Effective Concepts of Harmonious Management of Production Systems

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Summary
Modern concepts of management of construction production systems require solving the problems of harmonization of the distribution of structural elements on the way to overcoming global destabilization processes. An effective ratio of functional subsystems of production in an environment of mutual influence create sustainable opportunities for production management and contribute to the logical development of the system as a whole in achieving the main goal of harmonious management.
The purpose of the study is to develop the concept of effective management of production systems in construction with the harmonious formation of organizational structures.
The results of the study allowed to reveal the harmonization approach in improving the interaction of structural elements of production and accelerating their functional sensitivity to changes in the environment. Harmonious production system more effectively adapts to the diversity of interests, goals and actions at all levels of management of different subsystems in any environment.

Key words:
concept, system, production, harmony, management, reliability, efficiency, distribution.

1. Introduction

The internal architecture of production systems consists of heterogeneous elements, where each carries its own functional and specific load in achieving the end result. The composition of any functional systems includes engineering research, feasibility study, design, spatial planning and design solutions of projects, methods of their implementation, production management and operation. In such conditions there is a problem of effective ratio of the whole and its elements (particles), which is accompanied by a harmonious combination of individual production operations (or parts) between performers (departments, divisions), taking into account qualification level, experience and degree of responsibility [2, 3].
Complex systems require an adequate approach to their management, ie the implementation of appropriate functions. They have a complex structure that implements specific functions. Miscalculations and errors in management strategy, structural confusion, financial arbitrariness are the result of erroneous focus in business.

2. Theoretical Consideration

Today, the structure of systems, functional integrity and stability of unity with the external environment form the basis of harmonious management, ie order, consistency of all components of the production system both internally and with external functions. It turns out that if you add and coordinate these components into a single harmonious structure, the "immunity" of the system to external and internal destructive (destabilizing) factors increases sharply. The probability of negative consequences drops sharply [1, 3]. In addition, the harmony in the system creates the effect of creating a new property, which did not exist before, which provides an indisputable advantage in the competitive business space, increases the efficiency of the association in achieving the goal and making a profit.
Harmonious management technology is designed to prevent crises in the activity by choosing a strategy for the development of production systems and is in demand by business structures. The introduction of harmonious management technology contributes to the sustainable operation of all construction processes. A necessary condition for the presence or beginning of the process of sustainable evolutionary development of systems is the existence of the proportion of the golden ratio in its

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structure [0,62: 0,38]. This provides a stable balance of development and reduction of costs to maintain a stable state of the production system [1, 4, 5]:

It is known that the use of the principles of harmony will improve the interaction of different departments and accelerate the response to rapid change - this is one of the first tasks that will accelerate the level of success of any organization. As a result, all conditions will be created for the harmonious interaction of people at all levels of government, which confirms the need to develop a modern concept of governance on the principles of harmony.

Requirements for the organization of harmonious production are reflected in the assessment of business activity of the enterprise and its components (shown in Figure 1).

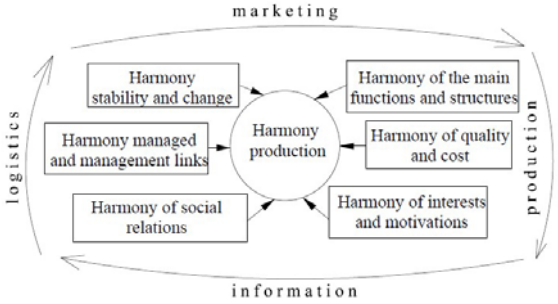

Figure 1. Components of harmonious management of a production enterprise

The concept of harmonious management of construction production systems will be developed on the analysis of components of harmonious management of the industrial enterprise (fig. 2).

We apply the concept of harmony in the study of two classes (groups) of elements contained in the production systems of construction: physical and technical systems (machines and mechanisms); organizational and socio-economic systems (construction organizations, contractors).

The essential difference between the systems is that physical and technical systems mainly function according to stable, orderly laws of distribution, and society and society - according to the opposite (unstable disordered). In the process of evolutionary development, each production system must inevitably pass between states of order and chaos, thereby acquiring new stable qualities. At the boundary of the transition between two opposite classes, the coordinates of the production system pass through the proportions of the golden section, at these points xd is the generation of fluctuations, which provides the process of further development [2].

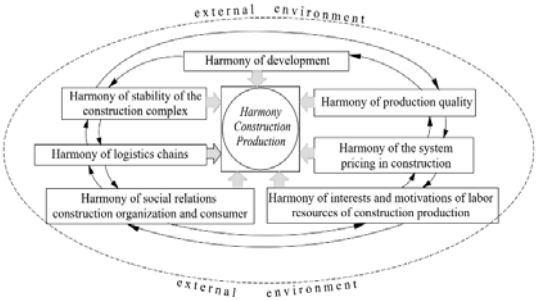

Figure 2. The concept of harmonious management of construction production systems

The implementation of a management decision without taking into account the law of averaging, inevitably leads to serious obstacles that may be insignificant, despite the significant cost of resources. Conversely, a goal-based strategy based on an understanding of this law will be more effective.

Let's search for the point of intersection between the opposite states of the production system. The description of the stable and ordered state of the system is performed using the normal mathematical distribution of probabilities of random values (Gaussian distribution), and the description of the unstable state of the production system - by the distribution of probabilistic values of reliability of the production system (Pareto distribution). The phenomenon of non-Gaussian social phenomena differs significantly from ordinary Gaussian distributions, which obey the central theorem of probability theory (averaging) [1].

The harmonization approach to determining the point of golden intersection in the fluctuation existence of production is to solve a system of equations, which consists of the equality of tangent equations of the proposed distributions of states $y(x_\partial)$ and the equality of their derivatives $y'(x_\partial)(1)$.

$$\begin{cases} y_1(x_\partial) = y_2(x_\partial) \\ y_1^{/}(x_\partial) = y_2^{/}(x_\partial) \end{cases} \quad (1)$$

Implement this expression by the formulas of the above mathematical distributions (2):

$$\begin{cases} \dfrac{1}{\sigma\sqrt{2\pi}} \cdot e^{\left(-\frac{(x_\partial - m)^2}{2\sigma^2}\right)} = c \cdot x^{-\alpha} \\ -\dfrac{(x_\partial - m)}{\sigma^3\sqrt{2\pi}} \cdot e^{\left(-\frac{(x_\partial - m)^2}{2\sigma^2}\right)} = c \cdot (-\alpha) \cdot x_\partial^{-\alpha-1} \end{cases} \quad (2)$$

The obtained value of the unknown system of equations (1) $x_д$=1,618 allowed to calculate the coordinates of the point of golden intersection [y_1=0,62; y_2=0,38], which harmonizes the opposite states of the production system.
Let's perform graphical visualization of finding the harmonious component of production systems management by superimposing graphs of system state distributions.

Table 1. Intervals of values of mathematical distributions in determining the harmonic point

№	Interval	Value y_1	Value y_2
0	1	0.564	1
1	1,2	0.542	0.694
2	1,4	0.481	0.51
3	1,6	0.394	0.394
4	1,8	0.297	0.309
5	2,0	0.208	0.25
6	2,2	0.134	0.207
7	2,4	0.079	0.174
8	2,6	0.044	0.148
9	2,8	0.02	0.128
10	3,0	0.01	0.111

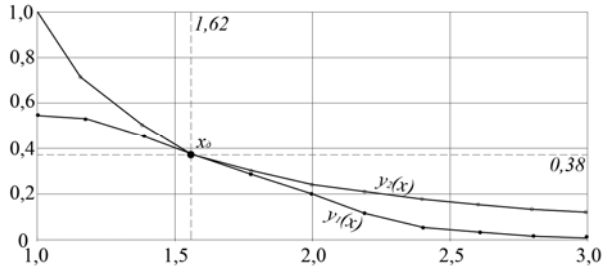

Figure 3. Graphical visualization of the harmonic component of production systems management at the golden ratio

These calculations showed that the systems in the process of their development pass the boundary between the distributions and acquire, as indicated, a new progressive quality. In the implementation of its functions, the fluctuations of the system determine the level of its organization, which corresponds to the harmonious (sustainable) development.
When managing the production activities of the system in the planning structure develops a strategy for the harmonious development of production, with calculations of productivity growth, taking into account and correcting changes in the structure of the work program, the amount of cost reduction. Additional investments should be attracted for the implementation of proposals and measures, and the task of maintaining stability in the development of the production system is within the harmony between the desired effect and the parameters of the variables that ensure the functioning. In such circumstances, a dialectic of understanding the process of development is formed: "to get the result, you need to spend something and do something." Reducing the complexity of work provides an increase in productivity and production costs, but all this requires additional development efforts in the form of attracting capital investment.
The production system seeks to acquire an orderly state, which at any stage of development corresponds to the level of organization of its activities. The concept of "organization" defines the numerical measure of statistical relationships of individual elements of the system. In the process of development, each element of the system takes many different states and any system is clearly characterized by a measure of uncertainty. If the state of one element does not affect the state of others, then the system is extremely disorganized, ie incoherent, and if the system is organized, the state of one element determines (affects) the state of others.
Determining the harmony of management in construction is not limited to our method. Harmony is multifaceted and the ways to achieve it can be different. The substantiation can be presented on the basis of use of various indicators and parameters (technological, organizational, economic, commercial, social, etc.).
The use of the "golden ratio" in the management of construction production in combination with information technology contributes to the evolution and development of structural diversity of production systems in a changing environment.

Conclusions

The ways of application of the principles of harmonious management in the management of construction production systems in the direction of sustainable and logical development are substantiated. The components of harmonious production in improving the interaction of different departments and accelerating the response to rapid change, which will accelerate the level of success of any organization. The result is the creation of all conditions for the harmonious interaction of performers and equipment at all levels of construction management, which confirms the need to develop a modern concept of management on the principles of harmony.
The concept of harmonious control of production systems by using the existing laws of mathematical distributions in accordance with destabilizing processes is proposed. Computational studies of the harmonization approach to determining the point of golden intersection in the fluctuation existence of production, which consists in solving a system of equations of equality of tangents and their derivatives of the proposed distributions of states of the system. The result of the study is the value obtained to

calculate the coordinates of the point of golden section, which harmonizes the opposite states of the production system.

The results of the study allowed to reveal the harmonization approach in improving the interaction of structural elements of production and accelerating their functional sensitivity to changes in the environment. Harmonious production system more effectively adapts to the diversity of interests, goals and actions at all levels of management of different subsystems in any environment.

References

[1] Iryna Arutiunian, Maryna Poltavets, Olena Bondar, Victor Anin, Fedir Pavlov. Structural Information Management of Production Systems in Construction. *International Journal of Advanced Trends in Computer Science and Engineering*. 2020. Volume 9, No.4, July-August 2020. P. 4794-4797.

[2] Iryna Arutiunian, Nataliia Dankevych, Yevhen Arutiunian, Danylo Saikov, Maryna Poltavets, Alexandr Maranov, and Denys Frolov. Development of a mathematical model for selection and rationale for making optimal construction decisions. *Advances in Mathematics: Scientific Journal.* 9 (2020), no.12. P. 10649-10659.

[3] A.V.Radkevych, I.A.Arutiunian, N.O. Dankevych. Analysis of existing methods and models in substantiation of organizational and technological decisions of object construction. Bridges and tunnels: theory, research, practice, № 11, 2017, pp. 74–79.

[4] I. Pavlov Project management and optimisation solutions under uncertainty and risk, *Zaporizhzhia*, Ukraine, ZSEA. 2008

[5] A. Berkuta, V. Osynska, O. Halinskyi, I. Vakhovych. Organisational and economic aspects of foreign experience of self-regulation in construction, *Building Production*, 52, 2010, pp. 3-8.

[6] N.O. Dankevich. Probabilistic and statistical principle of systems engineering as a tool for reliability of management decisions, Ways to increase the efficiency of construction in the formation of market relations. Kyiv, № 43, 2020, pp. 67 –73.

[7] M. Pyvovarov, E.Hyzhnyak. Organisation of capital construction: Shortcomings and ways to optimistic expenses, *State and Regions. Series: Economics and Entrepreneurship*, 5, 2014, pp.94-97.

[8] A. Martysh. The methods of improving of organizational and technological reliability of development and implementation of schedules, *Journal of Lviv National Agrarian University. Series: Architecture and Agricultural Building*, 16, 2015, pp.109-115.

[9] M. Iasechko, N. Sachaniuk-Kavets'ka, V. Kostrytsia, V. Nikitchenko, S. Iasechko (2020). The results of simulation of the process of occurrence of damages to the semiconductor elements under the influence of multi-frequency signals of short duration. Journal of Critical Reviews, 7 (13), pp.109-112.

[10] M. Iasechko, V. Larin, D.Maksiuta, S. Bazilo, I. Sharapa (2020). The Method Of Determining The Probability Of Affection Of The Semiconductor Elements Under The Influence Of The Multifrequency Space-Time Signals. Journal of Critical Reviews, 7 (9), pp.569-571.

[11] M. Iasechko, M. Kolmykov, V. Larin, S.Bazilo, H. Lyashenko, P. Kravchenko, N. Polianova and I. Sharapa. Criteria for performing breakthroughs in the holes of radio electronic means under the influence of electromagnetic radiation, ARPN Journal of Engineering and Applied Sciences, 15(12), 2020, pp. 1380 ― 1384.

[12] O. Sotnikov, M. Iasechko, V. Larin, O. Ochkurenko, and D. Maksiuta. The model of a medium for creation of electric hermetic screens of the radio electronic means, IJATCSE. 8(2), 2019, pp. 300-304. doi:10.30534/IJATCSE/2019/32822019.

[13] M. Iasechko, O. Tymochko, Y. Shapran, I. Trofymenko, D. Maksiuta, and Y. Sytnyk. Loss definition of charged particles in the discharge gap of the opening of the box-screens during the formation of a highly conductive channel, IJATCSE. 8(1.3), 2019, pp. 1-9. doi: 10.30534/ijatcse/2019/0181.32019.