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SUBSTANTIATION OF INFLUENCE FACTORS ON THE VALUE STREAM IN THE CONTEXT OF LEAN ENTERPRISE MANAGEMENT

Об'єктом дослідження є чинники впливу у їх взаємодії й супідрядності з орієнтацією на генерування/руйнування потоку створення цінності для замовника/кінцевого споживача в контексті ощадливого управління підприємством. За результатами здійснення системного та критичного аналізу виокремлено й обґрунтовано складники потоку створення цінності: людський потік, матеріальний потік, грошовий потік, інформаційний потік. Доведено пріоритетність людського потоку, який забезпечує перетворення матеріального потоку з подальшим генеруванням грошового потоку та одночасним підкріпленням змін усіх складників через інформаційний потік.

Запропоновано авторську систематизацію чинників впливу на потік створення цінності для кінцевого замовника в контексті ощадливого управління підприємством за такими ознаками:

- в розрізі складників потоку створення цінності (людський потік, матеріальний потік, грошовий потік, інформаційний потік);
- за цілісовим базисом ощадливості (обсяг, цінність, якість, час);
- за вектором впливу окремого чинника на потік створення цінності (додають/генерують цінність для споживача; не створюють/руйнують цінність для споживача; не додають цінності для споживача і є невід'ємними).

За результатами структурно-логічного аналізу, групування та графічного методу (діаграми Ісікави) наочно представлено супідрядність й причинно-наслідкові взаємозв'язки між виокремленими чинниками впливу на потік створення цінності. Разом з тим, структурування чинників впливу на потік створення цінності описано з використанням системи множини кортежів повної комбінації (потік створення цінності).

Визначено залежність групування чинників за вектором впливу на потік створення цінності від секторальних особливостей та цільових орієнтирів функціонування підприємства та його бізнес-партнерів. Також доцільно враховувати відмінності у способах створення цінностей та конкурентні переваги щодо унікальності підходів задоволення вподобань замовників з орієнтацією на посилення й підтримування бізнес активності.

Дістало подальшого розвитку застосування окремих методів ощадливого виробництва (VSM, SOP, 5 W, JIT, Heijunka, Visual Management, Kaizen) для обґрунтування та перегляду цілісної системи чинників впливу на потік створення цінності. Активне використання зазначених методів забезпечить точний з вищим ступенем деталізації та погоджений перелік чинників впливу на потік створення цінності, що в перспективі надасть керівництву можливість:

- покращення ефективності управління;
- здійснення раціонального розподілу й використання обмежених ресурсів;
- формування системи мотивації, орієнтованої на внесок у створення цінності.

Ключові слова: потік створення цінності, людський потік, матеріальний потік, грошовий потік, інформаційний потік, ощадливе управління.

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1. Introduction

The most important condition for overcoming adverse situations for the stable economic development of the enterprise is to satisfy the value of the end user while strengthening competitive positions. The relevance of the problem is the justified determination of the value stream and its components both within the framework of an indi-

vidual enterprise and in the chain «supplier – producer – customer». At the same time, it is advisable to pay due attention to the establishment of factors affecting the value stream with identification of the direction of impact. There is a need to study the relationship and influence of factors on the generation/increase or destruction/decrease of the value stream as a whole and on its constituent elements. It can be argued that the objectivity and accuracy of the

systematization of influence and control factors in the stream of lean-based value creation will help to achieve the desired level of future functioning of the enterprise. Neglecting the outlined questions leads to imbalances:

- 1) the economic interests of market participants, in particular, suppliers, manufacturers, buyers;
- 2) the main results of functioning (first of all, labor productivity and wages of workers);
- 3) the interests of owners, top management and staff.

Violation of this equilibrium can be overcome by studying the interdependence of factors of influence on the value stream from the position of an interested consumer through proper structuring and justification of the direction of impact.

2. The object of research and its technological audit

The object of research is the factors of influence in their interaction and subordination with a focus on the generation/destruction of the value stream for the customer/end user in the context of the lean management of the enterprise.

The value stream is part of the lean manufacturing concept [1, 2]. Highlighting the value stream with the correct description and justification:

- firstly, it contributes to the satisfaction received from the product and focuses on increasing the value of the product from the position of the customer;
- secondly, it improves business processes and work in general;
- thirdly, it allows to identify wastes/unproductive expenses and direct the actions of top management and employees to minimize them before liquidation;
- finally, it ensures sustainable economic development of the enterprise.

Effective enterprise management in turbulent conditions, exacerbating changes, increasing fluctuations in consumer demand and reducing the planning time horizon cannot be carried out without identifying and systematically considering the factors affecting the value stream. There is no unified set of factors influencing the value stream from producer to customer. The hypothesis of the study is the assumption that the set of key factors influencing the value stream can be universal in the context of lean management of the enterprise, and sectoral characteristics are crucial for establishing the priority of their components.

3. The aim and objectives of research

The aim of research is to justify the list of factors influencing the value stream in the context of the lean management of an enterprise.

Achieving this aim necessitates the solution of the following scientific problems:

1. To substantiate the key components of the lean-based value stream from the perspective of an interested consumer.
2. To substantiate an ordered set of factors that generate/destroy the stream of value creation in the context of the lean management of an enterprise.
3. To establish the feasibility and necessity of studying the factors that value-added (generating) to the consumer; do not-value-added (destroy) for the consumer; do not add value to the consumer and at the same time are integral to the value stream (required non-value-added).

4. Research of existing solutions of the problem

Value is considered to be an integral characteristic, contains the main components (all without exception actions within the enterprise's business processes [2]) and is formed by the manufacturer from the position of the consumer (expected quality, quantity, price, delivery time [3]). For sustainable economic development and the well-being of society, value is recognized as a priority target and the main object of management in the concept of lean manufacturing.

Among the main directions of modern scientific research, the researchers selected the following problems:

1. *Creating value for the consumer with minimizing resources.*

An interesting position is in [4], where it focuses on the importance and importance of understanding the place where value is formed, created, generated. This is what allows to maintain a constant focus on the value stream, as well as the feasibility of establishing its constituent elements.

The position [5, 6] on the need for a spatio-temporal description of the stream of creating value and the clarity of establishing boundaries: processes, the time horizon, and cooperation focusing on the request deserve support. In work [5] two types of description are distinguished:

- 1) logical design – a description that provides a sequence of processes to satisfy customer requests by establishing logically consistent relationships of elements in the system through the exchange of information;
- 2) physical design is a diagram of the process of satisfying customer requests with a detailed specification of specific actions and operations with a focus on value creation.

This will contribute to an unambiguous understanding of the creation of value in the material flow from the planning of material resources, the process of their processing to delivery to the final consumer. At the same time, assessment of the importance of the efforts of management and specific performers in the process of forming value as a separate element in the stream of creating value is ignored.

Visualization of the value stream helps to identify where, when, how the movement of materials and information occurs, as well as establish communication links between personnel to monitor losses and operational efficiency [6]. However, the necessity and significance of such a component of the value stream as cash is determined.

An important position [7] is on improving processes for the formation and delivery of value to the final customer by combining the technical potential and competence of staff on the principles of lean management. This can be achieved by concentrating efforts on improving business processes with an orientation towards the expected result and predicting the influence of factors on the value stream.

It is worth noting and maintaining the position [8] that the main factors influencing the value stream can be:

- time (How much time?);
- staff (How many people?);
- quality (First time quality?);
- value (External cost?).

However, this position causes ambiguity and debatability, since the expected value, quality and time are recognized as the target basis for lean production [1–3]. At the same time, the staff creates value for the customer through the best realization of professional competence [7]. So, in the future, it is advisable to consider personnel as an integral

element of the value stream, which is influenced by value, quality and time.

2. *Creating the maximum benefit for the end customer, taking into account the attraction and motivation of each employee.*

Creating actual value for the customer is impossible without the involvement of executives and managers on lean thinking. The management of its own example creates the conditions that ensure the success of lean changes with a focus on the production of value within the enterprise [8].

According to the results of a study of scientific papers, it is found:

- the use of diverse aspects to justify the importance of personnel in the operation of the enterprise:

1) human resources – the totality of people as carriers of the ability to exist and social value, is realized through the implementation of certain processes in a certain time period [9]. Human resources are the basis for the development of any enterprise, consisting of the competencies of managers and employees, their knowledge, skills, motivation, behavior and attitude to work [10];

2) human potential – a set of physical, mental and creative abilities of a person to work and economic relations, which are realized in the process of evolution of the economic system and represent a person's property, the source of its self-development [11];

3) human capital – a set of original knowledge, abilities, skills and innate talents, the costs of mastering which or developing them in the future can provide income to the enterprise [12]. At the same time, human capital is considered as a carrier and an object of creating values for the client and for the enterprise [10];

4) human flow – a set of individuals who are directly involved in the creation of a product and services; use of products and consumption of services [13];

- the value of the individual is the basis for the development of an effective economy, which makes targeted management activities [14];
- providing a personal contribution to the process of creating value for the consumer through discipline and the obligation to fulfill the scope of official and/or functional tasks [8].

Therefore, it can be argued that staff is the engine of lean transformations with a focus on the rational creation of value for the end user.

3. *Transformation or improvement/development of enterprise management on an ongoing basis.*

To overcome this problem and ensure the development of the enterprise by moving from an actual to the desired state, some authors in [5, 15] suggest an important method of lean management of Value Stream Mapping (VSM) as appropriate. On an ongoing basis, the formation of a current-state map, a future-state map, an ideal-state map [2, 16] with an orientation toward simplifying and improving the efficiency of business processes [17] is justified. Undoubtedly, the use of a value stream map for the correct visual description of business processes with the simultaneous installation of:

- holistic sequence of creating value for the consumer at any stage of its formation at any time [4];
- wastes by types of activities or operations that value-added/not-value-added or business-value-added [4, 16, 18];
- understanding of the nature of wastes (overhead costs and processes/hidden losses), their criticality by type

and volume, as well as the feasibility of minimizing up to elimination or prevention of occurrence [6, 18, 19];

- possibility of optimizing the use of limited production resources, space, manufacturing time with a focus on increasing productivity and improving efficiency [16];
- possible planned activities, the implementation of which is aimed at improving and improving, in particular the production process (improving throughput, reducing the processing time), from the position of the consumer [5, 19].

In [15, 16], a conclusion is drawn on the necessity and insufficiency of using the VSM method for analyzing value stream problems. Better VSM results provide a combined use of the following methods:

- Cost of poor quality (COPQ), Failure mode and effect analysis (FMEA), 5S analysis, Waste analysis, Kaizen (continuous improvement) [15];
- 5W1H (What, When, Why, Who, Where and How), ECRS (Eliminate, Combine, Rearrange and Simplify) [16].

To justify management decisions, it is recommended that certain precautions be taken. This is primarily due to the identification of factors influencing the value stream and the correctness of their coordination at a particular point in time, technological sequence, information and communication communications of performers and top management.

Recognizing the significance of the accomplished developments, it should be noted that the systematization and structuring of the set of factors of influence on the value stream in the context of managing the enterprise on the lean-basis were not properly substantiated. This determines the prospects of this problem and the need for this study.

5. Methods of research

The research methodology is based on the provisions of organization theory, systems theory, set theory, control theory, strategic management theory, lean manufacturing theory.

The specific scientific results of research are obtained during the implementation of general scientific and special methods of scientific knowledge:

- system and critical analysis, theoretical and analytical modeling – to determine the components of the stream of creating value for the consumer and the vectors of the influence of individual factors on its change;
- structural-logical analysis, grouping, graphical method (Ishikawa diagram – the methodological construction approach is described in [20]) – to determine possible factors of influence on the value stream, highlighting the key ones and establishing significant causal relationships between them;
- set theory, structural-logical analysis – to establish causal relationships of individual factors and their components;
- synthesis, induction, deduction, generalization – to justify the feasibility of studying the vector of the influence of individual factors, assessing the results, formulating conclusions.

6. Research results

The value stream should be considered as a cyclic process of transformation of its components with a focus on the maximum possible satisfaction of the needs/requirements of the end user. This creates economic incentives

for the development of inherent value, among which the main ones can be identified:

- unique stream of value creation with a focus on the customer, which ensures the growth of cash flow as the main goal of functioning;
- integration and cooperation in the chain «supplier – producer – customer» with the focus of business processes on the formation of product value for the consumer, reduces the gap between the expected result and the actual level of its achievement.

One of the important and complex problems is the justification of the value stream for a particular type/group of products from a customer's position within an individual enterprise or in the chain «supplier – manufacturer – customer». In the framework of the study, the value stream in the context of the lean management of an industrial enterprise should be considered as a set of interrelated components:

- material flow, where there is a change in the material form of raw materials through work in progress to the finished product with the simultaneous creation of value for the consumer. A model of managing the material flow of an lean-based industrial enterprise using process, functional, and systemic approaches was proposed by the author in [21];
- cash flow – targeted cash generation with a focus on synchronizing the receipt and disposal of cash and cash equivalents, in accordance with IFRS 7, and the constant maintenance of an acceptable level of solvency and liquidity;
- human flow – the appropriate number of personnel with lean thinking and a sufficiently necessary level of professional competence with a focus on the success of creating value for the enterprise and the end user;
- information flow – movement and transformation of data into lean information with minimization of content waste.

In the framework of the author's study, the human flow is the priority part of the value stream, the basis of which should be the personal responsibility of each employee:

- for conscientious performance of official duties;
- for individual actions to create value within the workplace;
- for rational teamwork within the stream of creating value and expanding and strengthening cooperation in the chain «supplier – producer – customer»;
- for combining efforts at all hierarchical levels of management for continuous improvement and continuous development.

Human flow carries out the transformation of material flow provides the generation of cash flow while reinforcing changes in all components through the information flow.

It is advisable to create an enabling environment for cooperation in the stream of creating value with a focus on the dissemination of innovative knowledge and information without restrictions. This implies minimizing the clear separation of hierarchical subordination by the level of enterprise management and weakening functional boundaries, as well as viewing/shaping information exchange policies. It becomes important to cooperate, understand and maintain informational relationships in the «supplier – producer – customer» chain. Such changes are aimed at improving the effectiveness of functioning with an orientation towards ensuring the desired level for the long term.

Effective lean management of an industrial enterprise is impossible without systematization of factors that increase/generate or reduce/destroy the stream of value creation from the position of the customer (external and internal). Systematization of the value stream factors for the end consumer in business management makes it possible to assess the impact of each of them on value creation. This helps to define tasks for managers and individual performers, as well as to control and stimulate their effective implementation through a contribution to increasing value for the consumer.

In the published results of theoretical and applied research, no theoretical design has been formed to establish a coherent system of factors of influence on the flow of creating enterprise value and assess their impact. The systematization of factors of influence on the components of the value stream for the end customer in the context of the lean management of the enterprise is presented in Fig. 1. In the framework of the author's study, a graphic method with the construction of the Ishikawa diagram is used to visualize the subordination and cause-effect relationships.

According to the results of the analysis of published developments [1, 2] of scientists and practitioners, it can be concluded that in a generalized form of a separate component of the value stream, four groups of factors affect the lean-based target basis:

1. The group of «VOLUME» factors determines quantitative economic indicators characterizing the magnitude of the movement:

- resources (human, material, monetary, information);
- costs (add value to the consumer, do not create value for the consumer, do not add value to the consumer and are integral);
- wastes (over-production, wait time, transportation, processing, inventory, motion, defects);
- expected result of the operation (cash flow generation, improving the competitive position and competitiveness in the market, building value to satisfy the customer).

2. The group of «VALUE» factors is the parameters that influence the change in uniqueness/individuality from the perspective of the end user. This is a certain set of subordinate elements, the assessment of which is the decisive goal for ensuring satisfaction and building customer loyalty. So, the value in the human flow, it is advisable in the future to consider both the value of the enterprise, and personal value.

3. The group of «QUALITY» factors – these are the parameters that determine the degree of objective uniqueness in a certain system of relationships with an orientation toward strengthening competitive status in the market. So, it is advisable to determine the quality in the material flow in three aspects:

1) input quality characterizes the property (ability) of raw materials to satisfy the need for use in the process of developing finished products;

2) which in the technological process reflects the degree of conformity of the transformation with existing standards (in particular, compliance of products with international standards ISO 22000:2005. Food safety management system), norms (in particular, internal requirements), conditions (in particular, the technological process and contracts for the supply of finished products);

3) quality of the finished product – the totality of the consumer properties of a unit of the finished product and its ability to satisfy the predetermined needs of the final consumer in accordance with the functional purpose.

4. The group of «TIME» factors determines a specific dynamic moment and/or interval assessment (for a certain date, for a reporting period, in time for the future). It is advisable to use the results of a retrospective analysis and take into account the possibility of changes for forecasting in the future. Thus, in the information flow, professional competence and professional judgment of an individual specialist, who are involved in the process of identifying, measuring, registering, accumulating, generalizing, storing and transmitting information for decision making, influences. Continuous maintenance of professional competence at a sufficient level necessary for the performance of official duties is possible subject to self-actualization and self-determination of the professional trajectory of personal development. Professional judgment assumes exceptional importance in the formation of address information at the request of the interested user and caution in relation to the variation/alternative justification.

$$VS=\{K_i\}, \quad (1)$$

where VS – the set of tuples of the full combination (value stream); K_i – i -the tuple of the full combination (components of the value stream: human flow, material flow, cash flow, information flow).

A tuple of a complete combination of the components of a system of sets encompasses elements that are subsets of the output sets $N^1, N^2, \dots, N^s$. A tuple is considered complete if its length is equal to the rank of the set system:

$$K=(M^1, M^2, \dots, M^s), \quad (2)$$

where K_i – the tuple of the complete combination of the constituent elements of the sets $N^1, N^2, \dots, N^s$, and $M^1 \subset N^1, M^2 \subset N^2, \dots, M^s \subset N^s$; s – the rank of the set system; M^i – the subset of the set N^i that is part of the system i is part of the tuple K , $i=1, 2, \dots, s$.

$$N=\{N^1, N^2, \dots, N^s\}, \quad (3)$$

where N – a system of sets; $N^1, N^2, \dots, N^s$ – the sets that make up the system; s – the rank of the system of sets, that is, the number of sets that make up the system;

$$N^1=\{n_i^1\},$$

where $i \in I$; $N^2=\{n_j^2\}$, where $j \in J$; ...;

$$N^s=\{n_k^s\},$$

where $k \in K$; $n_z^f \neq n_p^h$, for all known f, h, z, p .

The set of tuples of the full combination will be consistent if the matching rules $M_1^1=M_s^s$ between the elements of the tuples K_i .

Under the system of sets, each individual component of the value stream that is recorded using tuples is considered.

K^1 – human flow that influences the formation of value through targeted rational use of intellectual abilities, practical skills, and leadership qualities of specialists with lean thinking. The task of enterprise management is to develop measures to create opportunities for improving professional knowledge and developing staff skills on an ongoing basis through the introduction of innovative training programs. A reliable measure of creating value can be considered job satisfaction and the quality of job performance.

The human flow influences the value stream through the key factors that make up certain sets: volume (h_1), value (h_2), quality (h_3), time (h_4), provided $n_1 \subset K^1, n_2 \subset K^1, n_3 \subset K^1, n_4 \subset K^1$. Then K^1 through formula (2) can be written in the following form:

$$K^1=(h_1, h_2, h_3, h_4).$$

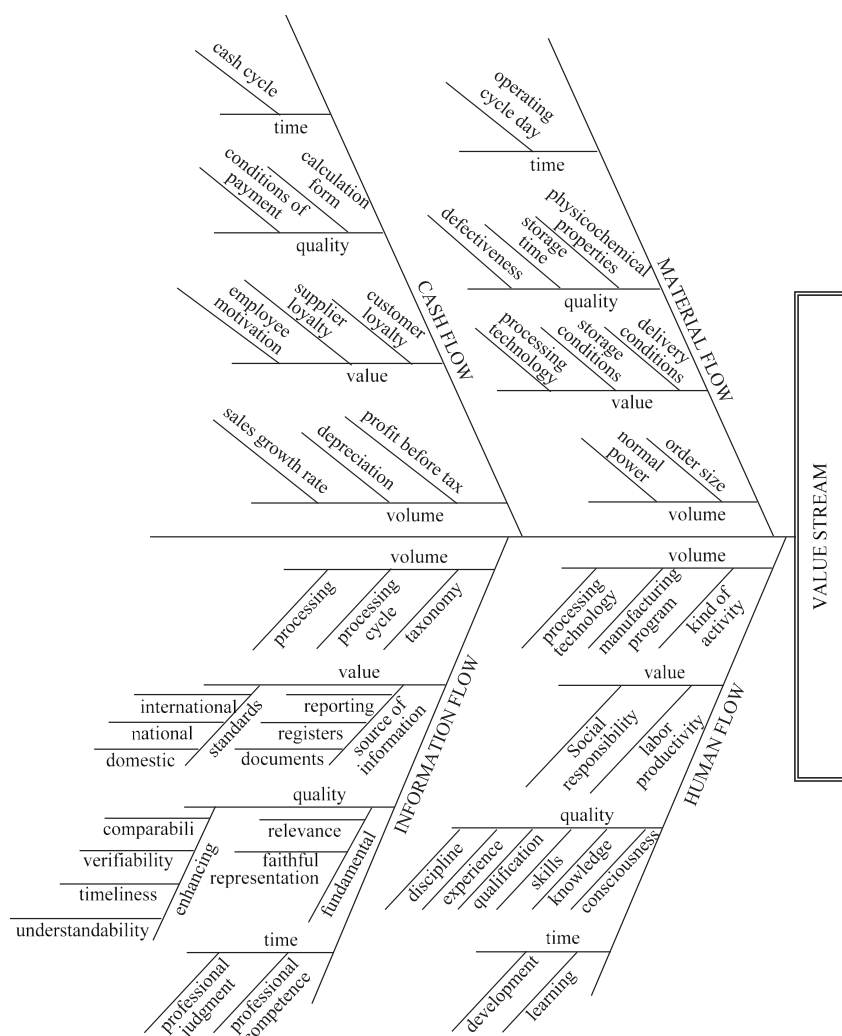


Fig. 1. Author's systematization of factors influencing the value stream in the lean context

It is advisable to describe the resulting holistic subordination of the structuring of factors of influence on the stream of value creation using the plural system. It is customary to consider a set as a collection of defined and disparate objects assembled into a single whole. The value stream in the context of the lean management of an enterprise using tuples of the full combination is proposed to describe as follows:

Each of the key factors is a subset for the formation of the human flow and at the same time can be defined as a set and calculated for a certain set of indicators – subsets.

In modern conditions, it is advisable to consider value as a priority group of factors influencing the value stream through the human flow. Each of these components of the value of the human flow can be represented through a system of sets, according to formula (3) it will look like:

$$h_2 = \{h^1, h^2\}, \quad (4)$$

where h^1, h^2 – the systems of sets that make up the system;

$$h^1 = \{h_i^1\},$$

where $i \in I, I$ – indicators that define the characteristics of social responsibility of both the enterprise and the employee;

$$h^2 = \{h_j^2\},$$

where $j \in J, J$ – indicators that determine the characteristics of labor productivity through motivated personal achievements to the level of the enterprise.

In a similar way, many factors of influence on the value stream within the material flow, cash flow and information flow are argued. The quantity and detail of component composition can vary in accordance with certain tasks of constantly creating value and continuously maintaining it at a sufficiently necessary and acceptable level for the end user. A more complete refinement of individual factors of influence on the value stream through its components can take place in the process of specifying tasks or adjusting the proposed model. The limitations of such a model can be time, money, and fairly reliable data.

The establishment of the vector of the influence of a single factor on the value stream is of great importance:

1. «Value-added (generating) for the consumer» group – a set of parameters and circumstances that provide a synergistic effect of the formation and accumulation of value in the stream of its creation.

2. «Not-value-added (destroy) for the consumer» group – a set of conditions, parameters and circumstances that cause imbalances and instability in the stream of value creation. As a result, this leads to the impossibility of value formation.

3. «Required non-value-added» group – a set of technologically necessary conditions, parameters and circumstances that contribute to the creation of the desired value for the selected stream.

In the framework of the study, according to the results of the implementation of the systems and critical

analysis methods, it is proposed to group factors by the influence vector in the context of the components of the value stream. The author's result is presented in Table 1.

Table 1

Author's distribution of factors by the vector of influence on the value stream

Influence vector Constituents	Value-added (generating)	Not-value-added (destroy)	Required non-value-added
1. Volume			
human flow	– processing technology	–	– kind of activity; – manufacturing program
material flow	–	– order size	– normal power
cash flow	–	–	– profit before tax; – depreciation; – sales growth rate
information flow	– processing cycle; – processing	–	– taxonomy
2. Value			
human flow	– social responsibility	–	– labor productivity
material flow	– processing technology	– storage conditions	– delivery conditions
cash flow	– employee motivation	–	– customer loyalty; – supplier loyalty
information flow	–	–	– source of information; – standards
3. Quality			
human flow	– consciousness; – knowledge; – qualification; – skills; – experience	–	– discipline
material flow	– physicochemical properties	– storage time; – defectiveness	–
cash flow	–	–	– calculation form; – conditions of payment
information flow	–	–	– fundamental characteristics; – enhancing characteristics
4. Time			
human flow	–	–	– learning; – development
material flow	– operating cycle day	–	–
cash flow	–	– cash cycle	–
information flow	– professional judgment	–	– professional competence

The significance, vectoriality and degree of influence of an individual factor on the value stream are primarily dependent on:

- sectoral characteristics of the economic functioning of a particular enterprise and its business partners, primarily suppliers and customers;
- targets for functioning as a basis for long-term sustainable economic development;
- differences in the ways of creating values with a focus on the consistency of meeting demand and matching a sufficient level of professional competence to fulfill it;
- competitive advantages in terms of uniqueness of approaches, pleasure of preferences, followed by customer loyalty, with a focus on strengthening and maintaining business activity.

Any enterprise is not able to predict the influence of all factors on the change in the value stream from the position of the consumer, but it is necessary to take into account possible changes under the influence of each of them. Each enterprise has its own set of factors affecting the formation of the value stream and its components, among which key/priority ones are determined. Management actions should be aimed at identifying the factors of generating value within an individual enterprise or in the «supplier – producer – customer» chain, as well as purposeful, rational management of them with sufficient reliable information. If some factors are ignored, omitted, rejected, the enterprise may not achieve the set goal, and the results of its functioning do not correspond to the development strategy.

For the practical implementation of sound recommendations, first of all, it is necessary to involve specialists in lean thinking and awareness with the principles and methods of lean production in the management of the enterprise and top management. To ensure the desired long-term functioning result, it is advisable to actively use lean manufacturing methods in enterprise management and justification of the system of factors of influence on the value stream, in particular:

- VSM (Value Stream Mapping) – a graphical method for displaying, in the form of separate cards, a holistic diagram of the stream of creating value within the human, material, monetary and information flows for all business processes;
- SOP (Standard Operating Procedure) – the implementation of the method provides for the development and approval of internal standards for the systematization of influence factors and the formation of value stream flow maps, taking into account the specifics of functioning and the production situation;
- 5 W – a method for establishing and studying the main cause-effect patterns based on the answers to the five-time question «Why?». This allows the systematization of factors of influence on the stream of value creation with the simultaneous determination of their subordination and vector;
- JIT (Just-in-Time) – the action of the method is aimed at synchronizing business processes by balancing the constituent elements in the value stream to better satisfy the end-user request. However, to ensure minimization before the elimination of operations/activities, do not-value-added;
- Heijunka – the implementation of the method allows to rationally meet the needs of customers through the value stream by aligning over a specific time period. So, in the material flow – the alignment of production volumes according to the product range, in the information flow – the totality of data in the context of information requests. As a result, avoidance or minimization of wastes in the human, material, monetary and information flow of value creation;
- Visual Management – the method provides for a visual representation of information about the actual level of achievement of the planned value of the controlled indicators in order to timely identify and identify deviations and quickly correct/eliminate them;
- Kaizen – the method is aimed at encouraging employees of the enterprise to develop proposals on an ongoing basis for improving the value stream. The imple-

mentation of the selected projects should provide the desired result in the short-term range with a focus on long-term success.

The integrated introduction of lean manufacturing methods to systematize the factors influencing the value stream will allow the consumer to create additional value for all components. At the same time, this will help protect the economic interest and property of business partners, in particular suppliers and buyers.

7. SWOT analysis of research results

Strengths. The strength of the study is the proposed author's systematization with the establishment of subordination and causal relationships of factors of influence on the value stream in the context of frugality with a simultaneous description through a system of sets. Positive is the further development of the possibility of using individual lean manufacturing methods to justify and view a holistic system of factors of influence on the value stream. The expediency of highlighting the key components of the value stream has been proved: human flow, material flow, cash flow, information flow.

Weaknesses. The weakness is the selection of key factors influencing the value stream in the system of economic management of an enterprise. The results are subjective and may be incomplete. That is why there is a need to clarify the direction of action, the degree of controllability and the strength of the influence of a single factor on the stream of creating value and its components, taking into account sectoral characteristics and uniqueness of the enterprise.

Opportunities. The possibilities of further theoretical and applied research lie in the development of information models for evaluating the components of the value stream with experimental confirmation of the integral evaluation result. At the same time, it is advisable to develop a methodology for quantitative assessment by the dominant force of the influence of an individual factor on the value stream, taking into account vectorization. It is advisable to establish the multiplicity of relationships and their synergistic effect on the value stream as a whole, as well as the need for coordination on priority. On the methodological aspect, to implement the formation of internal standards within the framework of economic management of the enterprise, taking into account sectoral characteristics.

Threats. Threats for further research are the difficulty of correctly forming a coherent subordinate system of factors of influence on the value stream. This is primarily due to the need for accurate coverage and analysis of the maximum possible set of factors to highlight significant positions and the installation of a direction vector of changes for each factor. To maintain the updating of the recommended system, it is advisable to view and update the components of the stream of creating the value of influence factors and their vectoriality, which is provided by personnel with lean thinking.

8. Conclusions

1. The set of interconnected components of the value stream in the context of the lean management of an enterprise is substantiated, namely: material flow, cash flow, human flow, information flow. The priority of human flow

is proved, which provides the transformation of material flow with the subsequent generation of cash flow and at the same time reinforcing changes in all components through the information flow.

2. The author's systematization of factors of influence on the value stream for the end customer in the context of the lean management of the enterprise is proposed according to the following criteria:

- in the context of the components of the value stream (human flow, material flow, cash flow, information flow);
- on the lean-based target (volume, value, quality, time);
- by the vector of the influence of an individual factor on the value stream (value-added (generating); do not-value-added (destroy); do required non-value-added).

For more detail, it is possible to use Ishikawa diagrams for each part of the value stream or use the description of the sets of tuples of the full combination.

There was further development of the application of individual lean manufacturing methods (VSM, SOP, 5 W, JIT, Heijunka, Visual Management, Kaizen) to justify the system of factors of influence on the value stream. The active use of these methods will provide accurate with a high degree of detail and agreed upon a list of factors of influence on the value stream, which in the future will allow management to:

- improvement of management efficiency;
- implementation of the rational distribution and use of limited resources;
- formation of a motivation system focused on the contribution to value creation.

3. Based on the results of the methods of systemic and critical analysis, the author allocated the selected factors taking into account the influence vector of each on the value stream through its components into groups:

- value-added (generating) for the consumer;
- do not-value-added (destroy) for the consumer;
- do required non-value-added.

The dependence of the grouping of factors by the vector of influence on the value stream is determined, first of all, on sectoral characteristics and target guidelines for the functioning of the enterprise and its business partners.

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