

# MODEL OF INCREASING THE EFFICIENCY OF PRODUCTION CAPACITIES MANAGEMENT AT TEXTILE ENTERPRISES

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**Abstract** — The article examines the issues of improving the management efficiency of the production capacity of textile enterprises. The author proposed a mechanism to control the use of production capacity of the enterprise. It is revealed that the system of goals for making strategic decisions does not always have a specific form, moreover, you first need to develop the target indicators required for making decisions. According to the author, in the course of the sequential identification and formulation of the main goals, a hierarchical target system is created through the definition of subgoals. At the same time, it is also necessary to establish differences in the importance of goals of one hierarchical level. However, with an increase in the number of criteria taken into account when evaluating alternative solutions, the ability of the decision maker (DM) to analyze problems decreases. In the second part of the article, an algorithm is proposed for organizing the effective use of production capacity of textile enterprises and a model for organizing the effective use of production capacity in textile enterprises.

**Index Terms** — textiles, production capacity, decision maker, model, Saaty, criteria, system of goals, algorithm of the process.

## 1 Introduction

Consistent work on harmonious development of the fuel and energy sector and diversification of energy resources is being carried out in our country. This is an important factor in meeting the growing demand for energy resources and sectors of the economy.

### Introduction

In world practice, an increase in the level of utilization of the production capacity of textile enterprises is ensured as a result of the planned and persistent implementation of a whole complex of targeted management decisions.

It is known that at present the utilization of production capacity on average, in Uzbekistan does not exceed 80%, and in many textile enterprises it is up to 70%. The activities of leading high-tech enterprises determine the overall technical and technological level and competitiveness of domestic products. The maintenance of non-loaded capacities on the balance sheet of enterprises today significantly restrains the motivation to invest and upgrade production, places a heavy burden on enterprises' finances, prevents savings in production costs and, thus, is a powerful factor of inflationary pressure on the economy.

In Uzbekistan, light industry is an important sector of the economy and a peculiar competitive environment is being formed. About 12 thousand

large and small enterprises, as well as about 500 joint ventures work effectively in such industries of the light industry as textile, spinning, sewing, knitting and silk, which employ more than 150 thousand people. However, there is a reserve of untapped potential in the textile and garment and knitwear industry. Therefore, in modern conditions it has become necessary to increase the use of the potential of enterprises operating in the industry on the basis of modern methods of managing the use of production capacity.

## 2. Literature review

The issues of management, specialization and optimization of production capacities are reflected in the scientific works of the following foreign scientists: V.J.Stevenson, R.Chase, N.D. Equiligny, R.F. Jacobs, D.J. Strickland, N. Slack, S. Chambers, R. Johnston, G.L. Tsipsa, A.S. Tovba, A. Thompson and others.

A significant contribution to the development of the theory and practice of management and use of production capacity was made by economists from the CIS countries: G.A.Aleksandrov, P.Gunich, A.A. Vodyanov, V.A. Vorotilov, N.L. Zaytsev, V.G. Zakharov, Ya.B.Kvasha, V.P.Krasovsky, R.G.Manilovsky, V.Ya.Medikov, D.M. Palterovich, N.M. Petrovich, L.D. Revutsky and others. Theoretical and methodological problems of organizing the effective use of the production capacity of an enterprise were stud-

ied in their works by such scientists from the CIS as N.M. Petrovich, R.P. Atamanchuk, N.L. Zaitsev, R.G. Manilovsky, B.V. Resurrection, Yu.Yu. Donets, D.M. Palterovich, P.I. Kumkov, V.N. Goncharov, A.P. Sidorov, Yu.Yu. Naimark, O.G. Turovets, V.N. Rodionova, G.V. Popova, M.I. Bukhalkova, L.D. Revutsky, G.L. Igolnikova, N.P. Konovalova, P.M. Petukhova, E.M. Prigogine, R.A. Fatkhutdinova and others. Aspects of the organization of the use of production capacity in industrial enterprises and its management were studied by Russian scientists K.S. Krivyakin and V.Dadalova.

The study of this problem is devoted to the work of many domestic scientists, economists, such as S. Iskandarov, A. Ulmasov, S. Gulyamov, M. Sharifhodzhayev, M. Boltabaev, N. Yuldashev, Yang Son Be, G. Zakhidov, Z. Hakimov, A. Tillakhodjaev, O. Davranov, S. Yusupov, and others, who mainly consider the theory of reproduction of basic production assets and increase the competitiveness of textile enterprises on the basis of marketing approaches.

### 3. Analysis and results

In modern conditions, an important activity of the enterprise is the constant analysis of the requirements of the consumer market and the use of the information obtained to develop corrective measures aimed at the effective management of the use of production capacity.

The development of market relations, the need to adapt the company to changes in the external environment brings to the fore the solution to the problem of effective management of the use of production capacity.

Before proceeding to the formation of a mechanism for the effective management of the use of production capacity, we define in terms.

From a technical point of view, a mechanism is a system of bodies designed to convert the movement of one or several solid bodies into the required movement of other solid bodies. Usually in the mechanism there is one input link that receives movement from the engine, and one output link connected to the working body or instrument pointer. This definition reveals a general idea of the mechanism, as a device through which the statics and dynamics are connected, their ordering is ensured and related to energy transfer, and, above all, indicates that the mechanism is a system.

In the management also occur similar phenomena. There are means of transformation of the goal, a managerial decision, the energy of the influence of the control subject is transformed into the energy of the activity of the control object, on the basis of which coordination of the joint activity is achieved, which allows to obtain a common result.

The mechanism is the system of organization of the system, the carrier and implementer of the organization, its process. Organization is the func-

tion of the mechanism, the result of its actions. Description of the mechanism - a description of its organization and its activities. In this case, we can speak not only about the mechanism's belonging to the organization's activities, but also about the logical interconnection of the organization and the macro-environment. The mechanism is a logically organized set of certain elements that interact in the process of its functioning. Based on the definition given in the economic literature, the object of management (the system being controlled) is understood as the organizational-selected structure-forming units of the socio-economic system, individual aspects of human activity. -sti on which the impact is directed.

The mechanism of managing the use of production capacity in general can be represented as a set of organizational, managerial and economic measures aimed at creating conditions for increasing the efficiency of using funds and objects of labor in an enterprise in order to produce products of the required volume and quality that meet market requirements.

Industrial enterprises are systems of high complexity, whose elements at the entrance and at the exit are subsystems of a great variety. The whole complex of activities within the enterprise is so complex that it cannot be fully interpreted. Therefore, the formation of a mechanism to control the use of production capacity is possible only with the use of a systematic approach and analysis.

The mechanism for managing the use of the production capacity of an enterprise should solve the main and complex problem - the realization of the functions of enterprise management as a mechanism for equalizing the internal components of the enterprise's activities under the influence of environmental conditions. The solution to a complex problem is its decomposition in aspects of consideration.

The object of the proposed mechanism for managing the use of production capacity is the production potential of the enterprise.

Improving the efficiency of capacity utilization requires continuous planning. Moreover, the plans are needed, of course, both operational and strategic. The formation of the mechanism for managing the use of production capacity takes its basis in strategic planning, since the achievement of the desired result depends on a number of interdependent decisions.

Note that in the existing level of instability, unpredictability of the external environment, the view of planning only as a clear and analytical changes.

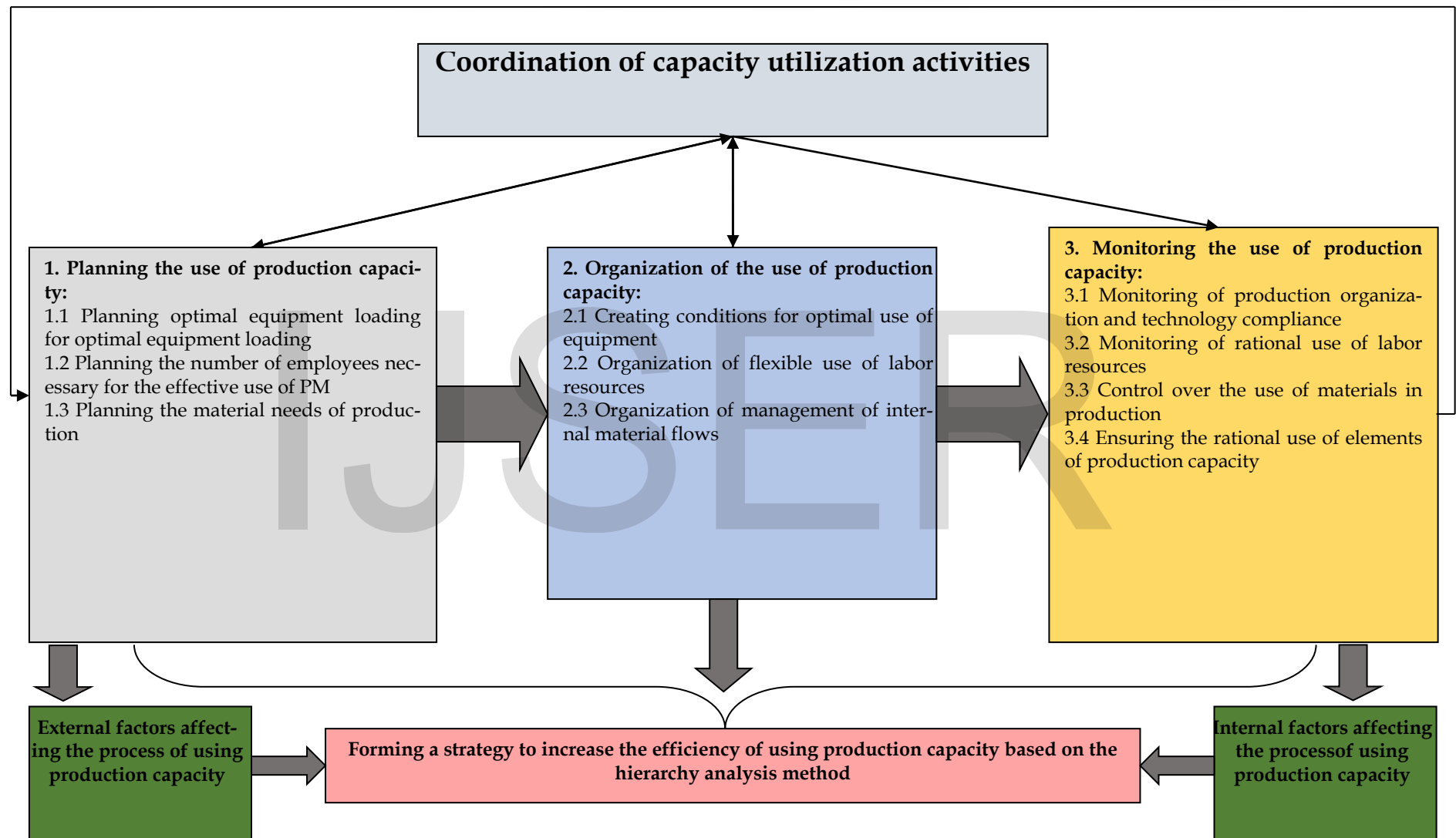
Competitive conditions in the textile market make it necessary to clarify the concept of structural

improvement with significant changes in the internal and external environment, which determines the importance of the requirement of adaptability. By adaptability, we will understand the ability of an enterprise to adapt to the changing conditions of the external and internal environment. Based on the influence of external and internal factors, enterprises are forced to choose various behaviors, form their own strategies in various areas of activity, including in the area of the use of production capacity.

The basis of the proposed mechanism for managing the use of production capacity (Figure 1) is the process of forming a strategy to improve the efficiency of the use of production capacity, implemented through a method of analyzing hierarchies.

The strategy to improve the efficiency of the use of production capacity is based on the results of coordinated actions in the field of planning, organizing and monitoring activities for the use of production capacity of the enterprise. The above activities are cyclical in nature, as a result of which the subject of management makes decisions on making appropriate changes, focusing on the achievement of planned indicators and factors of the external and internal environment of the enterprise.

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The subject of management of the process of using production capacity in an enterprise in order to make a rational managerial decision requires the decomposition of a complex problem into simpler particular tasks. This is the focus of the hierarchy analysis method (analytic-hierarchical process). The method is based on ordinal processing, i.e. The "soft" information that comes to the decision maker (DM), and on the basis of this incomplete information, allows us to determine a number of alternative solutions.

The whole mechanism is focused on the choice of an enterprise strategy, here the formation of a strategy to improve the efficiency of the use of production capacity is a key element. It should be noted that external and internal factors influence the formation of a strategy for increasing the efficiency of production capacity utilization.

The system of goals for making strategic decisions does not always have a specific form; moreover, it is first necessary to develop the targets required for making a decision. In the course of the sequential identification and formulation of the main goals through the definition of sub-goals, a hierarchical target system is created. At the same time, it is also necessary to establish differences in the importance of goals of one hierarchical level. However, with an increase in the number of criteria taken into account when evaluating alternative solutions, the ability of the decision maker (DM) to analyze problems decreases. []

For optimization, it is reasonable to use a multistep decision-making using a modified hierarchy analysis method using express estimates of dominance and different weights of experts, depending on their qualifications and consistency. Such approaches make it possible to exclude the least significant variants of the criteria and get rid of the analysis of obviously losing alternatives. A fairly large number of papers are devoted to theoretical methods for substantiating such approaches. An interesting example of the use of the combined multi-stage method to simplify the management of competitiveness is given in the works of L. B. Shabanov and others. []

In this article, we will call the "analysts" a group of experts working on the adoption of an optimal mechanism for managing an enterprise. "Stakeholders" will name all interested persons whose opinion will be taken into account when searching for the appropriate solution. All together we will call "experts."

In some cases it is important to take into account the different significance of the opinions of experts. For this purpose, we introduce the concept of the weight of the expert,  $v_i, i = 1, \dots, m, m$  - the total number of experts. For simplicity, further calculations will assume that the weights of the experts are normalized:  $v_1 + v_2 + \dots + v_m = 1$ .

To select the optimal solution in these systems, it is proposed to use the following multi-stage mechanism for choosing the optimal solution, built on a combination of polling methods, domination analysis and hierarchy analysis.

Stage 1. Formation of a preliminary extended list of alternatives and criteria and their rapid assessment.

Stage 2 Optimization of the number of alternatives based on the choice of their Pareto-effective set.

Stage 3 Determination of criteria significance weights and optimization of their number by eliminating extremely insignificant ones.

4 stage. Stakeholder survey with a view to pairwise comparison of alternatives by criteria. Determination of the total weights of alternatives using the Saaty method and various weighting factors of the stakeholders, adjusted to the consistency of the estimates.

If necessary, the alternative leaders obtained in the final stage can be analyzed using more labor and financially costly methods.

Stage 1. Analysts present their options for criteria and alternatives to management decisions.

A set of criteria and alternatives are proposed to complement the stakeholder. After offering their options, they also give a preliminary assessment on a 5-point scale to the criteria and alternatives for the tables (see below). Gathering all the offers, a similar 5-point evaluation is carried out by analysts.1

**Table 1**

**Scale for first assessment of criteriaes**

Score	Value of criteria
5	very important criteria
4	important criteria
3	middle important criteria
2	not important criteria
1	criteria was not proposed by experts

**Scale of preliminary assessment of alternatives**

Score	Quality of criteria
5	one of the best management decision
4	good management decision
3	acceptable management decision
2	bad management decision
1	Very bad management decision

As a result, after the end of the first stage, we obtain two matrices of preliminary estimates.:

$$A_0 = (a_{ij}),$$

here  $a_{ij}$  – evaluation of the  $i$ -th alternative by the  $j$ -th expert;  $n$  – total number of alternatives,

$$C_0 = (c_{ik}),$$

assessment of the  $k$ -th criterion by the expert;  $k = 1, \dots, N_c$ ;  $N_c$  – total number of criteria.

If it is clearer, you can write: We get two tables of rapid assessment

**Table 2**

**Table of rapid assessment alternatives**

$A_0$	Альтернатива 1	Альтернатива 2	...	Альтернатива $N_a$
Эксперт 1	$a_{11}$	$a_{12}$	...	$a_{1N_a}$
Эксперт 2	$a_{21}$	$a_{22}$	...	$a_{2N_a}$
...	...	...	...	...
Эксперт $m$	$a_{m1}$	$a_{m2}$	...	$a_{mN_a}$

$C_0$	Критерий 1	Критерий 2	...	Критерий $N_c$
Эксперт 1	$c_{11}$	$c_{12}$	...	$c_{1N_c}$
Эксперт 2	$c_{21}$	$c_{22}$	...	$c_{2N_c}$
...	...	...	...	...
Эксперт $m$	$c_{m1}$	$c_{m2}$	...	$c_{mN_c}$

So, the weights of alternatives according to all criteria are obtained as weighted average by weight of experts, taking into account the consistency of their opinions:

$$g_p^k = g_p^{k1} \cdot v_1 \cdot z^{k1} + g_p^{k2} \cdot v_2 \cdot z^{k2} + \dots + g_p^{km} \cdot v_m \cdot z^{km}$$

$g_p^k$  – weight alternative  $p$  by criterion  $k$ .

As a result, we determine the matrix of weights of alternatives by the criteria:

$$G = (g_p^k).$$

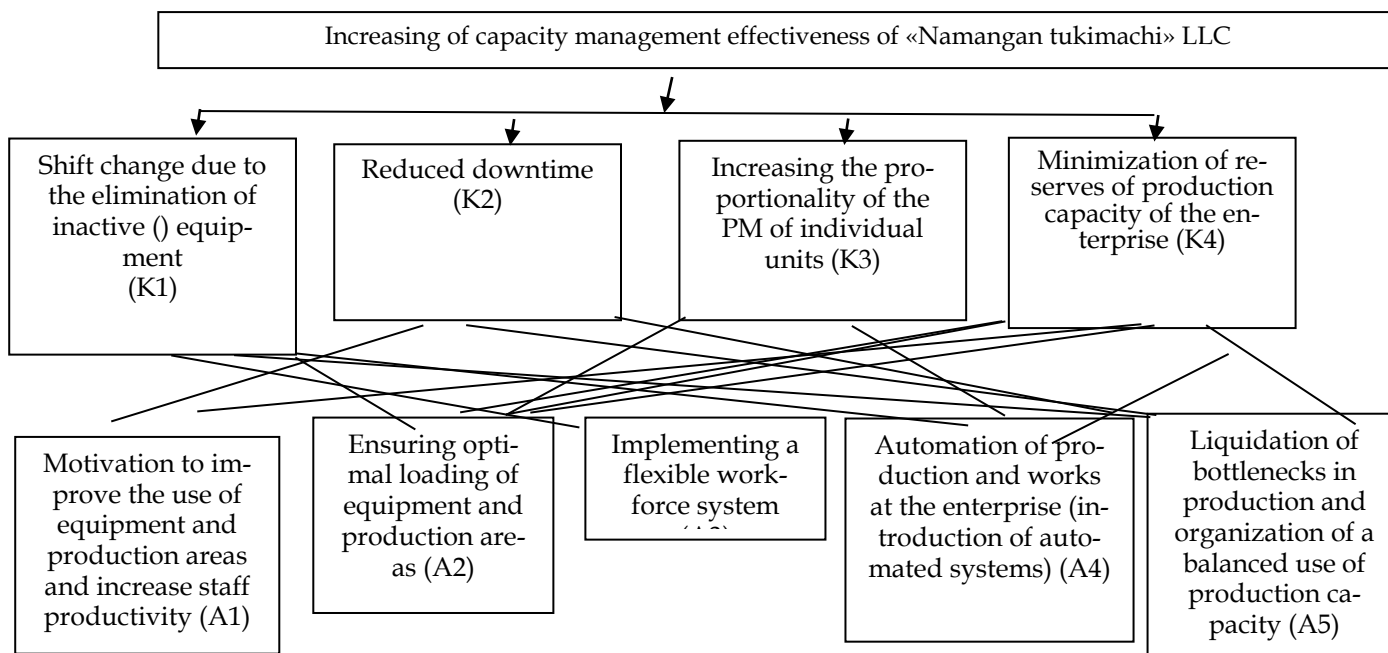
The alternatives with the greatest weights are accepted as alternatives-leaders and are recommended for implementation in production.

Multiplying matrix by vector, we get the final column of weights of alternatives to achieve our goal:

$$\omega = Gw$$

or if to paint on elements:

$$\begin{pmatrix} \omega_1 \\ \omega_2 \\ \vdots \\ \omega_{n_a} \end{pmatrix} = \begin{pmatrix} g_1^1 w_1 + g_1^2 w_2 + \dots + g_1^{n_c} w_{n_c} \\ g_2^1 w_1 + g_2^2 w_2 + \dots + g_2^{n_c} w_{n_c} \\ \vdots \\ g_{n_a}^1 w_1 + g_{n_a}^2 w_2 + \dots + g_{n_a}^{n_c} w_{n_c} \end{pmatrix}$$



**Fig.1. Decision tree.**

The approbation of the mechanism for managing the use of production capacity proposed by the author based on the hierarchy analysis method was based on materials from Namangan Tukimachi LLC.

The assessment was carried out on the basis of three criteria (K1-K3). To solve the problem of increasing the efficiency of the use of production capacity, there are several alternatives.

These strategic alternatives can be schematically represented using a tree of goals and solutions. (table 2).

Next, you need to carry out a pairwise assessment. Based on the judgments of specialists based on their preferences, the degree of influence of the criteria on increasing the efficiency of using the production capacity of the enterprise under study is determined. The obtained data are presented in matrix form.

Let's make the initial matrix of pairwise comparison (table 3).

**Table 3**

**Source matrix pairwise comparison criteria**

K	K1	K2	K3
K1	1	3	1/4
K2	1/3	1	1/3
K3	4	3	1

Next is a pairwise comparison of alternatives for each of the criteria. Data is entered into the PRIMA PPP in a similar way.

Matrix estimates of pairwise comparison of alternatives and the calculation of the parameters are presented in tables 4,5,6.

**Table 4**

**Matrix pairwise comparison of alternatives by criterion K1**

A (по K1)	A1	A2	A3	A4	Priority vector
A1	1	7	5	2	0,5129
A2	1/7	1	1/3	1/5	0,0562
A3	1/5	3	1	1/4	0,1128
A4	1/2	5	4	1	0,3182

Table 5

Matrix pairwise comparison of alternatives by criterion K2

A (по K2)	A1	A2	A3	A4	Priority vector
A1	1	1/2	1/5	1/2	0,0953
A2	2	1	1/5	1/3	0,1227
A3	5	5	1	2	0,5191
A4	2	3	1/2	1	0,2629

Table 6

Matrix pairwise comparison of alternatives by criterion K3

A (по K3)	A1	A2	A3	A4	Priority vector
A1	1	2	1/3	2	0,2310
A2	1/2	1	1/3	1/2	0,1155
A3	3	3	1	3	0,4901
A4	1/2	2	1/3	1	0,1634

Based on the available estimates, you can determine the hierarchy of alternatives. To do this, it is necessary to weigh the priorities of the alternatives obtained using the AHI for all criteria:

$$Pac = (Pac_1; Pac_2; Pac_3); Pac * Pcs = Pa$$

$$\begin{pmatrix} 0,5128 & 0,0952 & 0,2310 \\ 0,0561 & 0,1227 & 0,1155 \\ 0,1128 & 0,5190 & 0,4901 \\ 0,3181 & 0,2628 & 0,1633 \end{pmatrix} * \begin{pmatrix} 0,2469 \\ 0,1306 \\ 0,6224 \end{pmatrix} = \begin{pmatrix} 0,2829 \\ 0,1018 \\ 0,4007 \\ 0,2146 \end{pmatrix}$$

Get the overall priorities of the alternatives.:

A<sub>1</sub> – 0,2829, A<sub>2</sub> – 0,1018, A<sub>3</sub> – 0,4007, A<sub>4</sub> – 0,2146.

For these conditions, the alternative hierarchy is:

$$A_3 > 0,4007 > A_1 > 0,2829 > A_4 > 0,2146 > A_2 > 0,1018.$$

Thus, for the textile industry enterprise LLC Namangan Tukimachi of the Republic of Uzbekistan, the most preferred is the A<sub>3</sub> alternative - automation of production and works (introduction of automated systems).

However, in Namangan Tukimachi LLC it is necessary to comprehensively assess the influence of various factors on the process of using production capacity, therefore each alternative is to some extent important for improving the management efficiency of the production capacity of an enterprise. The proposed methodology for the formation of a strategy for increasing the efficiency of using production capacity based on the hierarchy analysis method is universal and can be used in other industries.

Based on the analysis of the practice of using production capacity, the author has identified the conditions for organizing a balanced use of production capacity, and to organize a balanced use of production capacity, it is not necessary:

- take into account the passport value of power and planned changes during the calendar period of time;

- focus on the most advanced technology and organization of production;

- use comparable measures of equipment operation, using the area, labor and technological resources;

- provide the optimal amount of reserves for quick response to changes in demand;

- eliminate the loss of time that can be caused by insufficient use of elements of production capacity, organizational deficiencies, poor quality processes and products.

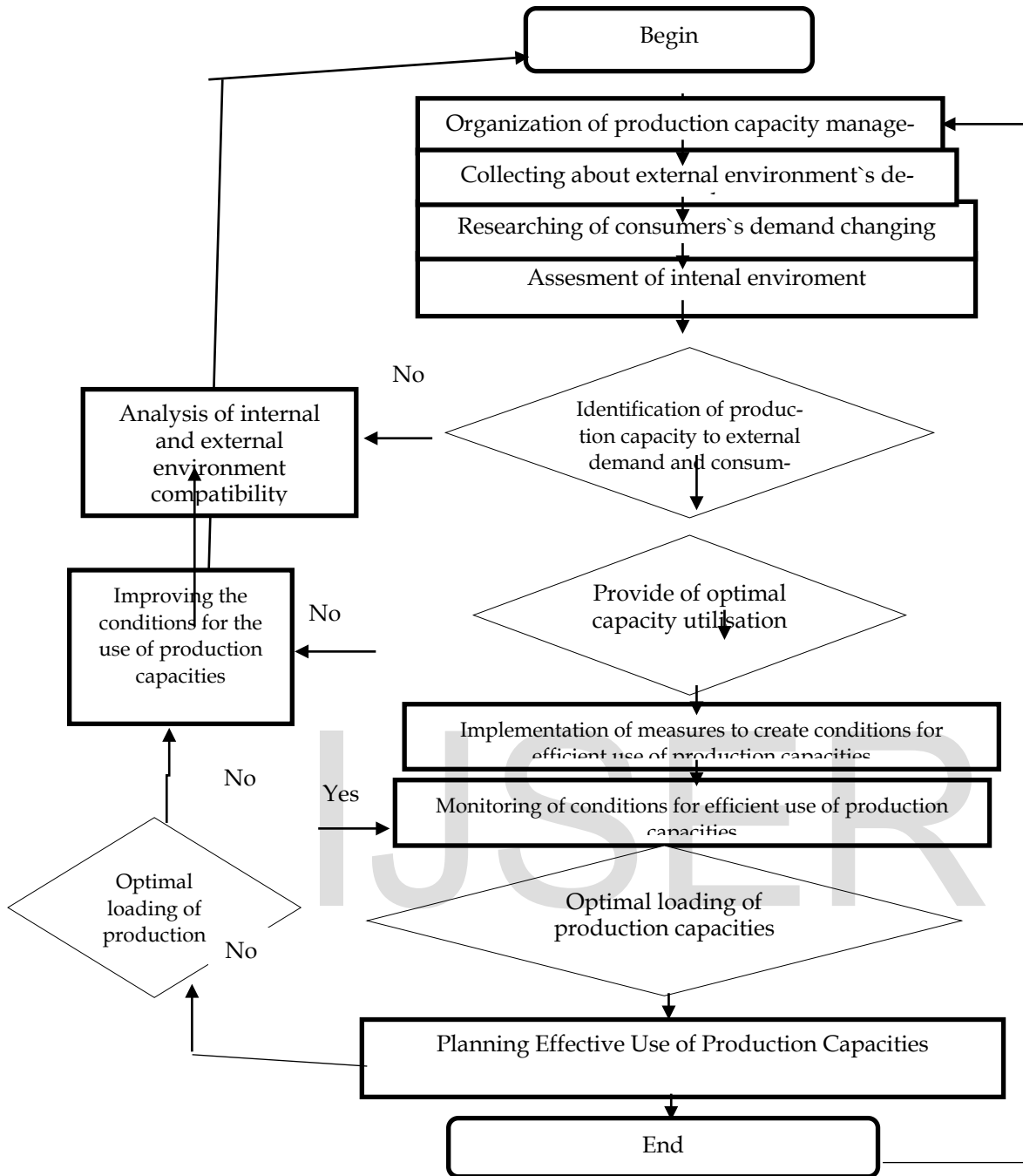
Consider the content of the main blocks of the above activities. It was rightly noted that the tasks and results described by the organization of the balanced use of production capacity correspond to the subsystems of strategic and operational planning. Consequently, when developing a strategy for the use of production capacity, it is necessary to make projections of the demand for production resources, calculate the planned value of production capacity, analyze the constraints on the conditions for its effective use and determine the planned changes in production capacity in accordance with the requirements for the quantity and quality of products.

Taking into account the previous studies in the first chapter, it is legitimate to conclude that all processes implemented in the system of organizing efficient use of production capacity should be divided into two groups: processes related to the organization and planning of production capacity use, and processes for managing the conditions necessary for optimal loading its elements.

The implementation logic and interconnection between processes is described by the author in the form of an algorithm for organizing efficient use and control of production capacity, shown in Fig. 3.1.

The results of the research show that the process of organizing the effective use of production capacity is fragmented, there is a lack of orderliness and complexity of processes and actions, which determines the need to build an organization system for the effective use of production capacity.





**Fig.1. The algorithm of the process of organizing the effective use of production capacity of textile enterprises.**

The conducted research allowed to formulate methodological provisions that need to be considered when forming and structuring the system of organization of effective use and management of production capacity:

- the processes of organizing the effective use and management of production capacity can be represented as a complex dynamic system;
- the main goal of the system of organization of effective use and management of production capacity is the output of products of the appropriate level of quality and volume required by the market, taking into account ensuring the flexibility of production processes and the adaptability of production;
- ensuring the effective use and management

of production capacity is a complex, multidimensional problem, for the solution of which it is advisable to use the advantages of the system and process approaches;

- a systematic approach allows you to combine the achievements of various areas of scientific knowledge and effectively apply them to solving specific problems of the organization of effective use and management of the production capacity of the enterprise;

- process approach allows you to integrate processes, to ensure the conjugacy of their goals and results, taking into account the fulfillment of customer requirements for quantity and quality.

The content of the subsystems of the organization of effective use and management of produc-

tion capacity is revealed through a targeted orderly combination of individual processes, their integration across the elements of production capacity and distribution of responsibility in accordance with their functional affiliation. Consequently, the proposed process approach for the formation of an organization system for the effective use and management of production capacity allows integrating the processes associated with creating the necessary conditions, identifying them according to the elements of production capacity and distributing responsibility for their organization among the production units of the enterprise.

Within the framework of the proposed model, the processes of organizing the efficient use of production capacity are presented as functional actions related to the creation and maintenance of necessary conditions conducive to the organization of rational use and balanced loading of production capacity components (Fig. 3.2). The type of organization model for the efficient use of production capacity was proposed in the work of K.S. (One-piece Flow Production Systems; Just-in-time Production, etc.); The model does not take into account the globally recognized conditions for effective management of personnel, such as developing corporate culture and creating corporate spirit, because the solidarity of all personnel and unity of purpose (in our case, efficient use of production capacity) ensures the expected result. Considering these shortcomings, we pro-

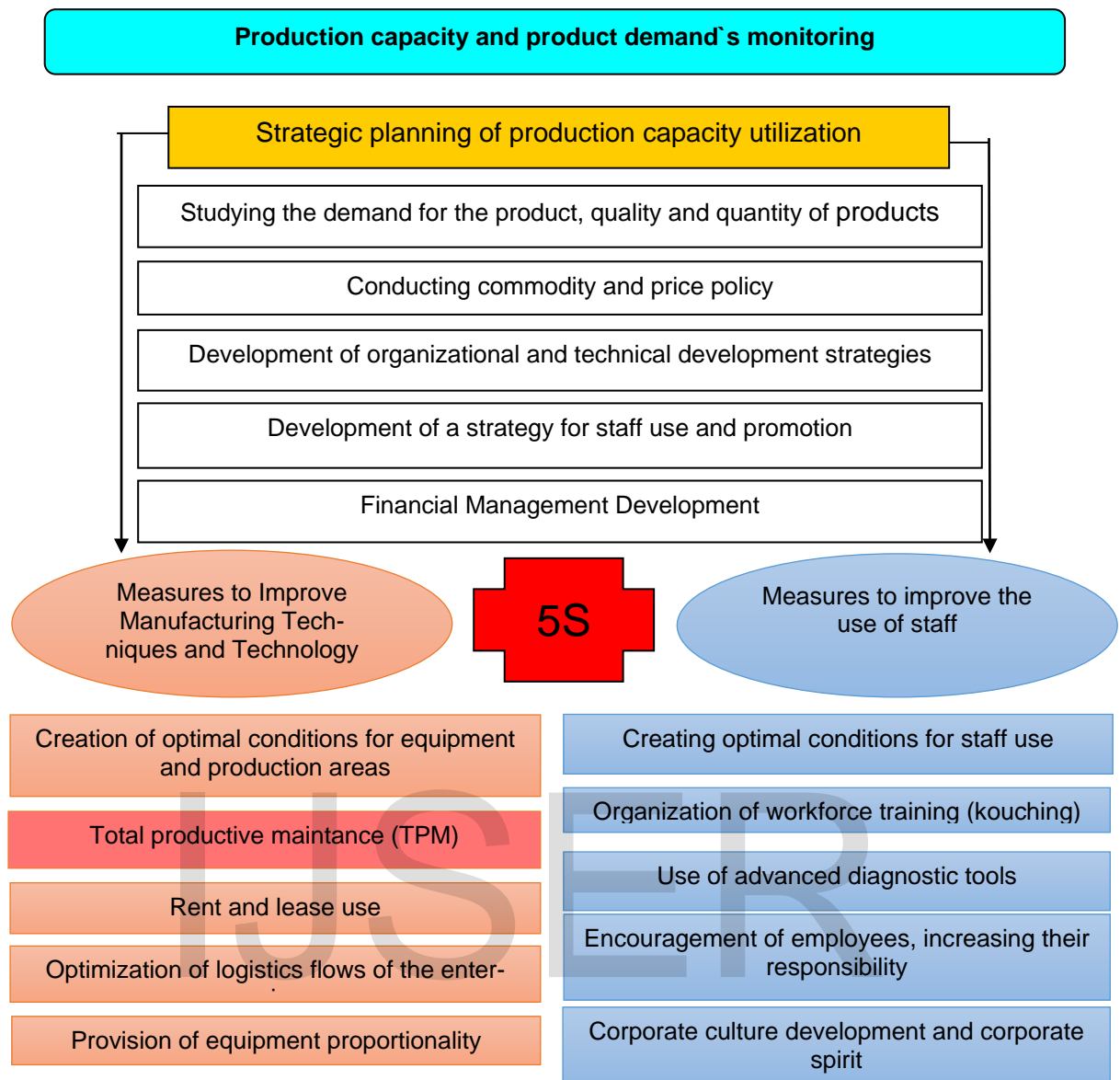
posed our own model for organizing the efficient use of production capacity in textile enterprises (Fig. 1).

Based on the results of the study conducted research, the author highlighted the following stages of building a system for organizing the effective use of production capacity:

- formulation of goals, definition of flow boundaries, input and output characteristics of processes;
- the formation of the identified organizational, technical, managerial, technical and socio-psychological conditions of production;
- diagnostics of production conditions;
- the construction of private mechanisms for organizing the effective use of components of production capacity, the implementation of which allows to ensure and improve the conditions for the flow of production processes;
- definition of a system of information support for the process of organizing the effective use of production capacity.

The initial data for the formation of the system of organization of effective use and management of production capacity are the components of production capacity - fixed assets, technology and labor resources and the resulting goal of the organization of effective use of production capacity, which should be consistent with the strategic goals of the enterprise.

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**Fig.2. Model organization of the effective use of production capacity in textile enterprises.**

The first step in the formation of the system is the coordination of these data and the formulation of the main goal - the organization of efficient use of the production capacity of the enterprise, the realization of which is connected with the creation and maintenance of the organizational conditions necessary for optimal loading of its elements and ensuring the release of quality products in the prescribed volumes.

**Conclusion**

Further, based on the goal, the author formulates the following tasks, implemented in the system of organization of the effective use and management of production capacity:

1. Ensuring proportional loading of the pro-

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duction capacity of functional units, which will lead to a more rational use of elements of the production capacity of the enterprise.

2. Regulation of the use of reserves of production capacity, as a result of which downtime and costs are minimized, a rational combination of various types of functional activity and optimal loading of elements of production capacity are ensured.

3. Managing the focusing of production capacity of the enterprise, depending on the market requirements for quality and quantity of products.

4. Building a rational mechanism for the interaction of all participants in the organization of processes for the effective use and management of the production capacity of an enterprise.

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