Application of the theory of inventive problem solving to amplifying creativity of employees

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Application of the theory of inventive problem solving to amplifying creativity of employees

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Abstract. The development of staff creativity becomes an important task in an innovative economy, as it's necessary to analyze market trends, develop strategies, participate in innovative projects and offer new solutions. TRIZ is one of the most accepted methods to construct systematic innovations (TRIZ is the internationally acknowledged Russian abbreviation for Teorija Resenija Isobretatelskih Zadac, which can be translated as the Theory of Inventive Problem Solving). TRIZ can be combined with traditional methods of strategic planning and allows for systematic training of staff. In this article are analyzed the results of TRIZ application to the training the creativity and forecasting and reengineering projects.

1. Introduction

Innovative economy is based on new ideas and their rapid implementation, and today we need employees, who can work in conditions of constant changes, analyze it and offer new solutions. Thus, it is necessary to develop new competencies of staff based on creativity and ingenuity.

The founder of the study of creativity Guilford J [1] showed a wide scope of this feature, and since the 40s creativity has been studied in pedagogy, management, personnel management, social psychology, knowledge management and human capital. Mednick S A [2] considered that creativity based on associations and as a process of redesigning elements in new combinations. Torrence E.P developed tests for diagnosing creativity [3]. Nonaka I and Takeuchi H [4], Senge P [5] examined the impact of knowledge on the development of organization.

Amabile T M [6] considers that daily creativity, developed by fixing the progress of achievements, providing social and emotional support, promoting creative results in related projects. Also she considers it necessary to keep up group creativity, which is essential in the conditions of distributed innovative projects, and the individual creativity often insufficient to promote innovative project within the organization and outside it [7]. Accordingly, the development of group skills may be trained on the base of the combination the methods of generating ideas, internal motivation, intellectual resources management, the forecast of market development.

2. Methods and discussion

TRIZ was developed by Altshuller G S [11, 12]. It's a complex method that takes into account the achievements of the previous methods (for example, William Gordon's Sinectic, method of test questions, mind storming), using 39 inventive principles, Algorithm of Solving Inventive Problems (ARIZ), contradictions matrix, laws of the development of technical systems, 9- Screen Model. Substance-field (Su-field) Analysis. Petrov V continued to develop the theory [13] and proposed new options for its application.

TRIZ differs from other methods in its attempt to reconstruct the process of thinking and create tools for solving inventive problems. TRIZ theory had developed in the USSR, and since the 80's began to spread around the world. Although TRIZ was originally developed for engineering problems, it was found quite wide application in marketing, design, quality management, which are also distinguished by sufficient complexity, as well as the high cost of the consequences of the decisions made.

TRIZ tools are widely used in various fields:

- conceptual development of new products, processes, business strategies [14];
- the prediction of the evolution of technical and economic objects and processes, functional cost analysis;
- comprehensive search for solutions and protection of the company with the help of patents;
- assessment of hidden desires and needs of consumers, market segmentation based on consumer qualities, development of new marketing projects [15];
- preliminary analysis of deficiencies and their elimination in new and existing products;
- additional opportunities for generating ideas, the development of personal and group creativity, new forms of motivation [16];
- QFD.

The figure 1 shows a diagram of methods and techniques used in TRIZ.

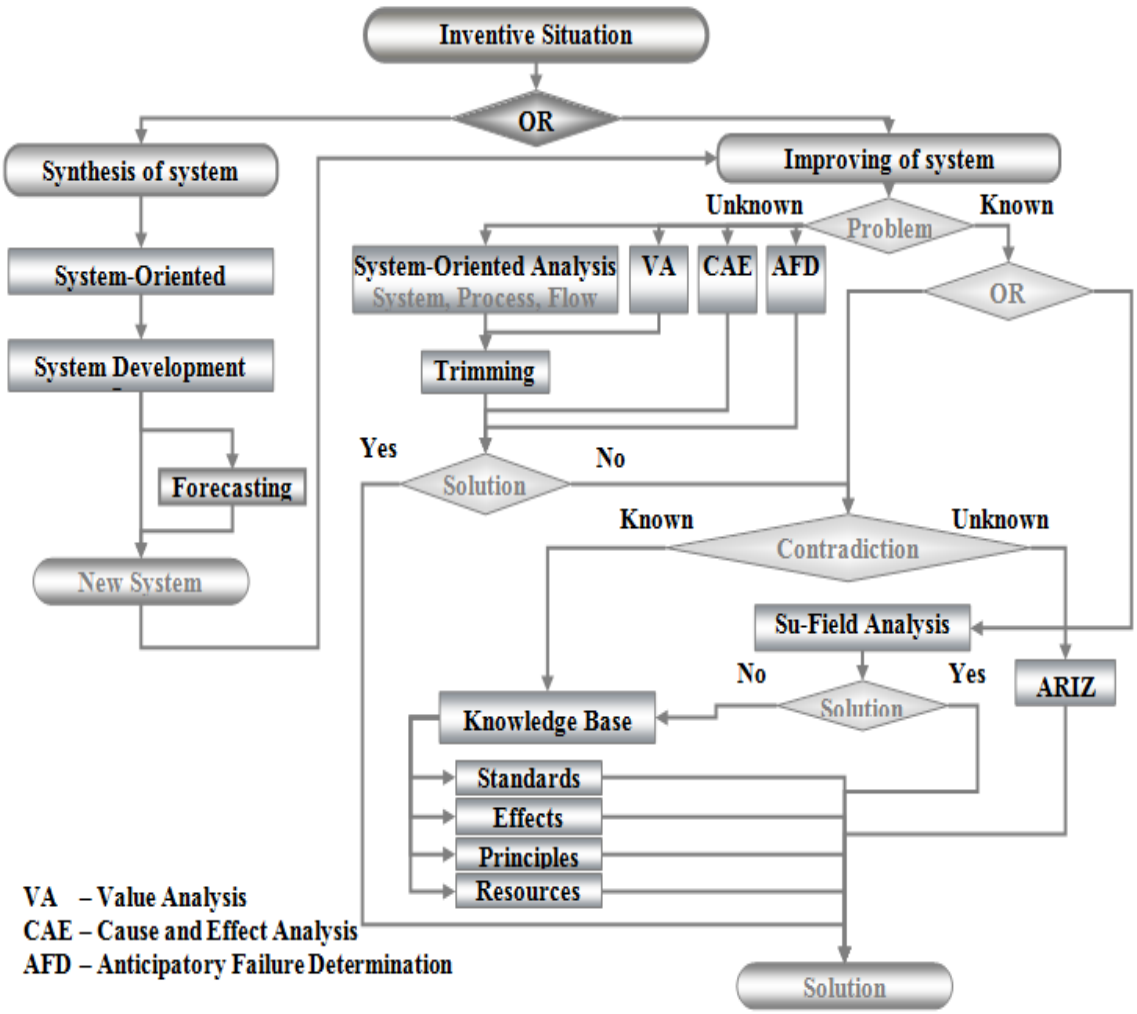

Figure 1. Algorithm for selecting TRIZ tools [13].

The use of TRIZ requires [16]:

- All members of the organization should know and use TRIZ.
- Trainings and coaching should be made possible for all involved.
- Additional training time.
- The advantages of the TRIZ methodologies should be explained.

TRIZ as a method can be applied in different formats - both group and individual training (commercial and educational).

During the training, there are several options for the distribution of roles:

- free distribution of roles;
- choice of roles by the participants;
- assign role (mostly for cases).

Training allows create new competencies that are important both for the individual and for the team. Different opinions create higher requirements for the product and make it more efficient. Using TRIZ allows you to develop and use a unified scheme of work; an important advantage of the methods of generating ideas is gamification, which allows you to develop additional scenarios and options for training [17, 18, 19].

TRIZ can be used to forecast the development of the organization and individual products (on the base of 9- Screen Model), that can be used for developing new products, planning carrier.

Table 1 presents a forecast of the development of education and training, while cognitive abilities must be maintained throughout life, and TRIZ here can be used as a regular training and a set of techniques for analyzing inventive tasks. At the same time, the set of competencies and their professional interactions become more complicated.

Table 1. Forecast of development of system of motivation.

	Past	Present	Future Scenario 1	Future Scenario 2
Super system	Training and Control System External motivation Team	The combination of internal and external motivation	Self-learning Organization Motivational environment	Self-learning Organization Self-learning environment MOOC
System	Basic Education	Basic Education + Continuing Professional Development	Lifelong Education Combination of professions	Lifelong education Professional interactions Emotional intelligence
Sub-system	employee	employee	employee	employee

Thus TRIZ has a number of advantages: adapted techniques for solving economic problems and the system of cases, focus on the formation of a creative personality on the basis of systematic training, management of the direction of the search, wide practice of application, different formats of training, the formation of new relationships in the group, the definition of the rules of preparation and sessions.

Table 2 shows the evolution of motivation systems, careers, sources of creativity, education. Forecasting based on the transition to the super-system shows the transformation of social systems and increasing demands on employees, but at the same time the growth of resources that can be used to achieve the aim.

For economic tasks, the structure of the algorithm is simplified; often 4 main stages are identified [20]:

- Task description, technical and economic constraints, desired target.
- Systems analysis (highlighting relationships and components, transition to a super-system, building an ideal end result).
- Synthesis (application of methods for eliminating contradictions, material-field resources, system operator, laws of systems evolution, S-curve).
- Analysis of options, their selection (if the problem is not solved, return to the first stage).

Table 2. Forecast of development of system of education.

	Subsystem	System	Super system
Motivation Modes	Internal motivation Self-realization	Internal motivation Self-realization External motivation (material and non-material) Competition Self-Actualization Needs	Corporate social programs participation in the company's capital Self-Actualization Needs Intra-organizational marketing
Career	Freelancer Outsourcing Downshifting	Horizontal vertical Step career	Inter-organizational career
Sources of creativity	Individual training Insight	Group trainings Foresight Delphi method Synectics Cooperation	Online Foresight, Online trainings On-line contests for solving non-standard tasks (project contests)
Education	Online Courses mutual learning self-education	self-learning organization quality circles	MOOC, Mentoring Forums Social networks Corporate universities

TRIZ can be applied in the reengineering of business processes, in this case an analogue of the model (as is - to be), see Figure 2. In this case, it can be combined with other methods (for example, foresight, SWOT – analysis, functional-cost analysis), which allow concentrating efforts on the chosen direction.Direct and reverse planning process should be carried out in parallel with business modeling to verify the proposed changes.

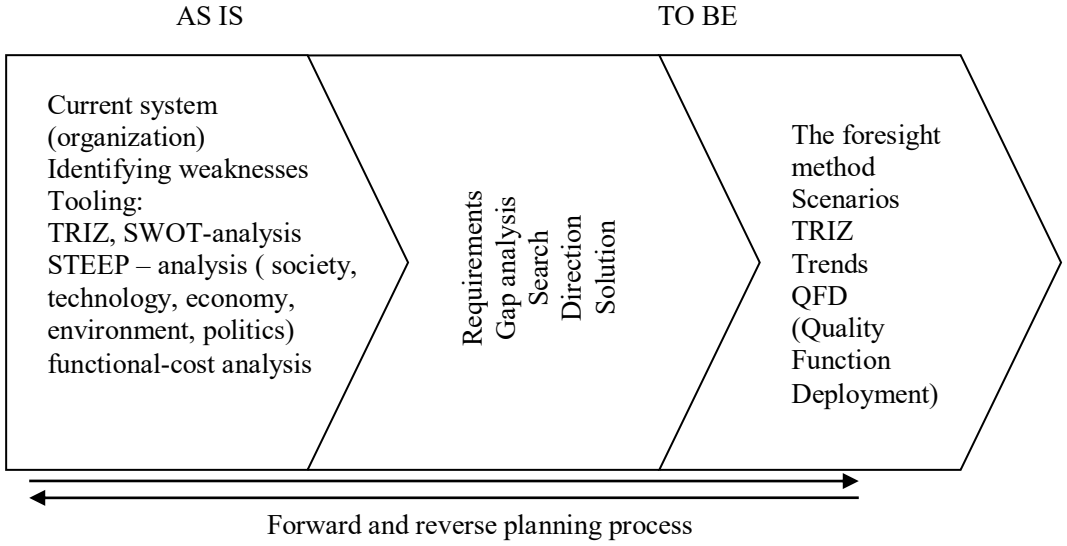

Figure 2. TRIZ and organization transformation.

Thus, TRIZ can integrate with other methods and helps to find the right solution in the field of innovation and marketing, because it helps broaden the horizons, properly analyze complex tasks, conduct patent searches, carry out business planning [21].

2. Conclusions Modern conditions require the integration of competencies, tracking of market trends and quick response. The development of new directions requires systematic efforts to develop the

creativity of the staff. Although there are many methods of generating ideas, TRIZ has significant advantages:

- The main techniques are published and available for study, TRIZ achieved results in various industries.
- The use of algorithm for solving inventive tasks, integration with traditional methods of strategic and marketing analysis.
- Developed inventive techniques for economic systems.
- Teamwork contributes to the joint promotion of ideas, the development of emotional intelligence, the development of scientific research skills, team building, cooperation.

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