

Taran-Lala E.N., Ph.D.
Of Economic Sciences,
Associate Prof.
Poltava university of
consumer cooperative,
Ukraine

Conference participant,
National championship in
scientific analytics,
Open European and Asian
research analytics championship

RELIABILITY IN THE THEORY OF MANAGEMENT OF SOCIO-ECONOMIC SYSTEMS

This paper focuses on the concept of reliability from the management point of view and the possibility of its adaptation to the socio-economic systems.

Keywords: reliability, stability, efficiency, adaptability, continuity.

Reliability of the administrative systems in the theory of management of social systems has evolved quite recently. That might explain the lack of fully developed theories and approved methods of estimating and providing reliability of management systems, which could be the subject of a detailed analysis.

The category "reliability" originated in engineering. Technological progress consistently set a task to ensure durability of building units and machines, reliable transmission of electric power and the like. Safety margin was considered to be a natural way of providing reliability at that time.

About twenty interpretations of the concept "reliability" have been identified as a result of the study of printed resources in the field of engineering. We can distinguish the following definitions among a great number of similar ones [1-15]:

reliability is an integral function of distribution of the probability of faultless work uptime since the moment of switching on to the first refusal.

reliability of unit (or a system) is the probability of the fact that the unit (or the system) will not break down for some time.

reliability of a system is its ability to smoothly work over a certain time under prescribed operating conditions at the minimum time needed for the removal of failures and for preventive activities.

Thus, the term "reliability" refers to the ability of a unit (system) to provide and maintain the prescribed values of the generalized co-ordinates and transmission ratio under the operating conditions within a specific time frame and prescribed tolerances. Though, in our opinion, it is possible to use a simpler and shorter definition, within the framework

of which reliability is considered to be a property of an object which ensures its normal functioning.

A general engineering theory of reliability can be a methodological basis for the study of reliability of only autonomous technical devices the functioning of which has a somewhat determinate character. However, a system approach makes it possible to borrow a number of principles of the theory of reliability of technical systems and to adapt them to the general theory of management.

Thus, the major task of this study is to define the concept of reliability from the management point of view and the ways of its application in the theory of management of socio-economic systems.

If we examine the evolution of ideas on reliability, we can track it closely connected with the formation and development of cybernetics and information theory. The problem of reliability appears to be closely associated with fundamental applicability of ideas and methods of cybernetics and related sciences in various fields of knowledge. The concept of reliability begins to be widely used and in relation to social systems and their components. Thus, a special feature of cybernetics is a study and synthesis of complex dynamic systems of different physical nature. It breaks away from the matter content of systems, striving to formulate their common laws of organization and information links. With the development of cybernetics new ideas and principles become part of the theory of reliability. They result from the cybernetic analysis of reliability in the wildlife (the synthesis of reliable systems from unreliable components on the basis of the principle of redundancy, the study of the properties of codes of error detection and correction) [1, p. 121; 12, p. 35].

The next step of our study is to explore how management systems are divided depending on the degree of human involvement in implementing managing effects on this system. Thus, depending on the degree of human involvement in implementing managing effects the systems are divided into technical, man-machine (ergatic), organizational. The systems which function without human involvement belong to the technical ones. The examples of the man-machine (ergatic) systems are management information systems (MIS), in which people are connected with technical devices, and the final decision is made by people, with the means of automation only supporting the decision making process. The organizational systems include social systems - groups, communities, society on the whole.

Modern organizations represent a certain synthesis of the systems of all three indicated classes and are considered to be socio-technical ones. The offered definition allows us to use the concept of reliability in relation to the systems of management of socio-economic systems as well.

In the process of functioning of any system, regardless of the class it belongs to, it is possible to distinguish between two constituents - normative and actual. The first and basic requirement to the effective management is reliability as a property that makes the process of functioning of the system congruous to the norm. Disparity, the emergence of which in complex systems is probabilistic by nature, is interpreted here as an error. Reduction of the number and size of errors characterizes how efficient and reliable management is.

It is equally obvious that the systems belonging to different classes are capable

of coping with similar tasks with varying degree of success. That primarily depends on the complexity and predictability of the system behavior. The influence of external parameters cannot be excluded either.

Most organizations are characterized by a complex internal structure. Each of them has to operate in a rapidly changing environment. Moreover, the internal state of an organization is uncertain in view of the fact that its basis is presented by people whose actions depend on countless factors, including uncontrollable ones. Thus, the system is no longer required to have optimal values of «initial» parameters, being satisfied with acceptable ones; efficiency loses connection with optimality and gets more related to certainty and reliability. Therefore, applicability and areas of usage of the concept “reliability” for assessing the efficiency of the socio-economic systems functioning are greatly determined by the nature and peculiarities of systems management.

The key to understanding the properties and mechanisms of management systems behavior is the concept of “the goal”. Both the definition of the system and the definition of the management contain links to it. Management is generally understood as purposeful influence on the object in order to change its state or adjust it to the changing environment. The goal can be defined as a concrete idea about the future, result, capable of meeting an initial need with existing opportunities [6, c. 42]. Regarding the system, a goal can be understood as a desirable state of its outputs, in other words, some value or a subset of values of its functions.

Coming from the aforesaid, one can confidently assert that a special feature of management systems is the specific character of relationship between the function and the goal. It is the quality of the function of the management system that is in charge of certain/particular goals to be achieved by the system in the changing environment. And the failure to achieve the goal testifies to the malfunctioning of the system, in other words, failure of the management system to perform its basic function. Thus, such connection of the function and the goal of the management system allows to assume that its reliability can be most fully proved by the abil-

ity of this system to achieve the goals set throughout its life cycle.

Behavior of the socio-economic systems has a normative character, in other words, they are consciously created by people for achievement of certain goals and as their necessity diminishes, they are liquidated. But, in fact, the normative aspect can occupy in the systems various positions: from an insignificant to a dominant one. It is known that after the system was created, notwithstanding enormous expenses which retain it within the framework of a normative structure, it quite often determines its own goals, interpreting the requirements as constraints. Uncontrolled or poorly controlled processes are of vital importance, along with the normative processes. In addition, the socio-economic systems do not belong to easily traceable objects, many of their processes cannot be directly traced, they can be only judged by indirect evidence which admits various interpretations.

In the process of managing the socio-economic systems which are, undoubtedly, rather complex, failures occurring on different levels of management are mostly of the character not critical for their viability. Substantial deviation of separate characteristics from normative values can be regarded/considered, in this case, as resulting from the negative impact which consistently accumulates, or failures simultaneously occurring on different system levels. The main consequence of failures is a decrease in the goal-oriented efficiency of the object at the permanent level of economic efficiency or the level which goes down.

Thus, the system reliability should be considered in close connection with its ability to provide infallibility and faultlessness in the management process. Reliability must provide adequacy of the procedure of the system functioning to a certain norm, and the simplest and most evident indicator of reliability (unreliability) might be considered the size of deviation of the values of parameters which reflect the current state of the system from the values which are used for setting a goal.

The assessment of the reliability of management of the socio-economic systems can bring to light not only the problems of providing reliable functioning of

the management system on the whole, and its separate subdivisions but also the place and reasons of their occurrence. The need for such analysis is determined by the fact that any error or failure is sure to result in additional costs for removing the consequences of unreliable activity. In most modern socio-economic systems the activity of both the object, and the subject of management is multiphase, the errors which occur on one of the stages can considerably increase in the future, causing an increase in costs. Moreover, in case of insufficient reliability of the management system, the consequences of even an insignificant error can, in the long run, bring it to destruction.

A comprehensive assessment of the reliability of socio-economic systems must result in identification of the levels and directions of the management system activity, and its basic elements which are characterized, on the one hand, by insufficient reliability, and, on the other hand, by considerable additional costs, related to the removal of the consequences of errors and failures, the impact of which extends to the whole system. The problem of insufficient reliability within the framework of each of such spheres can be solved by means of standard mechanisms of providing faultless performance, the use of which in the field of management is justified, first of all, relative to the processes of planning and organization of plans fulfillment.

If you look for general ways to improve the overall reliability, the only way so far is redundancy. Modelling redundancy at all levels of systems adjusting is not always justified from the point of view of technical, organizational and economic expediency. Thus, for the socio-economic systems within the framework of choosing an option there appears a task of estimation and comparison, on the one hand, of the losses, related to the removal of consequences of failures, and, on the other hand, the costs of mechanisms to ensure reliability. However, implementation of the principle of redundancy is the most important factor of achieving sufficient reliability.

Thus, the analysis of the submission generated in this study proves the statement, that an adequate theory of reliability for the socio-economic systems has not been created yet. Therefore, the im-

portant tasks for its formulating should be: development (clarification) of a set of categories, establishment of limits and determination of features of application of the concept "reliability" concerning the subject and the object of management, different stages of vital functions of the management system, modes of functioning and development of an organization, a study of the correlation between reliability and such categories, as quality and efficiency of the systems of organizational management, the study of the factors which determine reliability, development of the methodological approach to monitoring, the analysis and assessment of reliability, researches of applicability of the known and development of the new mechanisms of providing reliability of organizational management systems.

An increase of the experience of the assessment of reliability of the socio-economic systems and their management systems will be especially important. Thus, even at the imperfection of methodology of such assessment, the piling up of practical data would assist the acceleration of advancement in the sphere of the further theoretical research in this direction of our study.

References:

1. Астафьев А.К. Надежность живых систем / А.К.Астафьев // Вопросы философии. - 1967. -№6. -С. 121-130.
2. Базаровский И. Надежность. Теория и практика / И.Базаровский-М.: Мир, 1965. - 332 с.
3. Берг А.И. Кибернетика и надежность / А.И.Берг - М. : Наука, 1964. -96 с.
4. Губинский А.И. Надежность и качество функционирования эрратических систем / А. И.Губинский-Л.: Наука, 1982. -270 с.
5. Епифанов А.Д. Надежность систем управления летательными аппаратами / А. Д. Епифанов- М.: Машиностроение, 1975. - 180 с.
6. Капур К. Надежность и проектирование систем / К.Капур, Л.Ламберсон. - М.: Мир, - 1980. - 279 с.
7. Князев В. Н. Основы теории надежности / В. Н. Князев.- М.: 1971.-216 с.
8. Ллойд Д. Надежность. Организация исследования, методы, математический аппарат / Д.Ллойд,

М.Липов. - М.: Советское радио, 1964. - 234 с.

9. Надежность в машиностроении: справочник / под общ.ред. В.В. Шашкина, Г. П. Карзонова. - СПб.: Политехника, 1992. - 719 с.

10. Надежность и гомеостаз биологических систем: сб. науч. тр. - Киев: Наукова думка. 1987. - 192 с.

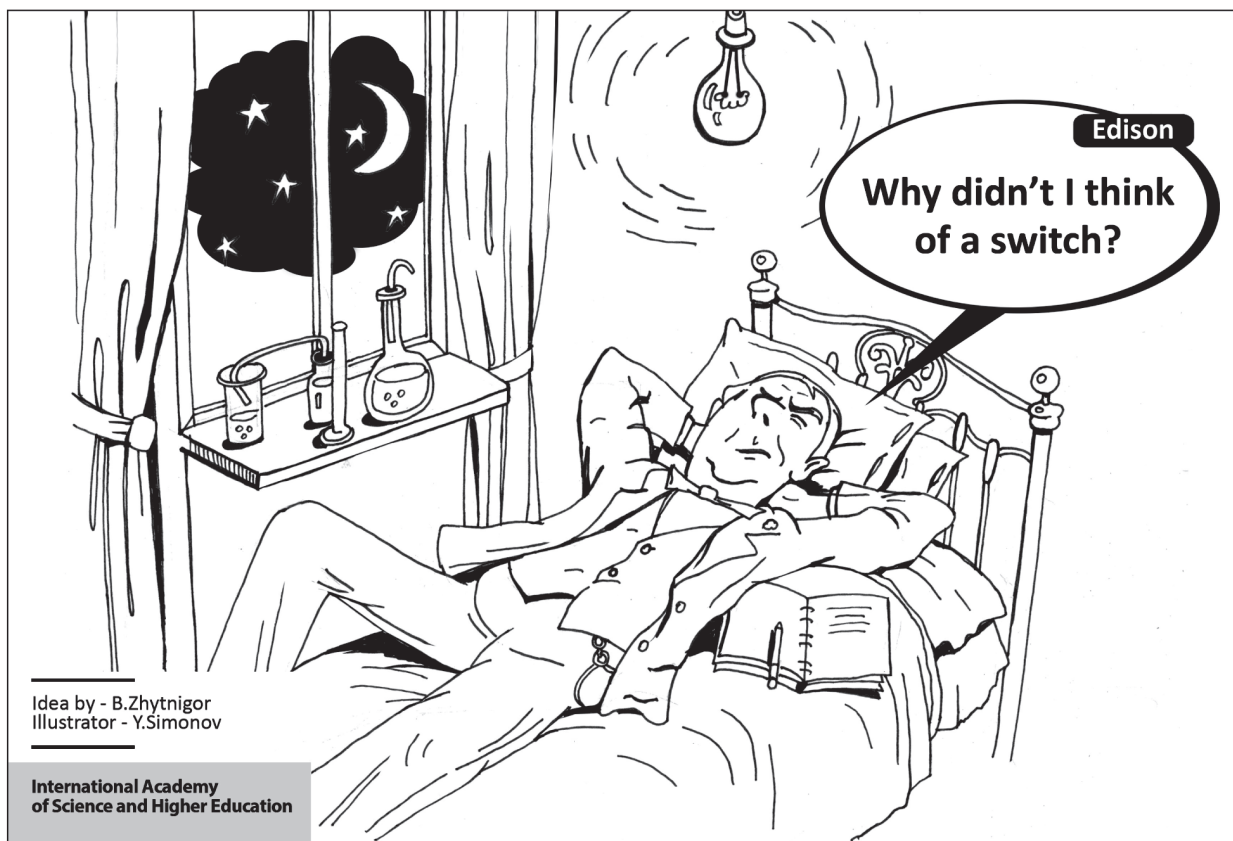
11. Половко А.М. Основы теории надежности / А.М.Половко.- М.: Наука, 1964. - 448 с.

12. Пушкин В. Г. Проблема надежности : философский очерк / В. Г.Пушкин. - М.: Наука, 1971. - 218 с.

13. Соколов В.Г. Исследование надежности и гибкости экономических систем / В. Г. Соколов, В. А. Смирнов. - Новосибирск, 1990. - 253 с.

14. Тахтаджян А. Л. Принципы организации и трансформации сложных систем :эволюционный подход / А. Л.Тахтаджян. - СПб: СПХФА, 1998. - 118 с.

15. Ушаков И. А. Основные принципы и методы теории надежности / И. А.Ушаков // Вопросы философии. - 1967.-№ 6.-С. 108-119.



Idea by - B.Zhytnigor
Illustrator - Y.Simonov

International Academy
of Science and Higher Education