# Model and information technologies for adaptive management of organizations according to the criteria of efficiency and timeliness

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*Abstract*—**Purpose is improving the adaptive management model of organizations on the criteria of efficiency and timeliness in order to reduce the destructive harmful effects of the VUCA-environment, ensure adaptation to the effects of COVID-19, Industry 4.0, and the transition to a circular economy. To solve the tasks following methods were applied: the method of analysis and synthesis, the system approach, the theory of solving inventive problems, methods of decision making, the method of structural analysis and systems design, grouping, generalization. A matrix of six quadrants was developed, each of which was obtained at the intersection of the criteria "efficiency - inefficiency" of management decisions, and the implementation timeliness of these decisions in states of delay, timely, and ahead (premature). The characteristics of each quadrant are determined: the adaptation of the organization to the destructive factors of the environment, the area of control of the system (viability, destruction, non-viability), the effectiveness of strategy implementation through project activities, and competitiveness. The developed approaches can be used to improve the procedure for evaluating the effectiveness of project activities of any sector of the economy for operational management and adaptation to the destructive factors of the environment. The article may be of interest to project managers and senior managers.**

***Keywords— organization adaptability, decision making, project management, information technologies, destructive factors, VUCA environment.***

## I. INTRODUCTION

System controllability ensuring in the VUCA-world involves the ability to change its structure and mechanism of operation in accordance with new goals under the influence of the external environment, which is largely correlated with the term "adaptation" [1-3].

System controllability means the ability to change the properties as required by the person who controls [4]. Therefore, under these influences, an indispensable condition for management is the prediction of dynamic correction of both criteria and performance targets.

Summing up, we can conclude that the scientific community faces the urgent task of developing and implementing effective management methods, models, and methodologies in conditions of instability, uncertainty, complexity, and ambiguity to ensure the manageability of socio-economic systems in various fields and including project activities to ensure adaptation to destructive environmental factors.

## II. ANALYSIS OF RECENT RESEARCH AND PUBLICATIONS

Rapid changes require quick and effective decisions, constant adjustment of what we have done and how it has done. Successfully implemented adaptation in content terms is the number (taking into account their importance) of effectively adopted and implemented management decisions over time, aimed at neutralizing or transforming the negative impact of destructive factors to the positive [5-7]. The quickly effective decision is implemented, the faster the system adapts to the new destructive challenges of the environment. Thus, adaptation is directly affected by the effectiveness of decision-making and timeliness.

In the scientific literature, many works are devoted to the terms of "efficiency", "decision-making", and "timeliness". Discussions in this direction did not stop with the beginning of radical economic transformations, when other, at first glance, more pressing issues came to the fore [8]. The terms "effectiveness of management decisions" and "timeliness" are so integrated into science, practice, and life that their meaning is used as self-evident. But these terms require more attention from scientists and practitioners due to the existing discrepancy between the theoretical and practical implementation (effectiveness) of management decisions [9].

In general, the management decision means the process of developing and implementing a rational solution to the problem or task [9-10].

Efficiency, in turn, is defined as the ability to bring effect, the effectiveness of the process, project, etc. [8]. In general, the efficiency is calculated as the ratio of the effect, the result to the costs that provided this result [8]. An important conclusion is that a solution is effective if it is comprehensive and solves the problem completely or for a long time [9].

The criterion of decision-making timeliness determines the speed of response of the controlled system, and hence the feedback. It is also important to note that the higher the instability, uncertainty, complexity, and ambiguity (VUCA) of the environment's destructive impact, the more time it takes to prepare, justify and make management decisions, i.e., to issue a ready decision at the right time.

In interpreting the consequences for the states of "delay" and "timely" scientists have a common opinion, but according to the state of "advance" there are different points of view.

Consider in more detail the three states of the system reaction "delay," "timing," "ahead (premature)".

It should be noted that a correct and reasonable decision, but made with a delay, loses its relevance [11], and therefore it is equivalent to a mistake [9], and it is ineffective. This is due to the fact that at the time of decision-making, the situation is already so changing and complicated that the decisions made, as a rule, do not meet the needs of the time, and therefore lose their relevance. The paper [12] notes that late decisions are harmful to society, they do not contribute to solving already "overripe" problems and further increase the already painful processes.

It is also clear that the state when management decisions are made in a timely manner is the most desirable. Time is understood as the ability to happen or do something at the right time [13]. "Timely" characterizes the state when a problem arises and there is a ready solution, or such a solution is made quickly and neutralizes the problem either completely or for a long time. Thus, timeliness is the correct determination of time for preparation and management decisions. One cannot disagree with scientists that the timeliness of management decisions means that it must be made taking into account the state and development of both the subject and the object of management, taking into account specific conditions and budget, time to perform tasks [11]. The timeliness of decision-making depends on the ability of the leader to properly navigate the circumstances, make sense of events and make decisions only when it is really ripe [11]. The timeliness of management decisions means that the decision should neither lag behind nor outpace the needs and objectives of the socio-economic system [12, 14].

The views on the state when management decisions are made prematurely or in other words anticipate the emergence of destructive environmental influences are opposite.

As noted in [11], premature decision-making, the desire to overtake events is harmful, because these decisions generate formalism and make them unfeasible. Some scientists also consider harmful ahead or premature decisions, because such a decision does not find a prepared basis for implementation and can give impetus to the development of negative trends [12, 14].

But there is another point of view, which is associated with the expression, which has already become an aphorism "to manage - means to anticipate." The authorship of this statement is attributed to many rulers, starting with Cicero. Some scholars consider the author of this expression to be the outstanding management theorist and practitioner Henri Fayol, who did use it in his scientific work [15].

In this context, anticipation is associated with a vital and priority management principle, which should become the rule to act on anticipation based on forecasting the situation and continuous planning of actions taken, without exacerbating existing problems [16-17]. But returning to the work [15] it should be noted that the advance is not considered as an action, but rather as preparation of an action program. "To anticipate is almost to act", and therefore only to calculate and prepare for the future [15], which means to have time to think and prepare for implementation.

Of course, solving a problem after it has arisen leads to the fact that it is not necessary to do it in the best way, because it takes time to develop an action plan. It is important to start work on large decisions in advance so that the destructive influence does not get out of control and does not catch you by surprise [17]. It is necessary to organize the work so that the thinking and preparation of the decision went in advance, the decision was made on the eve of events, and implementation began immediately with the beginning of events [17].

So, in summary, it is useful to anticipate the preparation of an action plan, and the actions themselves taken prematurely are harmful and equivalent to mistakes.

In the glossary of the theory of time (temporology) [13], untimeliness is defined as a kind of relation of the inconsistency of some objects, their properties, forms, and others in the form of either lagging or anticipating its appearance somewhere and sometime in the past, present, or future. Thus, both delay and prematureness correspond to untimeliness and therefore have a detrimental effect on the system.

On the basis of fundamental works on temporology (theory of time), of the Institute of Time Nature Research Razumovsky O. S. we can distinguish a number of properties of "timeliness - untimeliness" by which we can determine its extent [13].

Such properties include [13]:

1. Implementation at the right time with a positive result of the event or condition.

2. Synchrony of events of what arose and what is happening with the necessary and sufficient basis in reality - the state of the object and its environment.

3. Relevance of events. The degree of relevance is defined as the significance at the time, usually the maximum level of adequacy, relevance, necessity, applicability from the point of view of the observer.

Based on the analysis of the literature, we can conclude that the effectiveness of management decisions is determined by the state of "timely", and the states of "delay" and "ahead (premature)" are harmful and destructive to the economic system.

## III. Main material

B The effectiveness of decision-making on the implementation of project activities is proposed as assessing the desire of the strategic portfolio of projects to perfection (through the assessment of its properties) and counteraction to destructive environmental factors (external, internal, entropic) [4].

External factors include those where the power of destructive external influences exceeds the power of internal system connections of the organization. Under these conditions, there is an acceleration or accidental mutual amplification of harmful properties.

Destructive internal factors are a priori present in the system in the form of various side effects. In fact, the side effects are all that do not suit us in the system. The accumulation of side effects makes the system complex, cumbersome, poorly managed. Adverse effects include, for example, waste from mass production, the need for their elimination, lack of productivity, excessive bureaucratization in decision-making, and others. Thus, harmful phenomenon degrades some consumer quality of the system [18-19] and is an undesirable effect. Over time, the number of side effects

increases, which reduces the effectiveness of the structure and requires its replacement with a new one. The economy, which aims to maximize the utilization of both production and project waste, and the disposal of project products after the completion of product life cycles have become circular [20]. Currently, the transition to a circular economy is one of the keys to the development of the EU [20].

Entropic factors determine the self-destruction of the organization at the end of life. As internal and entropy factors must be taken into account when planning the project. However, it is the external destructive factors that, as unpredictable, require management and adaptation.

An absolutely adapted system is an ideal system, which is defined by G. S. Altshuller, as a system that does not exist, and its functions are performed in full by themselves, i.e., goals are achieved without means [18; 19, p. 38]. The development of all technical systems goes in the direction of increasing the degree of ideality [18-19] and therefore each system strives for its ideal when its parameters of weight, volume, area, and others, approaching the extreme. There is no doubt that socio-economic systems are also evolving towards ideality.

It is clear that ideal systems do not exist. Striving to approach the ideal, the system if "disappears" and becomes self-organized, and the necessary function is performed. Therefore, a priori management connected with only imperfect systems. The pattern of ideality is of scientific interest in that it determines the direction in which any system should develop to increase its efficiency.

The desire for ideality can be assessed in accordance with the eight properties of the ideality of systems, which are set out in the theory of solving inventive problems (TRIZ) [4; 21, p. 141]. These 8 properties are designed specifically for technical systems [21, p. 141] and therefore need to be adapted for such complex socio-economic systems as organizations.

The obtained results allow us to consider the matrix of ability to adapt a project-oriented organization according to the criteria of "efficiency of management decisions – timeliness" [4] (Fig. 1). Let's analyze the six obtained quadrants of the matrix.

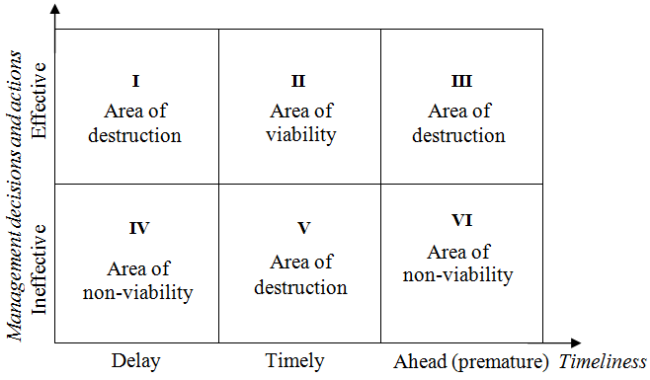


Fig. 1. Matrix for assessing the ability to adapt a project-oriented organization according to the criteria of "efficiency of management decisions - timeliness" *(proposed by the authors)*

Quadrant I – management actions are carried out effectively, but with a delay in time. There is a loss of profit or a loss of competitive advantage in the event that competitors are ahead of the market. Characterizes the area of the destruction, when the total impact of indicators "effective" and "late" is critical and leads to a decrease in competitiveness, and adaptation does not occur or occurs inefficiently. The organization loses control and the ability to change properties as needed.

Quadrant II – management actions are carried out in a timely and effective manner. The most desirable condition. Area of sustainability, when the organization is able to effectively address the destructive factors through effective management, to effectively and timely adapt. The organization changes the properties as required by the person who manages them.

Quadrant III – management actions are carried out effectively, but ahead of the need (prematurely). At first glance, this state may seem appropriate and desirable. The organization successfully responds to external disturbances with a surge of activity. But such processes are primarily characterized by prediction and assumption. The illusion of vision can lead to the riskiness of the leader, and therefore such decisions can be attributed to the area of destruction.

Quadrant IV – management actions are carried out inefficiently and too late. The organization did not adapt to the changes. Solutions have been implemented inefficiently, the problem is either not solved at all or not neutralized, as required for the long term. The area of the organization's unsustainability, characterized by inefficient management, declining competitiveness, unwillingness to make any changes, especially when "inefficiency" and "untimely" are repeated.

Quadrant V – management actions are carried out in a timely manner, but inefficiently. Area of destruction and reduction of competitiveness. The total impact of inefficiencies and timeliness is critical and leads to the destruction of the organization, adaptation does not occur as required by the end-user, and management is not effective enough, the organization loses control and competitive advantage.

Quadrant VI – management actions are carried out ahead of schedule, and therefore untimely and inefficient. In this case, the organization responds to external disturbances with a burst of activity that is not constructive. Resources and potential of the organization are spent on inefficient decisions. Management masks the real failure of strategic transformations under the guise of rapid but inefficient activities. In the economic literature, this is called "active inertia disease" [22]. The organization did not adapt to the changes. Solutions have been implemented inefficiently, the problem is either not solved at all or not neutralized, as required for the long term.

## IV. CONCLUSIONS

1. The criteria of "management decisions", "efficiency" and "timeliness" are studied. It is obtained that the criterion of "timeliness" complements the criterion of "efficiency of management decisions", but should be considered as a separate one.

2. Three states of the criterion "timeliness" are defined and analyzed: late, timely, ahead (premature). It is obtained that the effectiveness of management decisions is determined by the state of "timely", and the states of "delay" and "advance (premature)" are harmful and destructive to any economic system.

3. Based on the details of the criteria "effectiveness of management decisions" and "timeliness" obtained a matrix of six quadrants, each of which is obtained at the intersection of criteria "efficiency – inefficiency" of management decisions and actions and timeliness of these decisions' implementation. The characteristics of each quadrant are determined: the adaptation of the organization to the destructive factors of the environment, the area of control of the system (viability, destruction, non-viability), the effectiveness of strategy implementation through project activities, competitiveness. The useful effect of the proposed matrix is to ensure the timeliness of monitoring and early detection of deviations or negative trends in the criteria of "effectiveness of management decisions-timeliness" in order to increase the number of successfully implemented projects and implement a strategy for fewer costs.

## REFERENCES


[1] S. V. Legominova "Conceptual principles of strategic management of competitive advantages of enterprises," Global and national problems of economy: Scientific Journal, Mykolaiv, vol. 18, 2017, pp. 250–255. URL: http://global-national.in.ua/archive/18-2017/48.pdf. [in Ukrainian].

[2] O. E. Gudz and A. A. Glushenkova "Management of ideas and project management," International Fund for Social Adaptation, Kyiv, 2016, p. 156. URL: http://www.dut.edu.ua/uploads/p_1010_33355877.pdf. [in Ukrainian].

[3] S. M. Savchenko and V. G. Nikitin "The essence and principles of strategic management of the efficiency of the enterprise," Efektyvna ekonomika: Scientific Journal, vol. 2, 2021. URL: http://www.economy.nayka.com.ua/pdf/2_2021/94.pdf. DOI: 10.32702 / 2307-2105-2021.2.92. [in Ukrainian].

[4] I. O. Hordieieva "Adoption of management actions for the adaptation of project-oriented organizations on the criteria of "efficiency-timeliness"," Management of Development of Complex Systems: Scientific Journal, vol. 46, 2021. URL: http://urss.knuba.edu.ua/zbirnyk-46. [in Ukrainian].

[5] I. O. Hordieieva and I. V. Kalinko "Evaluation of the relevance of strategic goals of the organization and project activities to ensure adaptation," Review of transport economics and management: Scientific Journal, Dnipro, vol. 4(20), 2020, pp. 128–135. URL: http://pte.diit.edu.ua/article/view/228816/228537. DOI: https://doi.org/10.15802/rtem2020/228816. [in Ukrainian].

[6] V. M. Molokanova and I. O. Hordieieva "Study of the organization adaptivity rate correlation in relation to its internal integrity," Scientific Journal Herald of Advanced Information Technology, vol. 3(4), 2020, pp. 292–304. DOI: 10.15276 / hait.04.2020.7.

[7] V. M. Molokanova and I. O. Hordieieva "System approach to project management in a behavioral economy," Management of Development of Complex Systems: Scientific Journal, Kyiv, vol. 45, 2021, pp. 43–49. URL: http://urss.knuba.edu.ua/files/zbirnyk-45/8.pdf. DOI: https://dx.doi.org\10.32347/2412-9933.2021.45.43-49. [in Ukrainian].

[8] A. A. Demchenko and O. I. Momot "On the essence of the concepts of "efficiency" and "effectiveness" in the economy," Economic Bulletin of Donbass: Scientific Journal, Donetsk, vol. 3(33), 2013, pp. 207–210. URL: http://dspace.nbuv.gov.ua/bitstream/handle/123456789/123349/27-Demchenko.pdf?sequence=1. [in Ukrainian].

[9] N. Podvirna "Conditions for the effectiveness of management decisions," Ukrainian national idea: realities and prospects for development: Scientific Journal, vol. 23, 2011, pp. 118–122. URL: http://ena.lp.edu.ua:8080/bitstream/ntb/10385/1/21.pdf. [in Ukrainian].

[10] D. O. "Somov Organizational and management mechanism of the process of adaptation of the enterprise," Scientific Bulletin of Uzhgorod University. Economics Series, issue 1(47), vol. 1, 2016, pp. 279–285. URL: http://nbuv.gov.ua/UJRN/Nvuuec_2016_1(1)__48. [in Ukrainian].

[11] O. O. Mandyuk "Individual administrative acts: theory and practice of application: dissertation of the candidate of legal sciences: 12.00.07," Lviv Polytechnic National University, Lviv, 2017. p. 214. URL: https://lpnu.ua/sites/default/files/2020/dissertation/1727/dysertaciyanazdobuttyanaukovogostupenyakandydtayurydychnyhnauk.pdf. [in Ukrainian].

[12] O. N. Ievtushenko "Management decisions: essence and characteristics," Public administration: scientific works, vol. 237, issue 249, 2014, pp. 47–51. [in Ukrainian].

[13] O. S. Rasumovskiy "Explanatory Dictionary of Temporology," Institute for the Study of the Nature of Time. URL: http://www.chronos.msu.ru/old/rglossaryraz.html. [in Russian].

[14] I. V. Kriviazuk and A. I. Pacholchuk "The process of making business decisions and its impact on the efficiency of the enterprise," Efficient economy, vol. 4, 2013. URL: http://www.economy.nayka.com.ua/?op=1&z=1962. [in Ukrainian].

[15] Henri Fayol "General and industrial management," Moskow: Electronic Publication: Center for Humanitarian Technologies, 1923. URL: https://gtmarket.ru/library/basis/5783/5788. [in Russian].

[16] E. N. Sheremetyeva and N. V. Mitropolskaya-Rodionova "The role of management decisions in improving the competitiveness of marketing activities of project-oriented organization of recreational services," Eurasian Union of Scientists (EUS): Scientific Journal, vol. 5(26), 2016, pp. 62–66. URL: https://cyberleninka.ru/article/n/rol-upravlencheskogo-resheniya-v-povyshenii-konkurentosposobnosti-marketingovoy-deyatelnosti-proektno-orientirovannoy-organizatsii/viewer. [in Russian].

[17] V. N. Kodin and S. V. Lityagina "How to work on a management decision. System campaign," Moskow: KnoRus, 2016, p. 190. [in Russian].

[18] G. S. Altshuller "Creativity as an exact science," Moskow: Soviet Radio, 1979, pp. 122–127. URL: https://www.altshuller.ru/triz/zrts1.asp#21. [in Russian].

[19] G. S. Altshuller, B. L. Zlotin, A. V. Zusman and V. I. Filatov "Search for new ideas: from enlightenment to technology," Kishinew, Karta Moldoveniaske, 1989. URL: https://www.rdita.kg/files/books/%d1%82%d1%80%d0%b8%d0%b7/poisk_novih1.pdf. [in Russian].

[20] S. D. Bushuyev, D. A. Bushuyev, V. B. Bushuyeva and O. V. Verenich "Project management in the transition to a circular economy," Management of Development of Complex Systems: Scientific Journal, Kyiv, vol. 45, 2021, pp. 21–26. DOI: dx.doi.org\10.32347/2412-9933.2021.45.21-26. [in Ukrainian].

[21] Yu. S. Stepanov, A. S. Tarapanov and G. A. Kharlamov "Heuristic methods in engineering: a textbook for higher professional education," Orel: FGBOU VPO "Gosuniversitet-UNPK", 2014, p. 181. URL: http://elib.oreluniver.ru/media/attach/note/2014/Stepanov_Evrictzeckie_metodi.pdf. [in Russian].

[22] I. L. Petrova "Personnel management in the process of organizational transformation," The formation of a market economy: Special issue: Human Resource Management: problems of theory and practice, Kyiv: KNEU, vol. 1(II), 2007, pp. 646–655. URL: https://library.krok.edu.ua/media/library/category/statti/petrova_0028.pdf. [in Ukrainian].