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DIAGNOSTICS IN LEAN MANAGEMENT SYSTEM OF INDUSTRIAL ENTERPRISE

Об'єктом дослідження є методи діагностування елементів потоку створення цінності промислового підприємства у їх взаємодії з урахуванням спрямованості результату на мінімізацію втрат в системі ощадливого управління. За організаційно-методичним аспектом діагностування доцільно розглядати раціональну сукупність дієвих методів, зокрема концепції ощадливого виробництва, використання яких спрямовано, насамперед, на подолання кризового стану діяльності промислового підприємства. Також безперервне оцінювання ощадливих змін і результативних перетворень, мінімізації втрат і встановленні резервів для можливого зменшення непродуктивних витрат.

За результатами застосування когнітивного методу і методу наукового інформаційного пошуку встановлено відсутність єдиного підходу до трактування сутності діагностики. Але загальною позицією залишається пошук, встановлення та ідентифікування проблемних аспектів діяльності і можливих перспективних тенденцій з метою розроблення альтернативних варіантів кращого розвитку підприємства. За результатами використання критичного аналізу і логічного узагальнення запропоновано розглядати процес діагностування через каузативний взаємозв'язок з функціями управління. Це забезпечується інтегрованим використанням сукупності доцільних методів ощадливого виробництва в межах окремих функцій.

Дістало подальшого розвитку діагностування як процес з позиції взаємоузгодженого виконання раціональних специфічних ощадливих методів, прийомів, способів та процедур. Метою є виявлення й ідентифікація зовнішніх і внутрішніх чинників зі спрямованою дією (сприяння/перешкоджання) для забезпечення цінності кінцевому споживачу й прогнозування розвитку промислового підприємства.

Доведено доцільність реалізації діагностування через функції облікування, контролювання, аналізування, планування та стимулювання. Результат орієнтовано на усунення витрат без додавання цінності, зменшення до мінімально допустимого рівня технологічно необхідних витрат без додавання цінності, пошуку прихованих резервів витрат для створення/додавання цінності.

Ключові слова: діагностування як процес, ощадливе виробництво, потік створення цінності, методи ощадливого виробництва, промислове підприємство.

1. Introduction

In today's business environment, which is characterized by the intensification of the vector of European integration reforms in Ukraine, the development of globalization processes, the deepening of economic and political imbalances and the asymmetry of the external environment, the implementation of diagnostic procedures reaches a qualitatively new level. It acquires special significance in diagnosing the different aspects of crisis conditions and phenomena. It is the state of the actual crisis and/or the artificially created crisis that facilitates the introduction of the concept of lean production and the activation of economic changes in functioning with a focus on satisfying the requirements of consumers, taking into account the interests of suppliers [1, 2]. The urgency of the problem is intensified by creating a basis for lean management of an industrial enterprise, in particular, the formation of high-quality information support based on the results of diagnostics. This allows for the rapid restoration of activities by overcoming the crisis, reducing the unproductive costs/waste to their complete elimination from a focus on creating value for the customer.

2. The object of research and its technological audit

The object of research is methods for diagnosing the elements of the value stream of an industrial enterprise

in their interaction, taking into account the focus of the result on minimizing waste in the system of lean management.

It should be noted that the functional aspect of diagnostics is an integral part of the enterprise management system and allows to assess and identify a retrospective, current and prospective situation, identify opportunities and threats to the functioning environment. And also to form information array for making informed management decisions [3, 4]. However, according to the analytical and information aspect, the results of diagnosing form the basis for planning through anticipation of the possible consequences of the developed alternative options for management decisions with an orientation toward the selection of priority directions for the development of the enterprise [4, 5]. On the organizational and methodological aspect, it is advisable to consider a rational set of effective methods, in particular the concept of lean production, the use of which is directed, first of all, to overcoming the crisis situation of the industrial enterprise. And also continuous assessment of economic changes and effective transformations, minimization of waste and establishment of reserves for possible reduction of unproductive expenses. Thus, the choice of methods of lean manufacturing, which is the key to the quality of the results, becomes the main one for conducting diagnostics in the system of lean management of an industrial enterprise.

3. The aim and objectives of research

The aim of research is development of theoretical and methodological provisions and justification of applied recommendations for diagnostics in the management system of an industrial enterprise on the basis of lean.

Achieving this aim has made it necessary to solve the following scientific problems:

1. Based on the analysis of published research results, to justify diagnoses as a process in the management system of an industrial enterprise in the context of lean manufacturing.

2. To substantiate the sequence of diagnosing in the system of lean management of an industrial enterprise in order to minimize waste in the value stream and to make balanced lean management decisions in the «supplier-producer-customer» chain.

4. Research of existing solutions of the problem

A critical analysis of the specialized literature from the published results of studies on the problems of diagnostics allows them to be systematized according to the thematic focus in the following areas:

– substantiation of the theoretical and methodological foundations of diagnosing the activities of business entities with the allocation of:

- 1) evolution of the economic entity [4–6];
- 2) approaches to diagnostics with an orientation toward solving the problems of functioning [5, 7–9];
- 3) diagnostic methods and techniques with a focus on establishing the overcoming of deficiencies/solving the problems of functioning [5, 6, 10, 11];

– substantiation of applied aspects of diagnostics (development of methodological support and technology of practical implementation) in the context of directions and objects of research, in particular:

- 1) an efficiency of enterprise management [6–9, 12];
- 2) scientific activity of higher educational institutions [13].

Problems of the introduction of the concept of lean production in the management of an industrial enterprise for overcoming crisis conditions are devoted to the scientific works of researchers in the directions: the basis of the concept of lean production [1, 2, 17], the characteristic of lean manufacturing tools [14–17]. At the same time, insufficient attention is paid to diagnostics in the lean management of an industrial enterprise, and the methods of lean production in the context of diagnostics of lean transformations have not yet been properly justified. This determines the prospects for this problem and the need for this research.

5. Methods of research

During the research, the following methods are used to solve the tasks:

- cognitive and scientific information retrieval – to generalize the definitions of the definition of diagnostics;
- critical analysis and logical generalization – to establish and justify a set of expedient methods of lean production within the framework of individual management functions.

At the same time, general scientific methods of scientific research – system analysis, synthesis, induction, deduction, monographic method are used.

6. Research results

The review of scientific publications of researchers provides an opportunity to conclude that there are different interpretations and the lack of a unified approach to disclosure of the essence of diagnostics. Based on the results of the application of the cognitive method and the method of scientific information retrieval, a generalized set of interpretation of the definition «diagnostics» is formed (Table 1).

Despite the existence of differences in the interpretation of «diagnostics», the overall position remains the search, identification and identification of problematic aspects of activity and possible prospective tendencies with the purpose of developing alternative options for the best development of the enterprise.

The purpose of diagnosing lean transformations is expedient to consider the identification and identification of external and internal factors in a directed action (assistance/obstruction) to provide value to the end user.

The most difficult and important problem is the correctness of the definition of the object of diagnostics. This can be the state of the enterprise, the flow of value creation, the types of work/operations in the process and/or the management aspect, the types of costs/waste. Within the framework of the research conducted, it is advisable to consider the flow of value creation with the allocation of technological and managerial works/operations as the object of diagnostics:

- 1) value-added;
- 2) required non-value-added;
- 3) non-value-added.

This is explained by:

- first, the importance of the value stream, where the product's inherent utility is formed (the expected quality, quantity, price, delivery time) that the customer is ready to purchase;
- secondly, a clear understanding of the systematization and hierarchy of subordination of works/operations both in terms of the technological process, and in the management of the enterprise, the functional subdivision or the selected subject of management;
- third, a correct estimate of costs from the point of creating/adding value to the customer;
- fourth, the need for continuous improvement with a focus on eliminating costs non-value-added, reducing to the minimum allowable level of technologically necessary costs non-value-added, searching for hidden reserves of costs to value-added in order to improve labor productivity.

Diagnosing in lean management of an industrial enterprise, the result of which is informing about the actual state to ensure the forecasting of development, it is expedient to consider by establishing rational specific lean methods, techniques, means and procedures [1, 14–17] for performing interrelated processes (Table 2):

- the process of collecting data and information is aimed at documenting the implementation of individual transactions within the value stream and generating data;
- the information processing process provides for the estimation of costs/waste within the value stream and the systematization of economically homogeneous information with a focus on forecast calculations;
- the process of dissemination of results facilitates its publication to the interested party in accordance with the request.

Table 1

Options for determining the «diagnostics» definition*

Interpretation of the «diagnostics» definition	Key accent
«... the process, the purposeful and systematic implementation of which allows to identify the financial situation, the causes and prospects for its change, assess the effectiveness of economic decisions and, on this basis, implement economically sound and coordinated strategic management of the company's financial and economic activities in accordance with the conditions of operation and its stage development ...» [5]	The process of identifying the financial situation and the prospects for changing it to ensure a sound and coordinated strategic management of the enterprise
«... the process of evaluating, analyzing and highlighting the development trends of certain areas of activity or the enterprise as a whole, which is carried out by first determining the main factors that influence or can influence the enterprise's activity, with subsequent identification and forecasting of consequences caused by their impact ...» [6]	The process of assessing, analyzing and isolating the factors of influence on the development of an enterprise with subsequent identification and consideration of their consequences in forecasting
«... a way of assessing the state of management ... based on a set of methods and tools and analytical information on all stages, aimed at identifying negative factors and bottlenecks in governance ...» [7]	The assessment method aimed at identifying negative trends in management
«... is the basis for ensuring effective crisis management ... provides for targeted continuous monitoring, analysis and assessment of the current and future state of the enterprise with the purpose of early detection, prediction, anticipation and overcoming of crisis phenomena that are capable of introducing dysfunctions into enterprise activities, development of appropriate restructuring measures and the adoption of well-founded anti-crisis management decisions ...» [8]	Targeted continuous monitoring, analysis and assessment of the current and future state of the enterprise for the purpose of early detection, prediction, foresight and overcoming of crisis phenomena, development of appropriate measures and management decisions
«... the teaching about methods, processes and principles of recognition and identification of negative phenomena and factors in the activities of the business entity ... is the basis for ensuring the economic security of the enterprise, because ... it provides for a purposeful assessment of the level of each component of the economic security of the enterprise, development prospects based on business indicators for the adoption of effective management decisions aimed at the development of the enterprise ...» [9]	The totality of methods, processes and principles for establishing negative trends and justifying management with enterprise-oriented development

Note: * – compiled by the author on the basis of sources [5–9].

Table 2

Harmonization of lean methods, means, techniques and procedures in the context of the diagnostics process*

Process name	List of methods	List of techniques	List of means	List of procedures
The process of collecting data and information	– Identification and establishment of waste/errors with subsequent elimination and non-occurrence in the future	– Identification, of waste; – Total Production Maintenance, TPM; – Five steps to the rational organization of the workplace (5 S); – Single Minute Exchange of Dies (SMED); – Five Whys (5 W); – Just-in-Time (JIT); – Standardization of works with a focus on the continuous process of document turnover from order to delivery; – Standard Operating Procedure (SOP); – Jidoka; – Poka-Yoke; – Tracking the level of stocks and the route of their movement; – Kanban	– Identification, systematization of data on costs and waste with a focus on the flow of value creation for economic decision-making	– Value Stream Mapping (VSM); – Distribution of duties and authorities in accordance with the level of competence and participation in the value stream; – Team work, small-group activities; – Selection of data for the formation of hourly management reports; – Kaizen; – Confirmation of settlements with suppliers and customers for the movement of material and cash flow through the document flow scheme (ordering, certification of the counterparty)
Information processing process	– Kaizen costing and costing for Direct Costing, Standard Costing, Target Costing, Value Stream Costing, with a focus on minimizing waste; – Calculating and estimating costs in the value stream to justify daily and weekly management decisions	– Key Performance Indicators (KPI); – 5 S; – SMED; – JIT; – Standardization of works with the focus on the continuous process of document turnover from order to delivery; – SOP; – Jidoka; – Poka-Yoke; – Tracking the level of stocks and the route of their movement; – Kanban	– Determination of economic benefits from economical improvements; – Calculation of target costs in the middle of the value stream, with an emphasis on generating cash and profits; – Formation of cost and costs in the value stream; – Calculation of the performance indicators of the workplace, the flow of value creation, the enterprise as a whole	– VSM; – Distribution of duties and authorities in accordance with the level of competence and participation in the value stream; – ABC analysis; – XYZ analysis; – Integration of ABC+XYZ+JIT; – Confirmation of settlements with suppliers and customers on the flow of material and cash flow in the document flow scheme (payment for order fulfillment through automated bank transfer, liquidation of accounts receivable and accounts payable); – Team work, small-group activities; – Kaizen
Dissemination process	– Visualization of the operational management of Andon, Visual Management in terms of the level of performance of the workplace, value stream, the enterprise as a whole within the framework of management reporting with the focus on stimulating continuous improvements in the flow of creation of values	– SMED; – JIT; – Standardization of works with the focus on the continuous process of document turnover from order to delivery; – SOP; – Jidoka; – Poka-Yoke; – Kanban	–	– VSM; – Distribution of duties and authorities in accordance with the level of competence and participation in the value stream; – Team work, small-group activities; – Kaizen

Note: * – compiled by the author on the basis of sources [1, 14–17].

It should be noted that the introduction of the lean manufacturing concept at an industrial enterprise, including the diagnostics of lean management, necessarily provides for accounting for the mentality and features of the business, as well as continuous training of all personnel in the theory of lean manufacturing and familiarization with the latest practical achievements.

In the system of lean management of an industrial enterprise, the process of diagnostics is appropriate to consider through a causative relationship with management functions (Fig. 1), which is ensured by the integrated use of a set of methods of lean manufacturing.

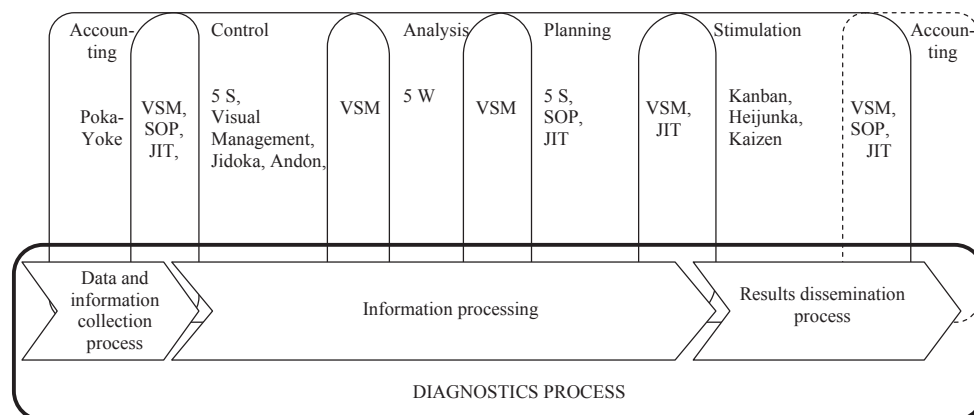


Fig. 1. The sequence of diagnostics in the system of lean management of an industrial enterprise

Timely evaluation of the results of operation and diagnostics of changes allows rationally balanced implementation of planned activities in the context of lean transformations. The result of diagnostics is manifested in balanced economical management decisions and coordinated economical actions of all personnel with a focus on continuous lean transformations to meet the needs of customers.

7. SWOT analysis of research results

Strengths. The strength of research is the further development of a combination of lean manufacturing methods in the process of diagnostics. This provides a purposeful generation and systematization of information on the actual state of the value stream in order to make reasonably balanced economical management decisions with a focus on continuous improvement on a continuous basis.

Weaknesses. The weak side is the choice of the value stream as the diagnostic object. Determining at the stage of introduction of diagnostics in the system of lean management of an industrial enterprise should be a thorough study of the state of the enterprise with the establishment of signs of a crisis or justification of proposals for creating an artificial crisis.

Opportunities. Opportunities for further research are the formation of a system of indicators for assessing the value stream and its components with a focus on the efficiency of industrial enterprise management.

Threats. Threats to further research is the difficulty of correctly introducing the diagnostics, because it depends on the formation of lean thinking among the staff, as well as the level of professional competence of the management of the industrial enterprise.

8. Conclusions

1. Further development of the interpretation of «diagnostics» is received as a process from the position of mutually fulfilling rational specific lean methods, techniques, means and procedures. The purpose of the diagnostics is identification of external and internal factors in a directed action (assistance/obstruction) to provide value to the customer and forecast the development of an industrial enterprise. The stream of value creation as an object of diagnostics in the system of lean management of an industrial enterprise is argued.

2. It is proved that diagnostics in the management system of an industrial enterprise is expedient to realize through the coordination of management functions (accounting, control, analysis, planning, stimulation). Result are focused on eliminating costs non-value-added, reducing to the minimum allowable level of technologically necessary costs non-value-added, searching for hidden reserves of costs to value-added.

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TESTING OF THE ASSESSMENT MODEL OF ENTERPRISE INVESTMENT ATTRACTIVENESS ON AN EXAMPLE OF UKRAINIAN MOTOR TRANSPORT ENTERPRISES

Об'єктом дослідження є модель оцінки інвестиційної привабливості підприємства (ІП). Більшість методів оцінки інвестиційної привабливості побудовані на визначенні та аналізі економічних показників за певними напрямками. Кожен з напрямків містить кілька показників, які суттєво впливають та всебічно відображають область діяльності підприємства. Мова ведеться як про якісні, так і кількісні показники. Одним з найбільш проблемних місць є об'єднання якісних та кількісних показників для визначення єдиного інтегрального показника ІП та перевірка такого підходу на підприємствах автомобільного транспорту. Використовуючи модель, можна вирішити найбільшу проблему, це агрегувати інформаційні напрямки та індекси, визначити універсальний інтегральний показник інвестиційної привабливості підприємства.

Для вирішення, поставленої в роботі проблеми, були застосовані наступні методи наукових досліджень:

- критичний аналіз, абстрактно-логічний метод та узагальнення наукового досвіду – вдосконалення принципів оцінки ІП;
- математичний та статистичний аналіз результатів дослідження, проведений за допомогою програмного забезпечення обробки статистичних даних, SPSS (v21.0) та Microsoft Excel (2010).

Завдяки цим заходам було:

- перевірено адаптивність моделі оцінки ІП підприємства на прикладі автотранспортних підприємств (АТП);
- визначено ІП АТП та основні фактори впливу на ІП АТП;
- розраховано коефіцієнти еластичності, відхилення фактичного показника ІП від оптимального;
- зроблено висновок про необхідність збільшення значень факторів, що впливають на ІП АТП.

Враховуючи виявлені слабкі сторони (негативні наслідки) для кожного підприємства, можна створити перелік пріоритетних заходів, які будуть впроваджуватись у АТП, та запропонувати алгоритм прийняття управлінських рішень щодо оптимізації рівня ІП АТП. На підставі отриманих даних можна розробити програму фінансової реструктуризації, адаптовану до системи управління ІП кожного вивченого АТП. Всі ці рекомендації дають можливість для подальших наукових розробок.

Ключові слова: *інвестиційна привабливість, рівень інвестиційної привабливості, коефіцієнти еластичності, автотранспортний сектор України.*

1. Introduction

Aggravation of the struggle for investments is a result of a sharply increasing demand for additional resources, while the volume of investment capital lags behind the needs of the sector and economy as a whole.

The reduction in the volume of budget funding and limited own funds of enterprises determine a particular relevance of researches on providing motor transport enterprises (MTE) investment attractiveness (IA).

Increasing the investment attractiveness can help an enterprise to create competitive advantages, open opportunities for innovation, reduce operating risks and operating costs, and improve the enterprise's profitability.

This problem is urgent not only for MTEs of Kharkiv region, which, despite the existing development potential, favorable geographical location are unable to attract the necessary investment resources because of a rather low level of IA caused by a low level of profitability of MTEs and negative investment image of Ukraine. The importance