발명관련 창의력 평가와 개발을 위한 온라인 십자말풀이 게임

Y. 다닐로브스키†,*** · 이민규* · 정규진* · 김성홍* · 김사홍* · V. 포톰킨** · D. 나자렌코**

㈜큐엠앤이 이노베이션*, 발명가모임 www.triz-solver.com**

An on-line crossword puzzle game for testing and developing creative capability for inventive activity

Yury Danilovskiy†*, Min-Gyu Lee*, Kyu-Jin June*, Sung Kim*, Sahong Kim*, V.Potyomkin**, D.Nazarenko **

* QM&E Innovation, ** Open society of inventors www.triz-solver.com

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1. 서 론

TRIZ (theory of inventive problem solving) according to the idea of its author G. Altshuller is intended for successful solving of production problems directed at th search of optimum solutions of problems with high level of infinity. As a rule, these problems have particular intentions, for example, they may be oriented at the decrease of the number of defects, at the reduction of manufacturing cost, at the problem of conferring new features to the goods (origination of new useful functions) and the problem of circumvention of patents of other companies.

Using TRIZ philosophy for many years contributes to the development of creative capacities both of practicing engineers and any people, who like to invent, even if they have no technical training.

Classical version of TRIZ was based predominantly on the recognition of inventive situation [1] as the beginning of any algorithm of TRIZ, for example, ARIZ 85– B [2].

After that the era of functional approaches started in TRIZ in 1985 – 92. These approaches came to TRIZ from the works of L. Miles from General Electric – "value engineering analysis" [3].

All these components of analysis are

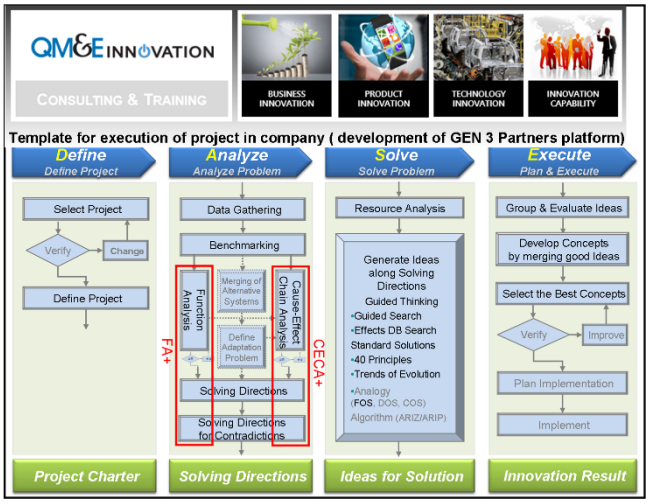


Fig. 1 An example of TRIZ project execution roadmap in QM&E Innovation

2. 본 론

Theoretical basis for forming an engineering solution of devices for checking their ability for further evolution.

All components of this template intended for execution are in cause–effect relations, which are reflected in Figure 2.

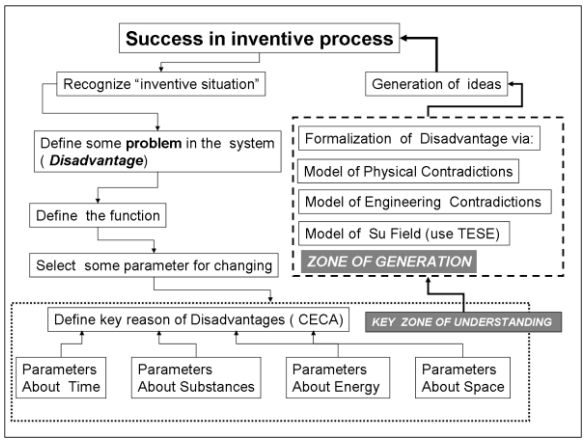


Fig. 2 Components of creative thinking and the succession of using important tools of formation of ideas.

According to the opinion of the authors the most important component, which determines the success of the inventor is his ability to formulate the functions and to define the parameters, which are important for solving the set (stated) problems, for example, cost reduction.

The next step of using parameters (key zone of understanding) offers a possibility to achieve formalizing through three different methods: via 2 parameters (Engineering contradiction), via one parameter (Physical contradiction) and through the tool of activation of imagination – Ideal Final Result.

Ann important feature of this set of tools, in which identified parameters play an important role is THE FACT

that all of them are components of the known trend "mono – mono – anti – bi – poly– – complex, as it is shown in Fig.3.

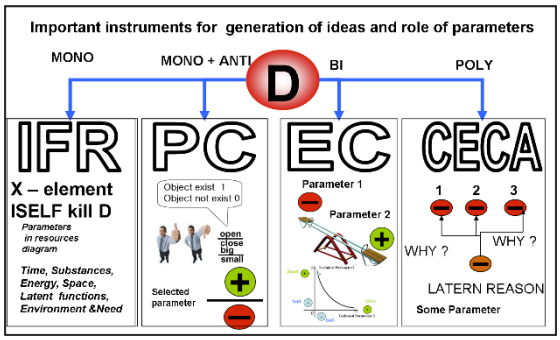


Fig. 3 Complete set of tools, which perform operations with parameters.

It is possible to define the essence of TRIZ in one sentence only" "People develop engineering systems in the direction of elimination of disadvantages, using such resources thereby, which are most accessible at the moment".

The company QM&E Innovation traditionally offers the following definition of resources [4] :

Resources of development of engineering (engineering evolution) – are understood as everything, which enables to create a new ES, embodied in a material product, which will be able to retain its position at the marketplace (be sold or used with the obtainment of other kind of profit, at least by several users) at least during one generation of this product. Resources can be classified in keeping with the basic categories of physics, chemistry and mathematics: SUBSTANCES, KINDS OF ENERGY (FIELDS), TIME, SPACE and INFORMATION.

This definition can be graphically presented in Figure 4.

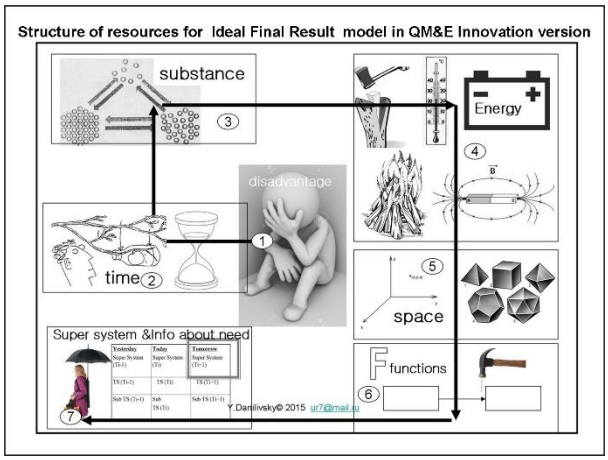
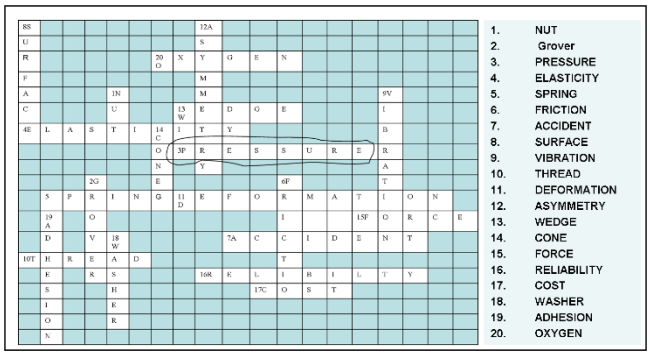


Fig. 4 Structure of resources for Ideal Final Result model in QM&E Innovation version

In all sections of Figure 4 there is its particular set of important parameters.

Based on the above, work specification for constructing texts should define the ability of the human to see all resources in the language of parameters and to be able to explicitly understand the essence of the models of Engineering Contradiction (EC).

Figure 5 features the fragment of one of the tests, which requires the following from the person being examined: a) recognition of parameters and b) recognition of EC models



- **3 noun, horizontal, 8 letters.** The question is formulated in the form of the model of an engineering contradiction (EC), which shows an elementary cause-effect connection between two engineering parameters or events, which have two opposite contexts – positive and negative. (IF... THEN... BUT (HOWEVER)...). **Example 1 :**
- ***IF we increase the power of the car engine, then it will be "PLUS +" and the car will be able to increase its speed quicker, HOWEVER, it will lead to the increase of fuel consumption (this is a MINUS ---).*** In the wording of the EC quoted below, there is one missing word **Example 2 :** ***IF we increase XXXXXXXX , THEN it will be "PLUS +" , because the reliability of the screw joint will grow, HOWEVER, in this case it is easy to deform the coils of the threading (this is a MINUS ---)*** Which word is missing in this EC? The solution of this EC takes the form of engineering solutions of inventions 2-3-4 presented at the attached drawing. (***XXXXXXXX*** = PRESSURE)

Fig. 5 Fragment of one of the computerized tests consisting of 20 questions aimed at definition of capacity to recognize parameters in engineering processes and models of EC, developed by the authors in two languages: Russian and English.

There are two types of tests: easy ones consisting of 12 words and difficult ones consisting of 18 and 20 words. For two months, they have been passing approbation at the following web–resource [5]

3. 결 론

This type of intellectual exercises in the form of computer games is distinguished by the following:

1) it does not require any special preparation

2) it is able to perform the functions of quick testing of intellect in terms of its ability to define disadvantages for creating new designs in the language of parameters

3) it is able (in amusing form) to provide for growth of capacity for recognition of disadvantages according to the model of inventive situation, if the number of such exercises, done during two years should exceed 300

4) It has a prototype in the form of computer applications of the company Lumocity [6], however, in this case it is essentially different at the level of approach to creation of sets of exercises, directed at the development of creative capacities from “capacities in general” to capacities in the field of engineering creativity

5) combining amusement with training of creative thinking is equally possible in using it both for training children and students and for training advanced engineers and inventors.

6) The Game in testing mode can be a filter for selecting trainees to form groups of "problem solving experts" in case with grown−ups and groups of “practicing inventors” in case with schoolchildren and students.

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