

LEAN MANUFACTURING AS A MECHANISM TO REDUCE PRODUCTIVITY COSTS

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Introduction. In recent years, many new management concepts and methods have been developed in world practice: Business Process Re-engineering (BPR), Full Quality Management (TQM), Balanced System Indicators (BSC), Statistical Process Management (SPC), Coaches, International Standards Models ISO 9000, ISO 14000, «Five S», «Six Sigma», HACCP¹ and many more.

Unfortunately, Georgia has not developed its own models in this direction. There are no traditions here, there are no schools, there is no experience, there is no experience of predecessors, there is no proper management system. Thus, Georgian managers have many more ways to go before they can gain experience and learn a "foreign language" for them. Going through this trail is essential if we want to be competitive in the business environment.

Analysis of recent publications. Mankind has realized the fact that the resources of the earth tend to be exhausted. This motivated economists to develop management models that are based on lean manufacturing.

The problems of lean manufacturing are considered in their work James P. Womack, Daniel T. Jones [2], Tahiti Ono [1]. The concept of lean manufacturing is theoretically justified in the works Shigeo Shingo, Masaaki Imai. Such Western scientists and practitioners as the popularizers of lean manufacturing ideas have become James Womack, Jeffrey K. Liker, Pascal Dennis [10].

Main body. Lean thinking and manufacturing is the most visible concept in global management. But Georgian culture is very far from the concept of «thrift». Let's remember: in Georgia, the fence is made of solid wood, furniture – from sawdust; wood materials are sold cheaply, and sawdust furniture – at an expensive import price; industrial waste is stored in special warehouses, finished products (cement, blocks, fittings, building and paving materials, fertilizers, etc.) in the open air; the workshop representing the individual links of one production cycle are far from each other and so on.

It must be understood that the competitive advantages of Georgian enterprises can be achieved only with high quality and lower production costs. Thus, today it is necessary to completely review the organization of production in order to exclude any losses in each link of the production chain. Once again, we really need an integrated approach that simultaneously includes product quality, concept, methods and tools. Given the problems with the work of Georgian enterprises, we believe that the introduction of an effective production concept and the use of its methods is an important factor in increasing the productivity of each link in the production system.

«Sustainable production» is a Japanese management technology, a philosophical system of business organization and management, which covers almost all aspects of production. Its founder is Tahiti Ono, who began his career in 1943 at Toyota Motor Corporation, where he was able to collect and integrate the best

¹ **HACCP (Hazard Analysis and Critical Control Points)** — Risk Analysis and Critical Control Points (Points) - A concept that provides systematic identification, evaluation and management of hazardous factors, which significantly affects the safety of products.

experience in the world. In the 1950s, he introduced TPS (Toyota Production System), which in the West is called Lean Production or Lean.

By the way, it should be noted that this idea of lean production was expressed by Henry Ford at the beginning of the twentieth century, but since it was far ahead of time, society could not accept it. We draw attention to the fact that the idea of frugality was originally expressed in companies with a discrete cycle – in mechanical engineering. Subsequently, this concept was adapted to the idea of continuous production, and then introduced into the spheres of trade, services, healthcare, the public sector and many others. Lean gradually went beyond the scope of production, uniting consumers, suppliers and other partners.

In many countries, the spread of lean manufacturing has government support. The purpose of this concept is to avoid all kinds of losses and maximize the use of resources. A feature of the concept of «sustainable production» is manifested in the continuous improvement of all business processes, which is aimed at complete customer satisfaction. According to this concept, leadership is expressed in the process of functioning of an organization or enterprise in a general sense, and its main idea is as follows: if any action, operation or process does not increase the value of the product (consumer value) from the point of view of the client, then this action, An operation or process is considered a loss to the company.

In the concept, all losses are divided into two categories:

- First-order losses are losses that we cannot ignore, for example: salaries of company employees. From the client's point of view, this does not add value to the product, but without it the company will not be able to maintain its viability. That is, this value cannot be undone, it can only be optimized;

- Losses of the second order – these losses are surmountable. For example, in Toyota they are classified as follows:

- 1) Production is the result of the thinking of managers for whom an important priority is to work at full capacity of all production capacities and all personnel;

- 2) Excess stocks – raw materials, finished and unfinished products, spare and repair materials for plants and buildings or anything that does not increase the cost of the product from the point of view of the client. For comparison: in Georgia, excess stocks are considered one guarantee of protection against inflation and continuous production, therefore (because of current economic and market conditions) there is no need to talk about the existence of a continuous production process without stocks. The task is to determine how much and which raw material is optimal. Finding the optimal or equilibrium point between the speed of production and the volume of stocks automatically leads to a decrease in stocks;

- 3) Marriage – obvious losses for which human and material resources have been spent. Lean-philosophy says that a system must be built in which any deviation from the norm is noticeable;

- 4) Excessive operations and movements in the workplace. If an employee moves to a place located a few meters from his own workplace to receive the necessary document or tool, this also does not increase the cost of the products he creates or is considered a loss. This can be avoided by rationally organizing the workplace;

- 5) Excessive processing – the imposition of an increasingly rigid structure than in the customer specification, which requires overcrowding of products, or processing using more expensive materials and tools, or a higher qualification of the processor. In addition, analysis of the production chain shows that many operations in it are completely unnecessary.

- 6) Loss of time – waiting for the results of work performed by the previous link in different parts of the production chain. This may be due to improper planning of the time of the previous call or as a result of an industrial accident. In the short term, the way out of this situation is the supply of incomplete products, in the future – the prevention of accidents at industrial enterprises;

- 7) Excessive movement – transportation and general movement does not add value to the product in the eyes of the client, but is considered a necessary expense;

- 8) Loss of creativity on the part of employees is a very serious loss that affects the general condition of the company. If a person does not care what he does, we cannot expect that he will feel responsible, and the quality of the work done is not necessary.

Lean technology can be traced back to a five-step sequential sales scheme that, at first glance, may even seem overly simple:

- Determining the value that the client expects to receive;
- Create an algorithm for creating this value;
- Organizing continuous movement of the created process;

- Replacement of the principle pull² with the push³ principle;
- Continuous improvement of all elements of the system.

All these steps are hard to implement. The primary task here is to determine the values here. According to the principle of Kano⁴, the client has three levels of values:

1) The first level – these are the characteristics, requirements and capabilities that are implied. The client believes that they should be a priori. But does the supplier have any idea what is going on? This is the first difficulty;

2) Second level – measurable values. For example, it could be a product characteristic of, say, a car speed. Measurable values must first be measured in some way, and this requires specific units of measure, means and methods of measurement, determination of talons (if possible), determination of metrological characteristics, etc.; at this stage, the principal task is to develop a process of value creation, during which you should avoid processes that do not add value to the product from the point of view of customers;

3) The third level – values that the client does not know about yet. To be more precise, he has a vague idea of the properties that a product must possess. Most times, the customer has not yet defined his own requirements, so neither he nor the manufacturer can establish the features that will give the product more market value. Third-level requirements are key for the manufacturer.

In the processes described above, five stakeholders are usually identified: customer, owner, supplier, community, employee. The key moment here is to escape the confrontation and create a management based on the agreement of the interested parties and the establishment of harmony between them.

The creation of value (the first stage) begins with the establishment of order and demonstration of the inconvenience created by excess reserves. To do this, it is necessary to introduce the 5S concept⁵ so that all employees feel an excess of self-organization and any excess of a reasonable minimum. In parallel, we must convey to the lower echelons a simplified version of the strategy in order to delegate part of the work to them and make the goals as accessible as possible to their understanding. The third stage is the implementation of the product, the delay of which at any link means loss of income. Thus, it is necessary to ensure the continuity of the process. The chain of internal and external consumption should be turned into coordinated processes, which allows creating a stream of values for both internal and external consumption. Thus, a system can be created that we can call «creation for an exact deadline». Since it is very difficult to ensure such coordinated actions, there is a fourth stage (point) at which the use of the Pull method is introduced. This means that no action is triggered in each previous link in the chain until the next link confirms its readiness to use the product created in the previous link. As a result, the need to produce and store unfinished products is reduced.

Currently, sustainable production measures are based on common initiatives to reduce costs and improve quality while redirecting them to continuous flows using TPM⁶ technology.

²The principle of push - the flow of management information in the same direction as the product

³ Principle pull - The next link in the chain makes a request for information that is intended for the previous link, the previous link responds by creating an order that includes internal operations and is filled as soon as the order is executed.

⁴ Cano Principle - A method used to test a user's emotional response to unique characteristics of a product. The results got through it allow to satisfy customers, and manage loyalty.

⁵ 5S is one of the most effective tools for production, optimizing jobs and the organization system. Designed in Japan after World War II. The name is an abbreviation of five Japanese words that express the five steps of rationalization:

- **Seiri (整理)** - “sorting”, a clear separation of existing objects into necessary and unnecessary groups, then release from unnecessary objects;
- **Sieton (整頓)** - “maintaining order”, organizing and storing the necessary items for their quick search;
- **Seiso (清掃)** - “cleaning”, cleanliness and care for the workplace;
- **Seiketsu (清潔)** - “standardization”, maintaining the order necessary to comply with the first three rules;
- **Sitsuke (躰)** - “excellence”, compliance with the rules, procedures and technological operations accurate and under established standards.

⁶ TPM (Trusted Platform Module) is a controller that provides basic security features. The chip is located on the motherboard of the computer and interacts with other components of the system. The concept of a

The fifth point is constant, it is constant perfection. If the main goal of the entrepreneur is to satisfy the needs of consumers, then he must constantly improve his production system.

After completing all five stages, we can assume that the company introduced self-sufficient production, so less than half of all resources that were previously intended for the same purpose were released.

Conclusions. The experience of unfamiliar countries shows that the implementation of the system requires two years of tireless and focused work, which is automatically followed by the launch of a full quality assurance system, while production reaches the highest level of efficient business. This applies not only to industrial production, but also to other areas. Construction, education, health, rural secondary and so on.

Thus, we can conclude that for the successful implementation and operation of this system, company leaders must be taken seriously, and for this, foreign experience should be widely studied.

Further research will be aimed at developing and selecting optimal strategies for applying the principles of the concept of «lean production», taking into account internal and external factors that shape the environment of production organization.

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Чечелашвілі Майя, доктор економічних наук, професор. **Зедгінідзе Саба**, магістр права, докторант. Грузинський технічний університет, Тбілісі, Грузія. **Птащенко Ліана Олександрівна**, доктор економічних наук, професор. Національний університет «Полтавська політехніка імені Юрія Кондратюка». **Ощадливе виробництво як механізм зниження витрат.** Розглянуто теоретичні та практичні аспекти «ощадливого виробництва». Запропоновано концепцію японських технологій управління, управління бізнесом і філософію, яка охоплює практично всі аспекти фінансово-господарської діяльності японських підприємств. Відому японську концепцію управління та практику ощадливості порівняно з вітчизняними традиціями і виробничим досвідом, окреслено шляхи досягнення аналогічних результатів. Підкреслено, що ідея ощадливості спочатку була використана в компаніях з дискретним циклом – в машинобудуванні. Згодом цю концепцію було адаптовано до безперервного виробництва, а потім – упроваджено у сфери торгівлі, послуг, охорони здоров'я, громадського сектора та багатьох інших. Lean поступово виходив за межі виробництва, об'єднуючи споживачів, постачальників, інших партнерів. Доведено думку, що конкурентні переваги

“trusted platform module” (translated from the abbreviation TPM) belongs to the consortium Trusted Computing Group (TCG), which has existed since 2004.

грузинських підприємств можна досягти лише високою якістю й меншими витратами на виробництво. Таким чином, сьогодні необхідно повністю переглянути організацію виробництва, щоб виключити будь-які втрати в кожній ланці виробничого процесу. В управлінні виробництвом потрібний комплексний підхід, який одночасно включає якість продукції, концепцію, методи та інструменти. З урахуванням проблем у діяльності грузинських підприємств, з'ясовано, що впровадження ефективної концепції виробництва й використання її методів є важливим фактором підвищення продуктивності кожної ланки виробничої системи. Подальші дослідження будуть спрямовані на розроблення та вибір оптимальних стратегій застосування принципів концепції «ощадливе виробництво» з урахуванням внутрішніх і зовнішніх чинників, які формують середовище організації виробництва.

Ключові слова: концепція ошадливого виробництва, технологія управління, підвищення якості, зниження витрат.

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Chechelashvili Maia, D.Sc. (Economics), Professor. **Zedginidze Saba**, Master (Law), Doctoral Student. Georgian Technical University, Tbilisi, Georgia. **Ptashchenko Liana**, D.Sc. (Economics), Professor. National University «Yuri Kondratyuk Poltava Polytechnic». **Lean Manufacturing as a Mechanism to Reduce Productivity Costs.** The article discusses the theoretical and practical aspects of lean manufacturing. The authors present the concept of Japanese management technologies, business management and philosophy, which covers almost all aspects of the economic activities of Japanese enterprises. The authors compare the well-known Japanese management concept and the practice of frugality with domestic traditions and production experience and outlines ways to achieve similar results.

Keywords: concept of lean production, management technology, quality improvement, cost reduction.