METHODS FOR CONTROL EFFICIENCY EVALUATION OF THE PRODUCTION CAPACITIES APPLICATION AT THE TEXTILE ENTERPRISES AND THE MECHANISM FOR OPTIMAL CONTROL

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Abstract: *The article describes the method for determining the efficiency of production capacity management in textile enterprises. The methodology is based on a weighting factor and expert assessment. Despite the fact, that there are many methods of assessment efficiency of production capacities usage, many of them based on financial results of enterprise, and this do not always show causes of the problem in performance of production capacity usage. In this paper, have been elaborated method based on integral rate of results and quality of the performance of production capacity management in textile enterprises. For choosing criteria of all performance process were involved fie experts in textile area, including leading engineers and managers. Proposed in article the technique is universal, and it can be used in other industries. At the end of the article, the methodology was tested on the basis of real textile enterprises. According to author`s opinion, proposed method does not reflect the influence of indicators of production capacity management efficiency on the financial results of enterprises, that approved the space for further research in this area.*

Keywords: production capacity, utilization, effectiveness, production process, assessment, textile.

In modern conditions, the problem of reliable assessment of the production capacity of the enterprise and the level of equipment load (jobs) has become particularly important and is very important. In the development of technology, production technology under the influence of technological progress there are significant changes, changing their quality part. They are reflected in the complication of technology, in its computerization, automatic control, increasing unit capacity. Large systems of machines are being created and implemented, which increase the efficiency of equipment of enterprises and accelerate the production process due to its threading, continuity, and flexibility. As a result, qualitatively new opportunities arise for the creation and growth of the production capacities of existing firms and enterprises.

The purpose of this article is to improve the methodology for assessing the efficiency of managing the use of production capacity in textile enterprises.

It should be noted that characteristic for textile production is the construction of production structures on the technological principle, the presence of a large number of consecutive technological transitions. For example, cotton yarn is ready for transfer to weaving after 8-11 transitions, wool – after 20; In the process of finishing cotton fabric goes through about 40 operations. Such a multi-stage production process makes it difficult to assess the efficiency of production capacity management in enterprises. Based on this, we decided to develop a methodology that will be able to evaluate the effectiveness of the process and the results of production capacity management. The technique is based on expert assessments and an appropriate scale.

Literature review

The issues of management, specialization, and optimization of production capacities are reflected in the scientific works of the following foreign scientists: R. Chase and R.F. Jacobs[822], W. Cline[823], C.G. Doeringer and K.G. Dickerson[824], J. Lee[825], M.M. Ahmad and N. Dhafr[826], C. Forza and F. Salvador[827] and others. A significant contribution to the development of the theory and practice of production capacity management was made by economists from the CIS countries[828]. Aspects of the organization of the use of production capacity in industrial

[822] R.F. Jacobs, R.B. Chase, *Operations and supply chain management*, McGraw-Hill Education, New York, 2015.
[823] W. Cline, *The future of international trade in textiles and apparel,* Institute for International Economics, Washington, 1992.
[824] C.G. Doeringer, K.G. Dickerson, *Textiles and apparel in the global economy,* Prentice Hall, New Jersey, 2004.
[825] J. Lee, *Competitiveness of textile and apparel industries in the United States and Japan,* Iowa State University, Iowa, 2013.
[826] M.M. Ahmad, N. Dhafr, "Establishing and improving manufacturing performance measures", in *Robotics and Computer Integrated Manufacturing*, 2002, no. 18, p. 171-176.
[827] C. Forza, F. Salvador, "Information flow for high-performance manufacturing", in *Inter. Journal of Production Economics,* 2001, no. 70, p. 21-36.
[828] M.S. Abryutin, *Enterprise economics: training,* Delo i servis, Moscow, 2004.

enterprises and its management were studied by Russian scientists K.S. Krivyakin[829] and M.V. Dadalova[830].

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, Z. Khakimov etc., which are considered mainly the theory of reproduction of basic production assets and improving the competitiveness of textile enterprises based on marketing approaches[831].

E. Milewska[832] researched problem of manufacturing process flexibility in view of a company's material and information flow stream management, were discussed IT tools supporting the process of production planning, organization and control, as well as MRP II/ERP, MES and APS. She scientifically approved that the automation of information flow in a production control system makes it possible to increase the level of production capacity use and optimize the size of the company's intensive and extensive reserves.

A performance indicator can be defined as a variable that quantitatively expresses the effectiveness or efficiency, or both, of a part of or a whole process, or system, against a given norm or target. The desired global production objectives in the context of a production management system can be more objectively defined as the reference values for significant measures of plant efficiency, production plant productivity, mean product quality[833], and others. These production objectives are often called implicit objectives as they usually can be expressed only implicitly as functions of the measurable and manipulatable variables[834]. Since implicit objectives are not directly measurable, their translation into a set of output production process variables should be

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829 K. Krivyakin, B. Tursunov, Z. Hakimov, "Estimation methodology of efficiency of production capacity management at textile enterprises", in *Bulletin of Science and Practice*, 2018, vol. 4, no. 1, p. 228-241.

830 M. Dadalova, *Management of production capacity at the enterprises of the glass industry,* Belgorod State Technological University named after V.G. Shukhov, Belgorod, 2009.

831 N.V. Buley, Y.A. Melnichuk, S.A. Makushkin, M.V. Vinichenko, A. Melnichuk, "Marketing in management structure of commercial activity of enterprise", in *International Journal of Applied Business and Economic Research*, 2017, vol. 15, no. 12, p. 251-259.

832 E. Milewska, "It systems supporting the management of production capacity", in *Management Systems in Production Engineering*, 2017, vol. 1, no. 25, p. 60-67.

833 E.V. Povorina, O.V. Serbskaya, N.F. Bondaletova, E.V. Duplij, N.V. Buley, "Improving quality control tools for domestic industrial production", in *International Journal of Applied Business and Economic Research*, 2017, vol. 15, no. 12, 283-296.

834 G. Stephanopoulos, "Perspectives on the synthesis of plant-wide control structures", in *Journal of Process Control*, 2000, no. 10, p. 97-111.

provided. These output production process variables should have the following properties[835]. Issues of utilization of key performance indicators in production control were investigated by V. Jovan, S. Zorzut and A. Žnidaršič. In their work was proposed an approach to measuring and presenting the attainment of production objectives in the form of introducing production KPI[836].

In current research were used expert assessment, analysis and economic-mathematical methods. For assessment of criterias were chosen five experts from textile branch, and has been checked the degree of reliability of the expert assessment for each group of indicators was calculated the coefficient of concordance. For evaluating production capacity management in textile enterprises elaborated the special scale, which consist of five criteria's.

The mechanism for the control over the production capacities application of an enterprise

The development of the market relations and the need in adopting an enterprise to the changes in the environment prioritize the solution of the efficient control of the production capacities application. Before turning to the formation of the mechanism for efficient control of the production capacities application, we should first define the terms.

Many famous scientists studied the kinds of 'economic mechanism' in their papers, and some of the most famous scientists L. Hurwicz and S. Reiter[837] considered systemic methods for designing the decentralized economic mechanisms, the efficiency of which achieves specific goals. While the other research scientists, such as Zh. Kaibing[838] and S. Chunchang[839], X. Zhang, F. Xie, J. Xu, and R. Jia[840] significantly

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835 S. Skogestad, "Control structure design for complete chemical plants", in *Computers and Chemical Engineering*, 2004, no. 28, p. 219-234.

836 V. Jovan, S. Zorzut, A. Žnidaršič, "Utilization of key performance indicators in production control", in *IFAC Proceedings Volumes*, 2006, vol. 39, no. 14, p. 173-178.

837 L. Hurwicz, S. Reiter, "Mechanisms and mechanism design", in: *Designing Economic Mechanisms,* Cambridge University Press: Cambridge, 2007, p. 14-62.

838 Zh. Kaibing, "Emergency management mechanism discerning", in *China's Disaster Reduction*, 2008, no. 4, p. 132.

839 S. Chunchang, "Overall reflection of emergency management mechanism building", in *National School of Administration Journal*, 2011, no. 1, p. 683-687.

840 X. Zhang, F. Xie, J. Xu, R. Jia, "Research on management mechanism innovation of emergency response in China – An analysis from the perspective of emergency response to epidemics", in *Proceedings of the 2012 IEEE ISMOT*, 2012, no. 2, p. 683-687.

contributed to the development of the emergency situations control mechanism.

The issues of the corporate control mechanisms were deeply studied by the national scientists, such as B. Ju. Khodiev[841], B.B. Berkinov[842], Sh.N. Zaynutdinov and Z.A. Ashurov[843], D.Kh. Suyunov[844], Sh. Kurbaniyazov[845], Z.A. Ashurov[846] and others.

The concept of 'mechanism' is borrowed from the technics and transferred to economics after medicine, biology and other branches of knowledge. It is not accidental in the economic research that the term 'mechanism' is met in various word combinations: market mechanism, a mechanism for the development of the production control, organizational mechanism, economic mechanism, the organizational-economic mechanism[847]. Its diverse application evidences the universal nature of its physical nature, and each specific application of the term implies its narrower understanding.

The control also observes such phenomena. There are means for the transformation of the goal, managerial decision, the energy of the control subject's influence is transferred to the energy of the active control object, on the basis of which the agreement of the joint activities is achieved that allows obtaining a common result[848].

The mechanism is a system for the system's organization, the carrier, and realizer of the organization and its process. The organization is the function of the mechanism and the result of its actions. The description of a mechanism is a description of its organization and its activities. In this case, one may speak not only about the mechanism's belonging to the activities of an organization but about the logical connection between the organization and the

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841 B. Yu. Khodiev, *Corporate governance*, Economics, Tashkent, 2010.

842 B. B. Berkinov, *Corporate structures: the basics of creation and management,* INB named after Alisher Navoi, Tashkent, 2005.

843 Sh.N. Zaynutdinov, Z.A. Ashurov, *Corporate governance,* TDIU, Tashkent, 2010.

844 D.X. Suyunov, *Corporate governance mechanism: problems and solutions*, Academy, Tashkent, 2006.

845 Sh. Kurbaniyazov, "Features of corporate governance effectiveness", in *Scientific electronic journal "Economy and Innovative Technologies",* 2016, no. 6, p. 14-19.

846 Z.A. Ashurov, "Corporate governance mechanism and its development in Uzbekistan", in *Social Opinion. Human rights magazine*, 2016, no. 1, p. 60-68.

847 F. Grashof, *Theoretische maschinenlehre*, L. Voss, Leipzig, 1890.

848 E.E. Nakhratova, I. Y. Ilina, A. I. Zotova, M. S. Stepanov, S. V. Dusenko, "Modern peculiarities of SWOT analysis when taking management decisions by Russian TOP managers", in *International Journal of Applied Business and Economic Research*, 2017, vol. 15, no. 7, p. 187-194.

environment. Control mechanism the production capacities application may be generally represented as an aggregate of the organizational, managerial and economic measures aimed at creating the conditions for the increase in the efficiency of using the means and objects of labor at the enterprise in order to manufacture the products of the necessary volume and quality corresponding to the requirements of the market.

Industrial enterprises are the systems of high complexity, the elements of which at the output and at the input are the sub-systems of greater diversity. The entire complex of activities inside of an enterprise is so complicated that it may not be fully interpretation. That is why the formation of the control mechanism the production capacities application is only possible with the use of the systemic approach and analysis.

Control mechanism the production capacities application of an enterprise should solve the main and most complicated problem, which is the implementation of the managerial function of the enterprise as a mechanism for balancing the internal components of the enterprise's activities under the influence of the environment. The solution of the complicated problem is in its decomposition by the considered aspects.

The object of the suggested control mechanism the production capacities application is the production capacities of the enterprise. The category of "production capacity" is one of the keys to economic science. It reflects the potential of associations, enterprises, production shops, and, therefore, the level of competitiveness of enterprises.

Professor of the Turkish Social Institute Kahramanmaraş Ö. Güneçıkan[849] gives the following definition regarding production capacity: "Production capacity of an enterprise is the production quantity that the enterprise is capable of realizing by using the available production factors in a rational manner within a certain period of time". Determining the value of production capacity occupies a leading place in identifying and evaluating production reserves, and its planning is one of the strategic directions of development.

In scientific works of M. Dadalova[850] and K.S. Krivyakin[851] various classifications of factors influencing the size and capacity utilization are given. Analyzing the classification data, it should be noted that it highlights

[849] Ö. Güneçıkan, *Kapasite planlaması ve optimim stok kontrolü yönetimi,* Kahramanmaraş Üniversitesi, Kahramanmaras, 2008.

[850] M. Dadalova, *Management of production capacity at the enterprises of the glass industry,* Belgorod State Technological University named after V.G. Shukhov, Belgorod, 2009.

[851] K. Krivyakin, B. Tursunov, Z. Hakimov, "Estimation methodology of efficiency of production capacity management at textile enterprises", in *Bulletin of Science and Practice*, 2018, vol. 4, no. 1, p. 228-241.

not only the factors influencing the size and level of capacity utilization but also:

1. Conducted an enlarged grouping of these factors;

2. Their influence on individual elements associated with the calculation of production capacity is measured.

The disadvantages of the considered classification of factors include the following:

1. The grouping of factors is not well constructed, i.e. it mainly relies on the analysis of the influence of elements on the calculation and use of capacity;

2. The previous drawback is caused, in our opinion, by the fact that the proposed grouping of factors does not properly take into account the influence of factors of production on the size and degree of utilization of production capacity;

3. The reliability of the influence of individual factors on the size and level of capacity utilization raises certain doubts. For example, the possible unscheduled operation of equipment (i.e., use of Saturdays, Sundays and holidays, the third (fourth) shift, lunch breaks, as well as the transition to a continuous week) should be taken into account in the process of calculating the production capacity. In other words, this only characterizes the shortcomings of the existing methods for calculating and planning capacities, but cannot be an objective factor that requires consideration of its influence in the classification. In addition, the methods used in various industries for determining the size of production capacities do not involve taking into account such subjective factors as reducing losses from marriage, reducing losses in working time, improving forms and systems of labor in enterprises, developing competition and others;

4. This classification of factors also implies consideration of the features of machine-building production only. We can single out a whole number of classification factors cited in it, which are characteristic of this type of production and do not affect the production capacity of instrumental or aggregate production: increase in the number of production areas; involvement in the production of unused space; use of more modern tooling and tools; introduction of methods of scientific organization of labor; rationalization of labor practices of production workers; professional development of production workers; reduction of unproductive loss of working time; reduction of losses from marriage; improvement of rationing and wage systems; expansion of socialist competition; increase in shift coefficient and equipment load due to reduction of unproductive losses in the use of equipment and an increase

in the number of key production workers; an increase in the production program in proportion to assortment; an increase in the production program disproportionately set assortment (change of nomenclature) due to production in accordance with the developed optimal production plan; an increase in the production program due to the expansion of deliveries from the cooperation.

In our opinion, this and other (noted above) classifications need further development by highlighting the interrelation of factors with individual elements of the production process. It is also necessary to take into account those factors influencing the size and degree of use of production capacity, which reflect the specifics of the activities of textile enterprises.

Production capacity factors classification

The classification we propose the main factors influencing the size and degree of utilization of the production capacities of enterprises in this industry is presented in Table 1.

This approach to the classification of factors allows to:

• to distinguish factors taking into account their influence on the size and degree of capacity utilization;

• takes into account the peculiarities of textile enterprises related to aggregate concentration (manifested in the periodic replacement of basic technological devices with more productive ones), flow continuity (in cotton processing) and their complexity;

• takes into account the relationship of factors with individual elements of the production process. The amount of production capacity is influenced by entrepreneurial abilities, labor, and capital. Entrepreneurial skills determine management decisions on the development of existing and the creation of new production facilities. These solutions are implemented in practice using the labor of employees of enterprises. The three elements that make up the capital directly affect the amount of production capacity – the active part of fixed assets, intangible assets and part of current assets, presented in the form of stocks. The development of the first element is manifested in an increase in the number of leading equipment units and the replacement of basic technological devices with new, more productive industrial units.

Intangible assets are associated with the improvement of the existing technology and the introduction of advanced technologies[852].

Table 1: Functional control units of production capacity in textile enterprises

PC value	Functional blocks of planning and management	PC usage level
External factors		
1. The technical level of purchased equipment	Technical block	1. Provision with spare parts and components for equipment repair
1. The degree of progressiveness of borrowed technology 2. Installed process schedules	Technological block	1. Restrictions on the supply of materials, tools, providing the technological cycle
1. Availability of state programs for subsidizing the development of the PM industry	Economical block	1. The need for the company's products from the market
	Resource block	1. Logistics of the enterprise 2. Level of energy supply
1. Legislative and regulatory acts restricting the activities of enterprises	Management block	1. Malfunctions in infrastructure operation
Internal factors		
1. Equipment performance 2. Available production area 3. The level of proportionality in the bandwidth of equipment groups	Technical block	1. The intensity of input of new capacities 2. Mode of use of equipment 3. Excessive downtime
1. The degree of automation and mechanization of production processes 2. The degree of development of technology workers	Technological block	1. The technical level of purchased equipment
1. The level of investment in the means of production and in its organization	Economical block	1. The technical level of purchased equipment
1. The depreciation policy of the enterprise 2. Entrepreneurial activity	Resource block	1. The technical level of purchased equipment

[852] D.A. Kaldiyarov, E.O. Kydyrbayeva, B.K. Shomshekova, M. Toregozhina, G.R. Baytaeva, "Cooperation of small forms of managing in agro-industrial sector in the Republic of Kazakhstan", in *Espacios*, 2017, vol. 38, no. 62, p. 13.

The peculiarity of this classification is that it was developed taking into account the specifics of the enterprise of the textile complex and includes the specifics of a continuous production process.

The main factors that determine the level of production capacity are considered to be: the number of available equipment, the size of production areas, the progressiveness of technology, the number of qualified personnel, the quantity and quality of material resources used and the advanced organization of production.

Methods for assessing results of the performance of production capacity management

Expert assessment of the importance of quality factors of production capacity management

In the course of the study, the author came to the conclusion that "the effective use of production capacity implies a rational distribution of the production resources available to the enterprise, which are necessary for the flow of interrelated processes in space and time by means of installed technology, advanced technology, and skilled personnel". A key factor in the level of capacity utilization in a market economy is the position of the enterprise in the market, the level of competition and the level of demand for products.

In the work of M.V. Dadalova[853], a methodology is presented for assessing the efficiency of production capacity management at enterprises in the glass industry, but there are some drawbacks:

- the absence of a valid point scale for the results of qualitative and quantitative assessments;
- in the parameter of quality of production capacity management there is an item "quality of production capacity planning", which does not exactly indicate what kind of planning was meant (calendar, tactical, strategic);
- in the parameter of quality of production capacity management there is an item "Performance of functions on the management of production capacity", and in the manual, it is not specified how to determine the degree of fulfillment (or non-fulfillment) of management functions in the enterprise;
- the points for the quality parameters and the effectiveness of the definition of the production capacity are divided into three: 0, 2.5 and 5.

[853] M. Dadalova, *Management of production capacity at the enterprises of the glass industry,* Belgorod State Technological University named after V.G. Shukhov, Belgorod, 2009.

The presence of a 2.5 point partially complicates the calculation process in multiplying by the significance of the parameter.

- in the parameter for determining the effectiveness of production capacity management in textile enterprises, there is an item "product competitiveness level", which is based only on the product quality level, which does not fully reveal the competitiveness of products. According to the theory of famous modern economists as M. Porter, the first factor of competitiveness is quality, and the second factor is the price of products.

Therefore, to evaluate the competitiveness of products only on the basis of quality is not entirely true. In addition, it is necessary to evaluate the effectiveness of the use of equipment, and not the competitiveness of products, which is the marketing function.

Considering a number of shortcomings of the method of M.V. Dadalova, we have presented a methodology for evaluating the efficiency of managing production capacity in textile enterprises (Tables 1, 2). One of the advantages of the methodology is the inclusion of the item "Average coefficient of total efficiency of all equipment (OEE)" in the quality control parameter of production capacity.

Another distinctive feature of the methodology is the reassessment of the significance of the parameters of the scale by experts in the textile industry. In addition, the scores for the quality parameters and the performance of the definition capacity management to simplify the calculations are divided into three integers: 0,5 and 10.

In order to improve the methodology for assessing the competitiveness of light industry enterprises, a questionnaire was developed and an expert assessment of the factors of enterprise competitiveness was conducted. In the course of the study, experts evaluated on a five-point scale the weight of each of the four proposed groups of factors assessing the competitiveness of an enterprise, namely, the competitiveness of a product, financial, production, and marketing factors. A ranking of the main indicators for evaluating each factor was also carried out.

To check the degree of reliability of the expert assessment for each group of indicators, the coefficient of concordance W was calculated, which shows how much the experts' opinions are coordinated, that is, belong to the same general population of estimates. The coefficient of concordance is calculated by the formula:

$$W = \frac{12\sum_{i=1}^{n}(r_i - \bar{r})^2}{N^2(n^3 - n)} \quad (1)$$

where 12 is a constant in the formula for calculating the coefficient of concordance proposed by Kendall;

n – the number of indicators;

N – the number of experts;

r_{ij} – rank of the i-th indicator determined by the j-th expert;

r_i – the sum of the ranks of the i-th indicator for all experts;

r – average score of all indicators. (r=N(n+1)/2);

W – Kendall coefficient of concordance.

The value of the coefficient of concordance can vary in the range from 0 to 1, where its equality to one means complete consistency of expert opinions, and equality to zero indicates that there is no connection between the estimates. In the case when $0.2 \leq W \leq 0.4$, there is a weak consistency of expert opinions, and with $W \geq 0.6$ it can be said that there is a strong consistency of expert opinions.

In addition, to determine the weights of each factor, we used the Fishbourne formula:

$$ai = 2 * (n-ri+1) / n*(n+1), \quad (2)$$

(for all i from 1 to n)

where ai is the weight coefficient of the i-th criterion; n – the number of evaluation criteria; ri – rank assigned to the i-th indicator.

The results of the expert assessment of the importance of competitiveness factors and checking the consistency of expert opinions are presented in Table 2.

Table 2: Expert assessment of the importance of quality factors of production capacity management in textile enterprises

Evaluation Criteria / Experts	Quality of capacity planning	Performance of capacity management functions	The motivation of staff in the use of production capacity management	Staffing	Methodical security
1 expert	5	4	4	2	1
2 expert	4	3	2	1	2
3 expert	5	3	5	4	3

4 expert	4	5	3	4	1
5 expert	4	5	2	4	2
Overall	22	20	16	15	9

Source: based on expert`s assessment.

The number of indicators (n) is 5. Five experts (N) were involved. The average score of all indicators $(\overline{r})$ is 15. Then we get:

$$W = 12*111/25*(125-5) = 1332/3000 = 0,44$$

The degree of consistency of expert estimates can be considered acceptable, since W = 0.44> 0.40. According to experts, the most significant is the financial factor, and the least – the production factor. Similarly, we find weighting factors for the effectiveness of production capacity management in textile enterprises (Table 3).

Table 3: Expert assessment of the importance of factors of productivity of production capacity management in textile enterprises

Evaluation Criteria / Experts	Sustainability of production plans	Investment provision of production capacity	The ratio of production capacity (annual)	Average total efficiency ratio of all equipment (OEE)	Utilization of equipment
1 expert	4	1	3	5	4
2 expert	5	1	2	4	2
3 expert	4	3	3	5	2
4 expert	5	1	3	5	1
5 expert	4	2	3	5	3
Overall	22	8	14	24	12

Source: based on expert`s assessment.

Here, too, n is 5, and N – 5. The average score of all indicators $(\overline{r})$ is 15. Then we get:

$$W = 12*189/25*(125-5) = 2268/3000 = 0,75$$

The degree of consistency of expert estimates can be considered complete, since W = 0.75> 0.60.

And the most significant, according to experts, is the average total efficiency ratio of all equipment, and the least is the investment provision of production capacity.

We have presented a methodology for assessing the efficiency of production capacity management in textile enterprises (Tables 4, 5).

The assessment is carried out by the expert commission, which includes leading experts with extensive experience in the field of textile industry. And the answers to the questions of staff motivation in the use of production capacity management can be purchased only through a questionnaire.

To determine the values of the parameters of the investment support of production capacity, the sustainability of the implementation of production plans, the calculation of the rate of renewal of production capacity and the level of use of production capacity must be based on the primary documentation of the enterprise. And as an indicator of the competitiveness of products manufactured at these facilities, product quality has been selected, and this item is faced with the task of determining the share of quality products complying with state standard (GOST) or ISO standards.

Table 4: Methods for assessing the quality of production capacity management in textile enterprises

Quality parameters capacity management	Parameter value	The significance of the parameter	Points
Quality of capacity planning	- there is no plan for the development of production capacity - there is a plan, but not linked to common enterprise strategy - the plan for the development of production capacity is an organic part of the overall strategy of the enterprise	0,27	0 5 10
Performance of capacity management functions	- not performed - partially performed - fully implemented	0,24	0 5 10
The motivation of staff in the use of production capacity management	- not motivated - poorly motivated - high level of motivation	0,20	0 5 10
Staffing	- not enough security qualified personnel - partially qualified personnel - fully qualified staff	0,18	0 5 10

Methodical Security	- missing - partial security - Full security	0,11	0 5 10
Capacity Management Quality Ratio			K_{qCM}

Source: author`s elaboration.

Table 5: Methods for assessing results of the performance of production capacity management in textile enterprises

Quality parameters capacity management	Parameter value	The significance of the parameter	Points
Sustainability of production plans	Absolute value actual deviations from planned: - above 10% - about 5 to 10% - up to 5%	0,21	0 5 10
Investment provision of production capacity	Investment in PM in total investment structure: - up to 30% - from 30 to 40% - over 40%	0,11	0 5 10
The ratio of production capacity (annual)	- from 2 to 5% - from 5 to 10% - over 10%	0,21	0 5 10
Average total efficiency ratio of all equipment (OEE)	Average total efficiency ratio of all equipment - to 0.4 - 0.41 – 079 - 0.8-1	0,28	0 5 10
Utilization of equipment	Utilization of equipment: - less than 60% - 61-80% - 81-100%	0,19	0 5 10
The capacity Management Performance Efficiency ratio			K_{rCM}

Source: author`s elaboration.

After determining the values of the relevant parameters of quality and effectiveness of production capacity management, we will calculate the integral efficiency factor of capacity management:

$$K_{CM} = \sqrt{K_{qualCM} \cdot K_{resCM}} \qquad (3)$$

K_{qualCM} – quality factor PCM; K_{resCM} – a coefficient of performance PCMP.

The calculation of the quality factor PCM is made according to the formula:

$$K_{qualICM} = \frac{\sum_{i=1}^{n} K_{val.qual} * d_i}{K_{qual.max}} \qquad (4)$$

d_i – the significance of this parameter, $K_{val.qual}$ – value of this parameter; $K_{qual.max}$ – a maximum value of this parameter.

The calculation of the coefficient of the effectiveness of the UPM is made according to the formula:

$$K_{resCM} = \frac{\sum_{i=1}^{n} K_{val.res} * d_i}{K_{res.max}} \qquad (5)$$

d_i – the significance of this parameter; K_{resCM} – value of this parameter; $K_{res.max}$ – a maximum value of this parameter.

After calculating the integral index, we need an appropriate scale for analyzing the level of management of the use of production capacity in textile enterprises. In the course of this research, we developed a scale for evaluating the management of production capacity in textile enterprises based on expert assessments; leading experts in the textile industry were selected as experts: chief specialist of the "Uztekstilprom" association, chief technologist, chief engineer, head of the production department and a financial manager of textile enterprises that have solid experience and rich experience (Table 6).

The proposed necessary measures to improve the management of production capacity are not exhaustive, they only indicate the main direction of identifying the reasons for the decline in production capacity. Here, in our opinion, it would be appropriate to use the cause-and-effect

method of E.M. Goldratt[854], and based on this methodology, construct a diagram of the current reality tree, and determine the root causes.

The approbation of the methodology for assessing the level of efficiency of use of production capacity of textile enterprises was carried out at three enterprises operating in Namangan region on the basis of calculation and statistical data for 2017, the results of which are given below (Table 7).

Table 6: Scale for evaluating production capacity management in textile enterprises

The result of the integral indicator	Evaluation value	Necessary activities to improve production capacity management
from 0 to 0,30%	Critical	There is an urgent need to audit the financial and marketing activities of the enterprise and make a technical inventory. Analyze the possibility of diversification of production. Urgent measures should be taken to increase the level of capacity utilization.
from 0,31 to 50	Unsatisfactory	It is necessary to calculate the break-even point of production. Measures should be taken to increase the level of capacity utilization.
from 0,51 to 70	Satisfactory	Conduct continuous monitoring of equipment downtime, identify bottlenecks of production capacity. Take measures to ensure the balancing of production capacity.
from 0,71 to 0,85	Good	It is necessary to conduct continuous monitoring of equipment downtime, identify bottlenecks of production capacity. Take measures to ensure the balancing of production capacity and to ensure the connectivity of the equipment fleet. It is advisable to create a development strategy for the use of production capacity.
from 0,86 to 1	Perfect	You can expand the scale of production, consider attracting investment in fixed assets of the enterprise. It is advisable to improve the development strategy of the use of production capacity.

Table 7: The results of the evaluation of the level of efficiency of use of production capacity of research enterprises

Enterprises name	The ratio of the quality of production capacity management	Capacity Management Performance Factor	The result of the integral indicator	Evaluation value
"Namangan Tukimachi" LLC	0.78	0.76	0.59	Satisfactory
JV LLC "Uchkurgan Tekstil"	0.85	0.86	0.73	Good
"MRT Textile" FC	0.73	0.84	0.61	Satisfactory

Source: author`s elaboration.

[854] E.M. Goldratt, *Late night discussions on the theory of constraints*, North River Press, Great Barrington, 1983.

As can be seen from the table above, the results of the integral indices of Namangan Tukimachi LLC, JV LLC Uchkurgan Tekstil, MRT Textile FC are respectively 0.59, 0.73 and 0.61. Judging by the evaluation results, it is clear that only at JV LLC Uchkurgan Tekstil the level of efficiency of managing production capacity is good, while at Namangan Tukimachi LLC and MRT Textile FC the level of efficiency of managing capacity utilization is satisfactory that confirms the availability of reserves to improve the efficiency of management of capacity utilization.

Application of the hierarchy analysis method

The increase in the efficiency of the production capacities application requires ongoing planning. And undoubtedly it requires both operative and strategic plans. The formation of the control mechanism the production capacities application is based on strategic planning because the achievement of the desired result depends on a series of interdependent decisions.

Notably, in the current level of instability and inability to predict the environment, the perspective of planning as a precise and analytical process is changing.

The competitive conditions on the textile market provoke the need in the elaboration of the structural improvement concept at the significant changes in the internal and internal environments, which defines the importance of adaptiveness. By the adaptiveness, we will mean the ability of an enterprise to adapt to the changing conditions of the internal and external environment. Based on the influence of the internal and external factors, enterprises should choose different variants of behavior, form their own strategies by various scopes of activities, including in the sphere of the production capacities application. The suggested control mechanism the production capacities application (Figure 1) is based on the procedure of forming the strategy of the increase in the efficiency of the production capacities application, implemented by means of the hierarchy analysis method.

The strategy of the increase in the efficiency the production capacities application is formed by the results of the coordinated actions in the sphere of planning, organization, and control over the activities of the production capacities application of an enterprise. The abovementioned scopes of activities are of a cyclic nature, as a result of which the controlled subject makes decisions on the introduction of the corresponding changes with the focus of the achievement of the planned indicators and factors of the internal and external environment of the enterprise.

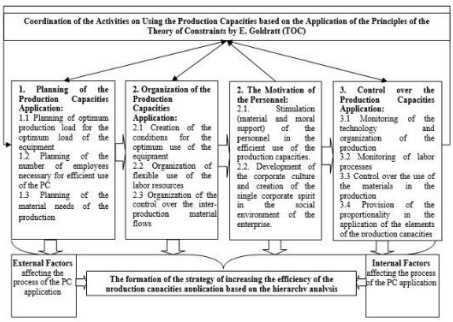

Figure 1: Control mechanism of the production capacities application of the enterprise using the principles of the theory of constraints by E. Goldratt (TOC)

The controlled subject of the process of the production capacities application at the enterprise for the purpose of adoption of a rational managerial decision should decompose the complicated problem into more simple particular tasks. This is exactly the focus of the hierarchy analysis method (hierarchy analysis process). The method is based on the processing of the ordinal, i.e. 'soft' information available to the person adopting the decision (PAD) and based on this incomplete information a series of alternative variants of decisions may be defined.

The system of goals for adoption of the strategic decisions is not always of a particular shape, besides, first, it is necessary to develop the target indicators necessary for the adoption of a decision. In the process of the consequential revealing and formulation of the main goals through the definition of the sub-goals, the hierarchy goal system is created. At the same time, it is also necessary to define the differences in the importance of the goals of one hierarchical level. However, with the increase in the number of criteria considered at the evaluation of alternative variants of decisions, the abilities of PAD in the sphere of the problems' analysis decrease.

Hierarchy analysis method (HAM) may be used as follows: after the factor of uncertainty of the considered problem is evaluated in the form of various scenarios, the pairs of these scenarios are compared using the ordinal scale for the definition of the probability of some or other scenario. Such a scale is presented in Table 8.

Table 8: The scale of pair-wise comparison of the alternatives

Scale Values V_{ij}	The Probability of One Scenario Compared with the Other; Comparison of Importance of Two Sub-Goals; Realizability of the Goal using Strategy *i* compared with Strategy *j*
1	similarly probable, important, significant

3 (1/3)	rather more probable (not more probable), more important (not more important), better (worse)
5 (1/5)	aloud more probable (not more probable), more important (not more important), better (worse)
7 (1/7)	much more probable (not more probable), more important (not more important), better (worse)
9 (1/9)	extremely more probable (not more probable), more important (not more important), better (worse)
2 (1/2), 4 (1/4), 6 (1/6), 8 (1/8)	intermediate values

Source: author`s elaboration.

This table is used for constructing the hierarchy of goals through answering the question: which of each two comparable sub-goals is more important to achieve the goals of a higher level. It results in the horizontal raw. Through the ordinal evaluation, it is defined, which of two comparable strategies is more preferable for the best achievement of the set goal. The obtained data of the pair-wise comparison of the scenarios, goals, and strategies are formed as matrices.

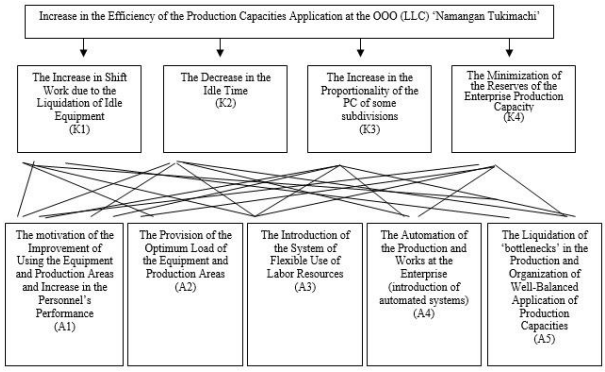

Figure 2: Tree of goals and decisions

When comparing two objects of analysis, we choose the corresponding value of scale V_{ij}, while the comparison of these objects in reversed order should be evaluated with reversed value $V_{ji} = 1/V_{ij}$.

The approbation of the suggested control mechanism of the production capacities application based on the hierarchy analysis method is performed according to the materials of OOO (LLC) 'Namangan Tukimachi'.

The evaluation was performed based on three criteria (K1-K3). To solve the task of the increase in the efficiency of the production capacities application, there are several alternatives.

These strategic alternatives may be schematically represented using the tree of goals and decisions (Figure 2).

Next, it is necessary to perform the pair-wise evaluation. According to the specialists' opinions based on their preferences, we define the extent of the criteria's influence on the increase in the efficiency of the production capacities application of the considered enterprise. The obtained data are presented in the form of a matrix. We have composed the initial matrix of the pair-wise comparison (Table 9).

Table 9: Initial matrix of pair-wise comparison of criteria

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

The automatized computation of the tables is performed using the Hierarchy analysis method Software (PRIMA application package). The initial data for the computation are the tables of the pair-wise comparison of the criteria preliminarily formatted for the fractional format in the Layout Menu (Format \ Cells \ Number \ Fractional).

To test the conformity of the experts' opinions, we define the conformity relation *CR*, as the quotient of division of the inconsistency ratio to the value of accidental conformity *AC*.

$$CR = \frac{IR}{AC} \qquad (6)$$

It is deemed acceptable if CR ≤ 10%, allowable if CR ≤ 20%, but if CR> 20%, then V_{ij} should be revised.

The value of the inconsistency ratio for the evaluation of the criteria's influence is below the acceptable value 0.2, so the obtained data may be used for the further evaluation of the alternative measures.

Next, we perform the pair-wise comparison of the alternatives for each criterion. The data is also inserted into the PRIMA Application Package. The matrices of the pair-wise comparison of the alternatives and the computation of the parameters are presented in tables 10, 11, 12.

Table 10: The matrix of pair-wise comparison of the alternatives by criterion K1

A (K1)	A1	A2	A3	A4	Vector of Priorities
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	½	5	4	1	0,3182

Table 11: The matrix of pair-wise comparison of the alternatives by criterion K2

A (K2)	A1	A2	A3	A4	Vector of Priorities
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 12: The matrix of pair-wise comparison of the alternatives by criterion K3

A (K3)	A1	A2	A3	A4	Vector of Priorities
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 evaluations, one may define the hierarchy of the alternatives. For this purpose, it is necessary to weight the priorities of the alternatives obtained through HAM by all the criteria:

$$\mathbf{Pac = (Pasc_1 ; Pac_2 ; Pac_3); \quad Pac * Pcs = Pa} \qquad (7)$$

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

We obtain the general priorities of the alternatives: A_1 – 0.2829, A_2 – 0.1018, A_3 – 0.4007, A_4 – 0.2146. For these conditions, the hierarchy of alternatives is as follows:

$$A_3^{=} 0.4007 \succ A_1^{=} 0.2829 \succ A_4^{=} 0.2146 \succ A_2^{=} 0.1018.$$

Thus, for the textile enterprise OOO (LLC) 'Namangan Tukimachi' of the Republic of Uzbekistan, the most preferable is alternative A_3 – the automation of the production and works (introduction of the automatized systems). However, in OOO (LLC) 'Namangan Tukimachi', it is necessary to complexly evaluate the influence of various factors on the process of the production capacities application, so each of the alternatives is to some

extent significant for the increase in the efficiency of the control over the production capacities application of the enterprise.

Thus, the use of the methodology proposed by the authors for evaluating the management of production capacity in textile enterprises, based on the application of a point method for evaluation, and characterized by the use of weights, will determine the level of efficiency of the production capacity management process in textile enterprises, and justify possible ways to improve competitiveness for each product.

In the case of a low level of the coefficient of efficiency of management of the use of production capacities, a number of measures should be taken to improve the management efficiency of the use of production capacities in enterprises.

The method proposed by us is distinguished by the strength of a comprehensive assessment of the entire process of managing the use of the production capacity of textile enterprises, and it can also be applied in other industrial sectors such as mechanical engineering, light industry, and food industry. But along with the advantages, this method has its drawbacks: the method does not reflect the influence of indicators of production capacity management efficiency on the financial results of the company. In addition, it will not be able to assess the competitive advantages of an enterprise in any way, which is very important in increasing the share of an enterprise in the market. In our opinion, should continue research in this area.

TRANSFORMATION OF LEGAL REGULATION OF FAMILY RELATIONS UNDER THE IMPACT OF SCIENTIFIC PROGRESS

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Abstract: *The actuality of the problem is conditioned by the fact that in the conditions of growing scientific and technological progress and the strengthening of the role of the individual in public life there is an acute problem of the legal status of the family in modern human life. The achievements of science and technology and social changes in the society inevitably affect marriage and family relations. The purpose of this article is determining the changes in the family legislation under the impact of scientific progress, in particular, concerning the legal regulation of the issues of determining the child's origin when using artificial insemination technology, the responsibility of the surrogate mother in case of refusal to hand over the born child to the spouses, the regulation of cases related to such legally significant circumstances as changing the sex of a person and so on. The leading methods of research are the methods of analysis and synthesis used for structuring and analysis of the available information as well as the comparative method as a special-scientific method of research that allows to consider this problem by finding and comparing common and different legal phenomena in the regulation of these issues. The results of the undertaken study is determining the drawbacks in the legal regulation of doctrinal provisions on the legal assessment of certain legally significant circumstances which have the status of legal facts for the purposes of legal regulation, in particular, the wide spread of methods of vitro fertilization, cloning, sex change, surrogacy, among other things, in solving the matter of the child's origin. The practical significance of the obtained results lies in the possibility of implementing a number of international legal acts in the national legislation of Ukraine at the level of international legal acts by imposing the obligations on the states parties of the conventions of the quality protection and protection of human rights.*

Keywords: Same-Sex Marriages; Surrogacy; Reproductive Technology of Artificial Insemination; Cloning; Legalized Abortion.

The most important problem of demographic policy and a necessary condition for ensuring the national security of Ukraine is increase of the reproductive potential and health preserving of the generation that is born.

At the same time, the state of reproductive health, which is an integral part of the health of the nation as a whole and is of strategic importance for the sustainable development of society, is of particular concern. Currently, the state of reproductive health of the nation is far beyond international standards and is characterized by a low birth rate at the background of a high level of the main components of the threat of