CSCanada
Advances in Natural Science
Vol. 7, No. 2, 2014, pp. 1-5
DOI:10.3968/4435

ISSN 1715-7862 [PRINT]
ISSN 1715-7870 [ONLINE]
www.cscanada.net
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About Philosophical Sense of Category *Reliability*

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Received 14 January 2014; accepted 2 April 2014
Published online 25 June 2014

Abstract
The article presents an analysis of the philosophical category *reliability* amid its polysemy and the current trend towards the convergence of technical, economic and socio-biological sciences. It is emphasized that the tasks for the optimization of existing technical problems in the world are intertwined with the problems of economic and social systems. In other words, it makes sense to talk about the reliability of the society and its systems not only in the gnoseological plan, but also in terms of his ontological characteristic and criterion for development. The necessity for theoretical analysis and synthesis of ultra-large and ultra-complex systems for cybernetic management requires reinvention of the *old philosophical categories* from the time of Greek philosophers: Aristotle, Socrates, and Plato.

Key words: Philosophical category reliability; Stability; Quality; Society; Information redundancy; Intelligence

Petrov, N. I., & Tanev, A. D. (2014). About Philosophical Sense of Category Reliability. *Advances in Natural Science*, *7*(2), 1-5. Available from: http://www.cscanada.net/index.php/ans/article/view/4435
DOI: http://dx.doi.org/10.3968/4435

INTRODUCTION
Reliability of natural objects (material and nonmaterial) is also of abstract philosophical category. This abstract can be seen in the fact that the **system** objects (events and processes) having a completely different nature is revealed as "something that is common" (Aristotle, trans. 1992; Hegel, 1827; Kant, trans. 1992) in some sense and to the same extent. In this sense, it should be emphasized that the reliability as a philosophical category is the primary determinant of the systems' quality (technical and nontechnical). However, mathematical expectation is the quantitative assessment of the primary and secondary parameters of the studied objects (Kalchev, Yordzhev, & Vachkov, 2007). As it is known, in the philosophy the **quality** means "an internal definiteness of the items identical to their being (matter); at the same time, the quality is abstraction from any specific, private quality" (Ovchinnikov, 1990, pp.7-22).

In *An Essay Concerning Human Understanding*, the English philosopher John Locke (1690/1970) described the "primary qualities as those belonged to an object and had an objective existence, while the secondary are rather only results of their ability to influence and to generate ideas in the mind". For example, a matter and a movement are primary qualities that are only subjected to a direct understanding. The understanding of the secondary qualities is always realized by the senses of information obtained for reliability, which belongs to the people under the relevant distribution laws.

1. RELIABILITY'S CONCRETENESS
If we ignore the abstraction in the reliability category, we will find a significant dose of *concreteness*. It manifests itself in the procedures for the implementation of technical practice. In this case, methodological patterns consist in the fact that if the theory tries to solve its scientific tasks in a formalized manner; this practice finds concrete paths for reliability solutions. In philosophical terms this means that the only practical reliability solutions provide the organic synthesis between the generality and specificity.

The interaction between the processes in the real world is reflected in the categories *reliability and failure*. As an example, we can consider the action of the universal law of mutual transition between the quantitative and qualitative changes. In this sense, the category reliability is extended to all cybernetic systems of the Universe. This is related to the fact that it reflects the quality of one or the other system in quantifiable forms. Therefore, the reliability of a broad class of cybernetic systems in general is represented by the "basic law of reliability"(Petrov, 2013a, pp.21-35) created by academician professor Aksel Berg (Admiral of Russia—submariner and radio engineer), professor R. Barlow, professor F. Proshan-mathematicians, academician Boris Gnedenko, and academician John V. Atanasoff (an American with Bulgarian origin), and so forth.

The identity of the mathematical form of the *basic law of reliability* is highlighted by one of the philosophical and mathematical principles: "The unity of nature is found in the 'striking similarity' of the differential equations describing the different areas of the material and immaterial world" (Petrov, 2012b). The quantitative aspect of the reliability of cybernetic systems is confirmed by the materialistic thesis of the unity of animate and inanimate matter (Kant, trans., 1992; Locke, trans., 1970).

At the same time, the quantitative changes in the system (increase or decrease of the structural units and functional elements) lead to profound qualitative changes (change of quality of operation changes the reliability of the system under consideration). Conversely, increasing the system's quality of functioning implies quantitative changes in it.

The operation of transition law from quantitative changes in the qualitative changes manifests itself in the fact that the complex cybernetic systems possess such properties that are not seen in their constituents or those forms of matter from which arose historically. Thus presented principle underlies the real synthesized reproduction of reliable cybernetic systems from unreliable elements.

Speaking about the two aspects of the law's presentation about the transition from quantitative changes to qualitative ones, Linkovsky (1964) notes:

The first aspect is represented by the ability to convert nonliving systems (technical devices) in the process of the emergence of artificial intelligence in living systems.

The second aspect is manifested in the ability to achieve a level of reliability of the technical device that exceeds in some cases the reliability of the functioning of living systems. The second aspect is inextricably linked to cybernetic analysis of the reliability in living nature (Linkovsky,1964, pp.221-226; Kalchev, Yordzhev, & Vachkov, 2007).

2. RELIABILITY AND STABILITY

The concept of reliability is closely related to the concept of stability. The formal approach of thinking concludes that the category reliability is replacing the category stability. This is not the case. The categories reliability and stability, without considering the logical link between them, are the expressions of the different properties of the objects and the processes of reality. The category stability does not match the category reliability because it can be used to analyze the processes and the phenomena underlying the realization of two opposite tendencies--reliability and failure.

In the phenomenon stability is located in the *decision* of the dialectical contradiction between reliability and failure. This phenomenon also contains the difference between the qualitative part and quantitative part of the category reliability. Internal causes, characteristics, and internal contradictions of stable systems appear more significant than external ones.

In connection with that the systems stability is a measure that determines their inherent unity of quantitative and qualitative characteristics. Warning of the destructive effects of the external environment and reducing the probability of reliable operation of the studied systems, stability prevents their transformation into fundamentally new quality conditions in quantitative changes in observed characteristics. But stability can be in contradiction with the reliability of the system. It can be manifested in the stabilization of such parameters that exclude reliable functioning of the system and therefore may be a factor in the violation of their failure-free operation. Thus, the reliability and stability are philosophical categories of the same order of magnitude; however, they are mutually different. Expressing their qualitative and quantitative certainty as to their functionality, reliability is a property of the systems (Gindev, 2002). This requires a comparison of the categories reliability and quality.

The role of category quality comes down to that to identify a special type of difference (determination) between objects, namely determination that is their internal specificity. Category quality is relatively poor on its content. It has a full line of categories quantity and measure in the "law for the mutual transition of the quantitative and qualitative changes" (Hegel, 1827). This category quality has absolutely universal character. Category reliability is part of the category quality, and it is highly relevant for the technical and economic systems in the modern world. The inclusion of reliability to quality indicators should be owed to Joseph Juran who in 1951 proposed and justified three groups of properties that were crucial to the quality of products: *functional compliance, reliability, and commercial attractiveness* (Gindev, 2002).

According to professor Evgeni Gindev (2002), academician of the Technological Academy of Russia, historically the reliability is associated with quality for obvious reasons. However, quality is not a mean to achieve a given reliability level. The reliability is the result of quality assurance rather than the performance of the production. The reliability is especially a user quality and its introduction, achieving, and maintaining requires specific efforts, specific knowledge, and skills other than the requirements in the assurance of functional and ethnic indicators (Gindev, 2002). The category quality is not able to reflect the *inner world* of the objects and processes of reality. This feature applies to ultralarge and ultramodern systems in the nature of the Earth and the Universe. In this sense, academician Nikolay Ovchinnikov (1990) is right in claiming that "for the development of modern science requires the introduction of new philosophical categories". The basis of the underlying reasoning is possible synthesis of the following characteristics of philosophical category reliability:

> Reliability is one side of things, phenomena, processes and systems that characterizes the degree of efficiency and stability of their operation and development". It is quantified in the special feature reaches a certain limit, to pass into opposite (failure), which amended the qualitative status of this or any other system or process. (pp. 7-22)

Thus, reliability is directly related to the categories from the time of Aristotle--**quality**, **quantity**, and **measure**. Reflecting the qualitative and quantitative aspects of the systems and processes in nature, the category reliability is closely related to laws of measure as a quantitative range of property values within which it is possible for existence of appropriate quality (Kalchev et al., 2007). The category reliability combines reflected moments of the Quality, the Quantity, and the Measure. This combination is vitally relevant and represents "flesh" and "blood" of scientific, technical, and socio-biological progress of mankind.

3. RELIABILITY, INFORMATION REDUNDANCY, INTELLIGENCE

From all real systems in the world the best reliability belongs to the living (biological) systems, especially human due to peculiarities of the man's brain, his ability for regeneration, and the presence of artificial intelligence (Popchev & Dakovski, 1988). The reliability of the human brain is determined by

- excessive redundancy in the information structure of the central nervous system;
- diffuse localization of the higher brain functions;
- protective compensatory functions of the human intellect;
- combination of high specialization of the nerve centers and their flexibility and adaptability;
- many levels of development of unconditioned reflexes;
- use of temporary nerve connections in the process of regeneration;
- probabilistic and statistical approach to the functioning of neural elements of the human brain;
- other yet unexplored factors in the functioning of the brain.

It is the most typical of all living organisms for the fact that the basis of their reliable functioning stands the *principle of redundancy* in the structural information relative to the central nervous system: "Each organism possesses, depending on the level of the body, more or less redundancy representing a variety of information resources with the same purpose" (Brauser, 1964).

Modeling of biological appropriate redundancy at all levels of regulation of living systems is not always justified in terms of technical feasibility. On the other hand, the implementation of the principle of redundancy is the most important factor to achieve enough high level of reliability in living nature, techno-economic systems, society, space, etc.. Because of this a close relationship was observed between the concept of reliability and the concept of redundancy. This connection between the two philosophical concepts occurs through the action of the "law for the unity of chance and necessity" in the field of complex cyber systems (Petrov, 2013a, pp. 21-35).

Proceeding from the contemporary notions of structure and functions of the human brain it can be argued that the redundancy is the main factor for the reliability of any natural cybernetic system. Understanding philosophical concept should not be limited by basic *mechanical form of redundancy* consisting in the simple duplication of the links between the unchanging components of the structures. This kind of information redundancy, if it is active during the entire period of reliable functioning, is called actual redundancy.

Information redundancy of brain is called a *special type of organization of matter*, which is determined by heuristic forms of its work. At its base are the random links between elements (cells) and stochastic processes, representing the basis of its structural organization. A remarkable feature of the redundancy of the brain is the fact that new connections between its elements arise in the course of his work and represent the result of its damage or aging. This type of redundancy exists as an opportunity and is called a **potential** redundancy. As a summary of the deliberations on the work of the human brain, forming the basis of the so-called artificial intelligence, it can be argued that the *reliability of the brain* is determined by the potential and actual information redundancy of its functioning.

The reliability of the cybernetic systems--such as the brain system of man--generally includes probabilistic moment. This is because it is based on random events, i.e. the presence or absence of the phenomena of failure.

Because of this reliable functioning or failed state of one or another system, it is considered to be a random event (probability). To cause the random events, reliable operation or failure in the cybernetic system is necessary to possess an information redundancy of states.

The redundancy in nature is aimed to increase the probability of fail-safe system's operation. It should be borne in mind that a quantitative measure of the realization of the fail-safe operation or failure appears to be the probability representing in a global sense level (degree) of the required in the possible. If the probability is close to one, the possibility practically becomes necessity and is carried out. If the probability is close to zero, the possibility is *pure chance*.

The competitive struggle of opposites (reliability versus failure) has a place not only in the realm of reality but also in the realm of possibilities. This determines the form of realization of the possibilities and the ratio of opposite sides in the sphere of existence. The ratio **reliability/failure** in a functioning cybernetic system largely determines the redundancy from information structure point of view. Therefore, to synthesize the following definition for information redundancy, "the philosophical sense of the term 'information redundancy' consists in this, that it is at any one time overcoming the contradictions between necessity and chance" (Petrov, 2012a). The randomness, as it is known, is a form of manifestation of the necessity and its appendix. The random processes underpin the potential redundancy of the human brain. They are not strictly deterministic, and in this sense are necessary. Randomness here appears as an appendix to the necessity. Of course, this kind of randomness is a necessary condition for the reliable operation of the studied systems (Yordzhev, 2012, pp.291-302).

Randomness and necessity are linked, and the form of manifestation depends on the conditions of the operation of the relevant cybernetic system (Petrov, 2012b). Therefore, there is no and there can be no randomness at all, nor is necessity. Randomness is a necessity in private limited connection and is subordinated to the necessity of the most common type, namely the common *accompanies* all private phenomena. The requirement for reliable operation is a necessity for cybernetic systems and is a common principle in their development. It is realized to a large extent by the presence of information structure's redundancy (reservation of systems; Petrov, 2012a).

4. PHILOSOPHY AND RELIABILITY

The philosophical category reliability is up to date, and it is in the social systems and their social components, especially in the presence of an economic and financial crisis in almost the whole of the European Union. Technical progress and the massive computer communication release man from hard physical labor, but at the same time bring strict requirements to the quality and reliability of mental work. All this leads to a substantial amendment to the place and the role of humans in the production processes. The main features of modern man are already associated with the programming, management, and control over the machines. In each cybernetic management system, as a rule, man and machine are merged into one whole. In "human-machine" systems, the man is a link, without which the machine is not able to function. In this context, it is becoming increasingly topical for the issue of organization of interaction between man and machine. On the basis of this interaction there appears very interesting problems connected with the reliability of the mixed complex and sophisticated systems. It requires an analysis of the reliability of both machine and human factors operating within the state.

The successful solution to the problem of the reliability of the *human unit* in modern management systems--including the public—implies the achievement of optimum combination of individual human psycho physiological resources and his moral properties, spiritual world of the individual. Scientific, technical and social progress sharply put the problem of the moral reliability of personality as an important link within specific social system. Here we are confronted with the need to study the category of *reliability in social aspect point of view* as modifying it in a category of *the moral reliability of the individual and modern society*. The category of reliability is applicable to public systems, in which "society can be regarded as an open dynamic system which is kept in a state of a balance, so increases or decreases the extent of its entropy" (Petrov, 2012a). In other words, it makes sense to talk about the reliability of the society and its systems not only in the gnoseological plan, but in the sense of ontological characteristic and criterion for its development. After all, the public is only a "complex bio-social system" (Petrov, 2009a; 2012b).

Therefore, the category of reliability is characterized by its polysemy and requires a multiciphered analysis in the presence of extraordinarily risky public factors (Petrov, 2007; 2009b; 2013b, pp.17-29, 2013c, pp.107-121; Petrov & Tanev, 2013, pp.89-96). This analysis should allow an identification of important scientific, technical, and economic aspects of the category and its studied objects. Finally, one should emphasize that this category has an outstanding philosophical and social importance for modern society, the state or the community of the countries.

CONCLUSION

On the basis of the analysis and synthesis of the philosophical category reliability, the following scientific results were obtained:

The philosophical category of reliability is characterized by its polysemy and requires a multiciphered analysis. There is a tendency towards the convergence of technical, economic, and sociobiological sciences, which is determined by sciences still in the mid-20th century such as cybernetics, robotics, and the corresponding trend towards mutual penetration of the living and nonliving nature.

The analysis of the tasks for the optimization of existing technical problems in the world is intertwined with issues of economic and social systems. In other words, it makes sense to talk about the reliability of the society and its systems not only in the gnoseological plan, but also in terms of its ontological characteristic and criterion for its development.

The necessity for theoretical analysis and synthesis of ultralarge and ultracomplex systems for cybernetic management requires reinvention of the *old philosophical categories* from the time of Greek philosophers Aristotle, Socrates, and Plato.

Successful resolution of the problem for the reliability of *human link* in modern management systems (including the public) implies reaching the optimal combination of individual psycho and physiological means with his moral and spiritual properties.

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