

**Macroeconomics**

Iryna KOLOS,
Alla GRECHAN

**STAGES OF DEVELOPMENT
OF THE LEAN PRODUCTION CONCEPT
AND SPECIAL FEATURES
OF ITS ADAPTATION
TO THE NATIONAL ECONOMY**

Abstract

Features for territorial and chronological changes in the orientations of the concept of lean production argued. Strict adherence to internal standards that ensure quality and speed of execution of productive and administrative tasks with necessary expenses (without expenses) on creation of value for the consumer and economic benefits in the future is characteristic for Japan. In the US, the quality and performance is achieved by the Executive within a professional competence through the use of appropriate tools. For Europe, characteristic is the use of lean tools to produce the desired result in clearly planned terms. In France, especially important is compliance with social standards on labor conditions and environment protection while increasing productivity.

Achievements of the world auto industry leaders in lean improvements that ensure adoption of lean thinking and lean culture are represented. The changes in the way of management of the enterprise are introduced by overcoming:

© Iryna Kolos, Alla Grechan, 2016.

Kolos Iryna, Cand. of Economic Sciences, Assist. Prof., Educational and Research Institute of Economics and Management National University of Food Technologies, Kyiv, Ukraine.
Grechan Alla, Dr. of Economics, Professor, National Transport University, Kyiv, Ukraine.

(1) production issues (economic order quantity determination, establishing effective use of limited resources, development of efficient production schedule, planning of the production process and production areas); (2) organizational issues (value stream for all structural units determination, empowerment particular executor, focusing on the value stream for customer through process improvement and losses elimination).

The feasibility of the introduction of company management on the principles of lean is proved taking into account peculiarities of the national economy through the prism of public-private partnership: public institutions, social organizations, top management of companies and stakeholders (primarily suppliers and customers). It was discovered that search for ways to overcome the external imbalances contributes to the development of partnerships at different levels: regional, national, supranational and global. The conclusion is made that the state support is crucial for the dissemination of the concept of lean production. Network of nongovernment organizations promotes ideas of lean thinking and practice through trainings, conferences and webinars (Internet-network), summits (full-time plenary). Top management must be ready for continuously transformations and trainings, development and improvement, which are the basis of successful practical implementation of the concept of lean production. This will increase productivity and improve working conditions through the mobilization of resources, increased standardization of processes and social dialogue with staff. Experience for the introduction of elements of the concept and implementation of the tools of lean production at domestic enterprises, which confirms the effectiveness and appropriateness of active implementation is considered.

Key words:

Lean Production, Lean Thinking, Lean Culture, public-private partnership on lean production.

JEL: M11, M21, O33.

Introduction

Urgency. Entry of Ukraine into the European economic space involves domestic business entities into active search of innovative ways to develop and improve production processes. The need to change productive methods and technology, revision of methods of production and company management with a focus on creating added value on efficiency and a consumer focus (quality and speed) as well as performance and minimization of unproductive expenditures are currently most important issues. Solution for these issues is reflected in the concept of Lean Production.

Both foreign and domestic scholars and practitioners pay considerable attention to research of concerns of the introduction of the concept of lean production in various aspects (Kolos, 2016, pp. 214–219; Kolos, 2016, pp. 27–31; Omelyanenko, Shherbyna, Barabas and Vakulenko, 2009). They set the logical-historical stages of changing the concept of lean manufacturing with the definition of the characteristics and limitations of each stage in enterprise management: (1) focus on efficiency and productivity through the study of costs and losses; (2) focus on the value to the customer through the involvement of employees; (3) focus on quality and sustainable development through the synergy of interests of key stakeholders (Kolos, 2016, pp. 214–219). Substantiated is the transformation of information requests and expectations of interested parties in the historical aspect, taking into account the experience gained from reporting in accordance with the changing priorities of the lean transformation of the financial statements (for the establishment of the costs), financial and management reporting (for a fair disclosure of related data on the results of the staff and meeting consumer demand) to the integrated reporting (to present the results lean transformation by combining financial and non-financial data in a logical coherent system) (Kolos, 2016, pp. 27–31). At the same time, researchers paid not enough attention to chronological and territorial peculiarities of the concept of lean production transformation with a focus on improving the efficiency of the individual enterprise, its role in the development of the national economy of a certain state is not defined, and these omissions determine the relevance of the problem and the need for further research.

The object of research is the development of the concept of lean production in enterprise management, taking into account territorial and temporary promotion and focus on overcoming the adverse economic situations.

Objectives and tasks. The aim of the research is to systematize and further development of theoretical and methodological bases of formation and use of the concept of lean production, and to establish features of its adaptation to the national economy.

Achieving this goal necessitated solution of following tasks:

- based on the analysis of the works of foreign researchers, to set the stages of changes of landmarks in the concept of lean production on the territorial-chronological basis;
- disclose the results of the achievements of the world's leading auto-makers to introduce lean improvements on a continuous basis;
- justify the role of active support in the implementation of technologies, methods, tools of lean production at the state, public and management of the enterprises levels in order to enhance the efficiency of the national economy;
- highlight the features of adaptation of the concept of lean production in national economies.

The study used such methods and techniques: structural logic and system analysis, historical method – to determine the logical-chronological stages of change in guidelines of the concept of lean production; grouping method, comparative historical and systematic methods for highlighting features of adaptation of the concept of lean production by territorial geography; comparative method – to determine the importance of the support of public institutions and non-governmental organizations in the implementation and dissemination of lean improvements in enterprise management. At the same time, we used scientific methods of research – analysis, synthesis, induction, deduction, monographic method.

The basic material

Period of the beginning of the concept of Lean Production among specialists in management remains controversial. According to the territorial aspect, the USA are the country of origin – the basic idea of the concept of lean production laid down by Henry Ford on the brink of the twentieth century. As it formed the production philosophy of consistent implementation of technological operations (Ford Production System, FPS), operation of an industrial enterprise is focused on the increase in productivity as a results-based measure of the performance through the introduction of standardized methods of production, division of labor, use of statistical control methods for quality improvement. But the problem of this philosophy was the failure to ensure the production of various models of cars in small batches that foresees performance of additional quantity of various technological operations.

The country of the establishment and formation of the basic principles of development and implementation of the concept of lean production tools is Ja-

pan. Taking as a basis the FPS, Japanese experts, starting from 1930 and more actively after the end of the Second World War, developed the basic principles and provisions of the production system – Toyota Production System (TPS). This system insists on change in targets of industrial enterprise on a slow build-up of production with a focus on a thorough and consistent reduction of losses through respect for the work of the worker, which provide only the necessary amount of the product at a set time and of selected quality. This justified the transition from the process of production (cars) to the flow of value creation for the consumer (the inherent usefulness of the product for the consumer: the expected quality, quantity, price, delivery time) (Wader, 2011, pp. 19, 124; Omelyanenko et al., 2009, pp. 12; Ohno, 2008, pp. 36–37, 97–98). At the same time, this approach provides a rational combined use of the limited resources (material, technical, technological, human, financial, information). As a result – improvement of production efficiency and involvement of employees in the process of continuous improvement.

Further international recognition and dissemination of the concept of lean production is also gaining, primarily among automakers. For a long time there was the spread of the ideas of thrift through the improvement and development, adaptation and change tools, in particular, Kaizen, Poka-Yoke, Kanban, 5S, TQM, JIT. Enhancing scientific, methodological and applied research on the implementation and use of tools aimed at a combination of such priorities as the high level of quality, consumer satisfaction, employee safety, responsible attitude to the environment facilitates the integration of best practices from different countries and business sectors.

Development of the Toyota Production System (1930 to 1970) was accompanied by international recognition, which further reflected in the spread among the industrial enterprises with different production capacity as the concept of Lean Production (since 1970), Lean Manufacturing (since 1980), Lean Management (since 2000), followed by the distribution sector (Lean sector since 2010), in particular Lean Engineering, Lean Office, Lean Hospitals (10 QUESTIONS SUR ... Le lean, 2015, pp. 9; Institut Lean, France, 2016).

Application of the concept of lean production to overcome the crisis and improve efficiency and effectiveness of the functioning of the long-term proven practice of industrial companies in the world (Ohno, 2008, pp. 27–30). Lean transformation provides the best opportunities for improvement and achievement of strategic indicators of organizations in various sectors: construction, transport and communications, logistics, finance, culture, health, education. The most effective implementers of lean production in the automotive manufacturing sector are following world leaders (Top 10 lean automotive manufacturing in the world, 2015, pp. 13–14):

- 1st place – Toyota – one of the three largest car manufacturers in the world where developed and successfully embodied the philosophy of

Lean Production (TPS) to reduce losses to ensure a minimum level of errors and maximize efficiency;

- 2nd place – the Nissan (one of the efficient producers with a unique system of production) – implements the principles of thrift through the emphasis on timing and information technology (Nissan Production Way);
- 3rd place – GM (one of the leaders in the US) – since 1980 constantly adapting and improving methods of production with a focus on environment and sustainable development (Saturn KanBan Implementation);
- 4th place – Ford – provides constant investments with a focus on reducing start-up time by 50%, and a focus on performance, the result of which is to improve the efficiency and reduction of losses (FPS);
- 5th place – Tesla – implements the concept of lean production in order to change the car through the equivalent on the relevance of the characteristics of aspects: Product Lifecycle Management and implementation of continuous updating of the software and hardware. As a result – reducing the load on the assembly line and maintenance;
- 6th place – Hyundai – the intention to further develop activities in the context of frugality caused by the appointment of the general director Dave Zuhovski (in 1980 marked the beginning of the term «lean production»);
- 7th place – BMW – changes in the activity concentrated on the production lines and are focused on lean standards and sustainable development for reducing the distance between the producer and the buyer;
- 8th place – PSA Peugeot Citroën (introduced within the 16 plants improvement initiative – PSA Excellence initiative) – production is organized on the principle of lean, with a focus on continuous technological and operational excellence, innovation;
- 9th place – McLaren (manufacturer of luxury high-speed production) – a business partnership with a provider of technology allows to focus on quality and creating a lean production facility;
- 10th place – Honda – deploys production facilities according to the standards of lean production, taking into account the context of globalization processes.

Thus, the introduction of the world's leading automakers lean improvements on a continuous basis is the evidence of effectiveness of this concept, which provides an innovative activity, enhances competitiveness and sustainability in the market. That is the concept of lean production in the current conditions

in the United States as the best approach to business management criteria for the proper performance and sustainable competitive advantages (Shah and Ward, 2007, pp. 785).

But it should be noted that lean production implementation necessarily involves a careful study of unique approaches and adaptation of existing methods, techniques and tools, taking into account the mentality and peculiarities of business operation and continuous conduct training of all personnel in theory of lean production and introduction of the latest practical achievements. The only constant is the control orientation – continuous improvement of production and reduction of losses (unproductive expenditures) to further minimize them up to complete in the flow of value creation for the consumer, the adoption of Lean Thinking and a Lean Culture.

Appropriate to consider in the light of the public-private partnership, which is contradictory, conflicting and competitive nature between subjects in modern conditions of business management based on the introduction of thrift: the state, the public, the company's top management and business partners, the key of which are suppliers and consumers. Only on fruitful cooperation with a focus on creating value for consumers will depend the achievement of the desired results of functioning of economic entities, welfare of the owners and staff, level of development of the national economy.

World experience shows that a significant role in boosting the spread of the concept of lean production plays a State, through appropriate institutions. On the state level the Lean Advancement Initiative (LAI) was created in the USA, in the UK – UK Lean Aerospace Initiative, France – l'Agence nationale pour l'amélioration des conditions de travail (Anact). The purpose of their activity – promoting targeted industry transformation through the implementation of modern methods of production organization, behaviors and tools to improve the cooperation of all parties concerned with the preservation and creation of jobs with safe working conditions (KAIZEN: experience of implementation abroad, 2015, pp. 12–14; L'AGENCE nationale pour l'amélioration des conditions de travail, 2013). At the federal level the Network Manufacturers Expansion Partnership (MEP) was organized in the USA to support small and medium-sized enterprises and to provide business consulting and industrial training (KAIZEN: experience of implementation abroad, 2015, pp. 13).

In France, during 2009–2012, the Ministry of Economy supported the pilot program «JIT-lean» in the textile industry and enterprises for the production of clothing. For its realization were selected 30 companies from the three regions (Midi-Pyrénées, Rhône-Alpes, Alsace-Lorraine), which received funding of 652 thousand euro on the elimination of waste sources and improving the flow of value creation for consumers on the quality criteria, costs, time performance (10 QUESTIONS SUR ... Le lean, 2015, pp. 3). Since 2013, the project «Future Industry» was launched in the country. The project is aimed on the modernization

of industry (production capacity), and transformation of the business model with a focus on strengthening the competitiveness, rapid satisfaction of consumer needs, care for employees and the environment. This project is based on five basic principles:

- development of technological proposals,
- state support of business,
- the development of professional competence and training of artists,
- strengthening of European and international cooperation,
- involving stakeholders in the promotion of the French experience.

Mobilization of all stakeholders in the dissemination of the «French know-how» going around «9 Industrial Solutions»: data economy, smart objects, digital trust, reasonable food, new resources, the eternal city, ecological mobility, transportation tomorrow, the future of medicine. Within this project we identified the most promising at the level of global competition sectors of activity, which will have the financial support of the Government: 2,5 billion euro reduction of the tax burden in the 12 months of investing in production and 2,1 billion euro in additional loans for 2 years development (GOUVERNEMENT RÉPUBLIQUE FRANÇAISE, 2016).

At the international level, the adaptation of methods, techniques and tools of lean production to the peculiarities of mentality and state of development of the national economy, theoretical and applied training and exchange of experience provides a network of NGOs. So, Japan Institute of Plant Maintenance (Japan Institute of Plant Maintenance, 2016), The Lean Enterprise Academy (The Lean Enterprise Academy, 2011), Planet Lean (Planet Lean: The Lean Global Network Journal, 2016), Lean Global Network (Lean Global Network, 2015), Lean Enterprise Institute (Lean Enterprise Institute, 2000), Lean Enterprise Institute Polska (Lean Enterprise Institute Polska, 2016), Institut Lean France (Institut Lean France, 2016) help to spread ideas of lean thinking and practice through training and Lean training, conferences and webinars (Internet-network), summit (full-time plenary).

With the aim of training, dissemination and exchange of experience in the practice of introduction the concept of lean production organization Lean Global Network was established, contact network of NGOs representatives in the field of lean production in the US, UK, Australia, Brazil, Holland, Israel, India, Italy, China, South Africa, Poland, Turkey, Hungary and France. Cooperation with such organizations enables business entities to introduce an innovative approach not only in manufacturing but also in business management in the performance of certain functions within departments and job responsibilities in a separate workplace.

One of the objectives of cooperation between the state, public organizations and industrial enterprises is to promote the adaptation of work on companies of different sizes and sectors of the economy. This will increase productivity and improve working conditions through the mobilization of resources, increased standardization of processes, and social dialogue with the involvement of staff.

In order to promote the unity of the Ukrainian-Japanese values in the social, economic and scientific fields in 2010 KAIZEN Club was created in Ukraine (KAIZEN Club in Ukraine, 2014). Activities to promote the philosophy of lean production and continuous improvement among the representatives of Ukrainian business, government, local authorities and public organizations are to be performed through:

- conduct for managers and professionals seminars and trainings, workshops, expert consultations, publications related materials;
- dissemination and exchange of experience in practice of the successful implementation of the concept of Lean Production tools by best domestic enterprises; disseminating useful information on the implementation of Lean Production in the different countries of the world;
- organization of study tours to the best enterprises of Ukraine, Japan and Europe to get acquainted with Lean Production in action;
- development of materials for Lean training on multi-level training program for certified practitioners and experts in the development of production on the principles of lean production;
- organization of effective cooperation between the Ukrainian enterprises, creating conditions for the effective development of Ukrainian business and improve its investment attractiveness.

With the support of the Japan International Cooperation Agency (JICA) representatives of domestic leading enterprises (heavy industry, light industry, agricultural sector) involved in the training mission in Japan, which contributes to the accumulation of experience in the implementation and use of the principles, methods, the Japanese style of management tools with a focus on continuous improvement (KAIZEN Club in Ukraine, 2015). Readiness of top management to continuous transformation, continuous training, development and improvement is the key to successful practical implementation and realization of the concept of lean manufacturing. The only enterprise in Ukraine with lean thinking, working on the philosophy of lean production for a long time, is Kremenchug factory of tobacco products of PJSC «JT International Ukraine» – the European division of Japan Tobacco Inc. (Boychevskaya, 2014, pp. 18; Public Joint-Stock Company «JT International Ukraine», 2014). Signs of this decision of lean thinking can be considered now: use of the concept of lean production methods within the economic activities in all areas of work; introduction of organizational culture with a

focus on lean production tools and its executor; understanding value stream with a focus on effective collaboration with suppliers and customers; pursuit of perfection of processes with focus on continuous improvement.

Among domestic enterprises in the food industry as a leader in the use of tools of lean production can be considered as the largest manufacturer of quick breakfast in Ukraine PJSC «Lantmannen Axa» (KAIZEN Club in Ukraine, 2016), a concept, whose business is focused on providing an exceptionally high level of product quality from the beginning of the production cycle (planting and finishing crops) through production to the final consumer at the supermarket. This was made possible through the establishment of teamwork, intensive open exchange of information, eliminating losses, improving on a continuous basis. In the course of economic activity starting from 2012, PJSC «Lantmannen Axa» is guided by the developed and approved rules and policies based on thrift:

- Code of Conduct, where a commitment in five areas: the environment, business ethics, work environment, social conditions and working conditions, health and safety, products and services (Public Joint-Stock Company «Lantmannen Axa», 2015);
- Code of Conduct for suppliers, which are fixed demands responsible behavior with regard to the principles of the UN Global Compact following areas: environment, business ethics, working conditions and social conditions, implementation of and follow-up (Public Joint-Stock Company «Lantmannen Axa», 2008);
- Code of the LEAD (based on the Kaizen philosophy – Learn – Engage – Analyze – Do), which is fixed methods of work on operational excellence, which aim at (1) improving performance by reducing costs and increase profits in the long term, (2) identify and develop the potential of all, without exception, workers, (3) involvement of all personnel in the process of continuous improvement, (4) increase in staff motivation, (5) improvement of communications between the structural units (6) development of common tools and working methods, (7) standardization and simplification of processes, (8) a qualitative change in the production of culture (Public Joint-Stock Company «Lantmannen Axa», 2012).

Thus, the introduction to the concept of lean production is aimed at harmonizing conflict between meeting the needs of consumers and improvement of production processes, quality assurance requirements of the product and time and cost of its production, achieving increased productivity and the creation of workplaces with appropriate and safe working conditions.

Conclusions

According to the results of the research the following conclusions are made:

1. In current conditions of the economy significantly tightened requirements for the management of the enterprise on the basis of innovation. It becomes relevant prediction of adverse factors and the nature of their impact on the functioning of the enterprise, as well as a justification of actions to address and prevent the negative consequences. Of particular importance is the introduction of the concept of lean production with a focus on ensuring the desired result in the long term.

2. On the basis of the analysis and synthesis of approaches to enterprise management features of reasoned historical territorial changes landmarks in the concept of lean production. Strict adherence to internal standards that ensure quality and speed of execution of productive and administrative tasks with necessary expenses (without expenses) on creation of value for the consumer and economic benefits in the future is characteristic for Japan. In the US, the quality and performance is achieved by the Executive within a professional competence through the use of appropriate tools. For Europe, characteristic is the use of lean tools to produce the desired result in clearly planned terms. In France, especially important is compliance with social standards on labor conditions and environment protection while increasing productivity.

3. Achievements of the world auto industry leaders in lean improvements that ensure adoption of lean thinking and lean culture are represented. The changes in the way of management of the enterprise are introduced by overcoming: (1) production issues (economic order quantity determination, establishing effective use of limited resources, development of efficient production schedule, planning of the production process and production areas); (2) organizational issues (value stream for all structural units determination, empowerment particular executor, focusing on the value stream for customer through process improvement and losses elimination).

4. The feasibility of the introduction of company management the principles of lean are proved taking into account peculiarities of the national economy through the prism of public-private partnership. We believe that government support is crucial for the dissemination of the concept of lean production, which will contribute to strengthening the position of the national economy. As a result of coordinated work of state institutions, public organizations, top management of an industrial enterprise and business partners (primarily suppliers and customers) is to strengthen the competitive status of the separate business entity, improve the functioning of the results of the corresponding sector of the economy

and the position of the national economy as a whole, as well as improving welfare of the nation.

5. Experience for the introduction of elements of the concept and implementation of the tools of lean production at domestic enterprises, which confirms the effectiveness and appropriateness of active implementation is considered.

Prospects for further studies of this problem in Ukraine and other countries require the development of theoretical and methodical positions, practical recommendations for business management in the context of thrift, which is crucial for the further development and long-term success of every enterprise.

References

1. Boychevskaya, S. (2014). Kaizen Activity Club in 2013. *Informatsionnyiy byulleten Kaydzen Kluba v Ukraine*, 1, 18–19 (in Russian).
2. Wader, M. (2011). *Lean Tools: A Pocket Guide to Implementing Lean Practices*. Textbook. Moscow: Alpina Pablishez (in Russian).
3. Kaizen: experience of implementation abroad (2015). *Informatsionnyiy byulleten Kaydzen Kluba v Ukraine*, 7, 12–14 (in Russian).
4. Kolos, I. V. (2016). Logical and historical stages of the evolution of the concept of Lean Production. *Ekonomika i suspilstvo*, 3, 214–219. Retrieved from: <http://economyandsociety.in.ua> (in Ukrainian).
5. Kolos, I. V. (2016). The role of reporting in the management of industrial enterprises on lean principles. *Texnologichnyj audyt i rezervy vyrobnytva*, 3/4 (29), 27–31. – DOI: 10.15587/2312-8372.2016.72203 (in Ukrainian).
6. Omelyanenko, T. V., Shherbyna, O. V., Barabas, D. O., Vakulenko, A. V. (2009). *Lean Production: concept, tools, experience. Monograph*. Kyiv: KNEU (in Ukrainian)
7. Ohno, T. (2008). *Toyota Production System. Beyond Large-Scale Production* [Textbook]. Moscow: Institut kompleksnyih strategicheskikh issledovaniy (in Russian).
8. KAIZEN Club in Ukraine. Retrieved from: <http://www.kaizenclub.com.ua/en/>.
9. Public Joint-Stock Company «JT International Ukraine». Retrieved from: <http://jtiu.emitents.net.ua/ua/> (in Ukrainian).
10. Public Joint-Stock Company «Lantmannen Axa». Retrieved from: <http://www.lantmannen.ua/en>.
11. Top 10 lean automotive manufacturing in the world (2015). *Informatsionnyiy byulleten KAYDZEN Kluba v Ukraine*, 9, 13–14 (in Russian).

12. 10 QUESTIONS SUR ... Le lean. Retrieved from: <http://www.anact.fr/10-questions-sur-le-lean> (in French).
13. Gouvernement République Française. Retrieved from: <http://www.gouvernement.fr/action/la-nouvelle-france-industrielle> (in French).
14. Institut Lean France. Retrieved from: <http://www.institut-lean-france.fr/> (in French).
15. Japan Institute of Plant Maintenance. Retrieved from: <http://www.jipm.or.jp/en/>
16. L'AGENCE nationale pour l'amélioration des conditions de travail. Retrieved from : <http://www.anact.fr/> (in French).
17. Lean Enterprise Institute. Retrieved from: <http://www.lean.org/>
18. Lean Enterprise Institute Polska. Retrieved from: <http://www.lean.org.pl/institut/> (in Polish).
19. Lean Global Network. Retrieved from: <http://www.leanglobal.org/>
20. Planet Lean: *The Lean Global Network Journal*. Retrieved from: <http://www.planet-lean.com/>
21. Shah, R., Ward, P. T. (2007). Defining and developing measures of lean production. *Journal of Operations Management*, Vol. 25, No. 4, 785–805. doi: 10.1016/j.jom.2007.01.019.
22. The Lean Enterprise Academy. Retrieved from: <http://www.leanuk.org/>

The article was received on September 13, 2016.