ESSAY: THE CONCEPT OF MODERN TRIZ AND DESCRIPTION OF THE CONTENT OF MTRIZ WEBSITE(S) BY PROF. ORLOFF

Reference website: www.modern-triz-academy.com

ESSAY IS DEVELOPED FOR THE WTS-PROJECT

ON THE INITIATIVE AND UNDER LEADERSHIP OF PROF. NAKAGAWA

2024.01.25

MAIN ESSAY POINTS

The purpose of the essay and websites of the Academy of Instrumental Modern TRIZ (AIMTRIZ) is to inform potential visitors (readers) about the following aspects of activity:

1. Preamble
2. Purpose and meaning of TRIZ.
3. Purpose and significance of Modern TRIZ (MTRIZ).
4. Methodological foundations of MTRIZ.
5. MTRIZ paradigms.
6. Instrumental methods and models of MTRIZ.
7. Advantages of the educational paradigm of the MTRIZ system.
8. Educational programs MTRIZ.
    - 8.1. Program MTRIZ Junior
    - 8.2. Program MTRIZ Practitioner
    - 8.3. Program MTRIZ Teacher
    - 8.4. Program MTRIZ Master
9. Main publications in the field of MTRIZ.

1. Preamble

The impetus for writing this essay about Modern TRIZ (MTRIZ) and the websites of the Academy of Instrumental MTRIZ (AIMTRIZ) was the call by Professor T. Nakagawa to the owners of TRIZ sites around the world to tell about their motivation for creating their sites, and at the same time about their interest in TRIZ and activities with TRIZ.

For starters, I can recall that I met the future TRIZ when I was 16 years old and I was a student at the Minsk Polytechnic College. In 1963, our class teacher once brought a small soft book (Fig. 1) with a black cover into the classroom and said (rather colloquially, even rudely, which was his manner of exerting a frighteningly-educational influence on us): *Here, who is not a fool, run now to the store and buy this wonderful book!*

I have carried this book through my entire life. The name TRIZ appeared only in 1971.

And in general, for us, students of a technical school, and then students of the Minsk Radio-Technical Institute (University), the application of the methodology for creating inven-

tions was a common thing, devoid of excitement. In 1969, the head of the patent department of the institute, Z.I. Lozneva, at her lectures on patent science, distributed the first catalogs and tables of G.S. Altshuller for use in term papers and theses. Which is what we did.

Fig. 1. The world's first book by Genrikh Altshuller on the Theory of Inventive Problem Solving (TRIZ), which then (in 1961) did not yet have this name

Much later, in the mid-1980s, having 30-40 invention certificates each, we began to understand the importance of TRIZ as an unsurpassed toolkit for engineering creative thinking. At this time, Valery Tsourikov began to create his famous and unsurpassed software "Invention Machine", which later became really a "machine" for creating inventions, rising after the first versions to the "TechOptimizer" stage, and then to the not-fantastic height of the software "GoldFire", which continues to be improved to this day (by a large group of programmers in Minsk, despite the fact that since 2022 the ownership of this software belongs to S&P Global, which acquired IHS, which owned the software for the last approximately 10 years or more).

Due to my various administrative abilities, I helped Valery to make the "Invention Machine" software, and then, after he created the famous "Invention Machine" company in Boston, USA, and in 1992 I created my joint venture with a German partner in Essen, I began to work on promotion of MTRIZ and "Invention Machine" software in Europe, and, in fact, in the world, as he represented and sold this software at several international exhibitions, for example, CeBIT in Hannover.

In 1996, I founded a TRIZ company in Berlin, which in 2000 was renamed the MTRIZ Academy. The number of co-founders has grown.

My first publication[1] on MTRIZ took place in 1996 (with additions until 1998) by the WEKA publishing house and included 100 pages, on which a sketch of TRIZ was given and my scheme of the four-stage Meta-Algorithm of Invention (MAI) was given. Major subsequent publications are listed in section 9.

Since 1997, a lot of research work has been carried out to refine the A-Matrix and A-catalogues, to develop software for various purposes (now it does not continue due to insufficient funding, since much more powerful software is needed), and to create educational programs. A lot of work was done in the interests of SIEMENS (1997-2004), then almost two years of work for SAMSUNG (2005-2006, trainings were held in Suwon and Berlin for engineers and managers and 4 predictive projects were completed with a total starting market prospect of more than $ 15 billion), then two years of work in China for dozens of enterprises (2007-2008), including for HUAWEI, and further distance learning, consultations, trainings, projects for dozens of enterprises. Our activity since 1997 covers a period of 25 years.

Particular experience since 2006 has been working on master's programs at the Technical University of Berlin (TUB), including for almost 7 years for the TUB Center in El Gouna, Egypt, in a number of specialties: Global Production Engineering, Energy Engineering, Water Engineering, Urban Development, etc.

In the early 2020s (during a global downturn in demand for educational programs due to the impact of the covid epidemic), we began a complete reorganization of all our activities with a review and revision of all our educational programs. This work has been going on for two years already, so the launch of new sites and programs in a new structure and content is being prepared.

[1] Konstruktionsmanagement / Prof. B. Klein (Hrsg.). WEKA Fachverlag, Augsburg, 1996-1998; 2 Bände – Losebl.-Ausg.; Inkl. Orloff, Michael: *Ein Instrument für innovatives Konstruieren: CROST™ – Constructive Resource-Oriented Strategy of Thinking*, ISBN 3-8111-5592-X

2. Purpose and significance of TRIZ

Thanks to the leadership efforts of Genrikh Saulovich Altshuller for almost 40 years, TRIZ has passed a solid path of its formation[2]. This path is far from complete and, moreover, urgently requires continuation and new development.

However, TRIZ already has international recognition and application. Information about the results achieved, and even more so, about specific examples of application, is practically not published by either companies or TRIZ consultants, limited by the terms of confidentiality of contracts with customers. There are only separate "high-profile" publications, such as an article[3] in "Forbes" magazine in 2013.

Here, only a brief description of TRIZ can be given, although its significance for a number of engineering achievements is undeniable and will continue to grow.

The main sections of TRIZ (edited by Prof. Orloff) are shown in Fig. 2.

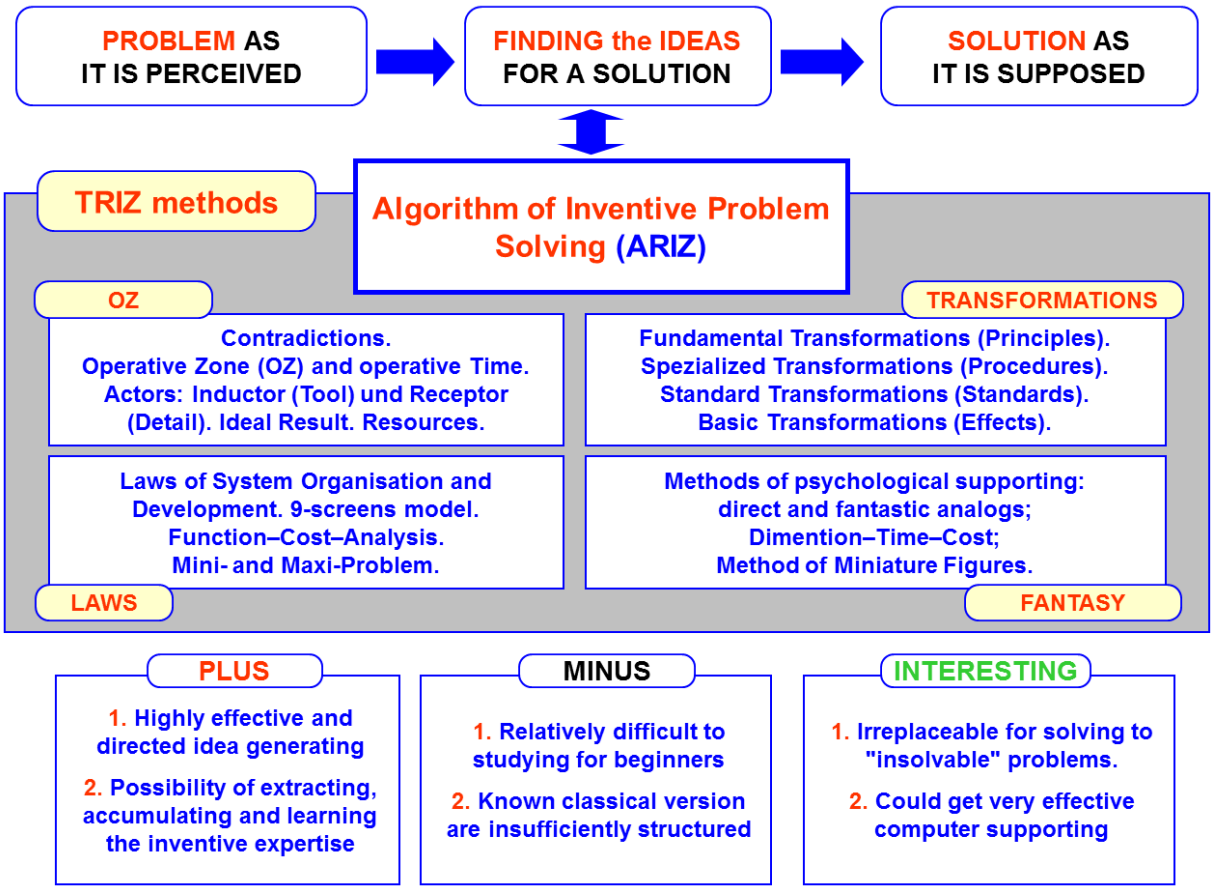


Fig. 2. The main sections of TRIZ (edited by Prof. Orloff)

The problems of TRIZ dissemination are caused by the following shortcomings:

1. lack of standard definitions, models, textbooks and guidelines (with the exception of MTRIZ);

[2] see, for example, the article by M. Orloff in the e-magazine TRIZ-Journal, June 2016, at the link https://the-trizjournal.com/the-great-is-seen-at-a-distance-ariz-and-triz-origins/ or also at http://mtriz.com/pdf/2016-05-12%20(ORLOFF)%2060th%20anniversary%20of%20the%201st%20TRIZ-article.pdf

[3] article "What Makes Samsung such An Innovative Company?" in "Forbes", March 3, 2013

2. lack of effective simple examples of TRIZ application (with the exception of MTRIZ);
3. excessive complexity of the "classic" versions of ARIZ for beginners (with the exception of the ARIZ versions of 1956-1961 and, further, the MTRIZ versions);
4. incorrect and wrong methods of presenting materials on TRIZ sections (except for MTRIZ);
5. lack of connection between TRIZ sections;
6. insufficient effectiveness of the application of the A-Matrix to resolve contradictions; lack of development of the A-Matrix and A-catalogues;
7. absence of new directions of TRIZ;
8. lack of convincing examples of the operation of the laws of system development;
9. other aspects.

3. Purpose and significance of Modern TRIZ (MTRIZ)

The quality of education is what was and what remains the main task for today and tomorrow.

The today that's moving into tomorrow.[4]

Genrikh Altshuller

Modern TRIZ can also be considered in the strategy of such development – the creation of a methodology for teaching the basics of TRIZ and, at the same time, the development of the principles of research work to improve TRIZ itself.

MTRIZ has proven itself as an effective tool for learning and accumulating creative experience.

The advantages and disadvantages of MTRIZ in the shortest form are as follows.

MTRIZ is an **uncomplicated** TRIZ: an understandable and visual method for mastering primary material, supported by the necessary graphic schemes and provided with dozens of proven examples, so that the student knows exactly what quality he should achieve and in what ways.

MTRIZ is **correct** TRIZ: clear and consistent definitions, explanations and recommendations are given in materials and textbooks; all examples – in books, software, forms, illustrations on websites – are made in the same style, in the same standardized formats, which makes them recognizable and understandable for any level of acquaintance with the material; recommendations are given on unacceptable errors and their prevention, as well as exemplary works are provided from the very beginning; so that the student is confidently guided by the best samples of previously completed test and certification works.

Symbolically, the system of standardized representation of information in MTRIZ is shown in Fig. 3.

[4] a paraphrase of the famous statement of Genrikh Altshuller; citation with corresponding changes from the work of Altshuller G.S. *The first performance of G.S. Altshuller at the 2nd Congress of the TRIZ Association* (Transcript. Fragment), Petrozavodsk, July 10, 1991; https://altshuller.ru/engineering/engineering14.asp; in Russian: Альтшуллер Г.С. *Первое выступление Г.С. Альтшуллера на 2 съезде Ассоциации ТРИЗ* (Стенограмма. Фрагмент), Петрозаводск, 10.07.1991; https://altshuller.ru/engineering/engineering14.asp

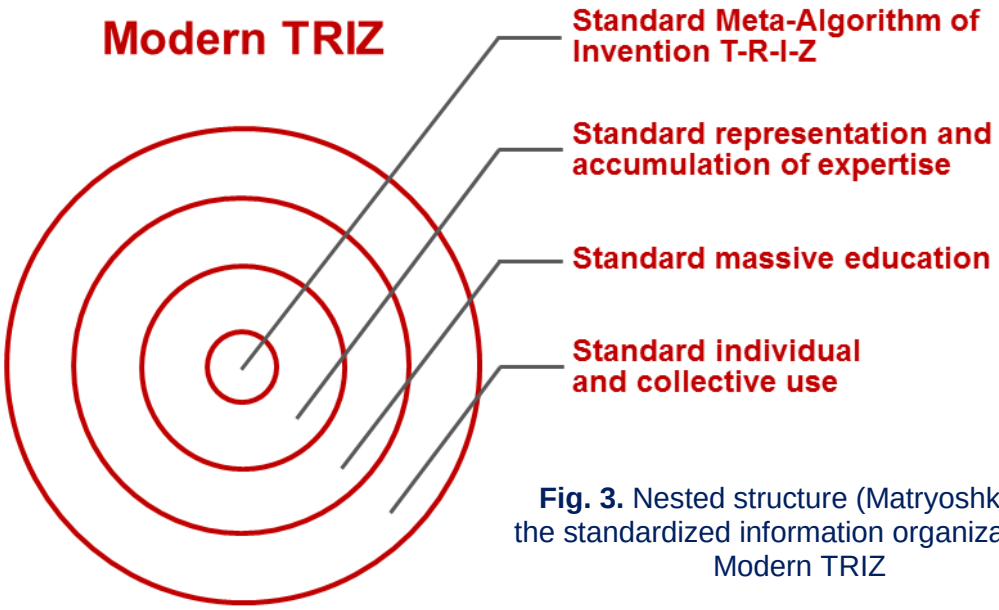


Fig. 3. Nested structure (Matryoshka) of the standardized information organization of Modern TRIZ

MTRIZ is **effective** TRIZ: learning has an integrated nature of play, research and design.

Each MTRIZ modeling – extraction or reinvention – is a study, since modeling the creative content of objects, with adequate and reliable identification of the key creative aspects of creating an effective solution in an object, is nothing more than a **research process**.

This is a game, since the student himself chooses objects for modeling, that is, the study of both objects and educational material is carried out on objects that are interesting to the student and chosen by the student himself, and therefore often – on objects that correspond to the professional interests and hobbies of the student.

The **game** is also because the simulation must be made interesting for others, to show how the solution is effective and beautiful.

This is a **project** because the results of a completed research and simulation are nothing more than a completed reproduction of the process of creating an effective idea and solution, presented as the result of a research project.

Such training is effective because it systematically organizes and disciplines thinking, brings up responsibility for one's choice and one's results, requires convincing evidence of the correctness of the results, and develops the skill of objective research – serious, exciting and productive.

4. Methodological foundations of MTRIZ

MTRIZ is based on 5 rational ideas[5], figuratively represented by metaphorical "names":

I. **"Artifact":** it is proposed to use any artifacts for training, and not just technical objects, as well as any information sources containing effective ideas and solutions.

[5] Orloff, M. *Modern TRIZ. A Practical Course with EASyTRIZ Technology.* – SPRINGER, NY, 2012. – 465 (16+449) pp.

All artifacts were once invented for the first time (!), and then improved by numerous changes, went through the life cycle of their development and evolution. This means that in everything that surrounds us, objectively there are not only visible technical solutions, but also creative solutions "hidden" inside them, creative insights and discoveries, ideas of beauty and harmony.

II. **"Extraction":** identifying models of creative transformations and identifying systemic contradictions from known solutions to create an effective idea.

III. **"Reinventing":** modeling the process of creating a constructive idea during the transition of a known artifact from the "was" state (prototype, contradictions) to the "became" state (result, effective ideas).

IV. **"Meta-Algorithm of Invention T-R-I-Z (MAI T-R-I-Z)":** standardization of training and the subsequent process of generating ideas based on the four-stage Algorithm for Solving Inventive Problems (ARIZ) as part of the stages **T**rend – **R**eduction – **I**nvention – **Z**ooming, or in short, **T-R-I-Z**.

Examples of MTRIZ modeling are based on the methods of Extraction and Reinventing, presented in the standardized MAI T-R-I-Z format, and are the basic material of the entire training system based on MTRIZ.

V. **Bank of examples "MTRIZ-pool":** the methodology and technology of TRIZ training is based on the bank of effective examples. Examples for the MTRIZ pool are developed by MTRIZ specialists, as well as by the trainees themselves, for example, university students and teachers, schoolchildren and school teachers. At the same time, a community of bank users, or the MTRIZ pool, is formed.

5. MTRIZ paradigms

The systemic and methodological principles of organizing and studying the impact course are represented by the following paradigms.

System paradigm

We start studying the basics of TRIZ with basic tools in order to gradually rise to more complex tools and, finally, to the patterns of system development. But not vice versa!

Methodological paradigm

The course is based on the following methodological principles:

Constructivism in education – student-researcher masters the theory on the basis of experiments with examples, modeling the thinking of the creators of TRIZ.

Pragmatism – the result is a solid understanding of TRIZ ideas and the creation of a practical skill in applying creative design tools.

Minimalism – minimum source material, ***impact course***.

Aestheticism – attractive examples of a very different nature.

Methodical paradigm

The course is based on three interrelated processes:

Process 1. Independent study by the student of textbooks and materials of the IMTRIZ Academy.

Process 2. Support for trainees from AIMTRIZ tutors.

Process 3. Completion of tests and certification tasks.

Technological paradigm

More than 25 years of experience in teaching the basics of TRIZ in the MTRIZ methodology and formats has allowed us to develop effective distance learning and training courses, provided with a complete set of textbooks, training materials (catalogs, tables, posters, slides, work samples, etc.). All materials have been thoroughly tested in numerous programs.

Organizational paradigm

MODERN EXTERNATION based on distance learning in our course guarantees the formation of knowledge and skills at the same level as training with a trainer in the classroom, but for an audience that is not limited in terms of mass! COMPLETELY AUTONOMOUS LEARNING, FREELY REGULATED BY THE STUDENT IN A RHYTHM AND VOLUME COMFORTABLE FOR YOURSELF, UP TO THE CERTIFICATE! And we do not have non-certified students, each student reaches a certification level of knowledge and skill.

Psychological paradigm

The topics, style and examples of the digest, textbooks and other materials are chosen and developed in such a way as not only not to create barriers to understanding in terms of content and complexity, but also to ensure interest in the material through ***exploratory***, partly ***entertaining***, partly ***game***, and, of course, the ***project*** nature of the presentation of educational information.

And, if possible, do not forget about the benefits of humor! ☺

6. Instrumental methods and models of MTRIZ

Our understanding of instrumental Modern TRIZ education is presented here briefly with the help of examples.

Methodological and methodological principles of the organization of the educational process, proposed by Prof. M.A. Orloff more than 20 years ago can be defined as ***retroanalysis***.

The foundation of MTRIZ-retroanalysis, a teaching method developed by the author for teaching TRIZ and the formation of the Modern TRIZ Academy, is based on the explanation, and then, on the study of the creative transition of an object from the **"WAS"** state to the **"HAS BECOME",** or **"IS"** state (Fig. 4). ***This is retroanalysis.*** This is the extraction (extraction) of knowledge from existing artifacts, from the civilizational empirical field.

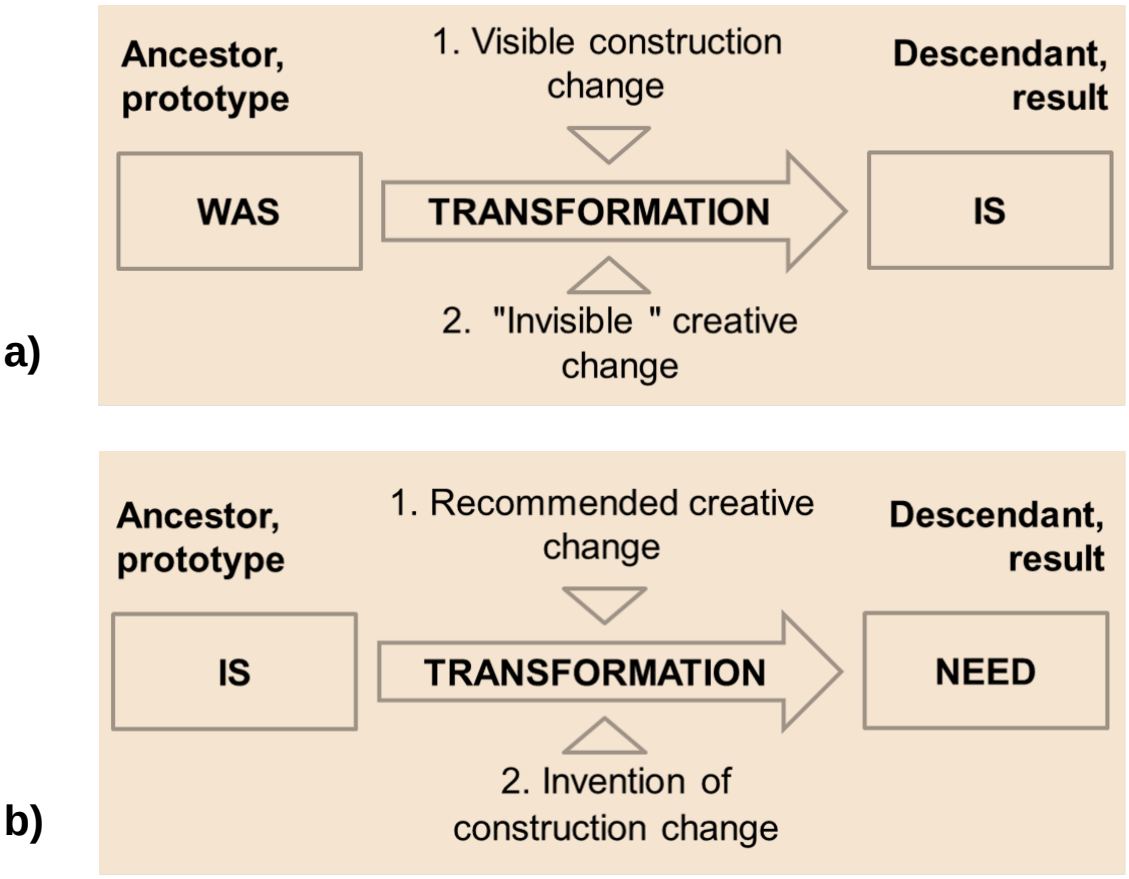


Fig. 4. Studied states of the object during retroanalysis (a) and the invention of a new artifact (b)

This is quite a traditional way of scientific research, starting with practice. Otherwise, where is it possible to extract "contradictions" and creative inventive "techniques" (transformation models) from? And, further, all other TRIZ models.

Moreover, in essence, this approach formalizes and makes it an instrumental, educational, natural-practical way of researching patents and other descriptions of innovations, which was used by Heinrich Altshuller already in his very first research.

And we consider two transitions in the transformation of any pair of known artifacts (Fig. 4, a): 1) visible – in the construction, and 2) "invisible" – in the applied creative principles of change. This is retroanalysis, reinventing.

After learning the basics of TRIZ and consolidating the skill of working with TRIZ models using the example of retroanalysis of known artifacts (prototype and descendant), the student is able to apply these skills and models to create a new invention (Fig. 4, b), while first using the methodology TRIZ recommendations are obtained 1) potentially effective creative changes, and then 2) structural changes are invented to obtain a descendant with the required properties (**"This is what we need"**, or simply **"NEED"**).

Thus, the skill of working with retroanalysis becomes the skill of creating new ideas and solutions in the MTRIZ methodology.

Example 1. Retroanalysis of the structural transition of the "computer mouse" object from a wired type to a wireless one.

A visible change in the design is that, for the informational connection of the mouse to the computer, instead of a wire, radio communication is used, for which the mouse has a built-

in radio signal reception and transmission unit, and a compact transceiver is also inserted into the USB port from the computer side . This is a brief description of what we see in a design change (Fig. 5).

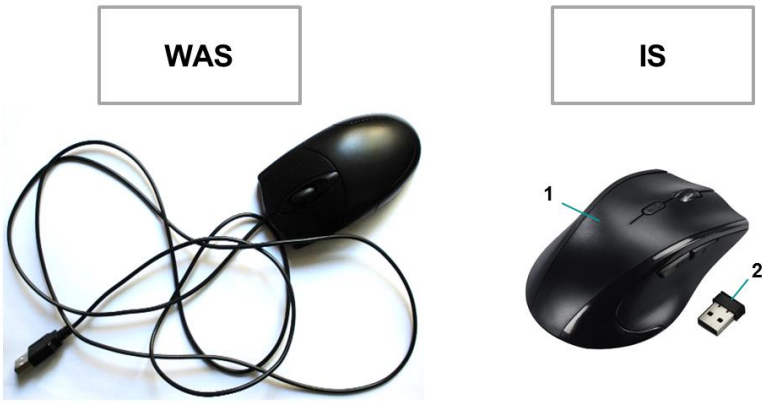


Fig. 5. An example of the transition "in the construction" of a computer mouse

Example 2. Retroanalysis of the creative transition of the "computer mouse" object from a wired type to a wireless one (simplified).

In TRIZ, we are interested in the creative transition. In accordance with TRIZ, the prototype must have had some kind of property that did not suit us, a drawback. The elimination of this shortcoming led to the invention of a wireless mouse with radio communication.

The state **"WAS"** is characterized by the following contradiction, which is called "technical" in classical TRIZ, and "standard" in Modern TRIZ.

Standard contradiction (SC):

Computer wired mouse ► far enough away from the computer (for ease of use) **VS performance** is reduced, as the wire often gets tangled.

Two different factors (properties, parameters) conflict here: "length" (wires) and "productivity" (work).

In the **"IS"** state, the original drawback is eliminated. We see that the key technical solution was the use of radio communications.

However, according to the TRIZ classification, such a solution corresponds to the main (dominant) transformation model (creative "method") **"Replacement of the mechanical environment".** Indeed, mechanical wire communication has been replaced by radio communication. Thus, we have the right to state that the transformation of the mouse from a wired design to a wireless one is based on the creative principle "Replacement of the mechanical environment". During training, each student chooses an object of interest to him and conducts a study of the transition of this object from the state **"WAS"** to the state **"IS"** with the identification of: in the prototype (ancestor) - contradictions, and in the descendant (result) – models of transformation ("methods").

Since the creative transition can be described by different models depending on many conditions and aspects of the study, the result of the study will be presented in the form of various creative descriptions.

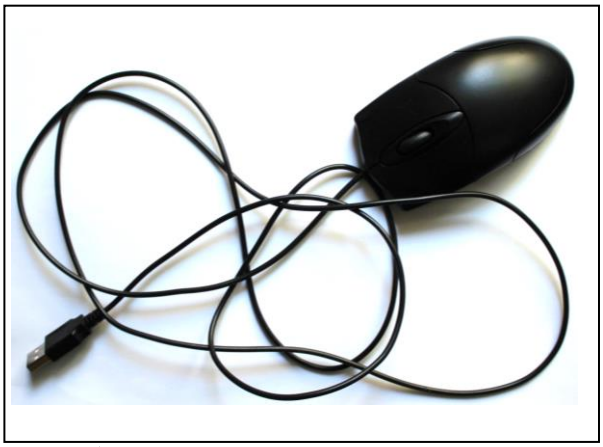
One way or another, the training stage and the actual generalized procedure for identifying creative models received the name **"Extraction"** in Modern TRIZ. The result of such extraction can be presented on a standardized form and become available to other students for the exchange of experience (Fig. 6).

ARTIFACT	WIRELESS COMPUTER MOUSE

Description

A wireless mouse was proposed (fig.19), in which the information connection between the mouse and the computer is carried out via radio communication! Mouse 1 has a built-in receiver-transmitter, as well as a second receiver-transmitter 2 is hidden in its case, built into the construction of the USB-connector. For operation, the second receiver-transmitter 2 is taken out from the mouse case and inserted into the USB-slot in the computer.

EXTRACTING:	Computer mouse with radio communication



WAS:
Artifact-prototype

Problem

Trend → Reducing → Inventing → Zooming

Idea

IS:
Artifact-result to study

Extracting the navigators

D	#	Navigator	Reason to select
++	07	**Segmentation**	separation of the mouse and the components of the communication system
++	04	**Replacement of mechanical matter**	replacement of mechanical wire communication via radio communication (with Bluetooth technology)
+	34	**Matryoshka**	USB-connector with the second radio device before use is hidden for storage in the mouse

Extracting the contradictions

Contradiction type	Object to transform: **Mouse with USB-cable**
STANDARD	***convenient*** **VS** ***sometimes productivity may decrease***
RADICAL	***should be,*** as this provides convenient storage **VS** ***should not be,*** because It takes time to install the necessary cable length

Fig. 6. Extracting creative models from the process of transforming a computer mouse and transitioning from a state "WAS" (wired mouse) to "IS" (wireless mouse)

Example 3. Meta-Algorithm of Invention (MAI) T-R-I-Z.

The final procedure of retroanalysis is **"Reinventing"** – compiling a complete description of the creative transition of an object from the state **"WAS"** to the state **"IS"** in the form of a multi-stage process. Reinventing is represented by a four-stage description based on the proposed by Prof. M.A.Orloff (in 1995) a scheme that is a direct simplified analogue of the Genrikh Altshuller models ARIZ-1956 and ARIZ-1961 (Fig. 7).

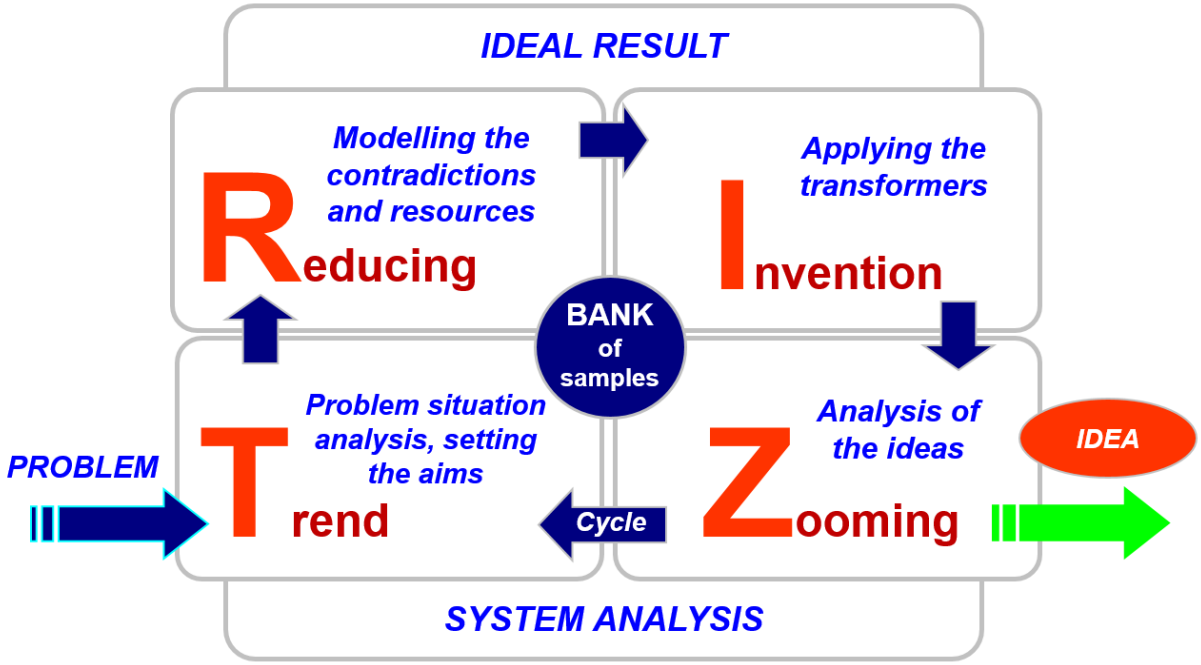


Fig. 7. Basic scheme of the Meta-Algorithm of Invention (MAI) T-R-I-Z

MAI T-R-I-Z was the result of a search for an effective simple presentation of the ARIZ concept for primary education.

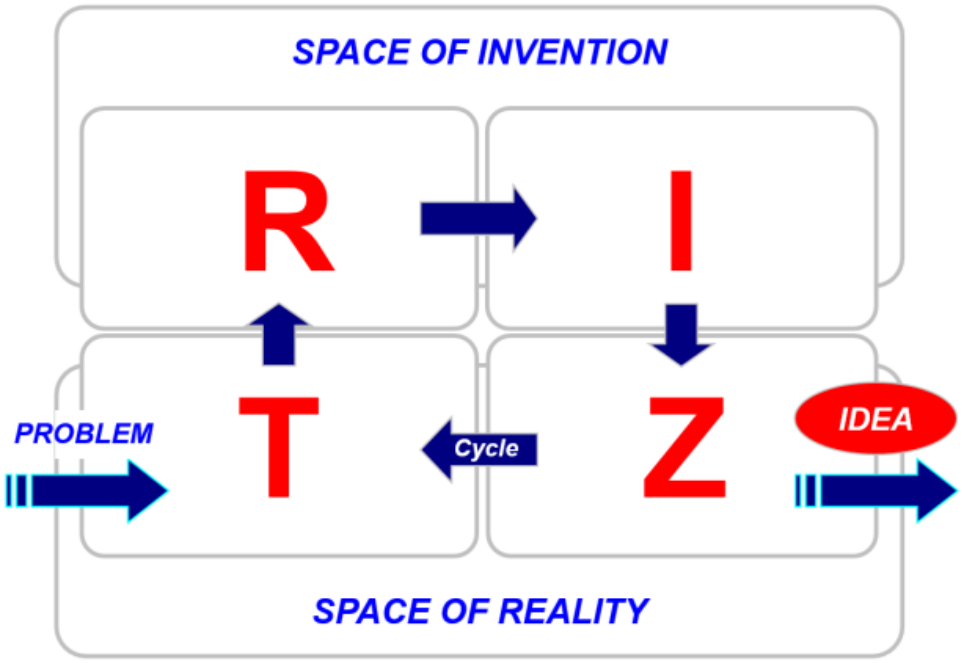
It turned out that MAI T-R-I-Z has become quite an effective tool-navigator for creating new solutions, that is, when solving inventive problems, in any case, for levels from 1 to 3, or 3+ (without going into in details).

MAI T-R-I-Z makes it easy to present the difference between a prototype and a descendant, to explain the extraction operations (revealing contradictions and transformation models) in any object, to explain the progress of the invention of any object.

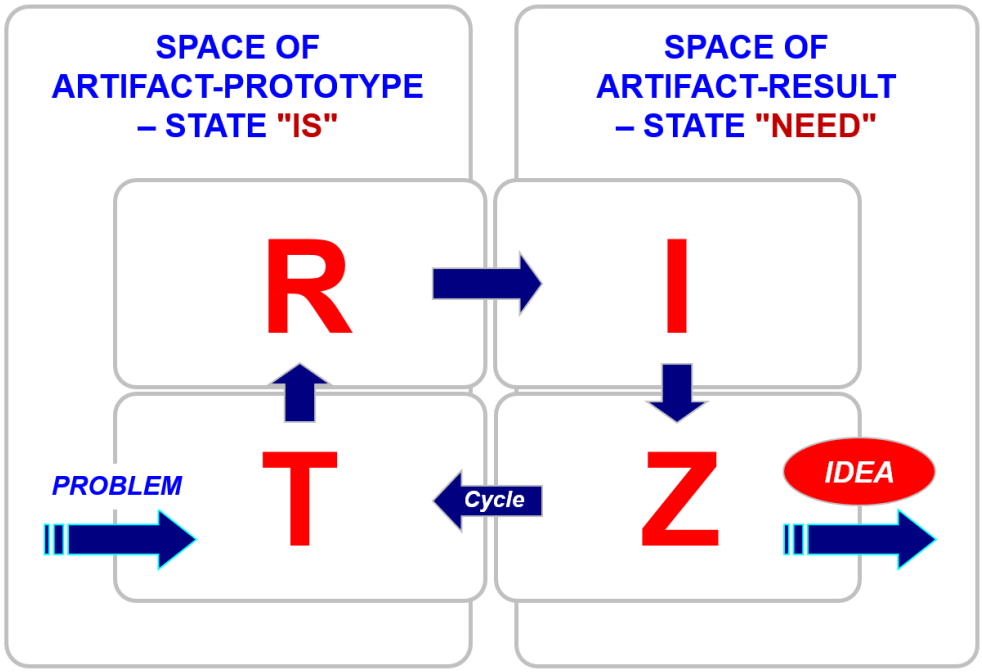
Thus, the "invisible creative change" is visualized, becomes "visible" and understandable to the student.

The skill of analysis, developed by applying the procedures "Extraction" and "Reinventing" on the basis of the MAI T-R-I-Z, will soon be transformed into the skill of rational creative, inventive thinking, according to a scheme that is adequate and does not contradict the general methodology of the "classical" TRIZ and the idea-concept of ARIZ, but more simple, completely visual and quite constructive (effective).

Extremely important is the possibility of demonstrating and explaining "mental spaces" on the basis of the MAI T-R-I-Z (Fig. 8).



a) the main creative transformations refer to the stages of Reduction and Invention in the "space of invention" of the idea



b) in short: contradictions and problems are extracted from the prototype, and creative models from the descendant

Fig. 8. Mental spaces MAI T-R-I-Z

An example of presenting the results of reinventing is shown in fig. 9.

To solve new problems, the simplest instrumental scheme of the MAI T-R-I-Z was compiled (Fig. 10) and called **START T-R-I-Z** (**S**implest **T**RIZ-**A**lgorithm of **R**esourceful **T**hinking).

REINVENTING: WIRELESS COMPUTER MOUSE

TREND

Working with a computer mouse with a long cable is often difficult due to the fact that a long cable is tangled. What could be done?

REDUCTION

Ideal Final Result: convenient and fast to work with the computer at any distance

STANDARD CONTRADICTION (SC)

USB-cable

(+) ***convenient*** → **10. Ease of use** → **03, 04, 34** Models from extracting

(–) ***long, productivity may decrease*** → **01. Productivity** → **03, 04, 07** Models from A-matrix

RADICAL CONTRADICTION (RC)

USB-cable ⇨ must be ***long*** enough to communicate with the computer **VS** must be ***short***, so as not to get tangled

INVENTING

In order to increase the productivity of working with a computer mouse, a wireless computer mouse with radio communication is invented.

The key transformer is model **04. Replacement of the mechanical matter**: substitution of mechanical wire communication by radio. To implement the radio communication with Bluetooth technology, the new mouse includes a detachable (model **03. Segmentation**) USB-connector 2 equipped with a receiver-transmitter.

The mouse is equipped with a built-in receiver-transmitter (model **34. Matryoshka**), and the USB-connector for storage is hidden in the mouse case (re-application of the model **34. Matryoshka**).

ZOOMING

Are the contradictions eliminated? – Yes.

Super-effects: This mouse is very convenient for the lecturer

Negative effects: Sometimes the USB-connector is lost, the need to change the batteries in the mouse

Development trends: USB-connector to be integrated into the computer! Do not change the batteries!

Change of surrounding systems: –

Advanced application: to apply this approach for remote object management systems

Fig. 9. Reinventing the invention of the radio mouse – the process of transforming a computer mouse and transitioning from a state WAS (wired mouse) to IS (wireless mouse)

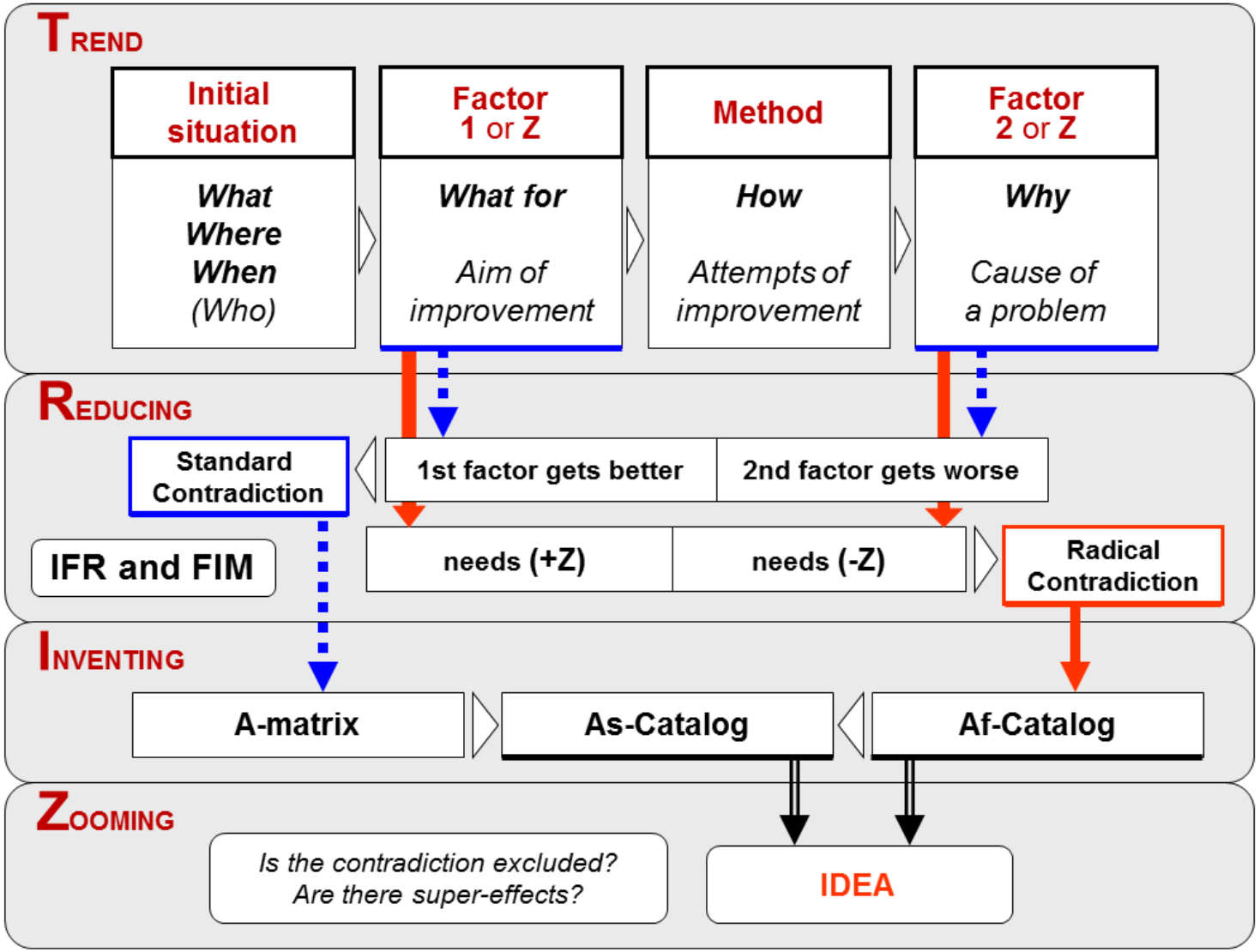


Fig. 10. Simplest instrumental scheme **START T-R-I-Z** (**S**implest **T**RIZ-**A**lgorithm of **R**esourceful **T**hinking)

Comparison of the MAI T-R-I-Z with the selected and newly identified schemes of inventive thinking in recent years can be represented in the form of a historical overview "classification" scheme (Fig. 11).

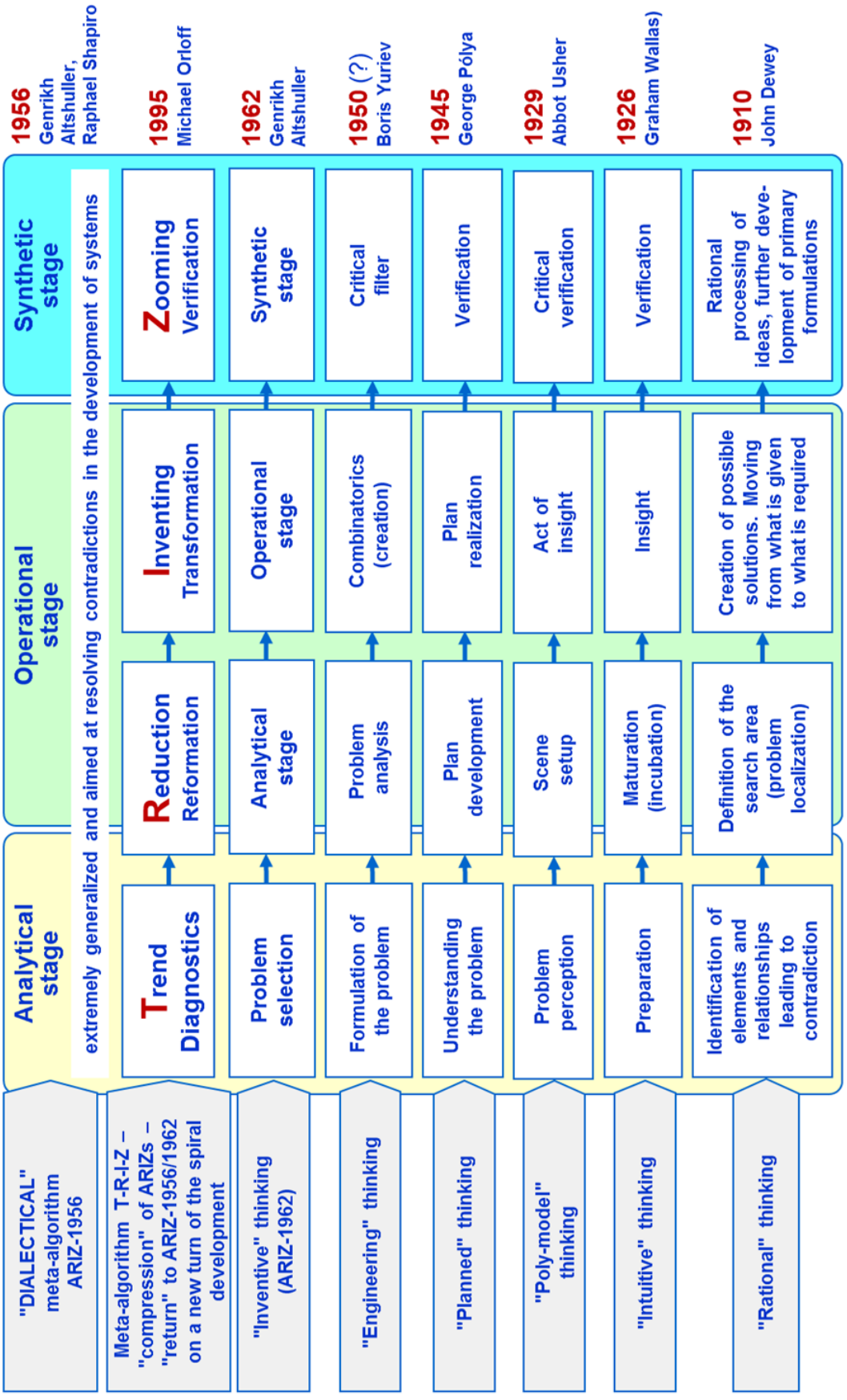


Fig. 11. Constructive four-stage meta-algorithms for inventive thinking

It would seem that the methodological emphasis in MAI-TRIZ and in the definition of the procedures "Extraction" and "Reinventing" is not so significant; however, with a systematic reliance on these patterns, we get a new quality in the learning process:

– standardized modeling,
– standardized representation information,
– the accelerated formation of a correct and reliable TRIZ skill,
– the possibility of accumulating the inventive experience of an individual, project department, enterprise and industry.

We get the opportunity for the effective work of professional multidisciplinary groups to search for ideas and solutions (Think Tank Team), since the standardized presentation and transfer of information creates, de facto, the ***standard communication language*** in the creative team. And this dramatically changes the nature and even the content of the process of collective problem solving.

These opportunities together represent a significant step in creating an effective methodological basis for mass training in the basics of TRIZ. This is exactly the direction in which TRIZ founder Heinrich Altshuller sought to orient TRIZ developers.

Therefore, the procedures "Extraction" and "Reinvention" proposed and tested for more than 25 years, together with MAI T-R-I-Z and well-established examples, samples, textbooks, reference books and other materials on Modern TRIZ, are of exceptionally great value for practice. .

This allows us to look with optimism at the continued development of TRIZ, at the future organization of mass education on the basics of TRIZ in schools, universities and industry.

In general, the basic models and methods of teaching the basics of TRIZ, which have been developed over more than a quarter of a century, provide a platform for further research for the development of TRIZ tools.

And this is also what Heinrich Altshuller was worried about throughout his entire career and, especially, in the last years of his active work.

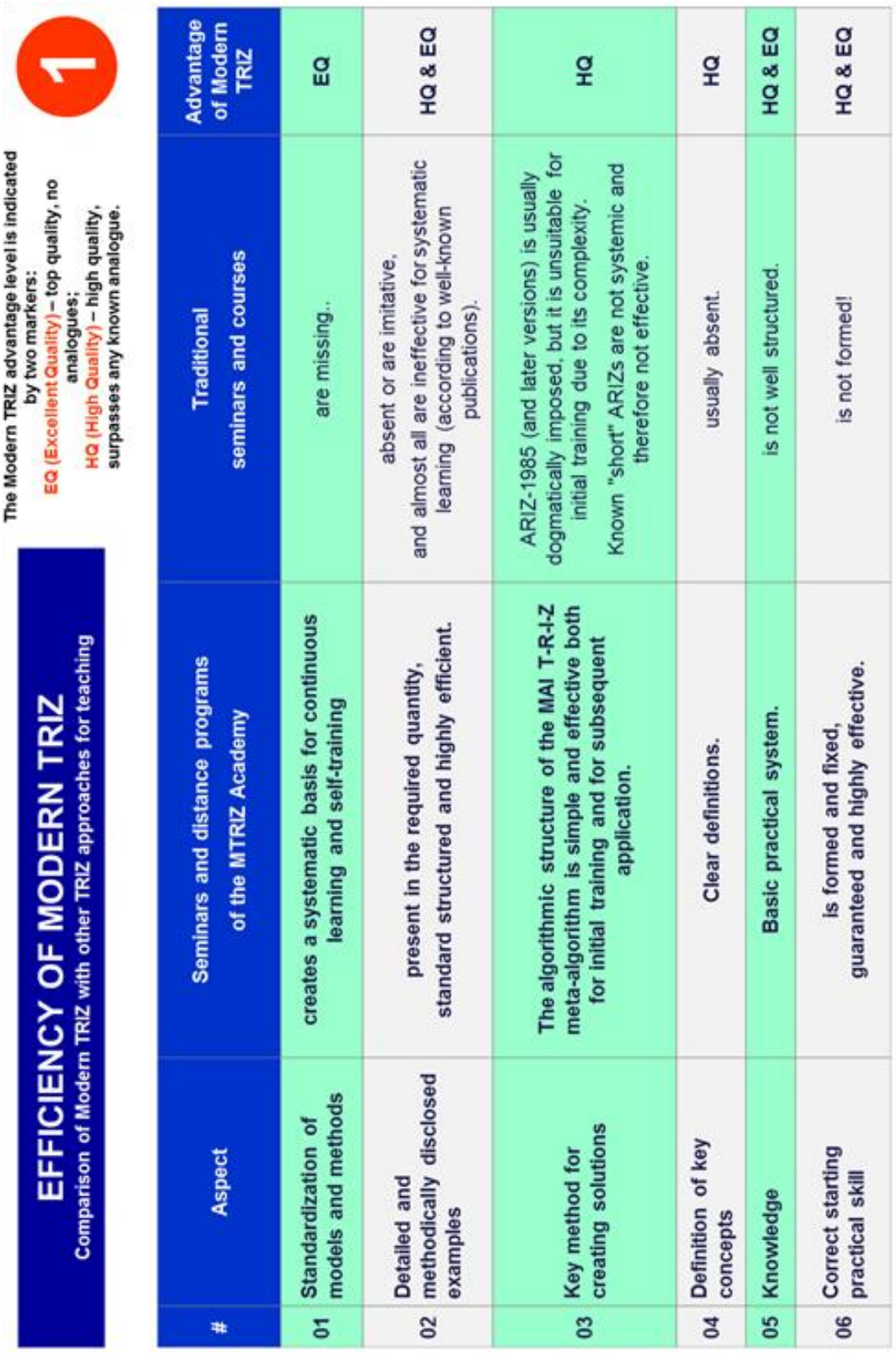
Therefore, I will allow myself to complete the section and the entire essay dedicated to Heinrich Altshuller, with the words of the famous mathematician, founder of cybernetics, Norbert Wiener, considering his statement in relation to the Modern TRIZ direction we are developing and, in principle, to all our work:

> ► There[6] are two types of improvements in science those in which the content of scientific information receives a definite advance, and those in which the content remains essentially unaltered, but ***the language of science and its ability to express a complicated situation in terse, relevant language is what is the main object of progress*** … the advantages gained by a good language and a good symbolism are:
>
> 1. A ***routine method*** of setting up a problem;
>
> 2. A method of expressing the facts of a problem which sup-presses the accidental choice of coordinates:
>
> 3. Sometimes, but not always nor even generally, suggestions as to the solution of a problem.
>
> …It does give a ***uniform language*** for the formulation of the most diverse problems. ◄

[6] quoting from page 277 of the work: Wiener, N., Notes on the Kron Theory of Tensors in Electrical Machinery, J. Electr. Eng., China, 1936, Vol. VII, Nos 3 & 4, pp. 277–291

7. Advantages of the educational paradigm of the MTRIZ system

The key advantages of the Modern TRIZ direction in comparison with the widespread "traditional" approaches to teaching the basics of TRIZ are shown in the table in Fig. 12.



EFFICIENCY OF MODERN TRIZ

Comparison of Modern TRIZ with other TRIZ approaches for teaching

The Modern TRIZ advantage level is indicated by two markers:
EQ (Excellent Quality) – top quality, no analogues;
HQ (High Quality) – high quality, surpasses any known analogue.

1

#	Aspect	Seminars and distance programs of the MTRIZ Academy	Traditional seminars and courses	Advantage of Modern TRIZ
01	Standardization of models and methods	creates a systematic basis for continuous learning and self-training	are missing..	EQ
02	Detailed and methodically disclosed examples	present in the required quantity, standard structured and highly efficient.	absent or are imitative, and almost all are ineffective for systematic learning (according to well-known publications).	HQ & EQ
03	Key method for creating solutions	The algorithmic structure of the MAI T-R-I-Z meta-algorithm is simple and effective both for initial training and for subsequent application.	ARIZ-1985 (and later versions) is usually dogmatically imposed, but it is unsuitable for initial training due to its complexity. Known "short" ARIZs are not systemic and therefore not effective.	HQ
04	Definition of key concepts	Clear definitions.	usually absent.	HQ
05	Knowledge	Basic practical system.	is not well structured.	HQ & EQ
06	Correct starting practical skill	is formed and fixed, guaranteed and highly effective.	is not formed!	HQ & EQ

Fig. 12. Comparison of MTRIZ and traditional approaches (beg.)

The fundamentals of TRIZ in the paradigm of the Modern TRIZ direction, developed at the Academy of Instrumental Modern TRIZ, Berlin, Germany, are presented by the authors in a number of books[7], which we invite our dear readers to get acquainted with.

EFFICIENCY OF MODERN TRIZ

Comparison of Modern TRIZ with other TRIZ approaches for teaching

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2

#	Aspect	Seminars and distance programs of the MTRIZ Academy	Traditional seminars and courses	Advantage of Modern TRIZ
07	Systemacy	Methods and models form system of training and self-development.	There is no system of self-training and self-development.	EQ
08	Textbooks	are multi-level oriented, original and highly effective.	are missing or imitative, not effective enough for self-study.	EQ
09	Self-education	is easy and highly effective.	is extremely difficult and inefficient.	EQ
10	Distance certification courses	are part of the training system, highly efficient.	as a rule, are not available. All without exception are ineffective.	EQ
11	Methodology and technology of continuous self-improvement	are included in the training system, highly efficient.	are missing.	EQ
12	Knowledge retention and skill	Forever and ever! ☺	Short time.	HQ & EQ
13	Standard modeling, accumulation and transfer of creative experience	are included in the training system, are used in training and practical solution of new problems based on analogue examples.	are missing..	EQ

Fig. 12. Comparison of MTRIZ and traditional approaches (end)

[7] see first Orloff, M. *ABC-TRIZ. Introduction to Creative Design Thinking with Modern TRIZ Modeling.* – Springer Nature, Springer International Publishing Switzerland, 2016. – 536 (20+516) pp.; Orloff, M. *Modern TRIZ Modeling in Master Programs. Introduction of TRIZ Basics to University and Industry.* – Springer Nature, Springer International Publishing Switzerland, 2020. – 545 (16+529) pp.

8. Educational programs MTRIZ

After 20 years of experience in promoting MTRIZ programs, we have begun a radical review of the structures and technologies of our educational programs for further distribution.

The main idea of such modernization is the complete transfer of programs to distance learning in order to reach the widest possible mass audience. This has always been the goal of Heinrich Altshuller, and also our goal.

Such modernization became possible thanks to the long-term experimental improvement of each training course.

A brief description of our programs is provided later in this section. The main thing is that now we are striving to fully implement the MTRIZ paradigms presented in Section 5.

We know that this is not the limit. We see even broader and more effective methodological and technological prospects. But now we will take an important pro-intermediate step, which is represented in the new structures of our main educational programs.

So, we will show only 4 main programs here (Fig. 13). In fact, there are other programs, both for schoolchildren and for business leaders and other professionals, as well as various specialized versions of these programs.

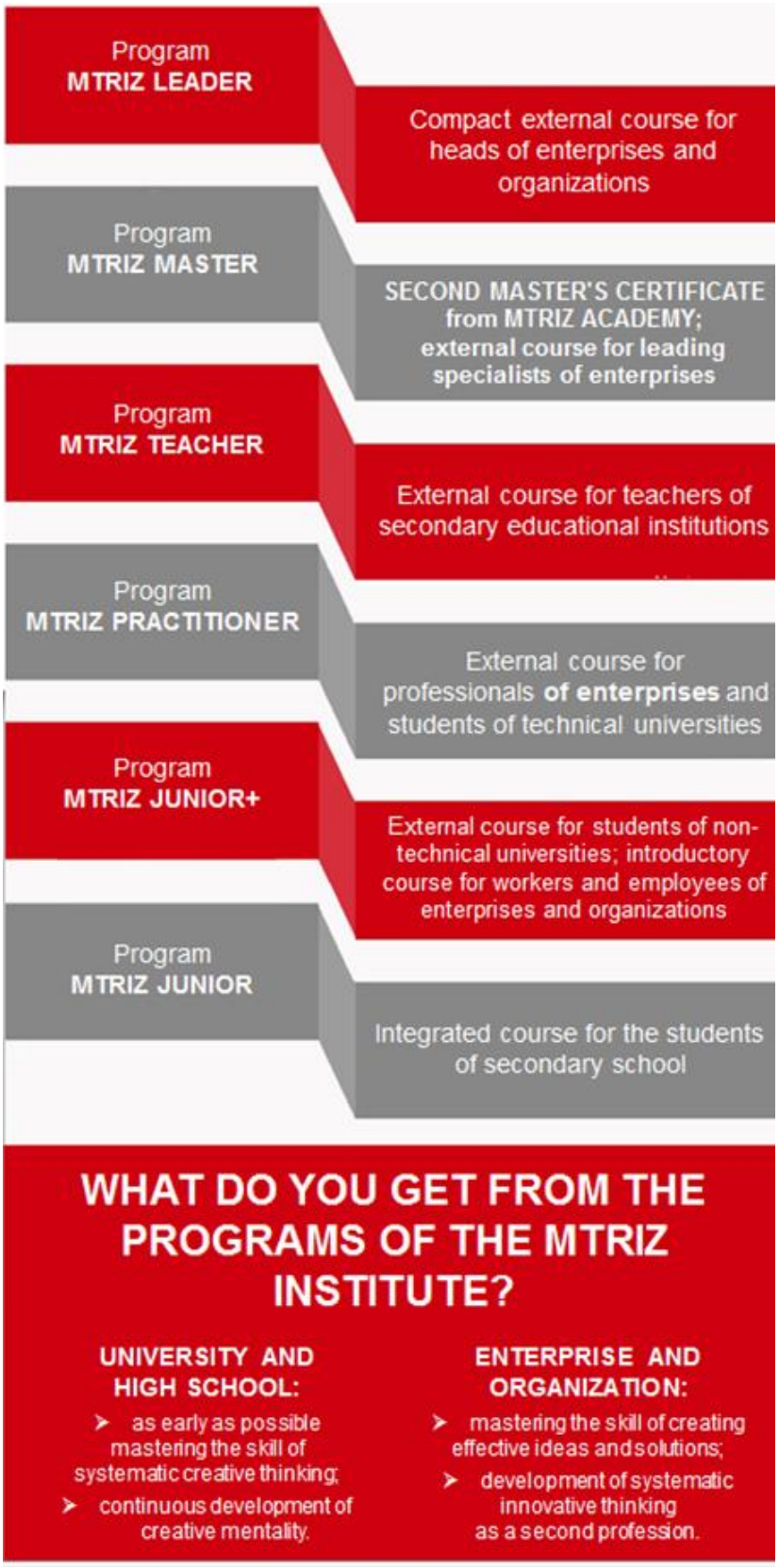


Fig. 13. Fragment of the list of programs of the Modern TRIZ Academy

8.1. Program MTRIZ Junior

Purpose of the MTRIZ Junior program: The initial (1 ECTS) Program "Modern TRIZ for Systematic Creative Design (MTRIZ-SCD)" provides the graduate with specialized initial knowledge and skills in invention and innovation (innovention):

- to model and solve "ordinary" design problems of 1-2 level of complexity with contradictive incompatible requirements at limited resources.

Our "classic" program (Fig. 14) at the MTRIZ Junior level has gone through the longest path of improvement. And today we have the following materials for the student:

1) basic textbook "ABC of modern TRIZ"; all sections of the textbook are provided with examples, as well as questions for self-examination (most questions are provided with control answers);

2) the study plan of the textbook - the main methodological tool for self-organization of student learning;

3) templates for students to fill in when doing tests on their own, including those for Extraction and Reinvention,

4) numerous examples of certification work previously done by other students;

5) instructions for filling out templates and completing certification works.

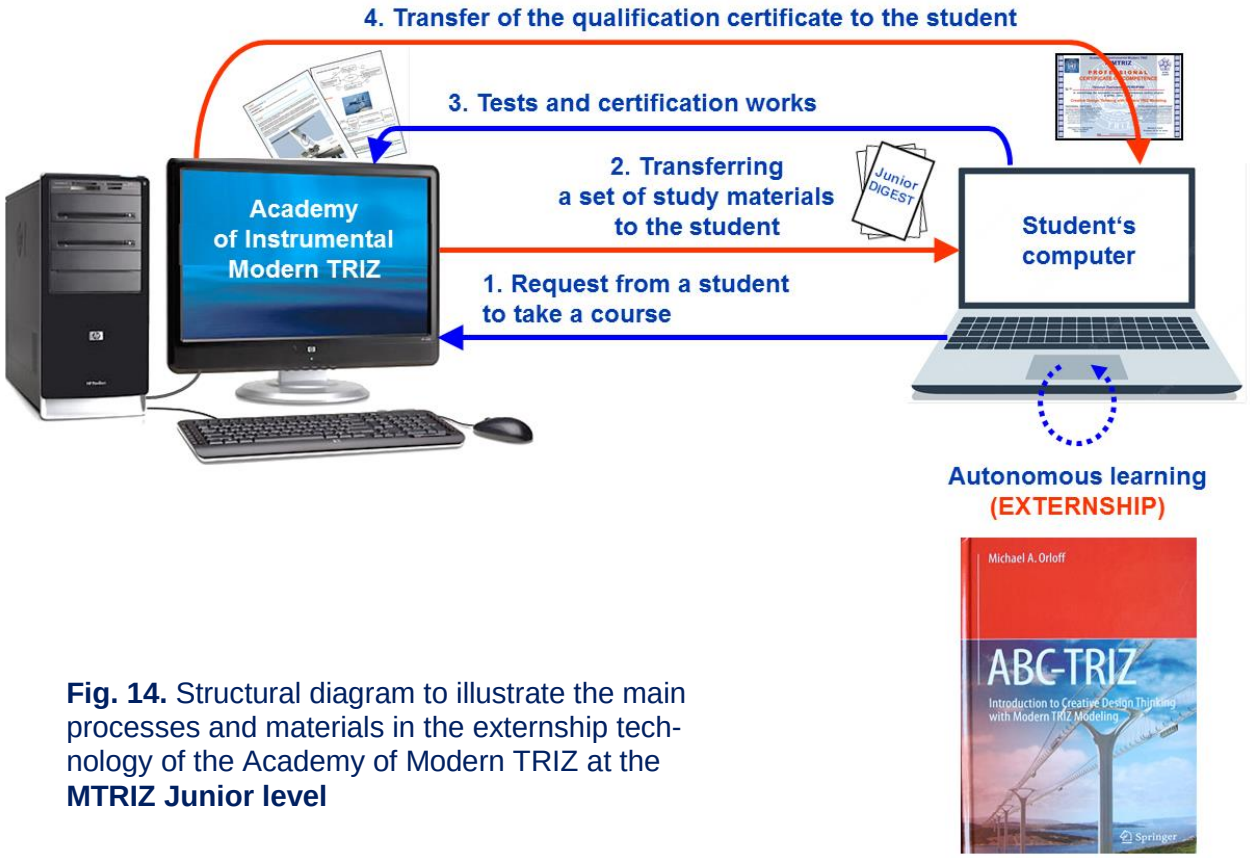


Fig. 14. Structural diagram to illustrate the main processes and materials in the externship technology of the Academy of Modern TRIZ at the **MTRIZ Junior level**

A number of other details of the course description will be presented on the websites of the Academy IMTRIZ.

The Academy has developed samples of certificates, as well as qualification characteristics (qualification passport) for each level of qualification.

Further, only structural diagrams of the organization of courses of higher levels are given, by analogy with Fig. 14.

8.2. Program MTRIZ Practitioner

The extended (Fig. 15) program "Modern TRIZ for Systematic Creative Design (MTRIZ-SCD)" provides the graduate with specialized initial knowledge and skills for invention and innovation (innovation):

- integrate MTRIZ knowledge into the professional area and solve "ordinary" (levels 1-3+) design problems with sharp contradictions between incompatible requirements with limited resources;
- effectively participate in a creative team in solving "ordinary" problems.

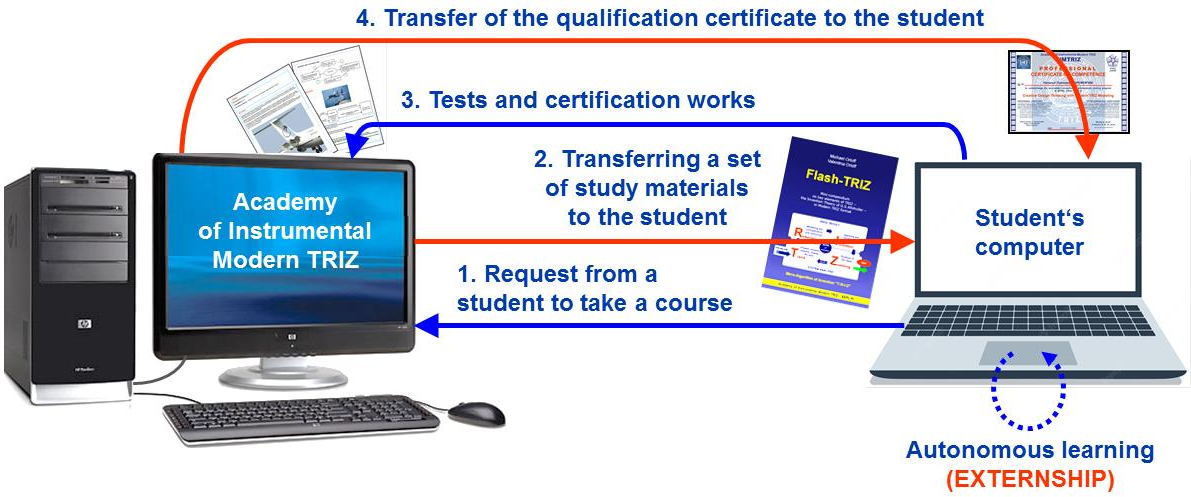


Fig. 15. Structural diagram to illustrate the main processes and materials in the externship technology of the Academy of Modern TRIZ at the level of **MTRIZ Practitioner**

8.3. Program MTRIZ Teacher

The extended (Fig. 16) program "Modern TRIZ for Systematic Creative Design (MTRIZ-SCD)" for secondary school teachers provides the graduate with specialized initial knowledge and skills for invention and innovation (innovation):

- integrate MTRIZ knowledge into the professional area and demonstrate the solution of "ordinary" (1-2 levels) design problems with sharp contradictions between incompatible requirements with limited resources;
- develop together with high school students examples of Extraction and Reinventing in their school subject.

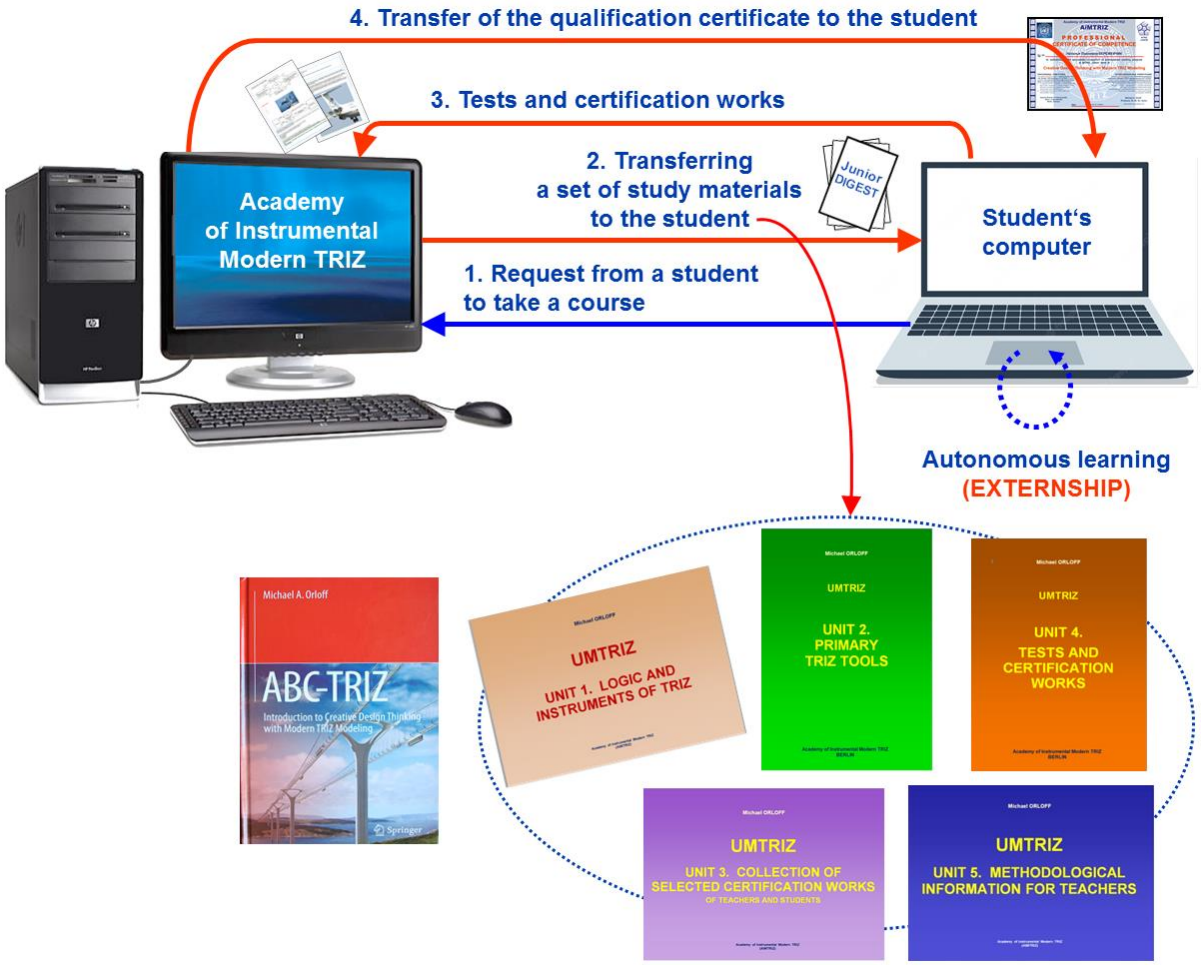


Fig. 16. Structural diagram for illustrating the main processes and materials in the externship technology of the Academy of IMTRIZ at the level of **MTRIZ Junior for a senior secondary school teacher**

8.4. Program MTRIZ Master

Specialized (Fig. 17) program "Modern TRIZ for Constructive Creative Design (MTRIZ-SCD)" complements the first university master's program for obtaining the MTRIZ Master certificate (90 ECTS) as the equivalent of the second master's degree in accordance with the requirements of level 7 of the EQF and provides the graduate with specialized knowledge and special skills for invention and innovation (innovation):

- integrate MTRIZ knowledge into the professional field and solve extremely complex design problems with especially sharp contradictions between incompatible requirements with limited resources;
- find ways to modernize and develop the system;
- train individually and in groups and contribute to problem solving by the innovation team.

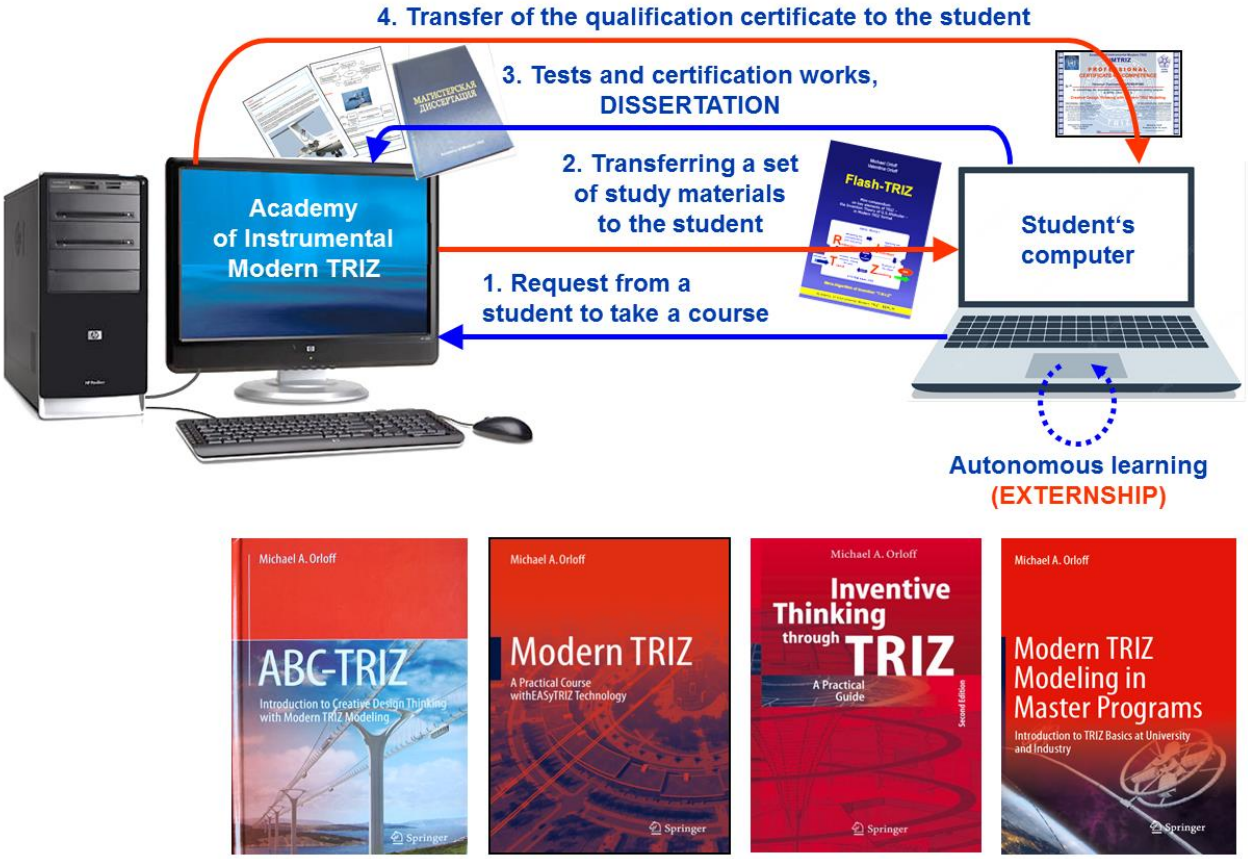
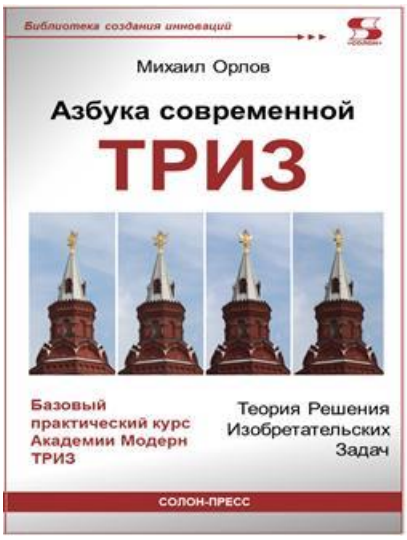
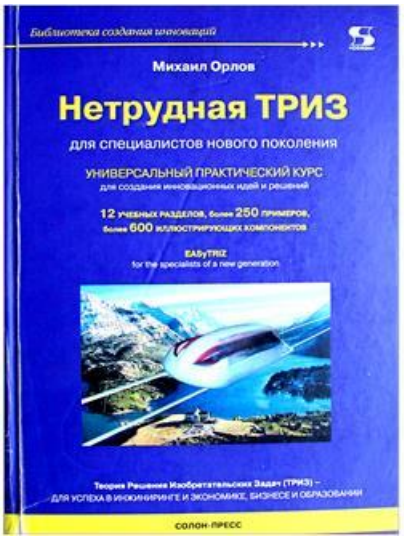


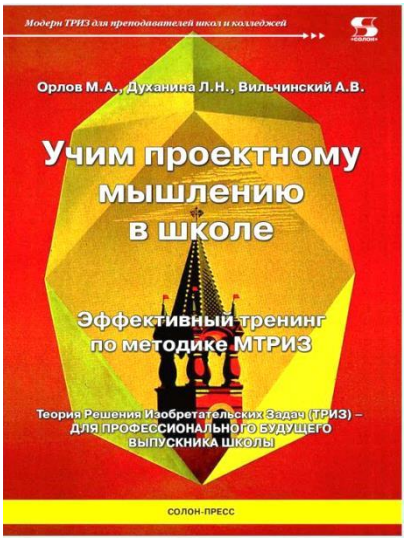
Fig. 17. Structural diagram to illustrate the main processes and materials in the externship technology of the Academy of Modern TRIZ at the level of **MTRIZ Master**

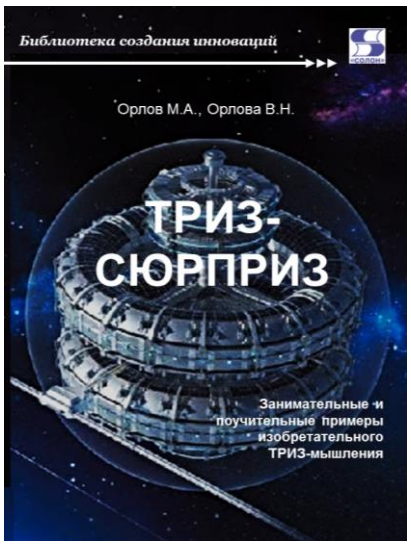
For certification, upon completion of training, a master's thesis is performed, as a rule, on the professional specialization of the student.

9. Main publications in the field of MTRIZ.

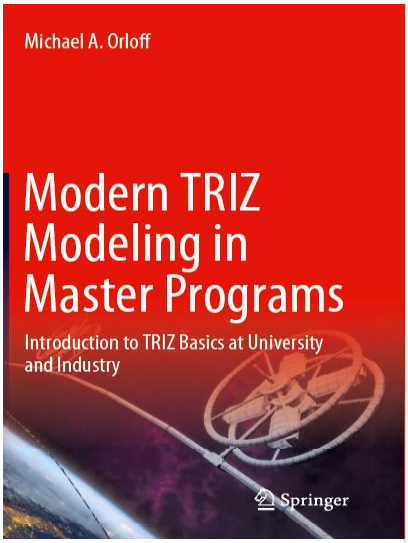


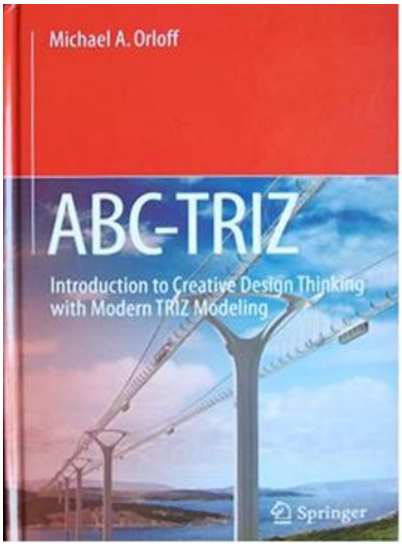


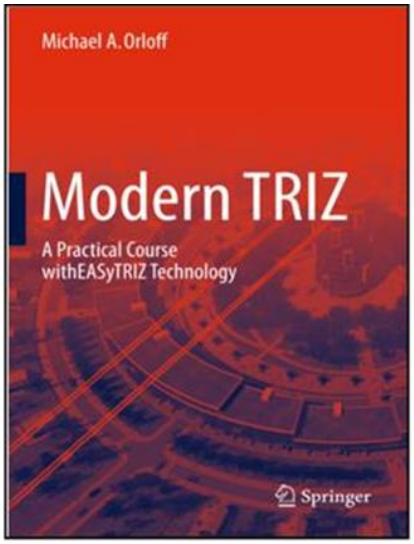


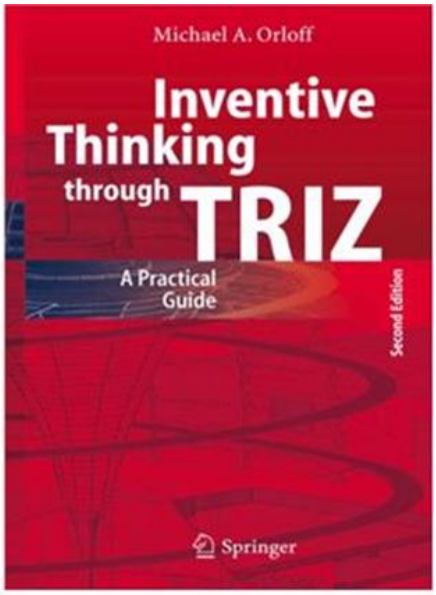


TRIZ-Surprise. Entertaining and enlightening examples of inventive TRIZ thinking (2023)





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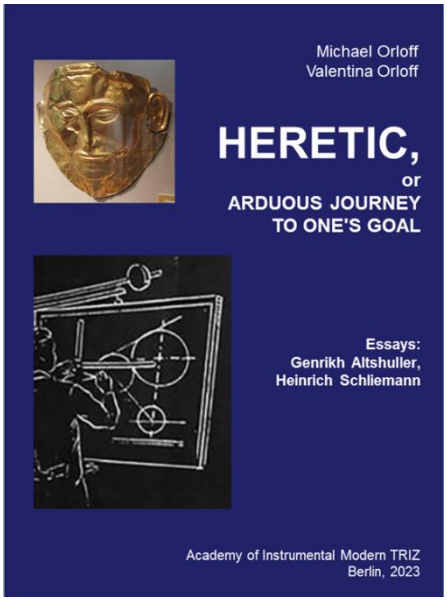
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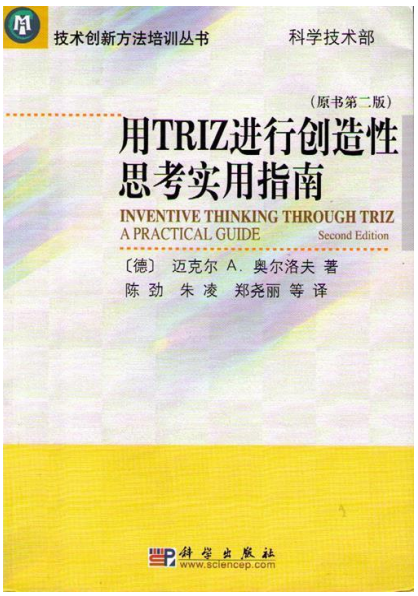
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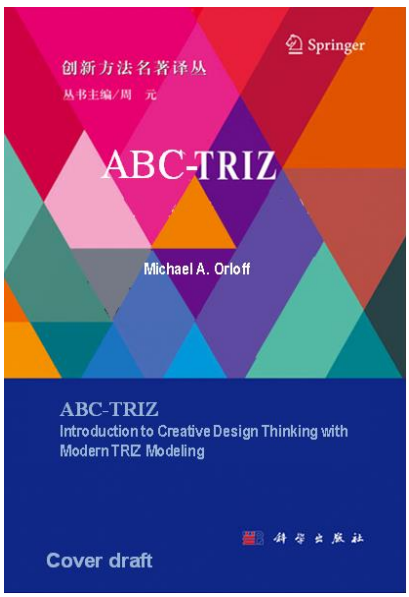
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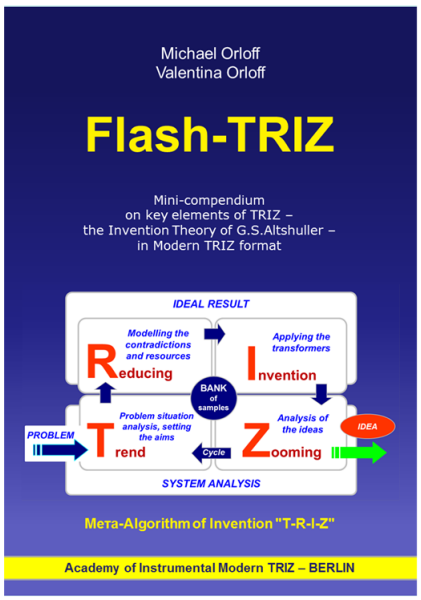

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