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ARIZ AND MODERN COMMERCIALIZATION THEORIES. ALGORITHM OF INTERACTION BETWEEN THE THEORY OF INVENTIVE PROBLEM SOLVING AND THE FUNDAMENTAL PRINCIPLES OF INVENTION COMMERCIALIZATION

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Abstract

The Theory of Inventive Problem Solving (TRIZ) and all of its derivative algorithms, including ARIZ, were developed in an environment and at a time where commercialization of innovative solutions was not considered a priority. One may even argue that during certain stages of the development of TRIZ and ARIZ, commercialization issues were intentionally ignored in favor of purely technological variants of innovative solutions – solutions often disconnected from real economics and, in most cases, from real life.

Keywords: *Theory of Inventive Problem Solving (TRIZ); Algorithm of Inventive Problem Solving (ARIZ); Principles of invention commercialization; Integration of ARIZ with modern commercialization theories; Organizational model of innovation process development; Competitive strategy techniques; Necessity of assessing the beginning of the innovation process; Evaluation matrix system*

As a result of this narrow and one-sided organizational model of innovation development, inventors trained within the TRIZ/ARIZ paradigm grew into highly capable problem-solvers but remained unprepared for the realities of competitive markets and the dynamics of commercialization in modern free-market economies.

They are ready-and enjoy-to-invent, but are not ready and often do not know how to monetize their inventions, nor how to obtain adequate compensation for their talent and creative work. What is particularly important today is the ability to evaluate the necessity of launching an innovation process, to understand-ideally to calculate-all possible development scenarios within the commercialization process.

Now let us assume that an inventor has obtained the necessary information or, at minimum, has learned about findings from scientific research. The core question becomes:

How can TRIZ and ARIZ help transform valuable knowledge, insights, or naturally occurring patterns from a near-idea stage into a successful commercial project?

The answer lies in adapting TRIZ tools not only to solve technical contradictions, but also to:

- analyze the market environment;
- identify commercialization barriers;
- determine stakeholders and beneficiaries;
- define integration and positioning strategies of the invention within an existing technological ecosystem;
- and formulate a commercialization algorithm with minimized risks and maximized value.

Thus, the modern extension of ARIZ should integrate both inventive problem solving and commercialization logic, enabling a transition from invention to innovation to commercial product.

Integration of the Algorithm for Inventive Problem Solving with Modern Commercialization Theories (Part One)

The Theory of Inventive Problem Solving (TRIZ) and all its known derivative algorithms were developed in a country and during a period when commercialization of innovative solutions was not considered a matter of significance. One could even say that, at certain stages in the creation of the Theory and Algorithm of Inventive Problem Solving, the issues of commercialization were deliberately ignored in favor of purely technological variants of innovative solutions-solutions often detached from real economics and, in most cases, from practical life.

As a result of this shortsighted and one-sided organizational model of innovation process development that prevailed at that time, inventors trained within the TRIZ and ARIZ frameworks found themselves highly capable of solving technical problems, yet completely unprepared for the mechanisms, strategies, and competitive realities of innovation commercialization in a market-driven economy.

Inventors who were trained and shaped within the TRIZ and ARIZ methodology turned out to be completely unprepared for the mechanisms and techniques of competitive behavior in a modern free-market economy.

They are ready – and genuinely enjoy – inventing, but they are not ready and do not know how to earn money from their inventions in order to receive fair compensation for their talent and creative work.

In this context, it becomes critically important to evaluate the necessity of initiating an innovation process, and – even more importantly – to model and calculate possible development scenarios throughout the commercialization phase.

G. S. Altshuller formulated the goal of his method as follows:

“How can one arrive at strong solutions immediately, without exhaustive trial and error?”

Achieving this goal is possible through adherence to the fundamental TRIZ principles:

1. Principle of objectivity in system evolution

The structure, functioning, and generational change of systems follow objective laws.

Strong solutions are those that are aligned with objective laws, patterns, phenomena, and effects.

2. Principle of contradiction

Under external and internal influences, contradictions emerge, intensify, and are eventually resolved.

A problem is complex because there is a contradiction, hidden or explicit.

Systems evolve by overcoming contradictions in accordance with objective laws and effects.

Strong solutions are the ones that eliminate or resolve contradictions, not the ones that compromise.

3. Principle of specificity (concreteness)

Each class of systems – and each individual system – has specific characteristics that may facilitate or hinder transformation.

These characteristics are determined by the available resources:

- internal resources – inherent to the system;
- external resources – defined by the environment and circumstances.

Strong solutions are those that take into account the specific characteristics of the given system, as well as the individual characteristics of the person making decisions.

As practice in managing innovation projects has shown, meticulous adherence to the requirements and recommendations of these three principles does not define and does not allow achieving the ideal final result in every specific development.

Today, any specialist in biomechanics or in the broader field of bio-engineering can provide numerous examples of borrowing the most important and astonishing technical solutions from among the technical solutions of nature.

Let lawyers resolve the issue of priority date and global novelty when borrowing from nature the most elegant and concise – in many cases unique – biological-engineering experience.

Now let us assume that the inventor has obtained the necessary information or, at the very least, has learned about interesting conclusions from scientific research.

How, in this case, can the Theory of Inventive Problem Solving help in advancing useful information, conclusions, and assumed natural patterns from an almost-idea stage to a successful commercial project?

Algorithm of interaction between the Theory of Inventive Problem Solving and the fundamental principles of invention commercialization (continuation, part two)

To begin, let us return to the Theory of Inventive Problem Solving (TRIZ):

Thus, the methodology of problem solving is based on generally studied TRIZ laws of system evolution, general principles of contradiction resolution, and mechanisms for solving specific practical problems.

Main functions and areas of application of TRIZ:

- solving inventive problems of any complexity and orientation;
- forecasting the development of technical systems;
- development of creative imagination and thinking;
- development of the creative personality and creative teams.

The key concept in TRIZ is the **"strong solution."** This is the best, or close to the best, solution.

TRIZ focuses on revealing a strong solution and includes:

1) mechanisms for transforming a problem into an image of a future solution;

2) methods of suppressing psychological inertia that prevents finding solutions;

3) a vast information base – concentrated experience in problem solving.

4) A **problem** is a recognized contradiction. In TRIZ, special and fully justified attention is paid to the formulation of contradictions. Three types of contradictions are distinguished: *administrative contradiction*, *technical contradiction*, and *physical contradiction*.

Administrative contradiction – a contradiction between a need and the ability to satisfy it. It is relatively easy to identify. It is often formulated by management or the customer and appears as:

- "It is necessary to accomplish this, but we do not know how";
- "A certain parameter of the system is poor and needs to be improved";
- "There is a defect, but we do not know the cause."

Technical contradiction – a contradiction between certain parts, qualities, or parameters of a system. Typically, improving one characteristic sharply worsens another. For example, a useful action simultaneously produces a harmful effect. Or: introducing a positive effect or eliminating a negative one results in deterioration (for example, unacceptable complication) of some part of the system or of the system as a whole. Usually, one must search for a compromise and sacrifice something. Resolving a technical contradiction often requires a qualitative change of the entire system.

Physical contradiction – imposing diametrically opposite properties on a specific part of the system. The study of reasons that give rise to a technical contradiction in technical systems usually leads to the identification of conflicting physical properties within the system. It should be emphasized once again that, in contrast to a technical contradiction, which belongs to the system as a whole, a physical contradiction relates only to a specific part of it. Formulating a physical contradiction formulation of the physical contradiction is paradoxical: a certain part of the system must simultaneously exist in two mutually exclusive states. For example, it must be cold and hot at the same time, movable and immovable, long and short, flexible and rigid, electrically conductive and non-conductive, etc.

Thus, the three types of contradictions form a chain: administrative contradiction → technical contradiction → physical contradiction.

To solve a complex technical problem means to improve the required parameters of the system without deteriorating others.

This can be achieved by identifying the technical contradiction, determining the causes that generated it – or even the causes of those causes – and eliminating them, that is, by resolving the physical contradiction.

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