Aleksandra Efimova

ARTIFICIAL INTELLIGENCE AND THE SPECIFIC ASPECTS OF ITS IMPLEMENTATION IN PSYCHOLOGICAL REHABILITATION PROCESSES

Artificial Intelligence: Characteristics and Applicability Indices in Modern Automated Industry and in the Ecosystem and Infrastructure of Innovative Start-Ups During Brainstorming

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The article examines current trends in the development and implementation of artificial intelligence and artificial neural network technologies in professional activities, automated industrial systems, as well as within the ecosystems and infrastructures of innovative start-ups. Particular attention is devoted to the integration of different artificial intelligence models and the development of technological mechanisms enabling their effective collaborative operation.

New algorithmic approaches designed to overcome differences between the tokenization systems employed by individual AI models and to enable the conversion of output data into a universal format are considered. The article analyzes methods based on the use of tokens with equivalent meanings across different models, thereby creating additional opportunities for the collaborative application of large and small language models and improving the efficiency of information processing.

Keywords: *Artificial Intelligence; Artificial Neural Networks; Application of Modern Artificial Intelligence Technologies; Application of Modern Artificial Intelligence Technologies Across Various Professional Fields; Applicability Indices of Artificial Intelligence Technologies; Range of Professional Tasks That Can Be Performed Using Artificial Intelligence and Artificial Neural Networks; Applicability Indices of Artificial Intelligence Technologies to Various Professions; Level of AI Integration into Professional Activities; List of Office and Administrative Positions and Professions in Fields Such as Marketing, Where Tasks Include the Analysis, Presentation, and Transmission of Information*

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Contents

Introduction

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It is noted that the application of such algorithms can significantly improve the performance of artificial intelligence systems: the processing speed of large language models may increase by approximately 1.5 times on average and, in certain cases, by as much as 2.8 times. The practical significance of these technologies for edge computing devices, including smartphones, unmanned aerial vehicles, and autonomous vehicles, is examined, particularly where such systems must operate with limited computational resources and without continuous Internet connectivity. Particular attention is given to the prospects for the development of collaborative artificial intelligence, which enables the functional advantages of different models to be combined within a unified technological system. This approach makes it possible to create more efficient and accessible solutions and expands the potential for the practical application of artificial intelligence across various professional and technological fields.

The article also considers the ongoing systematization of artificial intelligence applications and the development of regulatory restrictions governing their use. Using the regulatory framework adopted in the European Union as an example, the article analyzes categories of artificial intelligence systems associated with an unacceptable level of risk, including technologies designed to influence human subconscious behavior, identify and exploit the vulnerabilities of certain groups of individuals, recognize emotions in employment and educational environments, and establish social ratings based on behavior and personal characteristics.

Special attention is devoted to the need to assess the level and applicability indices of artificial intelligence across different professions and types of professional activity. The article examines the range of tasks that can be performed using artificial intelligence and artificial neural networks, including the analysis, systematization, presentation, and transmission of information, as well as the possibilities for integrating AI into office, administrative, analytical, and marketing activities.

The article demonstrates that the continued implementation of artificial intelligence is becoming increasingly systematic and requires a comprehensive approach combining technological efficiency, professional applicability, safety, and regulatory compliance. At the same time, the development of mechanisms enabling interaction among different artificial intelligence models creates the prerequisites for deeper AI integration into modern industrial, administrative, and innovation processes.

Main part

Teams of scientists from the research centers of the world's leading corporations have analyzed the implementation and practical application of current artificial intelligence technologies across various professional fields.

Figure 1. A robot whose control and monitoring systems utilize artificial intelligence and artificial neural networks

Strictly speaking, the researchers did not assess the "disappearance of human professions"; rather, they developed an "AI applicability index" for different occupations.

This does not necessarily mean that machine-based pseudo-intelligence will replace humans in the fields with the highest levels of AI applicability.

On the contrary, AI may facilitate human work by taking over a substantial proportion of routine and analytical tasks, while still requiring the supervision and oversight of a highly qualified multidisciplinary specialist.

Figure 2. Examples of the application of artificial intelligence and artificial neural networks in various digital technologies across different areas of industrial and professional activity

As part of the research, 200,000 user sessions with the Microsoft Bing Copilot chatbot were examined. It was found that users most frequently turn to AI for information gathering and text generation. The most common activities performed by AI itself include providing information and assistance, generating written content, teaching, and providing guidance.

The highest values of the AI applicability index are observed in professions involving intellectual work, such as computer and mathematical occupations, as well as in office and administrative positions and professions in fields such as marketing, where tasks involve the analysis, provision, and transmission of information.

Artificial intelligence also plays a key role in the development and stabilization of environmentally sustainable practices, and the author provides a real-world example of such an application.

Environmental sustainability played a central role in the design of a hotel being developed in accordance with the standards of the U. S. Green Building Council and certified under LEED (Leadership in Energy and Environmental Design).

LEED is an international voluntary building certification system designed to assess the environmental sustainability and energy efficiency of buildings. LEED certification confirms that a building has been designed and constructed in accordance with sustainable development principles, with the aim of minimizing its adverse environmental impact and improving the quality of life of its occupants.

A second example concerns medical diagnostics.

The start-up Imagene AI, in collaboration with Oracle, developed an AI model that significantly accelerates the diagnostic process.

The solution proposed by the start-up is based on a multimodal AI model with 1.1 billion parameters, integrating biopsy image data, genomic information, and patients' clinical data. The system is capable of analyzing complex tissue patterns and providing actionable recommendations.

Figure 3. Examples of robots incorporating elements of artificial intelligence and artificial neural networks used in automated production lines of automotive manufacturing companies, such as Ford

The principal achievement of Imagene AI lies in the speed of diagnosis. The new platform can identify a high probability of cancer within just a few minutes, whereas conventional molecular sequencing methods may require several weeks. This enables physicians to prescribe personalized treatment considerably faster and apply precise targeted therapies.

The system has already been implemented in 20 medical centers and laboratories worldwide, including major pharmaceutical companies.

Thus, virtually any chatbot is already capable of performing certain tasks typically assigned to a junior programmer by generating code in a specified programming language for a given task. However, a **highly qualified multidisciplinary professional** is still required to define the project architecture, supervise and guide the AI in performing the assigned tasks, coordinate files and functions within the project, separate the back end from the front end, and perform other essential functions.

Therefore, in order to remain competitive with AI in creative professions, people will need to further develop precisely those skills that, at least for the time being, distinguish humans from machines: the ability to construct abstractions and integrate individual components into a coherent whole, perform testing and error detection, introduce variation and diversity into creative processes, and carry out other complex intellectual tasks.

The widespread integration of **artificial intelligence and artificial neural network technologies** into innovative technical solutions, together with the incorporation of non-contact monitoring and measurement technologies based on the principles of **electromagnetic resonance spectroscopy** into supervisory control and management super-systems, creates a need to modify certain provisions of the **Theory of Inventive Problem Solving (TRIZ)** and the **Algorithm for Inventive Problem Solving (ARIZ)**. Such modification is necessary in order to maintain their applicability, at least within brainstorming processes conducted by innovative start-ups. Particular attention should be given to revising the **40 classical inventive principles and methods for achieving the Ideal Final Result**.

The Theory of Inventive Problem Solving was originally conceived as an **"exact science."** For a certain period of time, its laws and methods generally corresponded to the existing level of technological development and the capabilities of engineering and technology.

What, however, does the Theory of Inventive Problem Solving actually represent under present-day conditions? How have modern high technologies and advanced processor technologies affected its integrative capabilities?

These are not the only questions that require clarification. Another important factor is the increasingly widespread search for analogues of future inventions in **biological systems**, particularly on the basis of biomechanical research. How does this approach correspond to the laws, methods, and techniques of the Theory of Inventive Problem Solving?

At present, many interesting and effective inventions originate from discoveries involving particular elements and mechanisms found in living systems, which inspire inventors to develop new technical solutions capable of addressing unconventional problems through unconventional methods and approaches.

When analyzed and forecast using the methodology and analytical techniques of TRIZ, as well as through **technological**

and dialectical synthesis, this phenomenon may provide practical pathways toward effective application in innovation processes, particularly in the fields of **biotechnology and genetic engineering**.

An undeniable advantage of the Theory of Inventive Problem Solving is its attempt to apply **dialectical approaches based on the identification and resolution of contradictions** to inventive problem solving.

For this purpose, TRIZ introduced a specialized algorithm – the **Algorithm for Inventive Problem Solving (ARIZ)** – consisting of a sequence of logical procedures designed to represent an inventive problem in terms of contradictions and to provide a set of recommendations for resolving them.

Furthermore, publications on the Theory of Inventive Problem Solving have traditionally contained numerous interesting examples and problems that possess considerable educational and cognitive value in their own right.

Today, however, largely due to the use of **artificial intelligence and artificial neural networks**, the processes of selecting and making decisions have accelerated dramatically. This factor also requires a substantial acceleration of related and interdependent decision-making processes.

The increasing speed of decision-making leaves significantly less time and opportunity for a qualified assessment of the correctness and sufficiency of decisions according to conventional established procedures. This creates a need for **specialized algorithms that take into account new and non-obvious solutions and, collectively, ensure the most comprehensive and rapid response to errors arising during the development of innovative projects**, particularly projects involving inventions that correspond to current technological conditions and requirements.

The start-up **Imagene AI**, in collaboration with **Oracle**, developed an AI model that significantly accelerates the diagnostic process.

The solution proposed by the start-up is based on a **multimodal AI model with 1.1 billion parameters** that integrates biopsy image data, genomic information, and patients' clinical data. The system is capable of analyzing complex tissue patterns and providing actionable recommendations.

The principal achievement of Imagene AI lies in the **speed of diagnosis**. The new platform can identify a high probability of cancer within just a few minutes, whereas conventional molecular sequencing methods may require several weeks. This enables physicians to prescribe personalized treatment considerably faster and apply precise targeted therapies.

The system has already been implemented in **20 medical centers and laboratories worldwide**, including major pharmaceutical companies.

Similarly, virtually any chatbot is already capable of performing certain tasks typically assigned to a junior programmer by generating code in a specified programming language for a given task.

However, a **highly qualified multidisciplinary professional** remains necessary to define the project architecture, supervise and guide the AI in performing assigned tasks, coordinate files and functions within the project, separate the back end from the front end, and oversee the overall integrity and consistency of the project.

Therefore, in order to remain competitive with AI in creative professions, people will need to further develop precisely those skills that, at least for the time being, distinguish humans from machines:

- **the ability to construct abstractions and integrate individual components into a coherent whole, perform testing and error detection, enrich creative work, introduce diversity into creative processes, and perform other complex intellectual tasks.**

Example:

Although chewing gum contains no significant nutritional value, it remains popular throughout the world, and scientists are still unable to fully explain why people find it so appealing.

The history of the popularization of chewing gum dates back to the nineteenth century, although its cultural and psychological effects have only recently become the subject of systematic research.

Chewing gum appeared in the United States in the 1850s, and by the end of the nineteenth century, marketer **William Wrigley** had transformed it into a mass-market consumer product.

He actively promoted chewing gum not only as a means of freshening the breath but also as a way to calm the nerves.

Modern research indicates that chewing may indeed have short-term effects on brain activity.

Although experimental studies have not demonstrated a convincing effect on memory or learning, they have recorded an approximately **10% increase in attention levels** among individuals performing monotonous tasks.

Furthermore, there is compelling evidence that chewing may help reduce stress levels.

In controlled experiments, participants who were given chewing gum before public speaking or testing demonstrated lower levels of anxiety and subjectively reported feeling less tense than participants who were not given chewing gum.

Nevertheless, researchers emphasize that the mechanisms underlying these effects remain unclear.

Some theories associate the potential benefits of chewing with increased blood flow to the brain or activation of facial muscles, which may help maintain attention.

Other theories suggest that the rhythmic movement of the jaw acts as a form of repetitive motion that may help individuals maintain concentration.

Ultimately, the reasons underlying the appeal of chewing gum remain an open question.

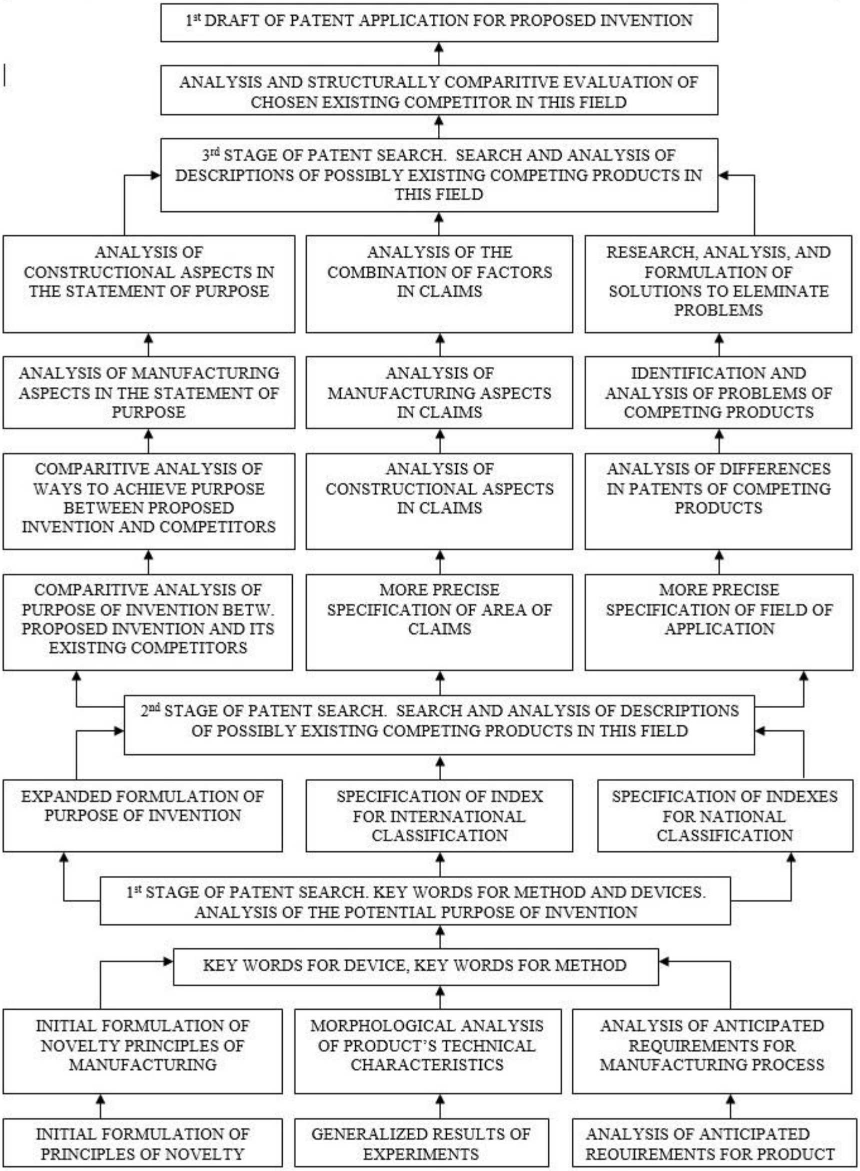
Researchers continue to investigate how the act of chewing affects the brain and why it may alleviate stress or improve concentration; however, no definitive explanation has yet been established.

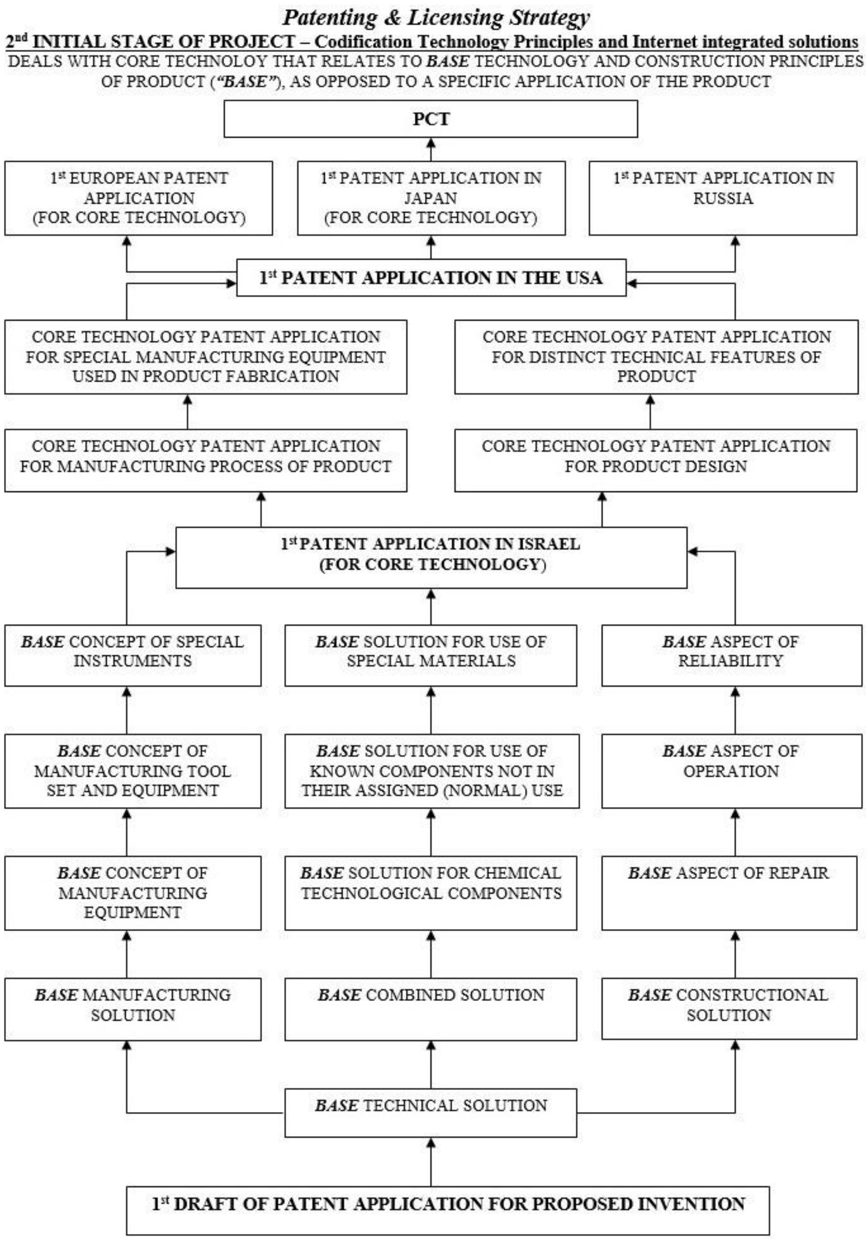
It is possible that the combination of physiological responses and culturally established habits accounts for the continuing popularity of chewing gum despite its lack of significant nutritional value.

Laws and Practices Governing the Comprehensive Development of Integrated Technical Systems and Super-Systems Under Conditions Involving the Application of Quantum Computers and Their Simplified Modifications in Combination with Embedded Elements of Artificial Intelligence and Artificial Neural Networks

Patenting & Licensing Strategy

1st INITIAL STAGE OF PROJECT - NEW INTERNET TECHNOLOGY PRINCIPLES (RESEARCH)

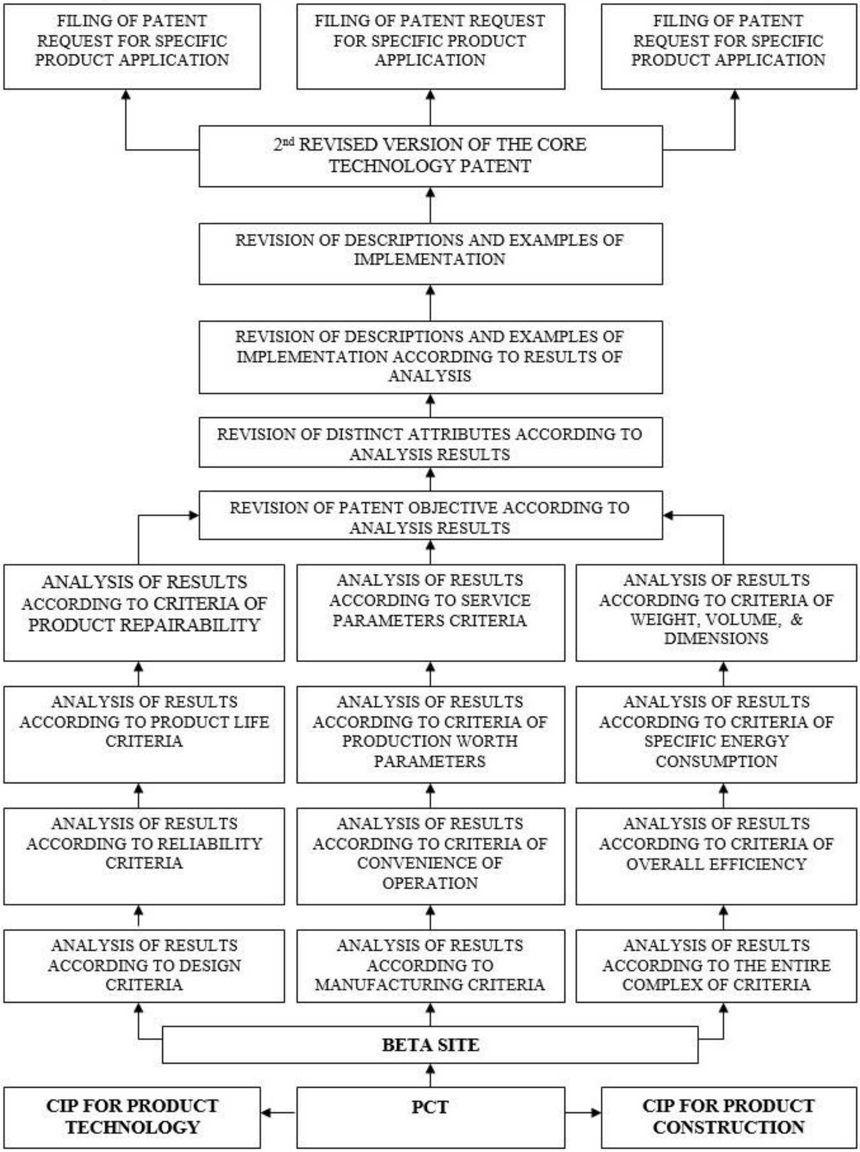



Patenting & Licensing Strategy
2nd INITIAL STAGE OF PROJECT – Codification Technology Principles and Internet integrated solutions
DEALS WITH CORE TECHNOLOY THAT RELATES TO BASE TECHNOLOGY AND CONSTRUCTION PRINCIPLES OF PRODUCT ("BASE"), AS OPPOSED TO A SPECIFIC APPLICATION OF THE PRODUCT
PCT
1st EUROPEAN PATENT APPLICATION (FOR CORE TECHNOLOGY)
1st PATENT APPLICATION IN JAPAN (FOR CORE TECHNOLOGY)
1st PATENT APPLICATION IN RUSSIA
1st PATENT APPLICATION IN THE USA
CORE TECHNOLOGY PATENT APPLICATION FOR SPECIAL MANUFACTURING EQUIPMENT USED IN PRODUCT FABRICATION
CORE TECHNOLOGY PATENT APPLICATION FOR DISTINCT TECHNICAL FEATURES OF PRODUCT
CORE TECHNOLOGY PATENT APPLICATION FOR MANUFACTURING PROCESS OF PRODUCT
CORE TECHNOLOGY PATENT APPLICATION FOR PRODUCT DESIGN
1st PATENT APPLICATION IN ISRAEL (FOR CORE TECHNOLOGY)
BASE CONCEPT OF SPECIAL INSTRUMENTS
BASE SOLUTION FOR USE OF SPECIAL MATERIALS
BASE ASPECT OF RELIABILITY
BASE CONCEPT OF MANUFACTURING TOOL SET AND EQUIPMENT
BASE SOLUTION FOR USE OF KNOWN COMPONENTS NOT IN THEIR ASSIGNED (NORMAL) USE
BASE ASPECT OF OPERATION
BASE CONCEPT OF MANUFACTURING EQUIPMENT
BASE SOLUTION FOR CHEMICAL TECHNOLOGICAL COMPONENTS
BASE ASPECT OF REPAIR
BASE MANUFACTURING SOLUTION
BASE COMBINED SOLUTION
BASE CONSTRUCTIONAL SOLUTION
BASE TECHNICAL SOLUTION
1st DRAFT OF PATENT APPLICATION FOR PROPOSED INVENTION

Patenting & Licensing Strategy

Codification Technology Principles, Coder-Encoder system and Internet solutions and interfaces

3rd INITIAL STAGE OF PROJECT (RELATING TO SPECIFIC APPLICATION)



In connection with the key factor determining the effectiveness of innovative initiatives and the appropriate selection of **patent and licensing strategies** for the development of innovative projects characterized by a high degree of global novelty in their technical and software solutions, investors and managers of new – or, one might say, **pioneering** – projects face limitations associated with the insufficient processing speed and analytical depth of instantaneous information processing when modeling complex processes using modern computers.

The following algorithms are arranged **sequentially in accordance with the stages of the innovation process.**

The algorithms cover all typical stages and phases of project development.

Information regarding the successful testing of a **quantum computer developed by Google** has provided well-founded grounds for optimism regarding further progress in this field.

According to the generally accepted definition and available fundamental information:

A **quantum computer** is a computing device that utilizes the phenomena of quantum mechanics to transmit and process data.

Unlike a conventional computer, which operates with bits capable of assuming a value of either 0 or 1, a quantum computer operates with **qubits**, which can represent combinations of the states 0 and 1 simultaneously.

In theory, this makes it possible to process multiple possible states of systems at different hierarchical levels – including both **super-systems and subsystems** – simultaneously, thereby providing the potential for substantial computational advantages over conventional computers.

Furthermore, the current lack of analytical tools of this kind significantly increases the cost component of innovative project budgets, since considerable resources must be allocated to computer modeling, high-speed evaluation of multiple alternatives, and analytical assessment of their feasibility and various aspects of their effectiveness.

A correct or incorrect formulation of a project's objectives and goals, particularly in the absence of step-by-step modeling, may lead to uncertainty regarding a fundamental question:

Is it possible to reliably protect the resulting technical solution against unauthorized copying?

Finding answers to this and numerous other questions is becoming an essential component of the dialectical process of developing strategies for innovative commercial projects, as well as ensuring the reliable patenting and licensing of inventions created throughout all stages and phases of project implementation and development.

From the perspective of an investor or project manager, an analytical assessment of project development requires a clear understanding of the current situation and analytical modeling based on the following framework:

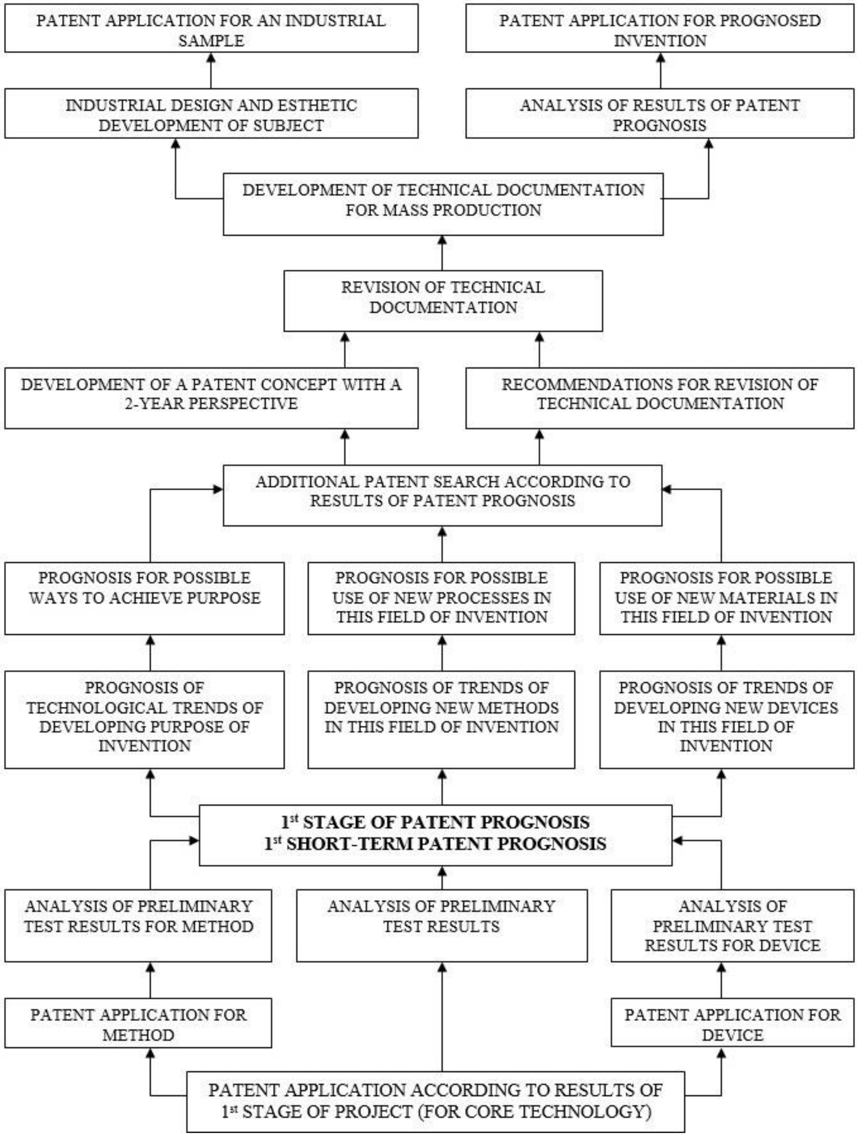
How can the correct or incorrect formulation of an inventive problem affect the commercialization of the resulting invention?

Patenting & Licensing Strategy

STAGES: DETAIL DESIGN FOR MASS PRODUCTION of CODIFICATION TECHNOLOGY PRINCIPLES and CODER-ENCODER systems FOR Internet solutions , - COMPONENTS

PRELIMINARY TESTING

DOCUMENTATION FOR MASS PRODUCTION



Gradually, the algorithm tracks the transition to the final phase of the project.

THE FOLLOWING SEQUENCE OF ORGANIZATIONAL AND TECHNICAL STAGES IS PROPOSED:

1. The project initiator or originator of the idea secures an initial private or other investor providing funding of at least USD50,000.
2. The parties approach a technology incubator (through the intermediary of a U.S. or Israeli company), where the project is established under certain standard terms and conditions developed by the technology incubator and coordinated with and approved by the Chief Scientist of the Israeli Ministry of Industry and Trade.
3. The Israeli technology incubator commissions the intermediary company, also under standard terms and conditions, to perform all necessary work required for the initial assessment of the feasibility of the idea and its subsequent patent protection.
4. The intermediary company submits all relevant materials to the technology incubator, which pays the intermediary company a specified amount from the initial investment funds.
5. Depending on the degree of success demonstrated by the project during its analysis and evaluation by the technology incubator or another competent organization, the technology incubator offers the authors and their initial investors several options for the project's further development.
6. If all parties agree and the technical level of the project permits further development, a project presentation is prepared for the Board of Directors of the Israeli technology

incubator. The Board of Directors determines the options for further advancement of the project and, provided that the project satisfies the principal technical and commercial requirements, makes a decision to establish an innovative company within the technology incubator.

7. The intermediary company's compensation for all preparatory work and technical evaluation of the project consists of an equity interest in the company established within the Israeli technology incubator, as well as payment from the budget of the newly established company for all work performed by the intermediary company in preparing the project for evaluation by the Israeli technology incubator, translating project materials into Hebrew, and carrying out other related activities.

The six algorithms presented above make it possible to monitor the progress of an innovative project, including projects that incorporate elements of **artificial intelligence and artificial neural networks**.

However, given the current state of technological development, an important question arises: **if a contradiction, in its classical sense, does not actually exist, how can a non-existent contradiction be overcome?**

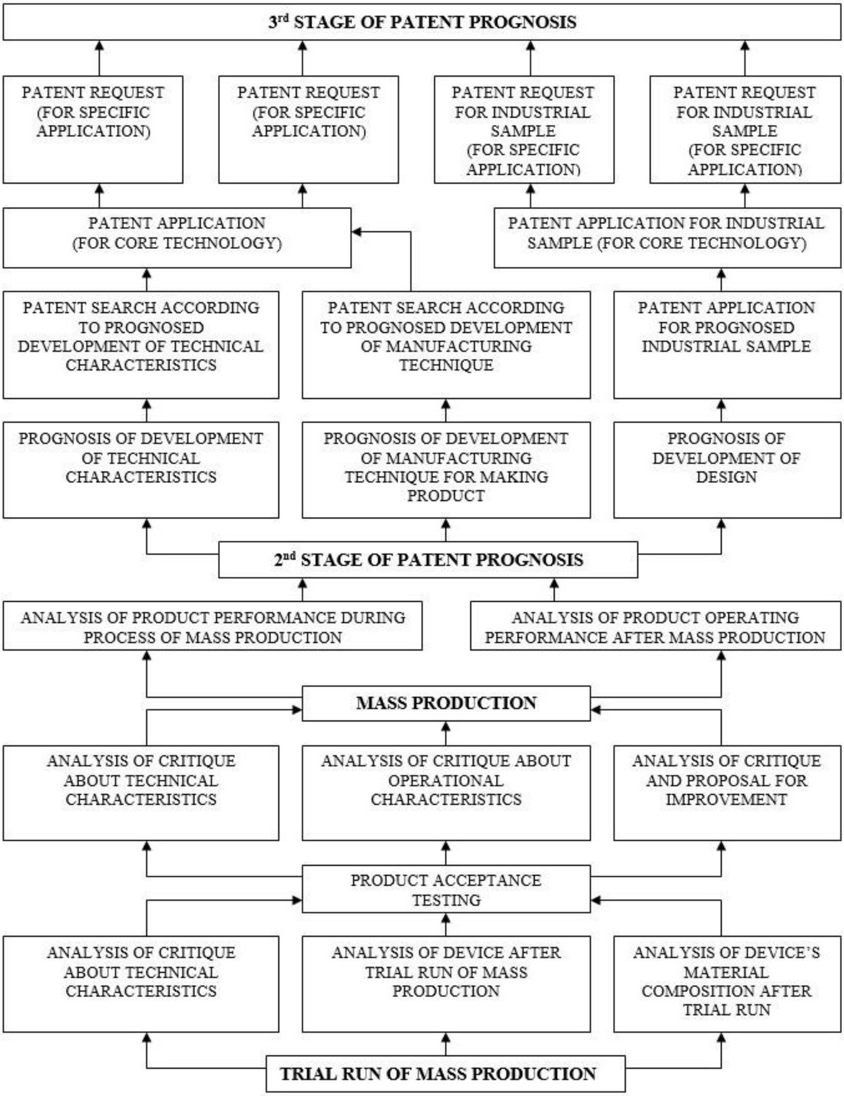
How can innovative technologies be developed using the methods and techniques of the **Theory of Inventive Problem Solving (TRIZ)** while simultaneously incorporating new, effective, and practically validated approaches?

Even apart from this issue, TRIZ has historically contained a number of significant limitations that, apparently, contributed both to the stagnation of its further development after the death of its founder and to considerable difficulties in its practical application.

Patenting & Licensing Strategy

Codification Technology Principles , Coder-encoder system and Internet new solutions and interfaces

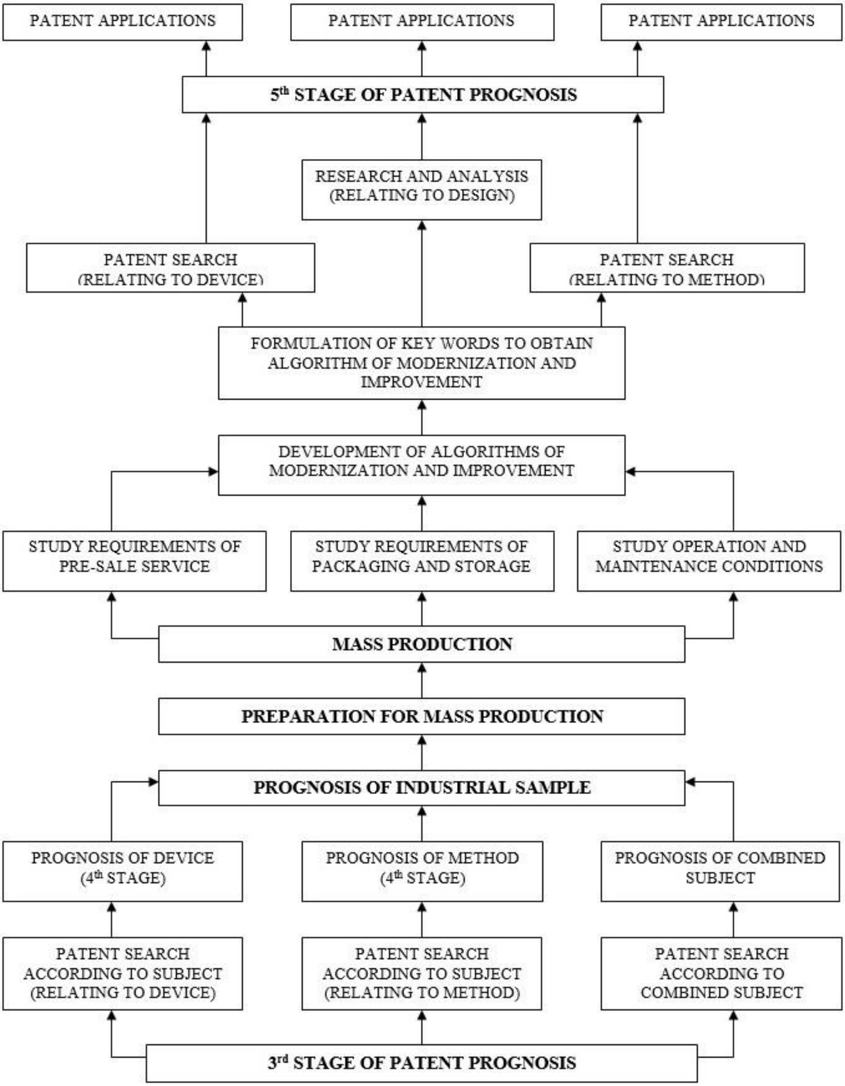
STAGES: **TRIAL RUN OF MASS PRODUCTION**
PRODUCT ACCEPTANCE TESTING
FULL SCALE MASS PRODUCTION



Patenting & Licensing Strategy

CODIFICATION TECHNOLOGY PRINCIPLES in Internet solutions, programs and interfaces

STAGES: **MASS PRODUCTION**
ACTIVE MARKETING PHASE
PRODUCT IMPROVEMENT



What, then, were these limitations?

Within TRIZ, an attempt was made to formulate the **laws governing the evolution of technical systems**, which were intended to serve as the foundation both for the Theory of Inventive Problem Solving itself and for a general methodology of problem solving, including the preparation of a **Freedom to Operate Opinion**.

However, most of the principles formulated as “laws” cannot, strictly speaking, be regarded as laws in the full scientific sense.

It would be more appropriate to characterize them as **patterns or regularities in the evolution of technology**, and even then as incomplete ones.

For this reason, a coherent problem-solving methodology genuinely based on the laws of technical-system evolution was never fully developed.

The formulated laws were used primarily as methodological explanations for the examples of inventions presented in TRIZ literature.

At the same time, factors relating to **commercial feasibility** were almost entirely excluded, and insufficient attention was given to the influence of such factors on the application of continuously evolving principles governing the development of technical systems. Yet these factors are essential when modernizing, optimizing, and modifying a technical object in ways that may enable an invention to evolve into a commercially viable and market-demanded innovative product.

Recent patent disputes involving some of the world’s largest technology companies demonstrate that the laws governing the evolution of technical systems as formulated within classical TRIZ are unable to reflect the full diversity of tasks, functions, characteristics, and interactions inherent in modern multifunctional technological objects.

Taking into account the emergence of new and continuously developing factors that characterize an innovative object as an **integrated system**, these laws should therefore be reformulated and connected with the principles governing the development of commercial structures and the commercialization of innovative ideas.

The dialectical approach based on the analysis of contradictions, which formed the basis of the principal problem-solving instrument represented by the Algorithm for Inventive Problem Solving (ARIZ), was subsequently distorted through the introduction of new concepts such as the “technical contradiction” and the “physical contradiction.”

These concepts altered the original meaning of the dialectical contradiction as formulated in dialectical logic and, in practical terms, created difficulties in identifying contradictions when ARIZ was applied to real inventive problems.

This issue requires particular attention:

What should actually be regarded as a real inventive problem?

How can the correct or incorrect formulation of an inventive problem affect the commercialization of the resulting invention?

Is it possible to reliably protect the resulting technical solution against unauthorized copying?

The search for answers to these and many other questions is becoming an essential component of the modern dialectical process of developing patent and licensing strategies for inventions, including within the framework of preparing a Freedom to Operate Opinion.

Naturally, the content and structure of such documentation can only be considered illustrative. For each individual project, depending on its technological characteristics, conditions of implementation and market introduction, as well as the requirements of potential investors, the list and scope of the relevant documents may vary substantially.

Projects in the fields of biotechnology and genetic engineering deserve particular attention. Such projects will most likely require a specialized combination of expert, technological, regulatory, and commercial analysis.

Figure 4. An Artificial Intelligence-Enabled Robot at Ford

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