



Development of A General Theory of Lean Production of Goods And Services

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Abstract: *the subject of the article is methodological aspects of the theory of lean production of goods and services; the object of the article is lean production of goods and services; the purpose of the article is the formation of methodological provisions of the scientific theory of lean production of goods and services (the theory of thrift); to achieve the goal, this article solves the following tasks: search and analysis of publications on the topic of lean production of services for confirmation of the relevance of the research presented in this article; definitions of the object, method, functions, roles, laws of the scientific theory of lean production of goods and services; the functions, roles of the philosophy of lean production of goods and services are described; the directions of development of the philosophy and methodology of lean production of goods and services are investigated; the scientific methods in this article are: historical and logical method, system analysis, expert assessments; the scientific novelty of the article is determined by the development of the methodology of lean production of goods and services, the study and description of the structural elements of the theory of lean production of goods and services (the theory of thrift) and its structural elements.*

Keywords: *theory, methodology, firm, philosophy, lean manufacturing, losses, mission, vision, structure, strategy, element, efficiency, risk*

I. Introduction

The relevance of this article in 2023 is determined by the fact that the lean manufacturing method can be an anti-crisis tool. To implement the lean manufacturing method in practice, it must be studied at universities. The study of lean production in universities is complicated by the fact that the general theory and methodology of such production (the theory of thrift) has not yet been developed. This determines the need to develop the philosophy, methodology, and scientific theory of lean production of goods and services.

The hypothesis of the article is the assumption that the development of the theory of lean production can increase the effectiveness of this method in the pedagogical process at universities and expand the practice of applying the lean production method in the real economy.

The purpose of the article is to increase the efficiency of studying at universities and the practical application of the methodology of lean production of goods and services (the theory of thrift) in the real economy.

To achieve this goal, this article solves the following tasks:
- search and analysis of publications on the topic of lean production of services in the real economy and higher education;

- definitions of the object, method, functions, roles, and laws of the scientific theory of lean production of goods and services.
- the functions and roles of the philosophy of lean production of goods and services are described;
- the directions of development of the philosophy and methodology of lean production of goods and services are investigated.

The object of the article is the method of lean production of goods and services.

The subject of the article is the methodology of lean production of goods and services (the theory of thrift).

To confirm the thesis about the absence of a general theory of lean production of goods and services, we will search and analyze publications in the Russian Scientific Citation Index on the topic of lean production in economics and higher education within the framework of this study.

At the same time, education is understood as a social service.

The conducted research has shown that this topic of lean manufacturing attracts the attention of the international scientific community.

Scientists are investigating the process of formation of lean production in Toyota [1, pp. 148-152]. Experts study the principles and tools of lean manufacturing [2, pp. 642-647]. University professors are exploring the possibilities of applying the methodology of lean production in universities and the impact of universities on lean production in the real economy [3, pp. 42-45]. It is proposed to implement the modernized university management scheme: to change the entire regulatory framework; and to organize the introduction of scientific, educational, and production complexes into the educational process [4, p.162-168].

Teachers believe that business games allow, without affecting the production sites of the enterprise, to study and test the basic tools of lean production [5, p.557]. Analysts express the idea of introducing a "lean" approach into the educational process of higher education [6, pp.133-139]. Researchers also raise the question of the need to develop the theory of lean production for their application in higher education in the interests of teaching students this methodology in universities [7, pp.39-42].

At the same time, at the beginning of the 21st century, the practices of project-oriented education for advanced training of engineering personnel are being introduced [8, pp. 85-91]. Researchers are studying the issue of optimizing educational processes, i.e. achieving such an organization of learning in which the transfer of knowledge from teacher to student occurs with minimal time and other resources. Analysts note that the principles of lean manufacturing can be extended to engineering higher education in general [9, p. 9].

The search and analysis of literary sources on the topic of lean production of goods and services carried out in this work showed the following:

- the topic of lean manufacturing attracts the attention of the international research community, and analysts are considering topical issues of introducing lean manufacturing ideas into the practice of the real economy and educational activities;
- when researching the topic of lean higher education, mainly private issues of teaching

students the ideas of lean manufacturing, reflecting the ideas of lean manufacturing in educational standards were considered;

- studies aimed at developing the methodology and philosophy of lean production are currently not identified (not known) in the process of searching and analyzing literary sources.

At the same time, the lack of a developed methodology for lean higher education:

- hinders the introduction of lean education methods in practice because not all subjects of the economy and education understand the advantages of lean production methodology;
- in the absence of a general theory or philosophy of lean production, errors may occur in determining the essence and planning the use of this approach in educational activities;
- in the absence of the philosophy and methodology of lean education, it is possible to falsify the content of the lean approach (for example, an erroneous understanding of thrift solely as a way to minimize resource costs) when developing programs for the transition of economic entities and universities to the philosophy of lean education development.

Everything stated above in this paper can be considered as a justification of the scientific and practical relevance of the development of the philosophy and methodology of lean production of goods and services.

The additional relevance of the formation of the concept and content of lean production of goods and services is also confirmed by the fact that the ideas of thrift in a crisis are becoming more widespread [10, p.10]. For example, lean thinking refers to the constant involvement and interest of the staff, both in personal development and in the improvement of production, which is called "kaizen". In translation, "kaizen" means "changes for the better" [11].

II. Research Method

When developing the methodology and philosophical concept of lean manufacturing and/or higher education, it should be taken into account that deep changes are taking place in the production of goods and services (for example, in higher education) under the influence of information technology, clip thinking of personnel and other factors [12, pp.107-119].

Additional complexity is attached to achieving the goal set in this paper: firstly, the philosophy of lean manufacturing itself has not yet been fully formed at the beginning of the 21st century; secondly, the philosophy of education as one of the types of services has not been formed.

By lean production of goods and services, it is proposed to understand such production, which is aimed at constantly improving the quality of goods and services, the working life of personnel based on optimizing the use of all types of resources, minimizing losses and damages to all participants in the process of production and consumption of goods and services. With this definition, lean production of goods and services can be based on and combined with the concept of socio-ethical management of organizations [13, pp.208-210].

Under the philosophy (philosophical concept) of lean production of goods and services, we agree to understand the most general view of this methodology and the system

of lean production of goods and services. At the same time, the philosophy of lean production of goods and services can be called wisdom in the process of understanding and practical implementation of the concept of the development of such lean production.

III. Results and Discussion

In the process of forming the philosophy of lean production of goods and services, it should be borne in mind that two approaches are known in the philosophy of science:

firstly, philosophy is considered a science of sciences (G. Hegel), in which philosophy acts as the basis for the development of methodology (general theory of method), a general methodological science that contributes to the development of any and every science and field of activity in this case, the philosophy and practice of lean production of goods and services;

Secondly, philosophy has a well-known approach in which it is believed that science is a philosophy in itself (O. Comte), this can be understood in such a way that each of the fields of activity (in particular, lean production of goods and services) in the process of its development forms an original philosophy inherent in this field of activity [14; 15, p. 4].

The philosophy and methodology of lean production of goods and services, formed in theory and practice, should be scientific. This means that the philosophy of lean production of goods and services as a scientific philosophy should have the following properties: it should become the same theoretical discipline as individual private sciences; the philosophy of lean production of goods and services should be built by scientific methods; at the same time, such a philosophy should take into account the provisions and conclusions of private sciences; the philosophy of lean production of goods and services makes these provisions of private sciences the starting point and object of its analysis; such a philosophy of lean production of goods and services uses the history of science and philosophy as a material for a general theory of scientific and philosophical thinking and much more. Scientists emphasize that the subject of the study of scientifically understood philosophy is not only science but also the whole culture as a whole. At the same time, philosophy as a whole is characterized as "a person's awareness of the foundations of the culture by which he lives", as "self-awareness of culture in a person" [16, p. 7], including the culture of lean production of goods and services.

Within the framework and based on the formation of the philosophy and methodology of lean production of goods and services, the provisions of the scientific theory of this type of production can be presented.

The scientific theory of the lean production of goods and/or the provision of services (the theory of thrift), we agree to call the science of creating scientific knowledge about the lean production of goods and services.

The scientific method in the theory of lean production of goods and services is proposed to be called a system of principles and techniques by which objective knowledge of scientific processes and socio-economic reality, the results of such production is achieved.

The methodological function of the theory of lean production of goods and services includes the definition of the conceptual apparatus, methodological foundations of production creation management, and scientific research in this area.

The cognitive function of the theory of lean production of goods and services covers the processes of accumulation, description, and study of the facts of reality in the field of science about this kind of production of goods and services.

The regulatory (instrumental) function of the theory of lean production of goods and services is of a practical nature, as it consists of developing methods and tools for managing such production and its research.

The legislative function of the theory of lean production of goods and services is aimed at the process of substantiating the need and developing legal norms that ensure the development of this type of production.

The optimization function of the theory of lean production of goods and services (the theory of thrift) includes the synthesis or selection of the best forms, methods, and techniques for the implementation of both individual stages and the whole process of lean production.

The prognostic function of the theory of thrift (lean production of goods and services) consists of assessing the state of this type of production and services and assessing the prospects for the development of its areas.

The preventive function of the theory of thrift includes the development and implementation of preventive proactive measures aimed at reducing the risks of the development of such production (goods and /or services) based on the results of the forecast of the development of this type of production.

The psychological function of the theory of thrift is to explain to the participants of the process the validity of financial and other costs for the continuous development of lean production of goods and services.

The function of socialization in the theory of thrift is to spread knowledge in society about the role and importance of modern lean production for the state and society, and the need for effective measures for its development.

The system-forming function of the theory of lean production of goods and services covers the accumulation of knowledge aimed at ensuring the creation of adequate management systems for the sphere of lean production.

Let's define the roles of the theory of lean production of goods and services:

firstly, increasing efficiency, optimizing the processes of development of lean production of goods and services;

secondly, risk reduction in the implementation of methods of lean production of goods and services in the real economy and higher education;

Third, improving the quality of products and/or financial results of the introduction of lean manufacturing in economic and educational entities.

It is possible to formulate such laws of the theory of lean production of goods and services (the theory of thrift):

- lean production of goods and services is not aimed at reducing the costs necessary for the production of high-quality goods and/or services;
- lean production management of goods and services should not be aimed at a radical change (reengineering) of production processes;
- lean production of goods and services does not lead to an increase in risks, inconveniences, or costs for consumers of goods and services;
 - lean production should be aimed at reducing unnecessary losses (costs, losses) in the production of goods and/or services;
 - the process of developing lean production of goods and services should be constant;
 - the process of lean manufacturing development should be continuous;
 - lean production is aimed at a more complete realization of the human capital of the organization's employees;
- the concept of lean production of goods and services in a particular organization is formed with the active and active participation of the organization's personnel, etc.

The development of lean production of goods and services involves continuous and gradual improvement of all aspects of such production; the development of new goods and services; the development of new markets; and the development of the organizational structure of the company. The development of lean production of goods and services affects the interests of people included in the system of such production.

In the philosophy of managing the development of lean production of goods and services, it is recommended to identify philosophical categories and factors that influence the development of lean production (mission; vision, structural changes; development programs, etc.).

The mission of lean production of goods and services can be called economic and social significance: continuous improvement of the quality of goods and services; increasing consumer satisfaction; and improving the quality of the working life of the staff through the most sparing and optimal use of all types of resources, including the personnel of the organization.

The mission of lean production of goods and services is to ensure the sustainable development of the economy and society, to improve the safety of the quality of life as a public good based on the rational and sparing use of all types of resources, including job security, sparing use and social development of the human capital of organizations in the economy and society.

The vision of lean production of goods and services can be called an inspiring scenario for the development of this concept of economic and social progress by eliminating losses in the production system and using all types of resources, including personnel of organizations.

Structural changes in the transition to lean production of goods and services should be aimed at optimizing the ratios of various structural elements of such production. At the same time, in the process of constantly improving the quality of goods and services, it is recommended to go through the most optimal and sparing use of all types of resources, including the human capital of organizations.

The company's development programs for its transition to lean production of goods and services should contain certain corrective and control measures. Such measures can be aimed at optimizing the ratios of various structural elements of such production, in the

process of constantly improving the quality of goods and services through optimal and sparing use of all types of resources.

The strategy for the development of lean production of goods and services will be called a long-term plan for the development of this methodological concept of production, aimed at adaptation and consistent implementation in the practice of production of goods and services. Such a strategy includes the introduction of ideas and methods of lean production by changes in the external environment of the organization through internal coordination of the elements of the organization. Practical tools for harmonizing the problems of the development of lean production of goods and services can be the philosophy and redesign of the development of lean production.

Under the philosophy of the company's development strategy based on the lean production of goods and services, we agree to understand the most general view of the long-term vision of the mission, vision, goals, tools, and social costs of the development of this concept in modern production and society.

The object of the philosophy of the strategy for the development of lean production of goods and services can be called the most general systematic view of the mission, vision, goals, and tools of lean production; economic and social costs of the development of lean production of goods and services.

The subject of the philosophy of the strategy for the development of lean production of goods and services can be called the most general idea of methods, techniques, and tools for the implementation of the mission, vision, goals, and sources of resources that form the social price of the development of lean production in the economy and higher education.

Consensual (based on consent in society) and confrontational (based on the results of the struggle) concepts of philosophy, methodology, and strategy for the development of lean production of goods and services are possible.

The philosophy of the strategy for the development of lean production of goods and services will be considered inherent in such functions:

- ontological in which it is necessary to develop certain "models" of real strategies for the development of lean production of goods and services against the background of the world picture and global trends in the development of the modern global world and markets;
- predictive, which will consist of creating a logical basis for determining the probabilities of success with various strategies for the development of lean production of goods and services;
- epistemological function of the philosophy of lean production of goods and services, which is designed to give knowledge of the general laws of the cognitive process itself, the essence of strategies for the development of lean production of goods and services in the modern world;
- methodological function of the philosophy of lean production of goods and services, which forms the most general principles of research, development, and implementation of the strategy for the development of lean production of goods and services;
- the axiological function of this philosophy contributes to the formation of ideological, and value attitudes in the development and implementation of a strategy for the development of lean production of goods and services;
- a selective function of the philosophy of lean production of goods and services, within

- which such a philosophy allows you to select acceptable or best options for lean production development strategies;
- the function of the derived criterion of the truth of the philosophy of lean production of goods and services, allows you to form a criterion basis that can complement the assessment of the practical results of the strategy for the development of lean production of goods and services;
 - an integrative (synthetic) function of the philosophy of lean production of goods and services, which contributes to the systematic, holistic generalization and synthesis (system aggregation in a new image) of various forms of cognition of the practice of strategy and tactics for the development of such lean production, including its mission and vision;
 - a critical function of the philosophy of lean production of goods and services, which, within the framework of the constructive (creative) concept of criticism in this philosophy, can give a value assessment, identify contradictions, strengths, and weaknesses, positive and negative aspects of the strategy for the development of lean production of goods and services, including social relations of people, the social cost of implementing a specific strategy for the development of lean production goods and services;
 - the practical (utilitarian) function of the philosophy of lean production of goods and services is that it provides a practical implementation of the philosophical concept of lean production in the process of mental activity at the level of making all managerial decisions and practical actions in the process of implementing the strategy for the development of lean production of goods and services.

The role of the philosophy of the strategy for the development of lean production of goods and services is to harmonize the ideology, place, mission, vision, goals, policies, strategies, and tactics for the development of such lean production and thereby contribute to reducing the risks of the development of such production.

The goal of the development of lean production of goods and services can be called the ideal result of such a production concept. The goal of the development of lean production of goods and services can be called a constant improvement in the quality of goods and services, provided that the sustainability of such production and socio-industrial relations, rational and prudent use of all types of resources, including the human capital of organizations, consumer attitudes, etc.

The development of the philosophy of lean production of goods and services opens up the opportunity to form a consistent, holistic paradigm [15, p.26] of the strategy for the development of lean production of goods and services, to reduce the risks of sustainable development of such production.

The philosophy of lean production of goods and services should become an innovative structural element of the philosophy of the higher education system [17, p.9]. At the same time, education can be considered as part of the system of innovative development of the economy and society [18, pp.83-90].

Discussion

When developing the methodology of lean production (the theory of thrift), it should be taken into account that within the framework of a market economy, all benefits appear in a specific form of tangible goods and intangible services.

It is customary to call a service any event, activity, or benefit that one of the parties can offer to the other party which is mostly intangible and does not lead to mastering anything

□ 19□ .

It should be noted that the service sector and the service as a rather complex social and economic phenomenon are the object of study of various sciences: economics, marketing, management, sociology, law, computer science, psychology, and other sciences, but the general theory of services is not developed □ 20,21□ . Consequently, the lean production of services should receive its philosophical understanding in general and within the framework of the philosophical concept of lean provision of services in particular.

The theoretical foundations of designing the development of the service sector are being developed, in particular, in the work □ 22□ .

The philosophical concept of the development of lean production of services in the field of higher education is formed in the works □ 23,24□ .

The characteristic of the service or the process of its delivery can have a qualitative (consists of comparison by quality) and quantitative measurement by the purposes for which, how, and by whom the assessment is made.

It should be noted that within the framework of the philosophy of lean production of goods and services as a general view of the essence of such production, a linguistic study of the meaning of the word "loss" is rational. Explanatory dictionaries give such definitions of this term: "Reduction, weakening of the quantity, degree, etc. of something; decrease. Aimless waste, spending something. Damage, loss".

The use of the term "losses" by the authors of the lean production methodology draws attention to the concepts of "loss" and "damage" that are close to it in content. Consequently, lean manufacturing is largely associated with risk management in manufacturing and, in particular, the detection and limitation of risks of quality reduction and excess cost increases in modern lean manufacturing.

To determine the structure and content of the philosophy and methodology of lean production of goods and services, it is customary to interpret the provisions that were previously developed by the founders and theorists of the lean approach.

In particular, the following can be named as ways to eliminate losses: losses due to overproduction; loss of time due to waiting; losses due to unnecessary transportation; losses due to unnecessary processing stages; losses due to excess inventory; losses due to unnecessary movements; losses due to the release of defective products. the unrealized creative potential of employees; overload of workers, employees, or capacities when working with increased intensity uneven operation, for example, intermittent work schedule due to fluctuations in demand □ 10,11□ .

In the further formation of the philosophy and methodology of lean production, it should be noted that large-scale studies of Toyota management methods by foreign authors were limited only to practical aspects of the implementation of the concept of thrift, but have not yet led to the formation of a detailed theory of thrift □ 25□ .

It is recommended to take into account in the process of developing the methodology of lean production of goods and services that Jeffrey Liker, a researcher of lean production at Toyota, described the following principles:

- principle 1: management decisions should be made taking into account the long-term perspective, even if it harms short-term financial goals;
- principle 2: the process in the form of a continuous flow contributes to the manifestation of production problems;
- principle 3: it is recommended to use a system of pulling (gradual increase in demand) to avoid overproduction;
- principle 4: it is necessary to equalize the amount of work (heydzunka) for different categories and representatives of the organization's staff;
- principle 5: it is necessary to stop production to solve problems as part of the production culture if quality requires it;
- principle 6: setting and solving standard tasks is the basis for continuous improvement and delegation of authority to employees;
- principle 7: it is necessary to apply visual control so that no problem in the organization's activities goes unnoticed;
- principle 8: it is recommended to use only reliable, proven technology for the production of goods and/or services;
- principle 9: it is recommended to identify and educate leaders who thoroughly know their business, profess the philosophy of lean manufacturing in the company, and can teach this to others;
- principle 10: you should educate outstanding people and form teams professing the philosophy of thrift in the company;
- principle 11: you need to respect your partners and suppliers, set them difficult tasks, and help them improve;
- principle 12: to diagnose a situation, you need to see everything with your own eyes (genti genbutsu);
- principle 13: you should make management decisions slowly, based on consensus, weighing all possible options, but when implementing a solution, you should not delay (nvmavasi);
- Principle 14: a firm should become a learning organization through relentless introspection (hansei) and continuous improvement (kaizen) □ 25□ .

In addition to these principles, the following principles can be proposed:

- principle 15: the organization must maintain reliable and effective direct and feedback communication with consumers of its goods and services;
- principle 16: it is necessary to maintain harmonious socio-economic and industrial relations in the company's team.

In the process of developing the general theory of lean production, it is necessary to take into account that the development of the philosophy of lean production can increase the level of understanding by personnel of the meaning of such an approach in the production activities of a firm or university □ 26, pp. 117-133□ . The development of lean production methodology can stimulate the formation of industry theories of lean production, in particular, the theory of lean production of social services in higher education □ 27, pp. 18-29□ .

In turn, the development of the philosophy of lean production serves as the basis for the formation of values of the organizational culture of lean production. In this case, the values of the organizational culture of lean production are understood as all factors that contribute to increasing the economic and social efficiency of this type of production. As you know, organizational culture is characterized by the functions of external coordination and internal integration.

As part of the external coordination function, the organizational culture of lean

production ensures that the methodology of such production adapts to changes in market requirements for goods and/or services produced in this way.

In the process of performing the function of internal integration, the organizational culture unites all the elements of such a method of production into a single whole -the lean production system of a given firm or university.

With another classification, the following functions of the organizational culture of lean production can be described:

- The motivational function of the organizational culture of lean production, encouraging staff to perform their duties better;
- The mental (meaning-forming) function of the organizational culture of lean production, which gives a new meaning to production;
- The evaluation function of the organizational culture of lean production, which sets the norms of acceptable and unacceptable behavior of employees within the framework of the philosophy and method of lean production, acts as an indicator and regulator of employee behavior;
- The cognitive function of the organizational culture of lean production, which contributes to the employee's knowledge of himself in the organization, other employees, and the organization itself;
 - The institutionalizing function of the organizational culture of lean production is the production, selection, accumulation, preservation, translation, and change of norms, values, rules, procedures, and traditions in the organization;
- The adaptive function of the organizational culture of lean production - contributes to the adaptation of the organization and its employees to changes in the external environment;
 - the information function of the organizational culture of lean production, which synthesizes, encodes, translates, and recognizes information circulating within the organization, as well as between the organization and its environment;
- the communicative function of the organizational culture of lean production, which forms the conditions and means of communication between employees of the organization with each other, as well as with the external environment;
- The integrative function of the organizational culture of lean production, which unites the employees of the company, allows you to form a "friend-foe" system;
- differentiating function of the organizational culture of lean production, which promotes competition between employees;
 - the fragmenting function of the organizational culture of lean production, which differentiates organizational subcultures in one firm, allows different subcultures to coexist with each other;
 - the function of socialization of the organizational culture of lean production, which contributes to the assimilation by employees of experience, knowledge, values, and norms of behavior corresponding to this organization, professional group, and organizational role;
 - the replacement function of the organizational culture of lean manufacturing, in which formal procedures for managing the lean manufacturing process are replaced by informal relationships and employee behavior.

The development of the lean manufacturing philosophy can be the basis for reframing and revitalizing the organization. Reframing is a shift in the organization's view of what it is now and what it can achieve in the future by mobilizing the mental energy of personnel to apply the lean production methodology; developing a vision of the prospects (sense of

purpose) of implementing lean production; building a system of indicators (creating a sense of pride) in the conditions of using the lean production method.

The revitalization of an organization is an incentive for the company's personnel to grow due to: the concentration of activity on the needs of the market; the invention of lean production tools within existing and new types of business; the introduction of information technologies in integration with lean production, and more.

V. Conclusion

The article analyzes research and publications on the topic of lean manufacturing in the real economy and higher education. This analysis showed the relevance of the development of the methodology and philosophy of lean production of goods and services. The article defines the concept, functions, roles, structure, and content of the scientific theory of lean production of goods and services. The paper develops the provisions of the philosophy of lean production of goods and services, which made it possible to identify the most promising areas of development of the philosophy and methodology of lean production of goods and services. The influence of philosophy on the development of the organizational culture of lean production of goods and services is described. The results of the article show that the further development and dissemination of the philosophy and methodology of lean production of goods and services can have a positive impact on the state of the entire real economy and society in the conditions of overcoming the global crisis.

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