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DEVELOPMENT OF DIGITAL TECHNOLOGIES INCORPORATING ELEMENTS OF ARTIFICIAL INTELLIGENCE AND ARTIFICIAL NEURAL NETWORKS. (Modern multidisciplinary digital technologies incorporate elements of artificial intelligence and artificial neural networks, methods for achieving the ideal final result, as well as the nuances and aspects of marketing innovative products developed on the basis of and through the advancement of these technologies, in conjunction with innovative design)

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Abstract

The article examines a number of fundamental factors that significantly influence the generation, development, evaluation, and commercial implementation of innovative technical solutions under the conditions of rapid digital transformation. Particular attention is devoted to the role of modern multidisciplinary digital technologies incorporating elements of artificial intelligence and artificial neural networks as instruments for enhancing inventive activity, innovation analysis, and the identification of effective technical solutions.

The study considers the distinction between practically applicable technical solutions capable of solving real technological and engineering problems and formal or speculative concepts that possess limited practical value despite their apparent novelty. The influence of technical stereotypes, technological paradigms, and associated psychological barriers on the formation and implementation of innovative ideas is analyzed. Special emphasis is placed on the mechanisms through which such barriers hinder the resolution of technical and technological contradictions and limit the emergence of non-obvious and highly effective engineering solutions.

The article further examines the impact of contemporary information technologies on the innovation process, including the substantial reduction of development cycles, increasing technological complexity of new products, rising costs of prototype creation and testing, and the growing importance of market-oriented innovation strategies. In this context, the necessity for inventors and developers to possess multidisciplinary competencies extending beyond traditional engineering expertise is highlighted.

Particular attention is given to the integration of foresight methodologies, innovation-oriented analytical approaches, market demand assessment, and consumer behavior analysis with modern artificial intelligence technologies. The author emphasizes the importance of combining technical creativity, predictive capabilities, and commercial awareness in order to maximize the probability of successful implementation and commercialization of innovative products.

The article proposes several key directions that, under current technological and economic conditions, exert a decisive influence on the future development and market success of new technical ideas and innovative products. These directions are presented as practical guidelines for improving the effectiveness of innovation management and increasing the commercial viability of advanced technological solutions.

Keywords: *Digital technologies; Elements of artificial intelligence; Elements of artificial neural networks; Innovative products; Innovation analysis; Creative activity; Technical and technological stereotypes; Specific local domain; Overcoming technical, technological, and design stereotypes; The most effective and non-obvious technical solutions; Combined highly effective and non-obvious technical solutions; Foresight techniques; The potential for developing technical solutions with auxiliary innovative functionalities*

All inventors are aware that some technical solutions prove effective under real operating conditions, function successfully, and solve numerous practical problems. Such solutions often stimulate innovation analysis at the formulation stage and initiate purposeful creative activity on the part of the inventor. At the same time, there are artificially conceived and seemingly obvious technical solutions that are developed in isolation from practical reality and ultimately solve nothing beyond satisfying ambitious aspirations to create some form of technical or technological concept, which is frequently of little or no practical value.

Furthermore, technical solutions arising within any specific local field inevitably affect existing technical stereotypes and the psychological barriers that have emerged and continue to emerge on their basis. These barriers hinder the resolution of technical and technological contradictions that have developed as a consequence of such psychological limitations.

Twenty years ago, the necessity of generating inventions of the second category, as well as the equally important need to account for the influence of psychological barriers, could be justified by their auxiliary role in the selective identification of the most effective and non-obvious technical solutions from the broad spectrum of technical and combined creative ideas generated during the innovation process.

The emergence of information technologies and the substantial reduction of the time cycle required to transform an inventive concept into a commercially demanded and practically implementable product, together with the increasing technical and technological complexity of modern products, which proportionally raises the cost of prototype development and testing, require a fundamentally new approach to the creation of technical solutions possessing auxiliary innovative functions while remaining highly non-obvious.

Today, if an inventor wishes his or her innovative ideas to be utilized in practice, it is no longer sufficient to rely solely on foresight techniques, intuition, and a well-developed imagination. The inventor must become a multidisciplinary specialist capable of understanding – or at least sensing – the commercial and consumer demands of the market, irrespective of prevailing stereotypes and the psychological barriers associated with them, which are often rooted in the apparent obviousness of the implementation pathways for synthesized ideas.

Several fundamental directions currently exert a decisive influence on the future of new ideas. Consideration of these directions can ensure a genuine and substantial level of commercial success, whereas neglecting them may permanently prevent an idea from being implemented in any commercial form.

The author proposes to examine several of these fundamental directions, recognizing that the scope of the present article allows only a concise thesis-based discussion.

Figure 1. *An example of modern innovative design featuring a complete simulation of the structural materials used, including their properties, performance characteristics, methods of mechanical processing, and types of finishing treatment.*

For contemporary technological innovations, which are often generated through intensive brainstorming involving large teams of specialists interested in achieving an effective result that may be considered an equivalent of the ideal final outcome, significant organizational challenges exist within the innovation process. These challenges arise from objective factors, including psychological, technological, and design stereotypes, as well as the apparent obviousness of emerging concepts and proposed solutions.

Emerging and continuously developing technical, compositional, and technological solutions are frequently evaluated through the prism of conclusions derived from the practical application of the laws governing the development and construction of industrial technologies, machines, and mechanisms established during the previous century, at a time when modern materials, components, assemblies, advanced industrial electronics, and laser technologies were unknown.

Moreover, the integration of artificial intelligence and artificial neural network elements into the infrastructure of new technical systems significantly complicates the design process and the formation of the technical and technological characteristics of innovative products.

This situation is further complicated by the fact that, as noted in the first part of this publication, recognition of a technical solution as an invention is based on different criteria in the United States and in most other countries. In the United States, patentability is assessed according to four criteria, whereas in most other jurisdictions three criteria are generally applied.

The fourth criterion is precisely the subjective evaluation factor that gradually initiates and reinforces the psychological stereotype based on the division of new technical solutions into obvious and non-obvious categories.

The presence of a clearly expressed subjective factor introduces into the evaluation process comparisons with known design and technological elements and their combinations derived from previously developed solutions.

The familiarity of a particular solution and all aspects of its implementation cannot constitute an objective factor, since the determination of whether a technical solution is obvious or non-obvious fundamentally depends on the knowledge, experience, and professional competence of the experts conducting the evaluation.

In modern engineering and technological developments, novelty is no longer a reflection of a single technical discipline. Rather, it represents the integration of multiple disciplines, including electronics, microelectronics, advanced materials science, fiber-optic technologies, and laser engineering. Consequently, the assessment of obviousness or non-obviousness must be conducted from multiple disciplinary perspectives and can be performed effectively only through the joint participation of highly specialized experts together with specialists in systems integration.

Figure 1–1. *The figure illustrates alternative industrial configurations of the devices presented in Figure 1, incorporating three-dimensional analysis of the scale factor, together with a parallel assessment of the level of non-obviousness associated with the entire set of engineering, technological, and design solutions integrated into this innovative product*

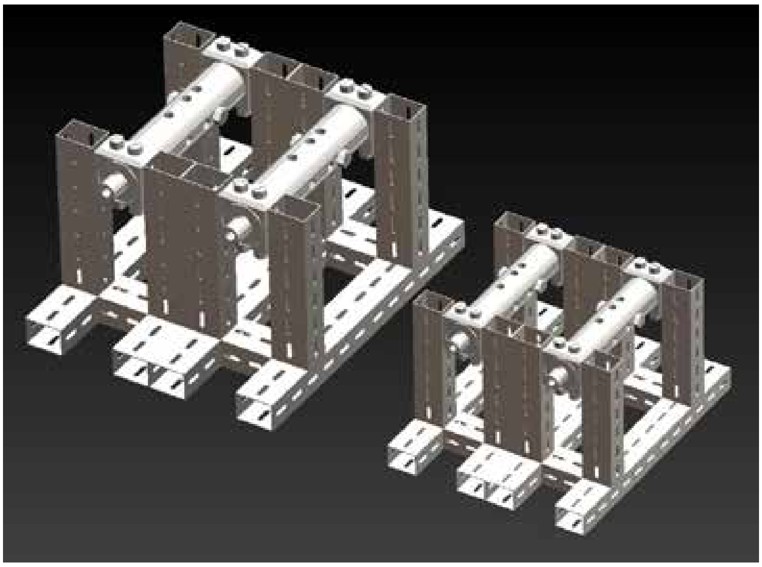


Figure 2. *An example of modern innovative design utilizing sectional views, accompanied by technical and innovation-oriented analysis aimed at substantiating and evaluating the degree of non-obviousness of all device components, as well as the corresponding non-obviousness of the functional characteristics of assembly associations and the subsequent commercial advantages derived from these characteristics*

Within every technical discipline, certain standard solutions gradually become established over time and eventually evolve into stereotypes that are familiar to virtually all practicing specialists in the respective field.

Such stereotypes become deeply embedded in everyday engineering practice, and any modification of a design or technology encounters a certain level of resistance, which, over time, develops into a well-defined technological and psychological barrier.

Under these circumstances, the effective generation of innovative ideas through brainstorming techniques, as well as the refinement of these ideas and their innovative combinations toward achieving a boundary-level ideal final result, may encounter – and in practice frequently do encounter – stereotypical psychological barriers. Even when a portion of the working group generates technically viable proposals that are non-obvious to an average specialist within a particular industry, such proposals may not be unequivocally accepted and, especially during the initial stages of evaluation, are often rejected.

If one turns to the Theory of Inventive Problem Solving (TRIZ) and its methodologies for achieving the Ideal Final Result (IFR), it becomes apparent that this theory is not entirely adequate under the conditions of contemporary integrative and highly complex technical solutions.

Moreover, even prior to the emergence of such solutions, the Theory of Inventive Problem Solving possessed a number of significant limitations that evidently contributed to the stagnation of its development following the death of its author and created substantial difficulties in its practical application.

What were the principal limitations of this approach?

Within the framework of TRIZ, and in accordance with the technological realities of its time, an attempt was made to formulate universal laws governing the development of technical systems that would serve as the foundation for a general problem-solving methodology.

These principles remained relevant until the emergence and widespread implementation of processor-based technologies and the subsequent adaptation of classical ideal-result concepts to new technological paradigms. The effectiveness of these paradigms became determined not only by the quality of engineering and technological solutions and their combinations but also by the sophistication of the software systems integrated with them, which introduced fundamentally new commercial characteristics to innovative products and inventions.

However, many of the principles and laws formulated more than seventy years ago can no longer be regarded as universal laws under the conditions of extensive digital transformation and the widespread implementation of modern information technologies.

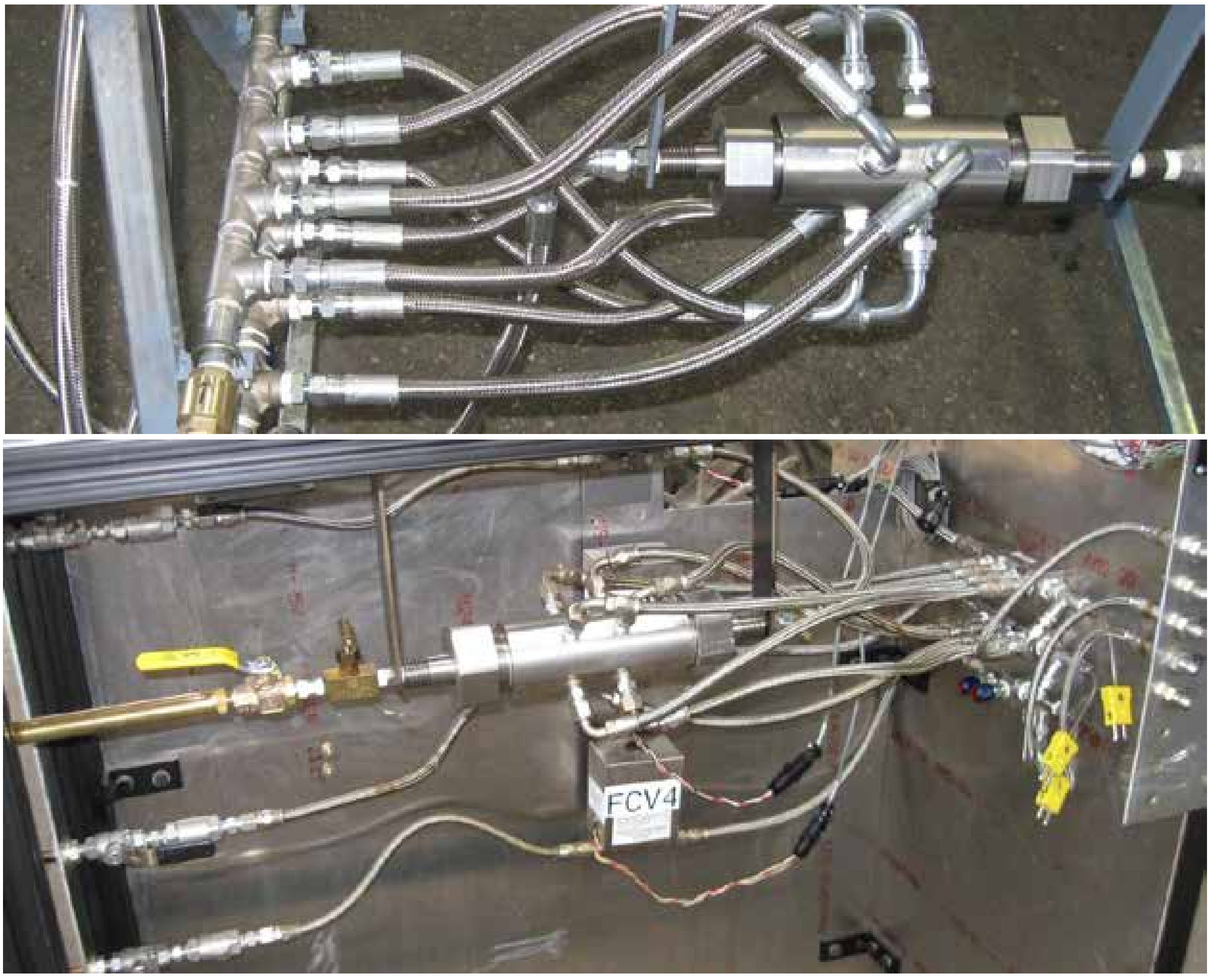
They should more appropriately be regarded as developmental patterns or tendencies in technological evolution, and even then as incomplete representations of the innovation process. Consequently, a comprehensive and coherent methodology for problem solving based exclusively on such laws never fully emerged.

The formulated laws were primarily employed as methodological explanations for illustrative examples of inventions rather than as a complete framework for innovation development. Factors of commercial feasibility were largely excluded from consideration, and insufficient attention was paid to the influence of market requirements on the application and continuous modification of the evolving principles governing technical systems.

As a result, limited consideration was given to the possibility of adapting, optimizing, and modifying technical objects in a manner that could transform an invention through evolutionary development into a non-obvious, commercially viable, and fully market-demanded innovative product at a fundamentally new level of commercial utilization.

Recent patent disputes among the world's largest technology companies clearly demonstrate that the traditional laws governing the development of technical systems are no longer capable of reflecting the full diversity of functions, characteristics, and challenges associated with modern multifunctional products whose structural features exhibit a high degree of non-obviousness. Taking into account the numerous new factors that characterize contemporary innovative products and continue to emerge as a result of technological progress, there is a need to reformulate these laws by linking them with the principles governing the development of commercial structures, the commercialization of innovative ideas, the infrastructure of the modern innovation economy, and the practical globalization of innovation processes.

Figures 3 and 4. *Examples of combinatorial innovative design developed on the principles of overcoming technological stereotypes*



The dialectical approach based on contradiction analysis, which formed the foundation of the principal problem-solving methodology, was substantially modified through the introduction of new concepts, including technical and physical contradictions. These concepts significantly altered the essence of the dialectical contradiction originally formulated within classical dialectical logic, thereby creating difficulties in identifying contradictions when addressing real-world inventive problems. Furthermore, this approach failed to adequately assess the degree of non-obviousness of technical solutions, particularly those incorporating elements of artificial intelligence and artificial neural networks.

In this context, and considering the extensive integration of digital technologies and software applications into classical engineering solutions, special attention should be devoted to several fundamental questions. What should be considered a genuine inventive problem? How can the differing perspectives of inventors, manufacturers, and consumers be harmoniously integrated into the evaluation process? To what extent can the correct or incorrect formulation of an inventive problem influence the commercialization potential of the resulting invention? Is it possible to reliably protect complex integrated technical solutions against unauthorized replication and imitation?

The search for answers to these and many other questions has become an essential component of modern patenting and licensing strategies and must inevitably be combined with a rigorous assessment of the degree of non-obviousness associated with innovative technical solutions.

The further development and modification of the algorithm underlying inventive problem-solving methodologies did not proceed through the elimination of inaccuracies in contradiction-identification procedures. Instead, the process largely followed a path of increasing complexity. As a result, the final official version of the algorithm evolved into an extremely cumbersome structure with limited practical applicability.

At the same time, no clear mechanisms were established for transitioning from a formally identified contradiction to its practical resolution. This created substantial difficulties in addressing real engineering and technological challenges.

Although the theory formally declared a departure from methodologies based on extensive enumeration of possible alternatives, the majority of the so-called problem-solving instruments effectively represented precisely such methods.

This analytical framework was presented as a scientific approach grounded in the study of patterns governing the structural evolution of technical systems. However, the acceptance of hypothetical physical fields that do not exist in reality, together with the possibility of ambiguous interpretations of structural models and transformation rules, suggests that the methodology should more appropriately be classified as a technique for stimulating variant generation rather than as a rigorous scientific analytical framework.

The approach most closely aligned with the objective of formalizing inventive problem-solving procedures was the development of contradiction matrices and associated principles for resolving technical contradictions. This methodology was based on statistical analyses of patent descriptions and invention disclosures available at that time. Nevertheless, despite its potential, it did not receive substantial further development and, due to a number of inherent limitations and the progressive obsolescence of its statistical foundations, gradually lost its practical relevance.

There remains a widespread misconception regarding the possibility of directly integrating such methodologies into industrial production environments. In essence, these approaches constitute individual problem-solving methods whose application depends largely upon personal choice and individual creative preferences. Consequently, a significant psychological component is inherently involved in their utilization. For this reason, it is impossible to transform such methodologies into a fully integrated component of a manufacturing process. At most, enterprises can organize training programs aimed at enhancing the creative capabilities of their personnel, a practice that continues to be employed by numerous organizations in the United States.

During the period of their most active development in the 1980s, many of these shortcomings were effectively compensated for by the enthusiasm of innovation advocates and practitioners. Nevertheless, the existing limitations, combined with the decline of the original development community capable of recognizing and addressing these deficiencies, ultimately led to stagnation in the further evolution of the methodology.

In the author's opinion, this represents the primary reason why, over recent decades, no fundamentally new developments of significant theoretical or practical importance have emerged within this field.

References and Patent Information

Ackerman. *Water Harvester and Purification System*. U. S. Patent No. 10,071,918, issued September 11, 2018.

Catherwood, Sr. *Dehydrating Air-Filtering Apparatus*. U. S. Patent No. 4,594,082, issued June 10, 1986.

Rolandson. *Exhaust Gas Recirculation Compressor Inlet Thermal Separation System*. U. S. Patent No. 10,767,659, issued September 8, 2020.

Hedlund. *Self-Contained Photovoltaic Distillation Apparatus*. U. S. Patent No. 10,759,677, issued September 1, 2020.
Kow. *Humid Air Stream Generator*. U. S. Patent No. 10,731,880, issued August 4, 2020.
Stuckenberg. *Atmospheric Water Generation Systems and Methods*. U. S. Patent No. 10,583,389, issued March 10, 2020.
Panda et al. *Economically Viable Atmospheric Water Generator*. U. S. Patent No. 10,718,101, issued July 21, 2020.
Bravo et al. *Modular Apparatus for Water Production*. U. S. Patent No. 10,422,112, issued September 24, 2019.
Bravo et al. *Water Production Apparatus for Rigorous Climates*. U. S. Patent No. 10,385,549, issued August 20, 2019.
Hering et al. *Advanced Laminar Flow Water Condensation Technology for Ultrafine Particles*. U. S. Patent No. 9,821,263, issued November 21, 2017.
Shinoda et al. *Indoor Unit of Air-Conditioning Apparatus*. U. S. Patent No. 9,976,769, issued May 22, 2018.
Vaughen. *Fresh Water Generation System Using Coastal Atmosphere and Ocean Water*. U. S. Patent No. 10,161,114, issued December 25, 2018.
Chen. *Water Generation System for Deserts*. U. S. Patent No. 10,337,175, issued July 2, 2019.
Heller. *Humidity Collector Apparatus*. U. S. Patent No. 9,758,948, issued September 12, 2017.
Elliott. *Method and Apparatus for Drying Compressed Air*. U. S. Patent No. 9,216,379, issued December 22, 2015.
Mayr et al. *Condensation Device*. U. S. Patent No. 8,967,096, issued March 3, 2015.
Claridge et al. *System and Method for Efficient Air Dehumidification and Liquid Recovery*. U. S. Patent No. 8,685,144, issued April 1, 2014.

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