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## **Возможности и перспективы использования траблхакинга в процессе решения глобальных мировых проблем**

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## **Opportunities and prospects for using troubleshooting in the process of solving global world problems**

**Principal terms:** Troubleshooting is a system improvement methodology, a set of methods and instruments aimed at inventing and using non-standard ways to solve problems.

The effective problem-solving algorithm (EPSA) is the basic troubleshooting method that allows, through a deep analysis of non-technical systems, to invent and use non-standard methods to solve problems. The algorithm is based on system analysis, risk theory and instruments of the Theory of Inventive Problem Solving (TIPS).

The core of the goal is the method of clarifying the final result. The core of the goal answers the question of what should be done by the systems when the goal is fully achieved.

The core of the interference is the most specific property of the system to be eliminated or modified to implement the core of the subgoal.

Nowadays mankind has entered the third millennium of its development, the era of the scientific and technological revolution. This increased the anthro-

pogenic impact on the nature, caused new questions and problems, and also increased attention to global problems [1].

Without exaggeration, it is possible to say that the concept of *global problems* became an integral part of the public consciousness of our time. The term started being officially used back in the 1970s under the impact of studies performed by the pioneers of the Club of Rome (D. Meadows & Co *Limits to Growth*, 1972), M. Mesarovich, E. Pestel *Mankind at the Turning Point*, 1974), and J. Tinbergen *Reshaping the International Order*, 1976). Then it became clear that as a result of many factors of the scientific and technological revolution, as well as sociocultural changes, mankind had entered a period of essentially new problems whose scale was determined by the entire planet.

Today, the global problems of mankind are caused by: a) global integration processes, b) uncontrolled increase in the global population against the regional demographic imbalance in development (depopulation, aging, high level of natural growth, as well as child and maternal mortality, low life expectancy, migration flows, refugees, and pseudo-urbanization), c) the aggravation of the food problem (hunger, overeating, and unbalanced nutrition), d) the exhaustibility of raw materials and energy resources, the search for new types of raw materials and alternative sources of fuel and energy, e) the deterioration of the population's health status (HIV/AIDS epidemic and civilization diseases), and f) the increase in the aggression in the world with a high degree of militarization of global and regional states (the threat of World War III, hybrid and information wars, and terrorism), etc.

Western researchers believe that modern mankind may face about a hundred global problems. National researchers define about thirty of them [2]. Undoubtedly, today the governments of all countries and the international community are concerned about solving the global problem related to the COVID-19 respiratory infection caused by the SARS-CoV-2 coronavirus. Moreover, according to the authors, along with the selection of the top priority problems to be solved first of all, the substantiation of an adequate method and way for solving them is as important. It goes about certain scientific, technical and technological, material and resource instruments, mechanisms and means of overcoming problems, or at least ways to mitigate their negative consequences, as well as the costs mankind will have to incur.

Nowadays researchers and practitioners substantiate various approaches to solving global problems of mankind and progressive paradigms for their elimination.

For example, a number of Western researchers believe that the synergetic effect of the NBIC technological (nanotechnologies) development will allow mankind to overcome today's difficulties. These technologies will make it possible to solve the problem of food shortage, and the depletion of raw materials and fuel. In addition, the active introduction of NBIC technologies in everyday life will contribute to the emergence of new energy and energy saving systems [3].

Some representatives of the international organizations, such as the UN, IMF, and WTO believe that foresight is the most appropriate method for solving global problems and identifying key trends in the development of the world community and countries. Foresight is a method that looks into the long-term future of science, technology, economics, and society to find areas of strategic development and identify the areas of those "generic" technologies that will cause the most considerable socio-economic benefits in the future [4].

The foresight methodology differs from traditional forecasting, futurology (studying the future) and strategic planning and is not limited to foresight. It is associated with predicting the future, rather than with its formation, so it is a specific instrument for managing technological development and solving the global problems of mankind.

However, in addition to selecting a certain methodology, approach or method for solving global problems, it is necessary to state that they cannot be solved quickly by individual countries: it is necessary to use a comprehensive, coordinated mechanism that can be applied without restrictions nationally and internationally and that will efficiently function within international legal and economic standards.

According to the authors, troublehacking can become one of such mechanisms. This is a methodology for improving systems, a set of methods and instruments aimed at inventing non-standard ways of solving problems, and their practical use [5].

Thus, taking into account the complexity and specificity of these global problems, which are associated with a variety of sources of their occurrence and the ambiguity of the methods and instruments used to solve them under modern conditions, as well as with the change in value systems and regulatory prerequisites that impede objective understanding of the current situation, the study of the possibilities of using progressive, innovative technology of troublehacking for overcoming crisis phenomena in the global space, and stimulating processes of the world development that determine the evolution of the social system, is an actual scientific and practical task this article solves.

It is necessary to specify the fundamental works of the following authors who determined the essence of these global problems and ways to solve them: A. Golikov, A. Dovgal, M. Zgurovsky, A. Zakharova, N. Tarhanova, E. Libanova, I. Matyushenko, V. Turaev, JoAnn Chirico, Robert K. Olson, Johan Galtung, J.E. Hickey, and L.A. Longmire.

The relationship of globalization issues and the global problems connected with them, as well as the evolution of the value foundations of the society have recently been researched in an increasing number of scientific studies and publications, both individual and collective, including the ones carried out within the relevant international research networks. In this context, it is necessary to specify the works of F. Dentener, F. Stevenson, J. Kofal, R. Mehler, M. Amann, J. Erismann, M. Sutton, J. Gellove, and Z. Klimont.

It is necessary to note the considerable contributions to the study of the above problems made by international organizations, in particular, UNESCO, the World Economic Forum, the North Atlantic Treaty Organization, and others.

The scientific achievements of most of the above-mentioned researchers and organizations include identifying and classifying global problems at a certain period of the society's development, and agreeing on areas for the international cooperation to solve them, etc.

At the same time, the available research and developments do not sufficiently reveal what impact the methods and models for resolving global problems have on the humanization of the society, the development and support of economic systems, the health of nations, and the ecological balance in the world. The studies dedicated to the comparative analysis, which define the advantages and disadvantages of the various methods of resolving the difficulties that accompany the development of mankind at the present stage still remain fragmented and non-systemic.

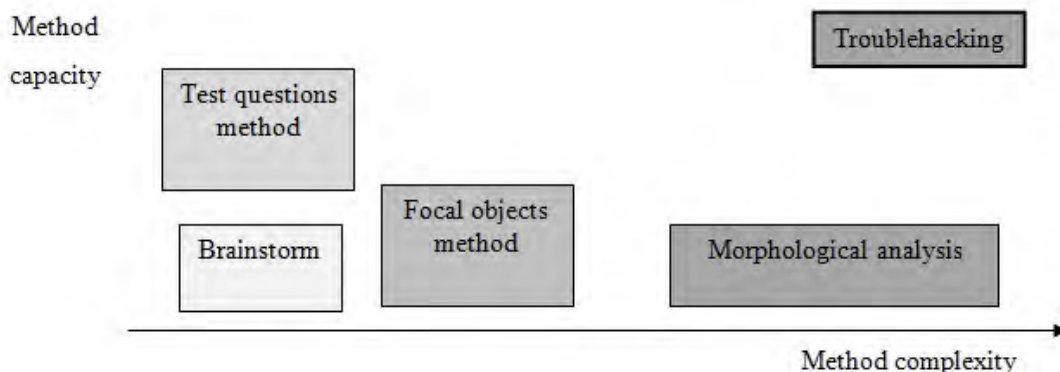
Thus, taking into account the above, the purpose of the article is to consider the peculiarities and principles of using troublehacking methods to solve global world problems.

According to experience and practice, it is clear that regardless of the accuracy of the traditional decision-making and planning and forecasting methods, uncertainty has a great impact on their efficiency. Uncertainty considerably reduces the quality of the solutions found and the reliability of forecasts, and does not allow making so-called non-linear conclusions without using the appropriate instruments for managing systemic effects [6]. Obviously, the limitation, which is also accompanied by the increased likelihood of taking

incorrect, erroneous decisions, requires a focus on innovative technologies including troublehacking.

As mentioned above, troublehacking is an instrument that searches for strong solutions in any area of human activity. It covers a fairly large area that includes the laws of systems development, special information funds and computer programs that creatively search for solutions. In addition, troublehacking is invariant, which makes it widely used in various fields of knowledge. It results in the opportunity to solve problems in almost any field of activity.

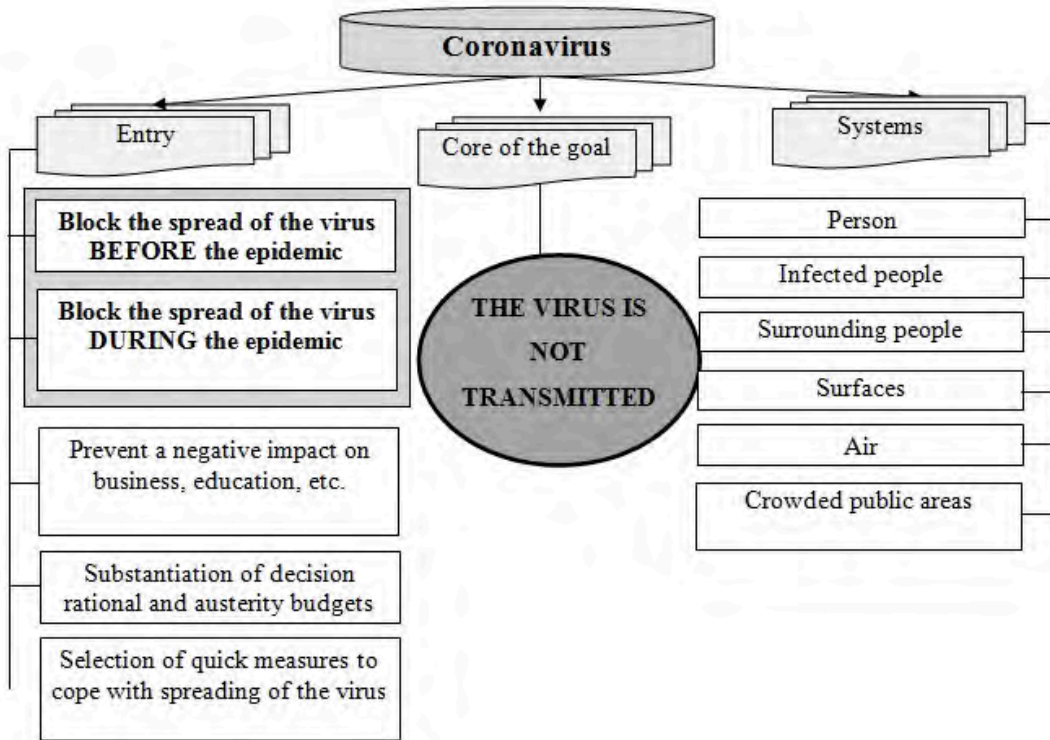
The efficient technologies of innovative creative management used by this methodology prove the benefits of troublehacking when searching for and designing a solution to overcome the coronavirus pandemic. They are based on the theory of inventive problem solving (TIPS). Its essence is that contradictions are eliminated in the development of systems through their (systems) in-depth study, analysis, and taking efficient management decisions against removing psychological inertia and the formation of creative thinking [7]. The instruments of troublehacking such as inventive techniques, a system operator, substantial and field analysis, standards and algorithms for solving inventive problems, methods for developing creative imagination and techniques for overcoming the inertia of thinking seem to also have considerable potential for solving global problems.



**Figure 1.** Comparison of Various Methods for Search for Solutions.

Figure 1 shows a conceptual comparison of the efficiency of various methods used to search for a solution to the problem related to the spread of the coronavirus pandemic in the world.

Thus, taking into account the above, as well as the essential characteristic of troublehacking, the authors formalize a certain algorithm to use for solving the global problem associated with overcoming the coronavirus pandemic.

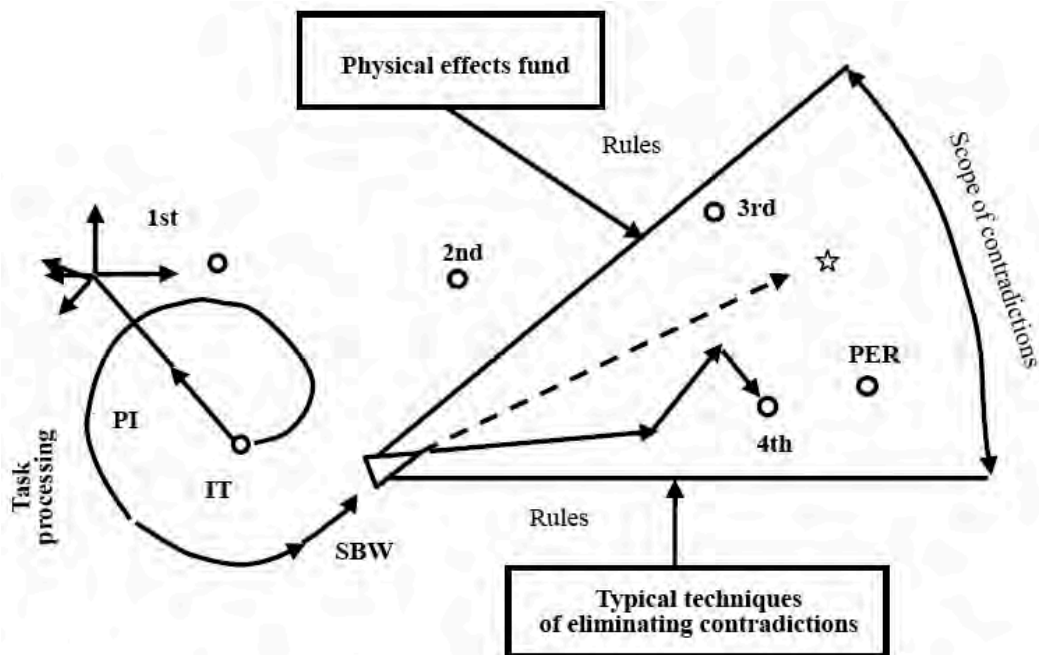


**Figure 2.** Determination of the Core of the Goal and the List of Systems for EPSA.

At the first stage of using the multiscreen thinking scheme (the system operator), the core goal to be implemented as part of overcoming the coronavirus pandemic in the world will be identified and formalized. Figure 2 shows a fragment of work on the EPSA, where the core goal is determined and a list of existing systems that can be influenced to achieve the final result is formulated.

The imposition of the system operator of troublehacking on the global problem of the coronavirus obtains reliable and objective information. Moreover, the use of troublehacking in strategic planning for overcoming problematic and narrow zones makes it possible to see mistakes made when taking certain decisions, the incorrect assumptions and supposals in the past, and find unused resources to stabilize the situation.

At the second stage of using troublehacking in general a scheme for solving the problem identified in the core of the goal is developed. Figure 3 is a structured view of this scheme with step-by-step actions.



**Figure 3.** Scheme for Solving the Problem on Preventing, Stopping, and Minimizing the Spread of Coronavirus in the World.

IT – the initial task, PI – the vector of psychological inertia, SBW – solutions being worked out, and PER is the perfect end result.

Let us consider the steps from Figure 3 in more details.

1. The formulation of the IT in a general form, e.g., the prevention, stopping, and minimization of the spread of coronavirus in the world, a separate region or a certain country.

2. Processing and clarification of the IT, taking into account the effect of the PI and developed technical solutions in this and other areas. The PI can occur globally, e.g., at the level of the World Health Organization (lack of understanding the importance of the problem, unwillingness to recognize the scale of the problem, bureaucratic difficulties, and delays in agreeing on necessary measures, refusal to initiate emergency procedures, etc.), on the level of national governments (reluctance to introduce quarantine measures, refusal from the international cooperation, suppression of the problem), as well as on the level of organizations and citizens (reluctance to wear a mask, disagreement to self-isolate, refusal to disinfect hands, protesting the

requirement to introduce quarantine measures at production facilities and temporarily stop the work of enterprises, etc.).

Technical solutions include the experience of the previous and successfully counteracted epidemics, the latest developments and vaccines against the pandemic, international emergency protocols, and the measures to be implemented by the international community and national governments. Troublehacking using TIPS instruments allows managing psychological factors in addition to finding efficient solutions to the set problem. The main purpose of these operations is to eliminate the PI and stimulate active actions on implementing the indicated measures and steps, taking into account the available resources that can be used when solving the problem: the resources of space, time, matter, and fields.

3. Definition and clarification of the conditions for solving the problem that include listing the elements of the technical system and side effects that may occur during the solution. This step allows moving from a vague situation to a clearly formed and extremely simple scheme (model) of the problem.

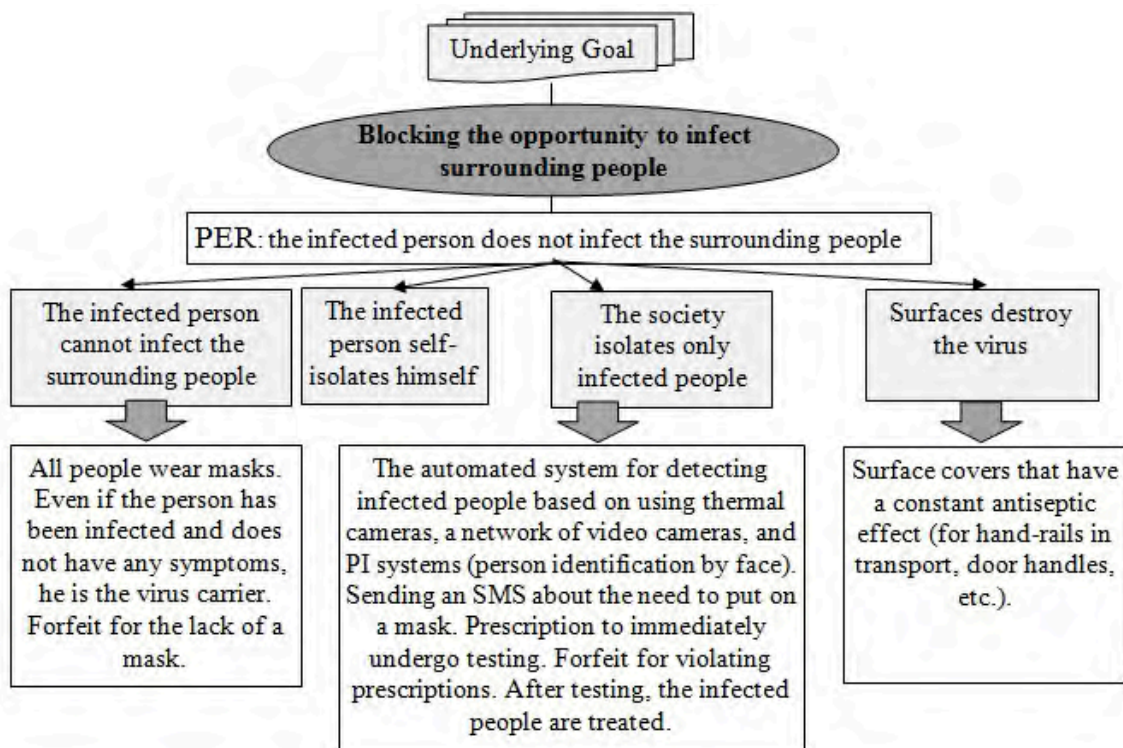
4. Clarification of the PER according to a certain scheme. It is a guide (a landmark) that is the direction of the problem solving. When comparing the PER with the real situation and the results actually obtained, there are often technical contradictions caused by physical inconsistencies that arise due to the fact that when trying to improve one parameter, the other inevitably worsens. For example, weakening of the quarantine measures and stimulating the renewal of the economic activity will inevitably increase the number of diseased with a high probability of a new wave of the epidemic. The technical impossibility to provide all hospitals with adequate means of protection entails a high probability of infecting medical personnel. The lack of free sale of masks and disinfectants intensifies the spread of the virus.

Figure 4 shows a fragment of the scheme for solving the problem of preventing, stopping, and minimizing the spread of the coronavirus in the world through EPSA (troublehacking).

Thus, taking into account the above, it is possible to state the fact that the main task of using troublehacking to solve the problem of overcoming the coronavirus pandemic is to develop efficient methods to restrain and stop the epidemic rather than to estimate the number of people who will get sick and the disease complexity.

The world experience indicates that the rate of spread of viral diseases does not allow experimentation with means of restraint, but requires a quick and efficient strategy to counteract the epidemic in the first days of

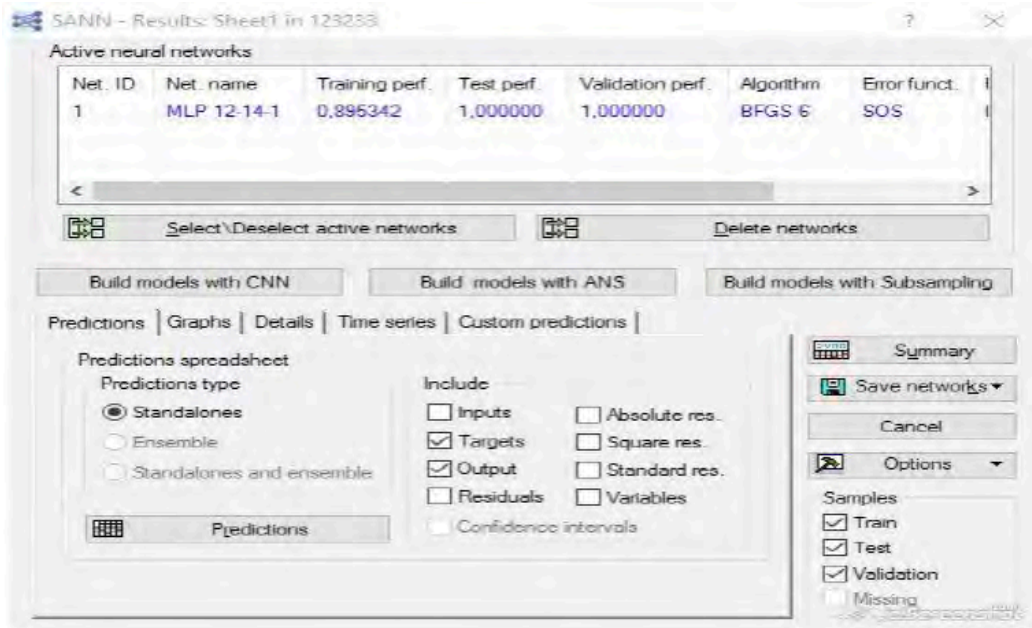




**Figure 4.** Fragment of the Scheme for Solving the Problem of Preventing, Stopping, and Minimizing the Spread of the Coronavirus in the World.

spread. This is possible only if there is an adequate methodology supported by a computer model of the epidemic that uses special information funds in a particular country and the ability to quickly study various means of restraining and preventing the spread of the virus. It is quite possible that in some cases the epidemic can be stopped without the complete isolation of cities and street disinfection, but simply by improving the resistance of the human body to the virus in the area around the primary site. This reduces the incidence rate, and after a few days the epidemic decreases [8]. However, not every virus can be stopped by this method, and these are computer simulation systems for the development of epidemics that can determine the means of counteraction.

In this context, in order to find an efficient managerial solution to counteracting the pandemic, it seems to be optimal to use neural networks within troublehacking that are an efficient instrument for forecasting the



**Figure 5.** Neural Network for Assessing the Quality of the Health Care System during the Coronavirus Pandemic.

impact of important socio-economic factors on the function of the health-care sector, as well as the health status of citizens, and the dynamics of the society in general.

The neural model will allow the independent expert assessment of the quality of management actions taken to restrain the coronavirus.

According to the authors, the expert assessment should have the following limitations:

1 – the highest focus of the state policy on counteracting the pandemic and overcoming its consequences,

0 – the lowest focus of the actions performed by state authorities on counteracting the virus and the introduction of the required quarantine measures.

Figure 5 is an example of a neural network for assessing the health system during the coronavirus pandemic.

The practical use of the neural network will determine the level of state support for measures to counteract the coronavirus and to take timely corrective actions.

Thus, in summary, it is possible to make the following conclusions. The ur-

ban sprawl and the rapid urbanization of the population create favorable conditions for the emergence and rapid spread of various epidemics, in particular, viral ones, whose recent example is the coronavirus pandemic. In the world, various methodologies for searching for an optimal solution to counteract such global problems have long been developed and implemented.

During the study, it has been determined that one of the promising and efficient methods for selecting and substantiating ways to counteract the pandemic is troublehacking. Troublehacking is a universal, invariant methodology that allows modeling and forecasting of the development of epidemics depending on a set of initial conditions and means of restraint. It can be used to develop efficient methods to restrain the spread of viral diseases and stop epidemics.

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