not create value, it is necessary to take into account in which of the processes, activities or units there is time, material resources, or other sources mostly wasted.

Many scientists and business representatives recognize that the Lean logistics concept in busi-

ness can be an effective way of achieving minimum cost for maximum profitability and efficiency in the long term as well as best meet customer needs (Womack, Jones 2003; Andersson *et al.* 2006, Myerson 2012).

The Lean logistics management system is a universal and transformable one. The Lean principles are applicable not only in industry but also in other sectors of services and facilities, health services, and public administration (Bicheno 2006; Santos *et al.* 2006; Bozarth, Handfield 2013).

Summarizing, Lean logistics include elimination of unnecessary processes and activities thus increasing the flow rate of tangible and intangible resources. Speed increasing does not necessarily mean that the flow will move faster. What will be eliminated are just individual proceedings or process steps, which slow down the flow or cause other procedural or bureaucratic barriers for more efficient and faster delivery of goods or services to consumers (Baudin 2004; Goldsby, Martichenko 2005; Ginevicius *et al.* 2008).

In order to operate efficiently and appropriately implement the Lean logistics philosophy in daily activity, it is necessary to adapt as many Lean logistics principles as possible seeking to integrate them all into a single functional system.

2. Elements of Lean logistics system

Lean logistics methodology is based on basic principles to help guide management actions to success:

Elimination of 7 types of waste: over-production, waiting, unnecessary transportation, inadequate process, unnecessary inventory, unnecessary /excess movement, and defects. The list does not include staff. It is recognized that often enterprise managers do not utilize the skills and decision-making abilities of the employees in full. Employees are hired in order to use their knowledge and potential (Conti *et al.* 2006; Bozarth, Handfield 2013). By assessing each "waste" and eliminating each of them, it is possible to achieve certain good results within the enterprise. The more of them are withdrawn, the more likely cooperation, course of process, and customer service may be improved (Lean Enterprise Institute 2008).

Value Stream Mapping. Value Stream Mapping is a Lean system tool that shows a detailed picture of each step of the process drawing the process sequence according to the set characters. Many enterprises and employees use this method as a primary means of determining the "waste", reducing the process cycle time, and improving the processes (Nielsen, 2008). The Value Stream

Mapping goal is to provide an optimal number of elements in the processes and process steps that create value to the customer and are performed at minimum cost. When drawing a Value Stream Map, it is important to draw the current situation Value Stream Map, analyze every process and eliminate "waste", transform the processes, draw a new Value Stream Map with amendments, and carry out control. (Nielsen 2008).

Flow. An efficient proceeding of one process – product movement. This principle seeks that operations for carrying out the proceedings are continuous throughout the entire process.

5S is a system for improving workplace organisation so that it could be used actively and efficiently and work elements could be selected and stored by maintaining order and security (Lean Enterprise Institute 2008): sorting (seiri), streamlining (seiton), shining (seiso), standardize (seiketsu), and sustain (shitsuke).

Kanban is a method, by means of which the "pull" system is adapted. "Kanban" means a signal to start work. Normally this signal is received from the client, who expresses what he wants and when it should be provided. In terms of logistics, this method generates benefits when applied: overproduction is avoided; individual needs of consumers are met; what is needed for the consumer is provided. The Kanban method has limitations, so the possibility to apply it shall be based on the specific situation analysis (Bowen, Spear 1999).

The *JIT* technique is a "pull" type system (manufacturing and service hit demand) that operates on the actual demand. With the "Just-in-Time" system, it is possible to reduce inventory and increase the reactivity of the system at all the stages of order processing and execution, although the system is quite risky. JIT requires introduction of improved methods of operation and service culture.

Perfection. It is aimed to perform all the proceedings correctly from the very first attempt. Otherwise, it is referred to as a continuous process of improvement – kaizen. This is continuous improvement of the activity and individual process seeking to achieve the best price, quality, and delivery time. The Lean methodology particularly emphasizes all the staff involvement into the process of continuous improvement. Personnel involved in the activities of the enterprise are becoming interested in its activity and results (Womack, Jones 2003).

Along with the basic Lean principles, there are mentioned other ones relating to the main principal ideas of Lean understanding and at the same time supplementing the basic principles:

Supplier network narrowing. This principle is based on the desire to reduce the number of suppliers, with which joint activity is carried out. This is required for the elimination of a variety of service specifics of different suppliers in order to standardize the process. In this way, the competition element is eliminated in the relationship and bilateral partnership develops.

Developing relationships with suppliers. The organization should actively develop its relationships with suppliers and work together towards a common profit.

Networking process. All required means for carrying out production or service are as close to the process as possible in order to reduce unnecessary transportation, waiting, as well as other expenditures.

Sequence of steps. A need to make major changes during the stages of the processes in order to avoid waste.

Overall replacement of process activities. It is designed to improve irregularities of activities or individual proceedings as well as random deviations arising due to unforeseen circumstances.

A saving system implementation includes three basic stages: activity assessment, training and development, implementation and coordination (supervision).

The company activity assessment determines and describes the organization's current situation as well as proceedings that do not cause a significant value creation but increase costs. It also mentions how it may change, what adjustment or amendment is to be made in order to increase efficiency, and what specific benefits can be achieved. All the company's employees along with the saving system outside consultants help assess the company activity. During the second stage of the saving system implementation – training and development – the employees are theoretically and practically acquainted with the saving system theory and its principles, their application through specific methods, and benefits that are generated. The third stage of the saving system implementation is to ensure that the planned saving system is put into practice.

One of the first steps in creating and implementing the company saving system is putting 5S (coping) into practice. Other directions of implementing the saving system are selected according to the nature of the activity in order to achieve a result. Often, it is customer satisfaction and loyalty-related challenges: the product or service quality improvement, shortening of order fulfilment cycle, delay reduction, productivity improvement, etc. (Leanprojektai.lt). During the third stage, continuous monitoring and coordination of applying

and implementing the saving principle system take place. The saving system experts consider maintaining of the implemented improvements one of the most difficult tasks. This phase includes continuous saving system supervision. In the course of the saving system implementation, measurements of the indicators of the key improved process changes of the company and assessment of the impact of these improvements on the indicators are carried out.

Having identified priority activities to be improved as well as still encountered problems to be removed, organisations switch to the search of solutions. Lean Six Sigma Logistics business management techniques suggest a number of methods and tools that help solve logistical problems in order to optimize individual processes of the activity. One of the means that was assigned previously just to the 6 sigma methodology, but now is regarded as a Lean Six Sigma Logistics problem-solving method, is DMAIC. According to the Lean Six Sigma Logistics ideology, the objective of applying this method (Goldsby, Martichenko 2005) is to improve and stabilize the logistical processes existing in the organization. It may be achieved by removing the processes that do not create value and improve the quality of the value-creating ones. The DMAIC approach consists of five strictly successive process refinement phases (steps):

Define. Organization activities are structured by identifying the process suppliers, inputs, process structure, outputs, and consumers; Voice of the Customer is structured and a Critical to Quality tree is created.

Measure. Information on all assessment parameters is collected.

Analyze. Based on the data collected at the measurement phase, the root problem reasons are identified. This phase results in a tested and proven hypothesis about the cause of the problem.

Improve. Solutions removing the main cause of improved activity are tested and implemented.

Control. Problem-solving efficiency is assessed, activity improvements through standardization are evaluated, and techniques for further improvement are foreseen.

These five phases are inseparable when implementing the DMAIC method (Arnheiter, Maleyeff 2005; Näslund 2008). Their consistent use in the process improving can bring great financial and qualitative results for an individual organization.

Waste is required to be eliminated in various activities and processes of a significant impact. Here, the importance of multiple criteria factors that influence the processes in the organizations

arise. Multiple criteria decision-making system enables you to find a common solution covering various process problems and providing its optimal application (Žvirblis, Zinkevičiūtė 2008; Meidutė, Vitkūnas 2011).

3. Analysis of results of Lean logistics system application

The Lean logistics principles help companies solve the dilemma of how to create more products, realize these products in new markets, and do it as speedy as possible and at a lower cost. Saving system implementing in companies is often synonymous to innovation introduction thus gaining an advantage over direct competitors.

Lean logistics has become already a business process optimization model for many famous companies (Boeing, Scania, Porsche, McDonald's, Pratt & Whitney, Danaher Corporation, Wiremold Company, Pella Corporation, Terex Corporation division – Genie Industries, Lockheed Martin Corporation, etc.), which implement Lean logistics and modify it by adjusting to their intended objectives. Lean logistics is not only a system created solely for production – this approach can also be applied effectively in any segment of the economy, where there may be found ineffectively exploited time, labour or other potential waste of resources. Some of the most prominent global service sector representatives that are guided by the principles of Lean logistics are the Bank of America Corporation, Park Nicollet Health Centre in Minneapolis, Jefferson Pilot Financial Insurance Company, Fujitsu Services (Technical Help Desk Services), etc.

3.1. Analysis of results of Lean logistics system application in North America and Europe

About 60 percent of North American manufacturing enterprises claim they are guided by the principles of Lean logistics. Lean Operational Improvements That Lasts (2010) data suggest that the enterprises that manufacture individual products (such as cars, toys, furniture, telephones, etc.) are more advanced than the companies with procedural (flour, salt, fuel, etc.) manufacturing or service, when implementing or developing and operating under a saving system philosophy in North America (Fig. 1).

It is not surprising that many of the individual product enterprises guided by the Lean logistics methodology report improved operational and financial indicators in comparison with the companies that show no interest in Lean logistics. The conducted study also provides that the sales volume per employee in the enterprises implementing

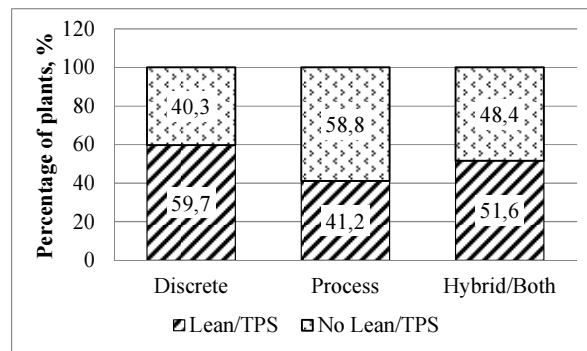


Fig. 1. Comparison of applying Lean logistics principles in different activity companies in North America (Source: Lean Operational Improvements That Last 2010)

Lean logistics reaches 176 thousand dollars (median), while in the companies that do not adhere to the principles of Lean logistics, the sales per employee are treble less – 54 thousand dollars. In the companies without existing production efficiency or improvement method, the sales per employee are about 37 thousand dollars.

Based on the study findings, timely delivery of the manufactured product to the customers (consumers) reaches 95.6% (median) in the companies using Lean logistics, 90% respectively – in the companies that have not implemented it yet, and 85% – in the companies that do not operate under any methodology that improves activity efficiency.

The study also shows that even two-thirds of American manufacturers (66%) guided by the principles of Lean logistics have had increased inventory turns over the last three years compared to the companies not following any method of improving activity efficiency.

In all sectors, European enterprises that apply the Lean logistics principles continue improving their activity processes and, thereby, increasing the gap between companies that are not guided by the Lean system philosophy. It is alleged that the improvement volume and scope in the organizations that have a wealth of experience using the highest principles of Lean logistics start decreasing after 5 or more years after introducing the Lean system. This testifies the organisation willingness as well as satisfaction (benefit) obtained from the ongoing improvements-changes.

In 2008, Allied Consultants Europe conducted a survey (Operational and Lean Management Survey 2008) seeking to evaluate the key elements of competitive advantages in the market for the European companies that are guided by the principles of Lean logistics. The survey is based on the data obtained from 771 European organizations.

Table 1 shows the percentage ratio between the European enterprises in manufacturing, service and public sector that are guided by the Lean logistics principles.

Table 1. Ratio of Lean principle application in European enterprises (Source: Applied Consultants Europe)

	Manufacturing, %	Administration, %	Public, %
Use Lean	69	41	39
Plan to use Lean	18	22	25
No plans to use Leans	13	37	36

The greatest spread of Lean logistics in Europe is noticed in the production sector (69%), while the use of Lean logistics in the service and public sectors is almost equally spread – 41% and 39% respectively. Over the past years, Lean logistics has become a popular methodology of improving activity and individual processes and is used by many companies in all sectors of the economy (Fig. 2).

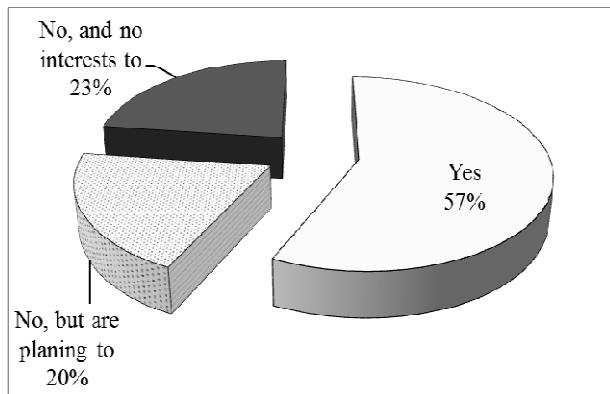


Fig. 2. Lean logistics system implementation in European companies (Source: Operational and Lean Management Survey 2008)

Figure 3 shows the correlation between the companies with introduced Lean logistics and their activity results as well as comparison with the

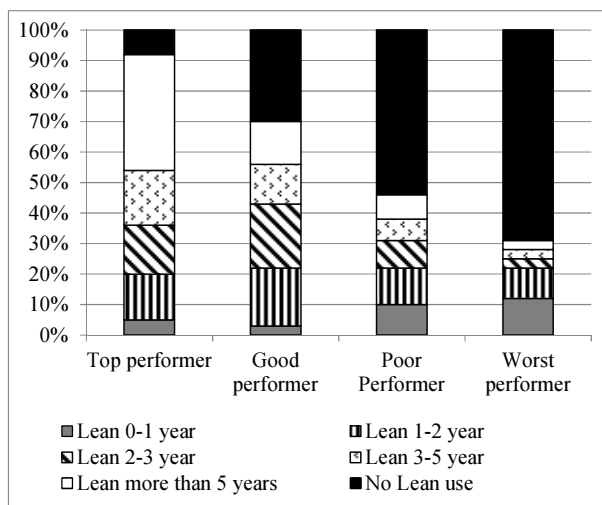


Fig. 3. Graph of correlation between application of Lean logistics system methodology and company activity (Source: Operational and Lean Management Survey 2008)

companies that were not guided by the Lean logistics methodology. The results show that 93% of the companies reporting the best activity have implemented Lean logistics, while 69% of the companies that had the worst activity results during the survey were not guided by the Lean logistics principles.

10% of the survey related companies guided by the Lean logistics methodology for more than 3 years have been ascribed to poor or the worst activity organizations. This proves that the Lean logistics kit specifically tailored for an individual company must be regularly reviewed and re-assessed seeking the best results.

3.2. Analysis of Lean logistics system application in Lithuanian companies

In 2012, Prime Consulting conducted a poll among 509 largest Lithuanian business leaders to determine their familiarity with the effective managing methods and theories. The poll showed that the effective management theory (Lean logistics) is among the best-known one among Lithuanian CEOs – at least 93% have heard something about it.

The poll results were quite unexpected and proving that Lithuanian business leaders think about the future and are interested in well-known effective management systems. Quite a few Lithuanian companies have implemented certain Lean logistics principles or adapted techniques, while still more are seeking to do it in the nearest future.

According to unofficial data, about 60 enterprises and organizations in Lithuania are implementing Lean logistics currently – international companies have taken this practice over from their mother companies while Lithuanian capital entities decided to take over their successful experience (Girdziušas 2014).

To find out more specific spread of implementation of the Lean logistics principles and opportunities to apply them in Lithuanian transport companies, a poll of CEOs was conducted. 83 Lithuanian companies with the highest revenues from the sales in I-III quarters of 2012 were selected for the poll. The core activities of all 83 companies are related to cargo and passenger transportation, logistics, charter services, postal and courier activities, cargo handling, warehousing, freight forwarding, vessel management and air navigation services, ship agency, chartering, harbour tug services, etc. Replies were received from 34 enterprises.

13 respondents (38%) represented medium size enterprises, 9 of the respondents (26%) – large enterprises, 7 respondents (21%) – small enterprises, and 5 respondents (15%) – micro enterprises.

47% of the responding companies provide 2 PL services – transport, storage, and forwarding services. Only transportation services (1 PL) are provided by 11 respondents (32% of all respondents), 5 provide 3 PL services – integrated transport services, which include 1 PL, 2 PL, and customs agent service. 2 poll respondents (6%) indicated that their represented companies provided 4 PL services (supply chain managing).

In order to figure out the spread of the Lean logistics principles as well as opportunities to apply them in Lithuanian transport companies, respondents were asked what methods of effective management they were aware of. According to the respondents, they were aware of the quality management system – 85% (ISO standards) and Lean logistics – 79%.

The respondents were asked whether their represented company was guided by the effective management methods and, if so, how it was guided and by which methods. 20 respondents indicated that their represented companies used effective management methods, while 14 stated that no effective management methods were applied.

The respondents, who indicated that effective management methods had been implemented, stated that it was the ISO 9001 standard (9 respondents – 45%), 6 respondents (30%) specified that it was the ISO 9001 standard as well as the Lean logistics methodology. Two respondents (10%) indicated that they were guided by the JIT method (10%), while three (15%) stated that they were guided by effective management methods without specifying them.

The respondents were given eleven principles of Lean logistics and asked to evaluate whether their represented transport company was guided, partially guided, or not guided by these principles.

The poll data showed that the transport companies were guided by the principles of networking process, narrowing of service supplier network, Kanban or JIT, flow (effective one process proceeding), as well as development and perfection of relationships with suppliers. According to the poll, many responding companies were partly guided by the principles of sequence of steps, minute time-saving at the process change-stages, comprehensive activity process replacement, Value Stream Mapping and value creation, and 7 types of waste identification. The mostly unused Lean logistics principles in the transport companies are: process Visual Stream Mapping, development of the relationships with suppliers, overall replacement of process activity, minute time-saving at the process change-stages, and sequence of steps.

The poll results respond to the research task – a part of the Lean principles are applied or partially applied by some Lithuanian transport companies.

The respondents expressed a view that their represented companies could adapt and face benefits from the next Lean logistics principles: creation of value and 7 types of waste identification (12 respondents, 35%).

The respondents were asked to identify the potential root problems when implementing Lean logistics in a transport company. According to the received answers, the major constraints are related to the specifics of the transport activities, when the process shortening or process removal is hardly imaginable. Value creation and waste identification are emphasized, while employee motivation and Lean logistics benefits lack understanding. Change or innovation is related to the staff resistance, fear of being unable to adapt as well as work differently. This is usually connected with presenting inadequate scope of information.

When implementing Lean logistics, one of the key steps is theoretical and practical training of employees and overall employee involvement in carrying out the changes.

The respondents were asked to give opinions on whether they would implement the Lean logistics principles in the transport company in case they would be leaders (are current leaders). 91% of the respondents were in favour of the implementation of the Lean logistics principles in the transport companies, while only 9% – against it.

These results suggest that applying the Lean logistics principles in the Lithuanian transport sector will gain more pace in the future; so it would be appropriate to propose a conceptual industry-tailored model of implementing Lean logistics.

4. Conceptual model of Lean logistics implementation in Lithuanian transport sector enterprises

The stages of implementing the Lean logistics principles in Lithuanian transport companies (conceptual model) should be related to each other and oriented to one objective thus seeking to reduce costs and waste and create a greater value for both the company and customers. The Lean logistics implementation methodology is the guidelines for applying a Lean logistics model to Lithuanian transport companies. Based on it, the model implementation should be divided into three main short-term stages (6–9 months) (Fig. 4).

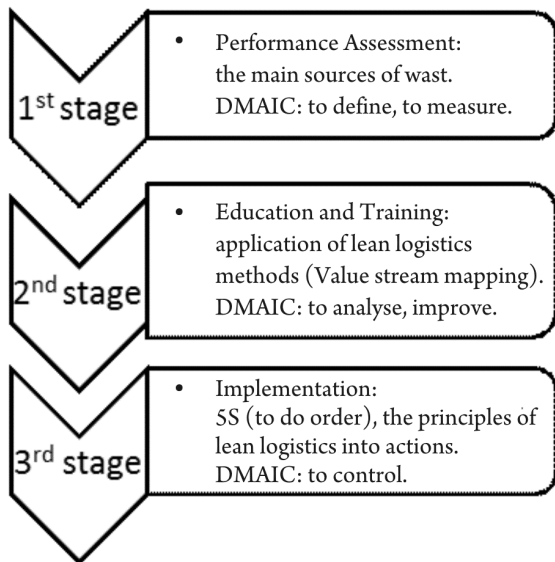


Fig. 4. Short-term Lean logistics model for Lithuanian transport companies (6–9 months) (Source: developed by the authors)

During all stages, the Lean Six Sigma Logistics problem-resolving method – DMAIC – is applied in parallel. The aim of the DMAIC method applied herein is to improve and stabilize the existing logistics processes in the organization. Different parameters are used at different stages of the method.

At the first stage, a specific activity assessment of Lithuanian transport companies is conducted. Two components are used at the first stage of the DMAIC method: define and measure. The transport company staff assisted by the consultants shall decide what to seek, what result to anticipate, and what customer satisfaction-level to create through implementing the Lean logistics system. At this stage, 7 key sources of waste should be determined. Thus, the transport company should set a clear and specific objective to be pursued.

The second stage is assigned for training. The transport company staff is given theoretical training in the Lean logistics basics as well as educated in practical application of the principles of Lean logistics in the activities. The third and fourth DMAIC method components are applied: analyse and improve. By analyzing the current situation, an action plan setting out the proposed solutions is created. Work groups (customs brokerage, customer service, sales, finance, and other areas depending on the range of services provided by the company) should be formed to prepare a specific action plan and pursue the improvement of the main activity processes of the company. The work groups convened according to the specifics use the analysis results along with the knowledge gained in time of training in order to prepare and later implement the most effective plan of the waste

removal and activity improvement. Value Stream Mapping is applied in planning as well.

The third stage of the Lean logistics model application is implementation of the Lean logistics principles, coordination and monitoring of results. The aim of this stage is to ensure the created action plan is put into practice. The fifth component of the DMAIC method – control – is applied.

At this stage, the first transport company step should be realization of 5S (coping). When putting 5S into practice, the transport company employees should be ensured that both work means and necessary documents (forms, phone lists, price lists, maps, calendars, etc.) are organized within a close reach, while those that are not used by the employees – removed. Documents should be sorted and, workplace is organized at the end of the work hours, bills, invoices and other related documents are duly filed, and incomplete work are sorted to a separate work box according to work importance. It must also be ensured that documents are consistently returned to their places while order and discipline procedures are complied with on a daily basis. After implementing the 5S method, it should be switched over to putting the action plan into practice by applying the Lean logistics principles.

Putting saving logistics principles into practice, a permanent control of carrying out the plan must be kept in mind. The fifth component of the DMAIC method – control – is applied, in time of which the Lean logistics principle of monitoring-coordination is used, problem resolving effectiveness is evaluated through applying a specific Lean logistics principle(s), activity improvements are assessed, and further improvement techniques are foreseen.

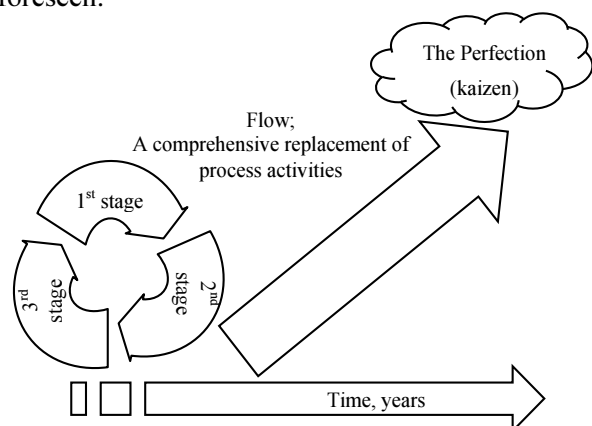


Fig. 5. Long-term model of applying Lean logistics system (Source: developed by the authors)

The company management should be permanently informed of the implemented changes and their benefits or unforeseen obstacles and failures, after evaluating what right decisions should be made seeking the planned activity efficiency. Continuous monitoring of the Lean logistics applica-

tion must be carried out in the company at all times after implementing the Lean logistics principles. Seeking perfection (kaizen), overall replacement of process proceedings, and flow within the long period (almost all the company's operation time) – it shall be repeated in the short-period phases (Fig. 5).

5. Conclusions

For the enterprises that are seeking to gain competitive advantage in the ever-changing business environment, applying Lean logistics is an opportunity to improve internal processes and thus reduce costs as well as increase the value that is created for the customers.

Applied as a complex, the key elements of Lean logistics – 7 types of waste elimination, Value Stream Mapping, 5S, Kanban, JIT techniques, Kaizen, and Lean Six Sigma DMAIC method, as well as other techniques can yield considerable financial and qualitative results.

Globally, the conducted research results show that applying Lean logistics in enterprises in the Western Europe and U.S. provides them with benefits. A greater benefit is achieved by the enterprises that apply Lean logistics for more than 2 years, and the most – over 5 years.

Research carried out in Lithuania suggests that the Lean logistics concept is known to Lithuanian businesses and increasingly used. However, this practice is still new (especially in the transport sector); therefore, there is lack of specifically tailored conceptual models of implementing the considered systems in this sector enterprises.

The presented conceptual model of implementing the Lean logistics system in Lithuanian transport companies is unique but, at the same time, quite versatile. It includes two periods: a short (6-9 months) and long one (on-going and never-ending), which actually have to ensure continuous activity improvement of a business (on-going improvement of service quality and competitiveness).

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