MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
KYIV NATIONAL UNIVERSITY
OF TECHNOLOGIES AND DESIGN

Borys Zlotenko

SCIENTIFIC RESEARCH AND INTELLECTUAL PROPERTY

Textbook

Recommended by the Academic Council
of Kyiv National University of Technologies and Design
for students of all specialties

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Рецензенти:

Березненко С. П. – д-р техн. наук, проф., професор кафедри дизайну та індустрії моди Східноукраїнського університету ім. Володимира Даля;

Защепкіна Н. М., – д-р техн. наук, проф., професор кафедри інформаційно-вимірювальних технологій Національного технічного університету України «Київський політехнічний інститут імені Ігоря Сікорського»;

Залюбовський М. Г. – д-р техн. наук, доц., директор Інженерно-технологічного інституту Відкритого міжнародного університету розвитку людини «Україна».

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The textbook “Scientific research and intellectual property” is suggested for students of all specialties of the second (master's) level of education and is aimed at developing competencies that ensure readiness for professional activity in the fields of scientific research and intellectual property.

The textbook provides detailed information on modern methods of scientific research, conducting and processing experimental results, filing applications for patents and trademarks for goods and services. Issues related to the publication of scientific research results, preparation and defense of qualification work, as well as the acquisition, management and protection of intellectual property rights are considered.

This textbook can also be useful for graduate students, young scientists and specialists in solving practical problems in scientific, innovative and publishing activities.

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INTRODUCTION

Modern global economy is characterized by the widespread and rapid implementation of the results of scientific research in the creation of new technologies, machines and devices, means of communication and other complex systems and products. In this sircumstances the demand for highly qualified professionals arises, that posess knowledge of: methods of conducting theoretical and experimental scientific research; principles of working with literary sources; delivering oral and written presentations on the results of scientific research; basics of intellectual property rights.

Sush professionals are expected to be able to: choose areas of scientific research; conduct a search and process scientific information; apply methods of processing scientific research and experimental results; use observation, interviewing, and experimenting skills to obtain the necessary information; orally and in writing present research results; formulate the goal and objectives of research; search and analyze information from scientific sources; plan and conduct experimental and theoretical research; possess methods of analyzing their results; create intellectual property objects.

They should be able to demonstrate: necessary theoretical and practical knowledge of methods of conducting scientific research; the ability to determine priority areas of development of scientific research, choose methods of scientific research adequate to the object of research; ability to use the obtained results of scientific research in practical activities; creative approach to generating objects of intellectual property.

This textbook is aimed to help students aquire: skills in analyzing sources of scientific information; formulating the goals and objectives of research, determining and conducting necessary research and analyzing their results; independently using the knowledge obtained and implementing them in production or the educational process; skills in preparing applications for obtaining intellectual property protection documents.

1. THE CONCEPT OF SCIENCE AND SCIENTIFIC RESEARCH

1.1. Science as a sphere of human activity

Science is a sphere of human activity that is constantly developing, aimed at creating new knowledge about nature, society and thinking for the purpose of their practical application [1, 3, 4].

Science arose at the moment of awareness of ignorance, which caused the objective need to acquire knowledge.

Knowledge is the result of exploration of reality, proven by practice, its adequate reflection in human consciousness.

The process of movement of human thought from ignorance to knowledge is called cognition, which is based on the reflection and reproduction in human consciousness of objective reality. In the process of cognition, a person masters the world, transforms it to improve life conditions.

Scientific cognition is a study that is characterized by its special goals, objectives, methods of obtaining and verifying new knowledge in order to master the forces of nature, learn the laws of the development of society, influence the course of historical events [5].

The path of the cognition process is from live observation to abstract thinking and from it to practice. Practice is the main driving force of cognition; it gives science factual material that requires theoretical understanding. Cognition grows out of practice, but then it is directed towards the practical mastery of reality. Practice is both the beginning and the end of any cognitive process.

The cognitive process begins with the accumulation of facts. Without systematization and generalization, without a logical awareness of facts, no science can exist. But individual facts are not science yet. Facts become an integral part of scientific knowledge when they appear in a systematized, generalized form.

Functions of science:

- cognitive - satisfying people's needs in knowing the laws of nature, society and thinking;

cultural and educational - the development of culture, the humanization of education and the formation of human intelligence;

- practical and effective - the improvement of production and the system of social relations.

The goal of science is to learn the laws of the development of nature and society, their influence on nature on the basis of the use of knowledge with the aim of obtaining results useful to society. Until the relevant laws are discovered, a person can only describe phenomena, collect, systematize facts, but cannot explain and predict anything.

The tasks of science:

- collection and generalization of facts (statement);

- explanation of the external relationships of phenomena (interpretation);

- explanation of the essence of physical phenomena, their internal relationships and contradictions (modeling);

- forecasting of processes and phenomena;

- establishment of possible forms and directions of practical use of the knowledge obtained.

Science is characterized by the following main features:

- the presence of systematized knowledge (scientific ideas, theories, concepts, laws, patterns, principles, hypotheses, basic concepts, facts);

- the presence of a scientific problem, object and subject of research;

- the practical value of both the phenomenon (process) being studied and the knowledge about it.

1.2. The concept of scientific knowledge

A scientific idea is an intuitive explanation of a phenomenon (process) without strong argumentation, without awareness of the entire set of connections on the basis of which a conclusion is made. It is based on existing knowledge, but reveals previously unnoticed patterns. Science provides for two types of ideas -

constructive and destructive, that is, those that have and do not have significance for science and practice. An idea finds its specific materialization in a hypothesis [10].

Hypothesis is a scientific assumption put forward to explain any phenomena (processes) or reasons that determine a given consequence. A scientific theory contains a hypothesis as a starting point for the search for truth, which helps to significantly save time and effort, to purposefully collect and group facts. Hypotheses are probabilistic in nature and go through three stages in their development:

- accumulation of factual material and the putting forward of assumptions based on it;

- formation of a hypothesis and argumentation based on assumptions of accepted theory;

- verification of the obtained results in practice and clarification of the hypothesis.

Law is an internal essential connection of phenomena, processes and features of material objects. Scientific laws exist objectively, independently of the consciousness of people. They are not created by people, but are only discovered, formulated in such a way as to reflect the realities of the objective world and be their exact reflection. The law must be logically proven, then it is recognized as science. For this, science uses judgments.

Judgment is an opinion in which something is affirmed or denied by means of a connection of concepts.

Scientific theory is the highest form of organization of theoretical knowledge, which is a set of basic elements of the theory (confirmed hypotheses, concepts, judgments) in the relevant field, united into a single system. Science can be considered as a set of theories. The criterion for the truth of a theory is its practical confirmation. The following requirements are put forward for a new theory:

- adequacy of the scientific theory to the object being described;

- the ability to replace experimental studies with theoretical ones;

- completeness of the description of a certain phenomenon of reality;

- the ability to explain the relationships between various components within the framework of this theory;

- internal consistency of the theory and its correspondence to experimental data.

The structure of the theory is formed by scientific concepts, principles, axioms, propositions, facts.

A scientific concept is a system of views, theoretical propositions, basic thoughts regarding the object of research, which are united by a certain main idea.

Principles are the initial provisions of any branch of science. A principle is a rule that arose as a result of objectively meaningful experience, the initial form of systematization of knowledge.

A concept is a thought expressed in a generalized form that defines the essential and necessary features of objects and phenomena and their relationships. If a concept has entered scientific circulation, it is denoted by one word or a set of words - terms [10].

1.3. General methodology of scientific creativity

Methodology (from the Greek methodos – way, method and logos – science, knowledge) – the doctrine of the rules of thinking when creating a theory of science. Methodology is considered as the doctrine of scientific methods of cognition, or as a system of scientific principles on the basis of which research is based and the selection of cognitive means, methods and techniques of research is carried out.

The main functions of methodology:

- determination of methods of obtaining scientific knowledge that reflect dynamic processes and phenomena;

- determination of a certain path by which the scientific research goal is achieved;

- ensuring the comprehensiveness of obtaining information about the process or phenomenon being studied;

- introduction of new information into the fund of the theory of science;

- clarification, enrichment, systematization of terms and concepts in science;

- creation of a system of scientific information based on objective facts and a logical-analytical tool of scientific knowledge.

The main goal of the methodology of science is the study and analysis of methods, means, techniques, with the help of which new knowledge is obtained in science both at the empirical and theoretical levels of knowledge. Methodology is a scheme, a plan for solving the tasks set in scientific research.

The methodology of scientific research is a set of specific forms, methods and means of theoretical and applied research in a certain field of knowledge (the direction of the researcher's professional activity). The methodology is a systematic set of research techniques, a system of rules for using methods, techniques and research techniques. If this set is strictly consistent from the beginning of the research to obtaining results, then it is called an algorithm.

The scientific method is a system of rules and prescriptions that direct human activity (production, political, cultural, scientific, educational, etc.) to achieve the set goal. The choice of research methods is dictated by the nature of the material, conditions and purpose of a particular study.

The following requirements apply to scientific methods:

- clarity, i.e., general intelligibility of the method;

- focus, i.e., subordination of the method to achieving a certain goal, solving certain specific tasks;

- determinism – strict consistency of using the method, in other words – its maximum algorithmization;

- effectiveness – the ability of the method to ensure the achievement of a certain goal;

- reliability – the ability of the method to provide with a high probability obtaining the desired result;

- economical efficiency - the ability of the method to achieve certain results with the least expenditure of resources and time.

There is another very important requirement for the method of knowledge - the correspondence of the method to the object of research and the level of knowledge, which requires the use of specific scientific methods of knowledge. However, different sciences, despite the differences, have much in common, since the essence of all sciences is the reflection of the laws of the material and spiritual world, they are all determined on the basis of experiments, use the same laws of thinking and serve the interests of society. In this regard, along with special methods, methods are used in scientific research that are common to a large group of scientific disciplines. These are the so-called general scientific methods.

General methods of scientific knowledge are usually divided into three large groups:

1) methods of empirical research (observation, comparison, measurement, experiment);

2) methods used at both the empirical and theoretical levels of research (abstraction, analysis and synthesis, induction and deduction, modeling, etc.);

3) methods of theoretical research (logical, historical, idealization, descent from the abstract to the concrete, etc.).

Empirical research - identification, accurate description and detailed study of various factors of phenomena and processes.

Theoretical research - study and identification of causes, connections and dependencies that allow predicting the course of phenomena and processes.

Analysis of theoretical and experimental research and formulation of conclusions and proposals.

The basis for the joint analysis of theoretical and experimental research is the comparison of the proposed working hypothesis with the experimental observation data.

2. ORGANIZATION OF MODERN SCIENTIFIC RESEARCH

2.1. Scientific institutions and departments

Scientific activity is an intellectual creative activity aimed at acquiring and using new knowledge. It exists in various forms:

1) scientific research activity;

2) scientific organizational activity;

3) scientific information activity;

4) scientific pedagogical activity;

5) scientific auxiliary activity, etc.

Scientific research is purposeful cognition, the results of which appear as a system of concepts, laws, theories.

There are two forms of scientific research - fundamental and applied [2].

Fundamental scientific research is scientific theoretical and (or) experimental activity aimed at obtaining new knowledge about the laws of development and the interconnection of nature, society, and human [3].

Applied scientific research is scientific and technical activity aimed at obtaining and using knowledge for practical purposes.

Scientific research is carried out with the aim of obtaining a scientific result. Scientific result is new knowledge obtained in the process of fundamental or applied scientific research and recorded on scientific information carriers in the form of a scientific report, scientific work, scientific prezentation, report on scientific and research work, monographic research, scientific discovery, etc. Scientific and applied result is a new constructive or technological solution, experimental sample, completed test, which is implemented or can be implemented in public practice. Scientific and applied result may take the form of a report, draft project, design or technological documentation for scientific and technical products, full-scale sample, etc.

The main legislative act regulating scientific activity in Ukraine is the Law of Ukraine “On Scientific and Scientific-Technical Activity”. The law defines the legal, organizational and financial principles of the functioning and development of the scientific and technical sphere, creates conditions for scientific and scientific-technical activity, and ensures the needs of society and the state in technological development. The main goals, directions, principles, forms and methods of state activity in the scientific and technical sphere are determined by the state scientific and technical policy, which is a component of the socio-economic policy of Ukraine.

2.2. Sources of funding for scientific research

State regulation and management in the field of scientific and scientific-technical activity are carried out by: the Verkhovna Rada of Ukraine; the President of Ukraine; the Cabinet of Ministers of Ukraine; ministries, departments and other central executive bodies in the field of scientific and scientific-technical activity; local executive bodies.

In each process of scientific research, the following elements are necessarily required: subject, means and object.

In the general sense, an institute of science can be defined as an organization of people who are connected by certain relations to perform tasks in the field of scientific, scientific-technical, scientific-pedagogical and scientific-organizational activity.

As a single element of the concept of “subject of science” a scientist can be defined sa a person who conducts fundamental and applied scientific research and receives scientific and (or) scientific-technical results.

The development of science and technology is associated with the complication of methods and forms of scientific research, the use of complex equipment.

In modern conditions, large-scale scientific research is carried out by large teams, and the scientist is an active participant in them.

According to the Law of Ukraine "On Scientific and Scientific-Technical Activity", the subjects of scientific and scientific-technical activity are: scientists, researchers, scientific and pedagogical workers, as well as scientific institutions, scientific organizations, higher educational institutions of III-IV levels of accreditation, public organizations in scientific and scientific-technical activity.

State scientific organizations include the National Academy of Sciences of Ukraine (NAS of Ukraine) and sectoral academies of sciences - the Ukrainian Academy of Agrarian Sciences, the Academy of Medical Sciences of Ukraine, the Academy of Pedagogical Sciences of Ukraine, the Academy of Legal Sciences of Ukraine, the Academy of Arts of Ukraine.

Subjects of science can be divided into two groups depending on the purpose of their activities:

– subjects whose activities are aimed at producing new scientific results: research institutes; universities of III - IV levels of accreditation; scientific divisions of production enterprises; scientific schools, societies;

– subjects whose activities are aimed at controlling, evaluating and recognizing the obtained scientific results (specialized scientific councils, the Ministry of Education and Science of Ukraine).

Classification of sciences – is revealing their interrelationships on the basis of certain principles and expressing the relationship of sciences in the form of a logically justified arrangement (or series).

Science is the main form of knowledge of the world and is aimed at identifying the most important aspects and properties of all phenomena of nature, society and thinking. In this regard, all sciences are divided into: natural (physics, chemistry, biology, etc.); social (economic, philological, historical, etc.); thinking (philosophy, logic, psychology, etc.).

There is also an approach to dividing sciences into research (fundamental, theoretical) and applied.

The Ministry of Education and Science of Ukraine has defined the following branches of science, which are the basis of the modern classification of sciences. It is in these branches of science that scientific research is conducted in our country, scientists defend dissertations, after which they are awarded the scientific degree.

Each branch of science involves the creation of a single logically clear system of knowledge about one or another aspect of the surrounding world, knowledge compiled into a system.

No branch of science can be presented as a sum of ready-made conclusions, truths.

Any branch of science develops and moves through contradictions: between new historical material and old theories, between different concepts, points of view, between established research methods and problems.

The interaction of branches of scienc occurs through the exchange of information, the integration of methodological techniques of research, the use of research results, etc.

The implementation of priority areas of development of science and technology is ensured by the development and implementation of state target programs, state orders for scientific and technical products, training of scientific personnel, information and material and technical support of scientific research and scientific and technical developments.

The amounts of funds allocated to the implementation of each of the priority areas of the development of science and technology are annually determined by the Law on the State Budget of Ukraine.

In order to ensure effective management and timely amendments to the implemented scientific and technical policy, adjustment of priority thematic areas of scientific research and scientific and technical developments, tasks of state target programs, state orders, the Cabinet of Ministers of Ukraine organizes systematic monitoring of the implementation of priority areas of science and technology.

The amounts of funds allocated to the implementation of each of the priority areas of science and technology development are annually determined by the Law on the State Budget of Ukraine.

One of the sources of financing for scientific research is a grant. The definition of the term grant is given in several legislative acts. Thus, a grant is financial or other resources provided on a gratuitous and non-refundable basis by the state, legal entities, individuals, including foreign and (or) international organizations for the development of the material and technical base for conducting scientific and scientific and technical activities, conducting specific fundamental and (or) applied scientific research, scientific and technical (experimental) developments, in particular for the remuneration of scientific (scientific and pedagogical) workers within the framework of their snvolvement sn condacting the scientific research, in the areas and on the terms determined by the grant providers.

The Horizon programme aims to bring together all existing European research and innovation initiatives funded through the Framework Programme for Research and Innovation (FP), the Competitiveness and Innovation Framework Programme (CIP) and the European Institute of Innovation and Technology (EIT). Thus, by combining the three separate programs, the research and innovation sector is being brought together.

At the same time, Horizon programme focuses on societal challenges and provides greater access for all companies, universities and institutions in the EU and beyond.

The Erasmus+ EU programme in the field of education/training, youth and sport. For the partner countries of the programme (including Ukraine), it opens up a number of opportunities for students, researchers, higher education staff, youth organisations and other institutions. All these opportunities are funded by the European Union.

The programme operates in three key areas of activity: KA1: Learning mobility. KA2: Collaboration for innovation and exchange of best practices

(Strategic Partnerships, Knowledge Alliances and Capacity Building). KA3: Support for reform.

2.3. Stages of scientific research

Stage – is a logically singled out section of scientific research that has an independent meaning and is the object of planning and financing.

The following main stages of scientific research are recommended:

1) development of technical terms of reference for research;

2) selection of the direction of research;

3) conducting theoretical and experimental research;

4) generalization and evaluation of research results

The main requirements for the research being conducted are established in the technical terms of reference, which indicate: the purpose and objectives of the research; the main stages of research; the dates of the start and end of research; the final result of the research; the procedure for accepting the work; a technical and economic justification for the feasibility of performing research.

A scientific problem is a question that requires a scientific solution; a task for searching for the unknown; a set of new dialectically complex theoretical or practical questions that contradict existing knowledge or applied methods in a specific science and require a solution through scientific research.

A problem in science is a controversial situation that requires its own solution. This situation most often arises as a result of the discovery of new facts that clearly do not fit within the limits of previous theoretical ideas, that is, when none of the theories can explain the newly discovered facts.

The solution to the problem is not contained in existing knowledge and cannot be obtained by transforming existing scientific information.

Since a scientific problem is a set of complex theoretical or practical issues, in the process of scientific research the problem is divided into constituent components – topics.

A theme is a part of a scientific problem that covers one or more research questions. A theme is not just the name of a scientific work, but the intended result of research aimed at solving a specific issue. It is a reflection of the scientific problem in its characteristic features; therefore, the formulation of the topic clarifies the problem, outlines the boundaries of the research, and specifies the main idea. At the same time, the theme is the main planning and accounting unit in the organization of scientific research.

The topicality or relevance of a theme is understood as its significance, that is, the necessity and urgency of its consideration for the needs of the development of the economy of the state, industry, or enterprise.

The main criterion for the relevance of the theme is the possibility of ensuring the greatest effect.

At the stage of forming the theme of scientific research, its name is determined – a meaningful title. The name of the scientific work is formulated using the following rule: the name of the topic of scientific work should reflect the direction (problem) of the research (goal or enlarged task), field of use, object of research, subject of research.

In the methodology of scientific research, the concepts of “object” and “subject” of knowledge are distinguished.

The object of knowledge (process or phenomenon) is usually called what the cognitive activity of the researcher is aimed at, the process or phenomenon that generates the problem situation selected for research. Accordingly, this is the set of connections, relations and properties that exists objectively in theory and practice and serves as a source of information necessary for the researcher. Only those connections, relations, properties of a real object that are included in the process of knowledge are defined as the object of knowledge. Any object of research is a certain set of properties and relationships that exists independently of the researcher, but is reflected by him or her.

The subject of knowledge is the properties of the object studied for a specific purpose.

The object and the subject of knowledge are not the same thing, although they are often wrongly identified.

When determining the object of research, it is necessary to answer the question: what is being considered? And the subject means the aspect of consideration, gives an idea of how the object is considered in this particular study, by this researcher.

The purpose of the study is the expected final result, which determines the general direction and logic of the study (theoretical or applied).

The purpose is determined by the answer to the question: “Why is the research being conducted?” A clear formulation of a specific purpose is one of the most important methodological requirements for a scientific research program. The purpose of the research is to solve a scientific problem by improving the selected field of activity of a specific object.

The set goal must be achieved, and at the final stage of the research it is necessary to check whether the conclusions correspond to the set goal. The purpose is formulated concisely; it must accurately express the main thing that the researcher is trying to do.

The purpose is specified and developed in the research tasks. The research tasks are determined in order to more specifically implement its goal.

Research methods are a way of acquiring reliable scientific knowledge, abilities and practical skills in various fields of activity. A list of research methods used to achieve the goal set is given in the work.

They should be listed not in isolation from the content of the work, but briefly and meaningfully defining what exactly was studied by one or another method. This will make it possible to verify the logic and acceptability of choosing these methods.

Elements of scientific novelty must be of a general nature and contain their own conclusions and recommendations on the subject of research.

Depending on the nature and essence of the research conducted, the scientific novelty of the master's or doctoral qualificaton work can be formulated

as follows: the presence of a comprehensive, general theoretical approach to studying the object of research and the development by the author of original methods for solving a problem related to the subject of research.

Depending on the educational master's or doctoral programs, the qualificaton work must contain a project part with the development of specific proposals and determination of the effectiveness of their implementation.

The scientific novelty of the work is determined based on the result of the research obtained for the first time or as a development of previously formed scientific approaches. Practical value is information about the practical implementation of the results obtained or recommendations for their use.

The practical significance of the work must contain a brief summary of new scientific solutions proposed by the master's or doctoral student personally, the results of independently conducted research that can be implemented in the activities of enterprises, institutions, and organizations.

The approbation of the results of the work should include the titles of articles, abstracts of reports prepared based on the materials of the work, and reports at scientific and practical conferences.

An approximate order of theoretical and experimental research includes:

1. Advancing a hypothesis;
2. Developing theoretical provisions;
3. Conducting experiments;
4. Comparison of experiments with theory;
5. Analysis of discrepancies;
6. Clarification of theoretical provisions, research models and conclusions;
7. Additional experiments (if necessary);
8. Transformation of the hypothesis into a theory;
9. Formulation of conclusions, preparation of a scientific and technical report;
10. Reviewing.

3. COMPONENTS OF SCIENTIFIC RESEARCH

3.1. Theoretical research

Theoretical research includes the creation and use of physical and mathematical models.

A physical model is a model that allows us to visually represent processes occurring in nature.

A mathematical model of a modeling object is a system of mathematical elements (numbers, variables, equations, inequalities, matrices, graphs, etc.) and relationships between them, which adequately reflects some properties of the object that are essential from the researcher's point of view for solving a particular problem [6].

A regression model is a function of an independent variable and coefficients with random variables included.

It is believed that the dependent variable is described by the sum of the values of a certain model and independent variables. Let us set the task of finding the most probable values of the unknown coefficients based on the results of observations.

Objects under investigatoin and models are classifitd according to the similarity of the nature of processes.

Dynamic objects correspond to mathematical models of dynamics, which are one or more (systems) of ordinary differential equations (in time) of the first and higher orders.

These differential equations are compiled on the basis of physical laws that allow describing the transition of an object from one state of rest to another under the influence of external factors or changes in internal parameters and are a universal type of description of the dynamic characteristics of an object, which depends both on the properties of the object and on the law of change of input influences.

Along with dynamics models, mathematical models of statics are used in the study of objects (important: there are no static objects in nature), which allow describing the relationships between input and output variables in a steady state of equilibrium. In essence, these are nothing more than static characteristics known from school.

Formally, a mathematical model of statics can be obtained from a dynamics model by equating all time derivatives to zero.

Linear and nonlinear objects and models, linearization. If the dependence of the output value of an object on the input in a steady state (static characteristic) has a linear form (i.e. can be graphically represented by a straight line, then such an object is called linear and can be represented by a linear static or dynamic model.

Much more accurate methods of linearization are analytical methods, among which the most widespread is the method of linearization by expansion in a Taylor series in the vicinity of a point corresponding to the operating mode of the object, with subsequent rejection of the expansion terms of the second and higher orders of smallness.

To use analytical methods of linearization, it is necessary to have mathematical expressions that describe static characteristics.

Stationary and non-stationary models and objects. If the reaction of an object (the nature of the change in the output variable) to any given type of input influence does not depend on the moment of the start of the action, but only on the time interval of its action, then such an object is called stationary. In practice, this means that at whatever point in time (after an hour, month, year) we apply some fixed signal to the input of the object, the nature of the change in the output signal must remain unchanged.

Most objects of nature (especially objects of chemical technology) are non-stationary in their physical essence. This is due to the fact that over time, all or some parameters of the object change with greater or lesser intensity (for example, due to the appearance of scale, the thermal conductivity coefficient of the heat

exchanger tubes decreases, the catalyst “ages”, etc.). However, the rate of change of parameters can be different.

If the parameters of the object change insignificantly during the studied time interval, so that this change can be neglected, then such an object can be considered stationary. Such objects and the corresponding models are called quasi-stationary.

The non-stationarity of the object in the mathematical model is taken into account by the dependence of the parameters (coefficients) of the model on time. The complexity of solving non-stationary mathematical models is significantly higher and requires the use of special methods.

Deterministic and stochastic objects and models. In the absence or presence of insignificant disturbances in the objects, the influence of input variables on the output can be determined unambiguously.

If the disturbances are large and introduce significant distortions into the nature of the relationships in the object, then even with a known nature of the change in the control variables, one cannot speak of their exact influence on the outputs, but only of some permissible influence, since such disturbances, as a rule, are random.

The presence and degree of influence of random disturbances in objects are determined by the essence (nature) of the processes occurring in them. Depending on the degree of influence of disturbances, all processes (objects) are usually divided into deterministic and stochastic.

Deterministic are objects in which the determining quantities change continuously according to quite certain patterns and have the property of repeatability. In this case, it is assumed that the values of the output quantities that characterize the process (state variables) are uniquely determined by the setting of the input control influences.

Stochastic (random, probabilistic) are objects in which the change of at least one of the determining quantities occurs randomly. In this case, the values of the

output variables are in a probabilistic dependence on the input variables and are not uniquely determined by them.

In principle, any technical process is inherent in elements of random fluctuations.

For example, all processes occurring in open devices are affected by atmospheric pressure, the fluctuations of which are random, but in many cases this influence can be neglected and the object can be considered deterministic. However, if we consider a military operation as an object of modeling, then the factor of randomness can no longer be neglected.

If the object is considered stochastic, then two situations can arise:

• for a random variable acting on the object, the distribution law is known (often this is a normal law), and then it becomes possible to replace the random variable with its mathematical expectation, which allows us to consider the object as deterministic;

• if the sources and characteristics of random variables acting on the object are not known, then special analysis methods must be used to study and model such objects.

To build a mathematical model of a stochastic object, the mathematical apparatus of probability theory is used, and the resulting mathematical model is called stochastic. Otherwise, the mathematical model is deterministic.

Continuous and discrete objects and models. If the output variable of the object is determined for any point in time, then such an object and the corresponding mathematical model are called continuous. In discrete objects and their corresponding mathematical models, the output variable is determined (known) only at some fixed points in time.

Continuous mathematical models describe only continuous objects and processes, while discrete models are used to describe both continuous and discrete objects.

To describe an object using a discrete mathematical model, the so-called finite-difference equations (analogs of continuous differential equations) are used.

Objects and models with lumped and distributed parameters. If the output variables of an object change in time equally at all its points (they are said to be distributed) or a certain unevenness with an error sufficient for practice can be neglected, then such objects and their corresponding mathematical models are called objects and mathematical models with lumped parameters. For the mathematical description of such objects, only ordinary differential equations (continuous or finite-difference) are used.

If the values of the output variables at different points of the object differ significantly and this is important from the point of view of modeling, then such objects and their corresponding mathematical models are called objects and mathematical models with distributed parameters. For their mathematical description, partial differential equations are used. In objects with distributed parameters, the change in the output variable can occur both in coordinates and in time.

Mathematical models at the micro level of the production process reflect the physical processes that occur, for example, when cutting metals. They describe processes at the transition (passage) level.

Mathematical models at the macro level of the production process describe technological processes. Mathematical models at the meta level of the production process describe technological systems (sites, workshops, the enterprise as a whole).

Structural mathematical models are intended. to reflect the structural properties of objects. For example, in CAD TP, structural and logical models are used to represent the structure of the technological process.

Functional mathematical models are intended to reflect information, physical, time processes that occur in operating equipment, during the execution of technological processes, etc.

Analytical mathematical models are mathematical expressions of output parameters as functions of input and internal parameters.

Analytical modeling is based on an indirect description of an object using a set of mathematical formulas. The language of analytical description contains the following main groups of elements: criteria, unknowns, data, mathematical operations, constraints.

The most significant characteristic of analytical models is that the model is not structurally similar to the modeling object. Structural similarity here means the unambiguous correspondence of the elements and relationships of the model to the elements and relationships of the object.

Analytical models include models built on the basis of the apparatus of mathematical programming, correlation, regression analysis.

An analytical model is always a construction that can be analyzed and solved by mathematical means.

Thus, if the apparatus of mathematical programming is used, the model consists of an objective function and a system of constraints on variables. The objective function, as a rule, expresses the characteristic of the object (system) that needs to be calculated or optimized. For example, this may be the productivity of a technological system.

Variables express the technical characteristics of the object (system), constraints - their permissible limit values.

Analytical models are an effective tool for solving problems of optimizing processes occurring in technological systems, as well as optimizing and calculating the characteristics of the technological systems themselves.

An important point is the complexity of a specific analytical model. Often, for real technological systems (automatic lines, flexible production systems), the complexity of their analytical models is so great that obtaining an optimal solution turns out to be very cumbersome from a computational point of view. To increase computational efficiency in this case, various techniques are used. One of them is associated with the breakdown of a large-dimensional problem into subproblems of smaller dimension so that autonomous solutions of subproblems in a certain sequence give a solution to the main problem.

In this case, problems arise in organizing the interaction of subproblems, which are not always simple.

Another technique involves reducing the accuracy of calculations, due to which it is possible to reduce the time for solving the problem.

Algorithmic mathematical models express the relationships between output parameters and input and internal parameters in the form of an algorithm.

Simulation mathematical models are algorithmic models that reflect the development of the process (behavior of the studied object) in time when external influences are imposed on the process (object). For example, these are models of mass service systems given in algorithmic form.

Simulation modeling is based on a direct description of the object. An essential characteristic of such models is the structural similarity of the object and the model.

This means that each element of the object, significant from the point of view of the problem being solved, is assigned a corresponding element of the model. When building a simulation model, the laws of functioning of each element of the object and the relationships between them are described.

Working with a simulation model consists in conducting a simulation experiment.

The process that occurs in the model during the experiment is similar to the process in a real object. Therefore, the study of an object on its simulation model is reduced to the study of the characteristics of the process occurring during the experiment.

An important quality of simulation is the ability to control the time scale. The dynamic process in the simulation model occurs in the so-called system time. System time imitates real time.

In this case, the calculation of system time in the model can be performed in two ways. The first method is to “move” in time with some constant step. The second method is to “move” in time from event to event, while it is assumed that in the time intervals between events no changes occur in the model.

Theoretical mathematical models are created as a result of studying objects (processes) at the theoretical level.

Empirical mathematical models are created as a result of conducting experiments (studying the external manifestations of the properties of an object by measuring its parameters at the input and output) and processing their results using mathematical statistics methods.

Deterministic mathematical models describe the behavior of an object from the standpoint of complete certainty in the present and future. Examples of such models: formulas of physical laws, technological processes of processing parts, etc.

Probabilistic mathematical models take into account the influence of random factors on the behavior of an object, that is, they estimate its future from the standpoint of the probability of certain events.

Examples of such models: description of expected queue lengths in mass service systems, expected volumes of production of over-planned products by a production site, dimensional accuracy in a batch of parts taking into account the phenomenon of scattering, etc.

Choosing a method for solving a problem and its argumentation. As already noted, mathematical modeling is reduced to solving a system of equations of a mathematical description of the object of modeling in order to find unknown dependencies of output variables on input (dynamic or static characteristics). To solve this problem, methods are used that can be divided into two large groups: analytical and algorithmic (numerical).

If the method used allows you to obtain a solution in the form of analytical expressions, that is, expressions that use no more than a countable number of arithmetic operations and a transition to the limit, then such a method is referred to as analytical methods.

A special case of analytical expressions are algebraic expressions, which use a finite number of arithmetic operations, exponentiation and root extraction operations.

Very often, an analytical solution can be represented in elementary or special functions: exponential, trigonometric, etc. To obtain the values of these functions, series expansion is used, and depending on the number of retained series terms, the accuracy of the results obtained will be different. Such solution methods are called approximate.

Analytical solution methods are more valuable in that they allow you to study the properties of the modeling object with less computational costs, using traditionally well-developed mathematical methods for analyzing analytical functions.

It is important that the application of analytical methods in most cases is possible without using a computer. In addition, obtaining a solution in an analytical form allows us to study the fundamental properties of an object, its qualitative behavior, and to build new hypotheses about its internal structure. The capabilities of analytical methods depend significantly on the level of development of the relevant sections of mathematics.

Recently, there has been a noticeable surge of interest in analytical methods for solving problems, which is associated with the emergence of a large number of software packages for mathematical symbolic calculations (Matlab, Mathcad, Maple, Mathematica, etc.). The range of problems solved by these packages is very large and is constantly expanding.

The use of such tools not only simplifies the procedure for obtaining a solution, but also facilitates the subsequent analysis of the obtained solution due to advanced visualization tools.

However, the currently existing packages allow us to obtain analytical solutions only for relatively simple mathematical problems.

In most cases, when studying models, it is advisable to use algorithmic approaches, among which it is necessary to distinguish between numerical and simulation ones.

In the numerical approach, the set of mathematical relations is replaced by their finite-dimensional analogue by discretization of the model, that is, a transition

is made from a continuous argument function to a discrete argument function. After that, a computational algorithm is developed, that is, a sequence of arithmetic and logical actions is determined that will allow obtaining a solution in a finite number of steps (using a computer!).

The solution of the discretized problem found, provided that the discretized step is sufficiently small, is taken as an approximate solution to the initial mathematical problem.

If in the numerical approach, a previously obtained system of mathematical relations is subjected to discretization, then in the simulation approach, the object of research itself is divided into separate elements. In this case, the system of mathematical relations for the object-system as a whole is not recorded, but is replaced by some algorithm that models its behavior and takes into account the interaction between elements. Both analytical and numerical methods can be used to calculate individual elements.

The use of both numerical and simulation approaches does not allow obtaining a solution to the problem in analytical form, which creates some difficulties in analyzing the results obtained.

Since the use of these methods is possible only if there is computing equipment, their effectiveness is directly related to the power and speed of the computers used. An undeniable advantage of algorithmic methods for solving mathematical models is the absence of fundamental restrictions on the complexity of the model.

The choice of one or another solution method largely depends on the qualifications and experience of the working group members. If the mathematical formulation of the problem (even in a simplified version) allows for an analytical solution, it undoubtedly has an advantage over a numerical one. Algorithmic methods, using the discretization of the problem, implement a computational experiment using a computer.

The accuracy of modeling in such an experiment significantly depends on the chosen method and its parameters (for example, the integration step).

Algorithmic methods are usually more laborious to implement, require good knowledge of computational mathematics, effective software, and powerful computing equipment.

Algorithmic numerical method, like analytical approximate method, is always implemented in the form of an algorithm, which is required to ensure maximum speed and the smallest possible error. These two indicators are incompatible with each other: the smaller the error, the greater the computer time required.

For very small error values, the calculation time can become unacceptably large.

Therefore, in practice, by choosing from the number of possible options an effective algorithm, one that provides a smaller number of operations to achieve a given accuracy, some compromise is achieved between accuracy and time spent.

Another important requirement for algorithms is their stability, that is, ensuring a limited growth of the error during calculations.

The huge variety of numerical methods creates some difficulties in their selection in each specific case.

Since several alternative methods can be used to solve the same problem, the choice of a specific method is made taking into account which of them is more suitable for a given model in terms of ensuring efficiency, stability and accuracy of results, as well as being more mastered and known to the members of the working group.

The following basic requirements are imposed on mathematical models: universality; accuracy; adequacy; cost-effectiveness.

The universality of a mathematical model characterizes the completeness of its reflection of the properties of a real object. A mathematical model reflects not all, but only some properties of a real object. For example, formulas for cutting forces do not take into account ambient air temperature, humidity, economic parameters, etc.

The accuracy of a mathematical model is assessed by the degree of coincidence of the values of the initial parameters of a real object and the values of the same parameters calculated using the model.

The adequacy of a mathematical model is its ability to reflect the specified properties of the object with an error not higher than the specified one.

The cost-effectiveness of a mathematical model is characterized by the cost of computing resources for its implementation. If work with a mathematical model is carried out manually, then its cost-effectiveness is determined by the cost of the designer's personal time. If the model is used in automated design, then by the cost of machine time and computer memory.

Since the specified values are determined by the characteristics of a particular computer, it is not correct to use them to assess the cost-effectiveness of a mathematical model.

Therefore, to assess the cost-effectiveness of the mathematical model itself, such values are used as the dimension of the system of equations in the mathematical model; the number of internal parameters used in the model; the average number of operations performed during a single access to the mathematical model, etc.

The requirements for a high degree of universality, accuracy, a wide range of adequacy of the mathematical model, on the one hand, and its high cost-effectiveness, on the other hand, are contradictory. Therefore, compromise solutions are determined by the problem being solved.

Mathematical models may also have other requirements, among which the following are worth highlighting:

Computability, i.e. the possibility of manual or machine research of qualitative and quantitative regularities of the functioning of an object (system).

Modularity, i.e. the correspondence of model structures to the structural components of the object (system).

Algorithm-based, i.e. the possibility of developing appropriate algorithms and programs that implement the mathematical model on a computer.

Visuality, i.e. convenient visual perception of the model.

The goal of mathematical modeling primarily consists in studying the regularities of changes in the variables of an object under the influence of external and internal factors.

The developed mathematical models can be used:

• to study the properties and features of the behavior of the object under study with different combinations of input data and in different modes;

• as modeling blocks in various computer-aided design (CAD) systems and automated control systems;

• when building optimization models and simulator models of complex systems.

Regardless of the area of possible application of the created model, a comprehensive analysis of the modeling results allows:

• to perform modernization of the studied object, find its optimal characteristics or at least take into account its behavior and properties as best as possible;

• to check the validity of the hypotheses adopted at the stage of mathematical formulation of the problem, to assess the possibility of simplifying the model in order to increase its efficiency while maintaining accuracy;

• to determine the permissible scope of application of the model, which is especially important in the case of its use for automatic control systems;

• to determine in which direction, it is necessary to develop the model in the future.

3.2. Experimental research

Often the problem arises of obtaining the dependence of the studied quantity on one factor. In this case, the experimental results are approximated by a function of one argument. Fig. 3.1 shows an example of a linear dependence:

$$\hat{y} = b_0 + b_1 x_1. \quad (3.1)$$

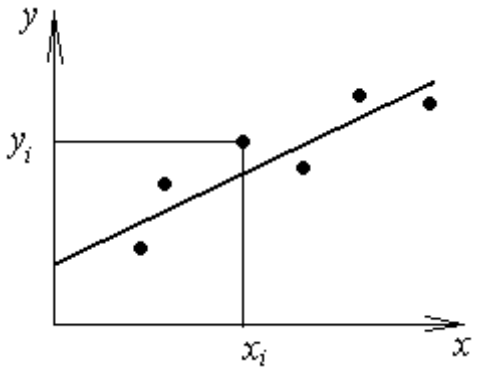

Fig. 3.1. Approximation by a linear function

The coefficients of the regression equation are found by the least squares method in the form of a system of normal equations:

$$\begin{cases} b_1 \sum_{i=1}^{n} x_i^{\,2} + b_0 \sum_{i=1}^{n} x_i - \sum_{i=1}^{n} y_i x_i = 0 \\ b_1 \sum_{i=1}^{n} x_i + b_0 n - \sum_{i=1}^{n} y_i = 0 \end{cases}, \tag{3.2}$$

where n – total number of measurements.

The values of the coefficients can be calculated using the formulas:

$$b_0 = \frac{\sum_{i=1}^{n} x_i^{\,2} \sum_{i=1}^{n} y_i - \sum_{i=1}^{n} x_i \sum_{i=1}^{n} x_i y_i}{n \sum_{i=1}^{n} x_i^{\,2} - \left(\sum_{i=1}^{n} x_i \right)^2}; \tag{3.3}$$

$$b_1 = \frac{n \sum_{i=1}^{n} x_i y_i - \sum_{i=1}^{n} x_i \sum_{i=1}^{n} y_i}{n \sum_{i=1}^{n} x_i^{\,2} - \left(\sum_{i=1}^{n} x_i \right)^2}. \tag{3.4}$$

The correlation coefficient is also calculated, which is a measure of the linear relationship between dependent random variables: it shows how well, on average, one of the variables can be represented as a linear function of the other. The correlation coefficient is calculated by the formula:

$$r = \frac{n\sum_{i=1}^{n} x_i y_i - \sum_{i=1}^{n} x_i \sum_{i=1}^{n} y_i}{\left[n\sum_{i=1}^{n} x_i^{\,2} - \left(\sum_{i=1}^{n} x_i \right)^2 \right] \left[n\sum_{i=1}^{n} y_i^{\,2} - \left(\sum_{i=1}^{n} y_i \right)^2 \right]}. \qquad (3.5)$$

In the case of a nonlinear dependence of the studied quantity on one factor, you can use the second-order approximating function (Fig. 3.2):

$$\hat{y} = b_0 + b_1 x + b_2 x^2. \qquad (3.7)$$

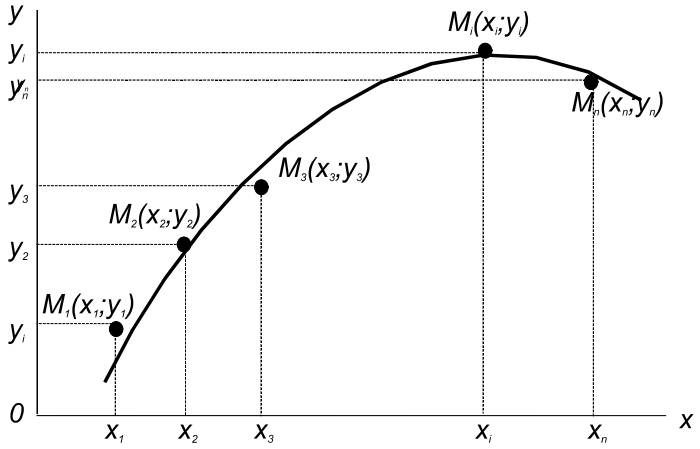

Fig. 3.2. Approximation by a quadratic function

The regression coefficients are found from the system of normal equations in the form:

$$\begin{cases} b_2 \sum_{i=1}^{n} x_i^{\,2} + b_1 \sum_{i=1}^{n} x_i + n b_0 - \sum_{i=1}^{n} y_i = 0 \\ b_2 \sum_{i=1}^{n} x_i^{\,3} + b_1 \sum_{i=1}^{n} x_i^{\,2} + b_0 \sum_{i=1}^{n} x_i - \sum_{i=1}^{n} x_i y_i = 0 \\ b_2 \sum_{i=1}^{n} x_i^{\,4} + b_1 \sum_{i=1}^{n} x_i^{\,3} + b_0 \sum_{i=1}^{n} x_i^{\,2} - \sum_{i=1}^{n} x_i^{\,2} y_i = 0 \end{cases} . \qquad (3.8)$$

For individual cases, you can choose other approximating functions, for example, power, exponential, logarithmic, etc.

You can determine the parameters of approximating functions and obtain graphical dependencies using Ms Exell, Mathcad, etc. software.

When conducting r esearch in multiple factors dependencies, they first try to describe the results of the experiment in the form of a first-order polynomial, for example:

$$\hat{y} = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_1 x_2.$$

To facilitate further calculations, the values of the factors are encoded:

$$x_i = (x_{in} - x_{i0}) / \Delta x_i, \qquad (3.8)$$

where x_i –coded factor; x_{in} –natural factor; x_{i0} – mean value; Δx_i – interval of variation.

Coded factors are determined as follows:

$$(x_{inmin} - x_{i0}) / \Delta x_i = -1.$$

$$(x_{inmax} - x_{i0}) / \Delta x_i = +1 \qquad (3.9)$$

The values of factors are changed at two levels -1 and +1corresponding to their maximum and minimum values (fig. 3.3).

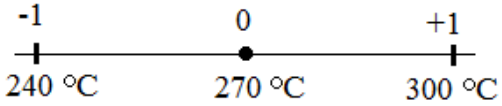

Fig. 3.3. Variation interval of factor

The matrix of experiment contains 4 possible combination of coded values of 2 factors (Table 3.1).

Table 3.1

Factors combinations for 2 factorial first-order experiment

№	x_1	x_2
1	+1	+ 1
2	-1	+ 1
3	+1	-1
4	-1	-1

For 3 factorial the matrix takes shape as shown in Table 3.2.

Table 3.2

Factors combinations for 3 factorial first-order experiment

№	x_1	x_2	x_3
1	+1	+ 1	+ 1
2	-1	+ 1	+ 1
3	+1	-1	+ 1
4	-1	-1	+1
5	+ 1	+ 1	-1
6	-1	+ 1	-1
7	+1	-1	-1
8	-1	-1	-1

The working matrix of the experiment is supplemented by a combination of factor interactions and experimental results (Table 3.3)

Table 3.3

The working matrix for 3 factorial first-order experiment

N	Factors								Result		
	x_0	x_1	x_2	x_3	x_1x_2	x_1x_3	x_2x_3	$x_1x_2x_3$	y_1	y_2	y_m
1	+1	+1	+1	+1	+1	+1	+1	+1	…	…	…
2	+1	-1	+1	+1	-1	-1	+1	-1	…	…	…
3	+1	+1	-1	+1	-1	+1	-1	-1	…	…	…
4	+1	-1	-1	+1	+1	-1	-1	+1	…	…	…
5	+1	+1	+1	-1	+1	-1	-1	-1	…	…	…
6	+1	-1	+1	-1	-1	+1	-1	+1	…	…	…
7	+1	+1	-1	-1	-1	-1	+1	+1	…	…	…
8	+1	-1	-1	-1	+1	+1	+1	-1	…	…	…

In order to avoid the influence of random factors on the results of experiments, parallel experiments are conducted for each combination of factors and the average values of the response function are found:

$$\bar{y}_j = \frac{1}{m}\sum_{u=1}^{m} y_{ju}, \tag{3.10}$$

where u – parallel experiment number; y_{ju} – value of the response function in the u-th factor combination.

The variances of the measured value of the response function for each combination of factors will be:

$$S_j^2 = \frac{1}{m-1}\sum_{u=1}^{m}(y_{ju} - \bar{y}_j)^2. \tag{311}$$

The obtained calculation results for all experiments are used to determine the Cochrane criterion:

$$G_p = \frac{S_{\max}^2}{S_1^2 + S_2^2 + ... + S_N^2} = \frac{S_{\max}^2}{\sum_{j=1}^{N} S_j^2}. \tag{3.12}$$

The calculated value is compared with the tabulated value (Table 3.4), and if it is less than the tabulated value, it is assumed that the dispersions of the response function values in all experiments are homogeneous. G_T:

$$G_p < G_T(q, f_1, f_2).$$

Table 3.4

Values of G-criterion at 5% level of significance

$f_2 = N$	$f_1 = m-1$			
	1	**2**	**3**	**4**
2	0,9985	0,9750	0,9392	0,9057
3	0,9669	0,8709	0,7977	0,7457
4	0,9065	0,7679	0,6841	0,6287
5	0,8412	0,6838	0,5981	0,5440
6	0,7808	0,6161	0,5321	0,4803
7	0,7271	0,5612	0,4800	0,4307
8	0,6798	0,5157	0,4377	0,3910
9	0,6385	0,4775	0,4027	0,3584
10	0,6020	0,4450	0,3733	0,3311
12	0,5410	0,3924	0,3264	0,2880
15	0,4709	0,3346	0,2758	0,2419
20	0,3894	0,2705	0,2205	0,1921

After that the variance of the value of response function is calculated:

$$S_y^2 = \frac{1}{N}\sum_{j=1}^{N} S_j^2, \tag{3.13}$$

For a 3-factor experiment, the regression coefficients are determined by the formulas:

$$b_0 = \frac{1}{N}\sum_{j=1}^{N} \bar{y}_j. \tag{3.14}$$

$$b_i = \frac{1}{N}\sum_{j=1}^{N} x_{ij}\bar{y}_j. \tag{3.15}$$

$$b_{ik} = \frac{1}{N}\sum_{j=1}^{N} x_{ij} x_{kj} \bar{y}_j . \tag{3.16}$$

$$b_{ikl} = \frac{1}{N}\sum_{j=1}^{N} x_{ij} x_{kj} x_{lj} \bar{y}_j . \tag{3.17}$$

where i,k,l – numbers of factors; x_{ij}, x_{kj}, x_{lj} – coded factors.

For each regression coefficient, the value of the Student's t-test is calculated:

$$t_{ip} = \frac{|b_i|}{S_{bi}} \tag{3.18}$$

If the calculated value of the Student's t-test is greater than the tabulated value (Table 3.5), then such a coefficient is considered significant, and otherwise, it is considered equal to 0.

Table 3.5

Values of t_p -criterion at 5% level of significance

f_0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
t	12,71	4,30	3,18	2,78	2,57	2,45	2,37	2,30	2,26	2,23	2,20	2,18
f_0	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
t	2,16	2,14	2,13	2,12	2,11	2,10	2,09	2,09	2,08	2,07	2,07	2,06

To check the correspondence of the obtained mathematical model to the experimental results, the adequacy variance is determined:

$$S^2_{\text{ad}} = \frac{m}{N-p}\sum_{j=1}^{N} (\bar{y}_j - \hat{y}_j)^2, \tag{3.19}$$

where p – the quantity of equation terms; $\hat{y}_j$ – the calculated value of response function.

Next, calculate the Fisher criterion and compare it with the tabular value (Table 3.6):

$$F_p = \frac{S^2_{\text{ad}}}{S^2_y}. \tag{3.20}$$

Table 3.6

Values of F-criterion at 5% level of significance

$f_0 = N(m-1)$	$f_{ad} = N - p$							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	161,45	199,50	215,71	224,58	230,16	233,99	236,77	238,88
2	18,513	19,000	19,164	19,247	19,296	19,330	19,353	19,371
3	10,128	9,5521	9,2766	9,1172	9,0135	8,9406	8,8868	8,8452
4	7,7086	6,9443	6,5914	6,3883	6,2560	6,1631	6,0942	6,0410
5	6,6079	5,7861	5,4095	5,1922	5,0503	4,9503	4,8759	4,8183
6	5,9874	5,1433	4,7571	4,5337	4,3874	4,2839	4,2066	4,1468
7	5,5914	4,7374	4,3468	4,1203	3,9715	3,8660	3,7870	3,7257
8	5,3177	4,4590	4,0662	3,8378	3,6875	3,5806	3,5005	3,4381
9	5,1174	4,2565	3,8626	3,6331	3,4817	3,3738	3,2927	3,2296
10	4,9646	4,1028	3,7083	3,4780	3,3258	3,2172	3,1355	3,0717
11	4,8443	3,9823	3,5874	3,3567	3,2039	3,0946	3,0123	2,9480
12	4,7472	3,8853	3,4903	3,2592	3,1059	2,9961	2,9134	2,8486
13	4,6672	3,8056	3,4105	3,1791	3,0254	2,9153	2,8321	2,7669
14	4,6001	3,7389	3,3439	3,1122	2,9582	2,8477	2,7642	2,6987
15	4,5431	3,6823	3,2874	3,0556	2,9013	2,7905	2,7066	2,6408
16	4,4940	3,6337	3,2389	3,0069	2,8524	2,7413	2,6572	2,5911

If the calculated value is less than the tabulated value, then the model is considered adequate:

$$F_p < F_T(q, f_{ad}, f_0). \tag{3.21}$$

Graphical dependencies are constructed using the obtained regression equation. If the model is built taking into account the joint influence of factors on the response function, then the graphical dependence has a complex spatial form. Fig. 3.4. shows the form of the graphical dependence obtained from the first-order regression equation taking into account the joint influence of factors on the response function.

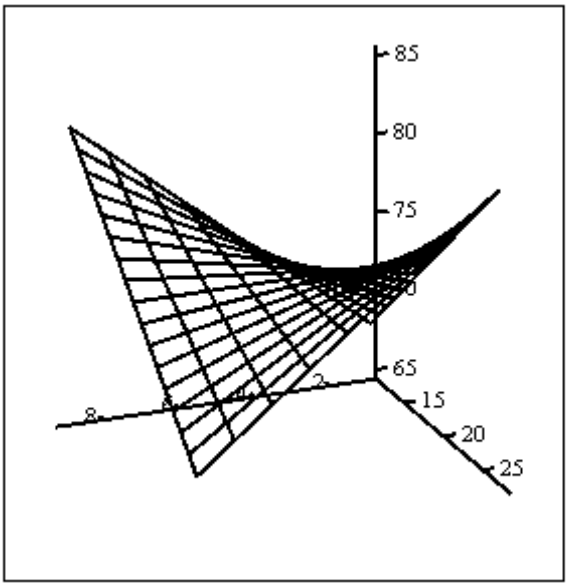

Fig. 3.4. Graphical dependence obtained from the first-order regression equation taking into account the joint influence of factors on the response function

In the case when the mathematical model is inadequate, we proceed to conduct a second-order experiment. For a 2-factor experiment, the regression equation will be:

$$\hat{y} = b_0 + b_1x_1 + b_2x_2 + b_{12}x_1x_2 + b_{11}x_1^2 + b_{22}x_2^2.$$

The matrix of the second-order experiment according to the Box design is given in Table 3.7.

In this case, to calculate the regression coefficients, you can use the formulas:

$$b_0 = \frac{A}{n}[2\lambda^2(k+2)\sum_{u=1}^{n} y_u - 2\lambda c\sum_{i=1}^{k}\sum_{u=1}^{n} x_{ui}^2 y_u] \quad (3.22)$$

$$b_i = \frac{c}{n}\sum_{u=1}^{n} x_{ui} y_u \quad (3.23)$$

$$b_{i,j} = \frac{c^2}{n\lambda}\sum_{u=1}^{n} x_{ui} x_{ui} y_u \quad (3.23$$

$$b_{ii} = \frac{A}{n}\{c^2[(k+2)\lambda - k]\sum_{u=1}^{n} x^2{}_{ui} y_u + c^2(1-\lambda)\sum_{i=1}^{k}\sum_{u=1}^{n} x_{ui}^2 y_u - 2\lambda c\sum_{u=1}^{n} y_u\} \quad (3.24)$$

where

$$c = \frac{n}{\sum_{u=1}^{n} x_{iu}^2}; \tag{3.25}$$

$$\lambda = \frac{n2^k}{(\sum_{u=1}^{n} x_{iu})^2}. \tag{3.26}$$

Table 3.7

Box's second-order experiment matrix

N	x_1	x_2	$\overline{y}_u$
1	–	–	$\overline{y}_1$
2	+	–	$\overline{y}_2$
3	–	+	$\overline{y}_3$
4	+	+	$\overline{y}_4$
5	–1,41	0	$\overline{y}_5$
6	+1,41	0	$\overline{y}_6$
7	0	–1,41	$\overline{y}_7$
8	0	+1,41	$\overline{y}_8$
9	0	0	$\overline{y}_9$
10	0	0	$\overline{y}_{10}$
11	0	0	$\overline{y}_{12}$
12	0	0	$\overline{y}_{12}$
13	0	0	$\overline{y}_{13}$

For this purpose, you can also use the formulas:

$$b_0 = a_1 \sum_{u=1}^{n} y_u + a_2 \sum_{i=1}^{k} \sum_{u=1}^{n} x_{ui}^2 y_u; \tag{3.27}$$

$$b_i = a_3 \sum_{u=1}^{n} x_{ui} y_u; \tag{3.28}$$

$$b_{ij} = a_4 \sum_{u=1}^{n} x_{ui} x_{uj} y_u; \tag{3.29}$$

$$b_{ii} = a_5 \sum_{u=1}^{n} x_{ui}^2 y_u + a_6 \sum_{i=1}^{k} \sum_{u=1}^{n} x_{ui}^2 y^2 - a_7 \sum_{u=1}^{n} y_u ; \quad (3.30)$$

where

$$a_1 = \frac{A}{n} 2\lambda^2 (k+2); \quad (3.31)$$

$$a_2 = \frac{A}{n} 2\lambda c; \quad (3.32)$$

$$a_3 = \frac{c}{n}; \quad (3.33)$$

$$a_4 = \frac{c^2}{n\lambda}; \quad (3.34)$$

$$a_5 = \frac{A}{n} c^2 [(k+2)\lambda - k]; \quad (3.35)$$

$$a_6 = \frac{A}{n} c^2 (1-\lambda); \quad (3.36)$$

$$a_7 = \frac{A}{n} 2\lambda c. \quad (3.37)$$

Figure 3.5 shows the graphical dependence obtained from the second-order regression equation.

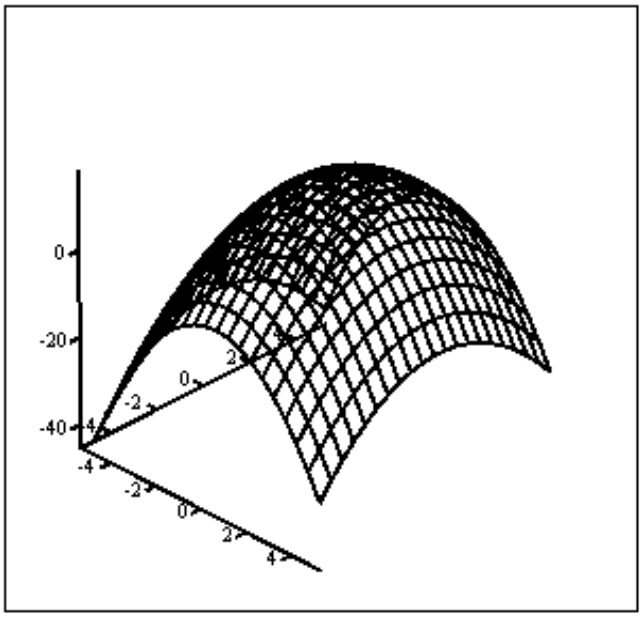

Fig. 3.5. Graphical dependence obtained from the second-order regression equation

3.3. Finding optimal parameters

To find the optimal experimental conditions, that is, when the value of the response function approaches a maximum or minimum, a number of special methods are used.

Steep ascent along a response surface. A gradient is a vector that shows the direction of the fastest change in some quantity, the value of which changes from one point in space to another.

Moving along the gradient provides the shortest path to the optimum, because the direction of the gradient is the direction of the steepest slope leading from a given point to the vertex.

If we change the factors proportionally to their coefficients, taking into account the sign, then the movement to the optimum will be carried out along the steepest path. This process of moving to the optimum region is called steep ascent.

The step of movement along the gradient is chosen so that its minimum value is greater than the error with which the factor is fixed. The maximum step value is limited by the area of determining the factor.

It should be taken into account that when moving towards the optimum, a small step requires a significant number of experiments, and a large step can lead to skipping the optimum area.

The movement along the gradient should start from the zero point (the main level of each factor), because the regression coefficients are calculated for the response function expanded in a Taylor series in the vicinity of the zero point.

If the regression coefficients differ significantly from each other, it is recommended to change the intervals of variation of the factors and conduct a new series of experiments, because if the coefficients differ by an order of magnitude or more, a multifactor experiment during steep ascent can turn into a single-factor one.

Having calculated the movement step for each factor, the conditions of the “imaginary” experiments are found. “Imaginary” are called experiments, the

conditions of which at the stage of steep ascent are set taking into account the movement step for each factor. In order to verify the results of steep ascent, some of the imaginary experiments are implemented.

If, when moving towards the optimum, a situation arises that prevents the change of any factors, then these factors can be fixed at optimal levels, continuing the movement along other factors. Steep ascent stops if optimization conditions are found or if constraints on factors prove further movement along the gradient unreasonable.

The relaxation method is based on moving towards the optimum in the direction of the coordinate axes along which the objective function changes (decreases or increases) most significantly.

At the initial search point, the partial derivatives of the objective function with respect to all independent variables are determined, and then the derivative with the largest modulus is selected from them.

In function minimization problems, steps in the direction of its decrease are carried out until the values of the optimization criterion along the selected axial direction become minimal.

The criterion for the end of the search is often the moment of reaching a point, which is characterized by the fact that when moving from it along any axial direction, there is no further decrease in the value of the optimization criterion. Sometimes the criterion for the end of the search is the condition for achieving positivity of all derivatives of the objective function along the permissible axial directions.

If the mathematical description of the object of research is unknown, then the experiment is conducted at the starting point and at least two points located on lines parallel to the coordinate axes corresponding to the factors.

4. TRAINING OF SCIENTIFIC PROFESSIONALS

4.1. Obtaining scientific qualification

In the Ukrainian system of education and science, there are scientific degrees – Doctor of Sciences, Candidate of Sciences, Doctor of Philosophy and academic titles – Professor, Associate Professor, and Senior Researcher.

Scientific degrees are awarded (after defending dissertations), and academic ranks are assigned to specialists with higher education, according to their qualifications, achievements in the development of science, technology and culture, in the training of highly qualified personnel.

Awarding scientific degrees and conferring academic titles is a state recognition of the level of qualification of a scientist. Specialized academic councils are formed in higher educational institutions of III-IV levels of accreditation, scientific research, scientific and technical institutions and other organizations conducting fundamental and applied scientific research. A dissertation for the degree of Doctor of Sciences is a qualifying scientific work of a certain volume, which must contain scientific provisions and scientifically substantiated results in a certain field of science that solve an important scientific or scientific and applied problem.

A dissertation for the degree of Candidate of Sciences or Doctor of Philosophy is a qualifying scientific work of a certain volume, which must contain new scientifically substantiated results of research conducted by the applicant, which solve a specific scientific problem that is of significant importance for a certain field of science.

Academic titles are a qualification level assigned to persons who have higher education, profound professional and scientific achievements in a certain field of science, a broad scientific and cultural outlook, and have shown themselves positively in scientific, industrial and social work. The following academic titles are distinguished: professor; associate professor; senior researcher.

The academic title of professor, associate professor and senior researcher is assigned, as a rule, to persons who have scientific degrees and demonstrate sufficient qualifications in the process of performing pedagogical and research work in a higher educational institution or scientific institution.

The main forms of training of scientific, pedagogical and scientific personnel are postgraduate and doctoral studies, which operate at higher educational institutions and scientific institutions.

The procedure for admission and study in postgraduate and doctoral studies is established by the Cabinet of Ministers of Ukraine. The opening and closing of postgraduate and doctoral studies in higher educational institutions and scientific institutions is carried out by the Ministry of Education and Science of Ukraine. Postgraduate and doctoral students study in postgraduate and doctoral studies, respectively.

A postgraduate is a person who has a complete higher education and a master's or specialist's qualification level, studying in a postgraduate program of a higher educational institution or scientific institution to prepare a dissertation for obtaining the scientific degree of Candidate of Sciences or Doctor of Philosophy.

A doctoral student is a person who has a scientific degree of Candidate of Sciences or Doctor of Philosophy and is enrolled in doctoral studies to prepare a dissertation for obtaining the scientific degree of Doctor of Sciences.

A Master's degree is an educational degree obtained at the third level of higher education and awarded by a higher education institution as a result of the successful completion of a relevant educational program by a higher education seeker.

A Master's degree is obtained under an educational-professional or educational-scientific program. Scientific research is characterized by different degrees and levels of depth and complexity. It is carried out by different people who have different qualification, training and research opportunities.

Elements of scientific research are used already during the educational process in general education schools. Requirements for scientific research are

increasing in higher education institutions. Types of student research work: abstract, term paper (abstract, research), qualification work (diploma project, diploma work, master's thesis).

Abstract – is a report on a specific topic, which involves a review of relevant literary and other sources or a presentation of the content of a scientific work, book, article.

Term paper – is a work on a specific topic, which involves the processing of scientific, legislative, educational sources, provides their objective presentation based on appropriate analysis and demonstrates a subjective degree of independence, the ability to apply acquired knowledge and skills, develops research skills and abilities.

Diploma (qualification) work is a special form of scientific work that involves the processing of scientific, legislative, educational, and archival sources, ensures their objective presentation based on appropriate analysis, and certifies a subjective degree of independence, has its own qualification characteristics, and is performed by a graduate student to obtain a diploma (certificate) of graduation from an educational institution.

4.2. Master's qualification work

Master's thesis is a final qualification work of scientific content, which is characterized by internal unity and reflection of the progress and results of the development of the chosen topic. It must correspond to the current level of development of science in a certain field, and its topic must be relevant. The master's thesis is presented in a form that allows you to determine how fully reflected and substantiated its provisions, conclusions and recommendations are, their novelty [8].

The master's thesis has all the features that are inherent in scientific works, since as a scientific work it is very specific. First of all, it is distinguished from other scientific works by the fact that in the system of education and science it

performs a qualifying function, that is, it is prepared for the purpose of public defense and obtaining the appropriate educational and professional level of a master's degree. In this regard, the main task of its author is to demonstrate the level of his educational and scientific qualifications, first of all, the ability to independently conduct scientific research and solve specific scientific problems

The following structure of the master's thesis is considered acceptable:

- title page;
- table of contents;
- introduction;
- sections and subsections of the main part;
- conclusions;
- list of used literature and sources;
- appendices (if necessary).

The content of each part of the master's thesis is determined by its topic. The choice of topic, stages of preparation, search for bibliographical sources, their study and selection of factual material, writing methodology, rules for design and defense of the master's thesis have much in common with the student's diploma thesis and the candidate's dissertation of the applicant for a scientific degree.

Preparation of the text of the master's thesis and its design.

Introduction. The approximate volume of this section of the work is two to four pages. The introduction should justify the relevance of the chosen topic, indicate the scientific and possible practical significance of the work, provide a brief description of the literature used, formulate the goal and objectives of the study, the object and subject of the study, and provide its methodological argumentation.

The first section of the main part is usually devoted to a literature review and highlights the theoretical foundations of the topic. The volume of this section is 10–12 pages, where the author should show his/her awareness of the sources used and the ability to work with them.

A generalized analysis of the content of theoretical sources in connection with the topic under study should be presented to determine how fully the topic has been disclosed in the literature, give his/her assessment of issues that are of significant importance, analyze different views on this problem and express his/her own understanding of it.

Such an analysis cannot be of a purely formal nature (copying), and the text should not be overloaded with quotes.

The master's thesis as an author's work should be analytical, creative, contain certain generalizations and independent conclusions. In the following sections, based on the theoretical provisions of the first section, the problem under study should be comprehensively analyzed and ways to solve it should be proposed.

The material presented in the work should be sufficiently reasoned and convincing. Both a large number of quotations and unconfirmed references to the sources of theses, thoughts, and ideas should be avoided.

The presentation of the material should be logical, all structural elements of the work (introduction, sections and subsections, main conclusions) should be interconnected.

The work should contain ideas, generalizations, and conclusions aimed at solving the main problem.

Conclusions to the master's thesis are summaries of the work performed. Their volume is two to three pages.

It is advisable to number the conclusions. In them, the author notes the prospects for further research into the problem, indicates the areas of possible use of the results of the work.

In addition, in the text of the work at the end of each section of the work, it is worth giving a brief conclusion about the material presented in the section. The list of used literature and sources is given at the end of the work on a new page in alphabetical order of authors and titles of works. It should contain only those

sources that the author used in the preparation of the qualification work and to which there are references in the text of the work.

The author's report at the defense of the master's thesis should contain information about the structure of the work, main conclusions, generalizations, specific proposals and recommendations. During the defense of the master's thesis, each of those present can ask the author questions on the topic of the research; make an assessment of the work.

The author must give reasoned answers to the critical remarks of the scientific supervisor and reviewer, as well as answer questions that are asked during the defense.

4.3. Scientific publications

Conducting scientific research requires appropriate information support. Support is what creates the conditions for the implementation of the specified process.

Information support is a set of information and methods for its search, processing, accumulation, storage, systematization and generalization for the purpose of use in the process of scientific research [9].

The task of information support is to inform scientists about the state of the objects being studied. In addition, information support is a means of communication (exchange of information) for scientists.

Information support of the scientific research process can be classified according to the following features: professional information communication; information cognizability; content of information support.

Communication support is based on professional information contacts of scientists (conferences, symposia, meetings, scientific seminars, etc.). From the point of view of the cognitive nature of information, information support can be divided into providing new information and providing relevant information that was used earlier.

According to the content of the information, the information support of the scientific research process is divided into legislative (laws and regulations, decrees of the President of Ukraine, Resolutions and Orders of the Government of Ukraine); planned (information from economic and social development plans); regulatory and reference (norms and regulations); contractual (information from contracts between economic entities); technological (technical documentation, standards, technical conditions, design and technical documentation); organizational and managerial (legal and organizational and administrative documents, official correspondence); factual (reporting, accounting, statistical and operational accounting data).

In a broad sense, information is knowledge, information, data that are obtained and accumulated in the process of developing science and in the practical activities of people; in a narrow sense, it is data that is the object of processing, transmission and storage.

Scientific information is a set of any information about the state and changes in the parameters of research objects or their compliance with regulatory and legal acts; one of the general concepts of science is new information about the world around us.

A scientific document, or a document of scientific and technical information, is a medium in which scientific data or scientific and technical information is recorded in one way or another, which must indicate by whom, where and when it was created.

Documents of scientific and technical information are represented by the following main groups: printed, typewritten (handwritten).

Printed sources of information include: educational materials; scientific materials; regulatory materials; statistical materials; other materials.

Educational materials are publications of literature on educational disciplines (textbooks, manuals, program and methodological materials), intended for the training of specialists in certain fields.

A textbook is an educational publication that contains a systematic presentation of an educational discipline (its section, part), corresponds to the curriculum and is officially approved by the Ministry of Education and Science of Ukraine as this type of publication.

Textbooks are printed, graphic, visual and other materials (books, tables, maps, paintings, models, slides, films, etc.) used in the learning process to ensure better assimilation of knowledge, skills and abilities by students.

Practical manuals are publications designed to meet the needs of certain categories of specialists in the national economy in their daily practical activities.

Scientific materials are published in the form of monographs, generalizing scientific works, collections of articles, abstracts, theses, which highlight various scientific problems.

A monograph is a scientific work in the form of a book that contains a complete or in-depth study of a single problem or topic, which belongs to one or several authors.

A scientific monograph is a scientific study that comprehensively and exhaustively covers a selected scientific problem with its critical analysis, determination of significance, and formulation of new scientific concepts. A monograph fixes scientific priority, provides society with primary scientific information, and is intended to cover the scientific content and results of a dissertation research.

Article – is information, usually in the form of several typewritten pages, published in a scientific or popular science journal, collection of scientific works, or newspaper.

Abstract – is a brief summary (oral or written) of a scientific work, teaching, the content of a book, or the results of a scientific study. Abstract – is a brief summary of the main points of a lecture, report, or work.

Abstracts of scientific conference reports – is a scientific non-periodical collection that contains preliminary materials published before the conference (annotations, abstracts of reports and (or) messages).

Scientific materials are of great value due to the fact that a scientist can get acquainted with the unconventional interpretation of certain issues, criticism of the views of other authors, as well as scientific novelty characteristic of science at a specific stage of its development.

Regulatory materials are issued by legislative and executive bodies of various levels in the form of laws, orders, instructions, regulations (standards), etc. and contain basic norms and rules and are the basis for carrying out any activity.

Law – is a generally binding act of the highest state authority issued in accordance with the established procedure, which has higher legal force.

Order – is a management act issued by the heads of ministries, departments, departments of the executive committees of local councils of people's deputies, as well as heads of enterprises, institutions and organizations.

Regulation (standard) – is a regulatory legal act approved by the relevant ministry, which regulates certain types of activities.

Instruction – is 1) a regulatory act issued by ministries, heads of other central and local state administration bodies within their competence on the basis of and for the implementation of laws, decrees, resolutions and orders of the government and acts of higher state administration bodies; 2) a collection of rules regulating production and technical activities.

Statistical materials – is information on the development of the national economy, presented in the form of tables, summarized in annual statistical collections published by the State Statistics Committee of Ukraine. Statistical materials consist of economic, demographic, social and other materials.

Documentary sources of information make it possible to study objects according to a certain periodization, that is, in dynamics by periods. This is necessary for studying and comparing factors that positively or negatively affect the economic activities of enterprises.

The group of other materials is represented by popular science, advertising, patent-licensing, reference, bibliographic, production materials, etc.

Popular science materials are brochures and books on individual issues, designed to promote scientific knowledge among a wide range of readers, primarily engaged in material production.

Advertising sources of information are information about products, services that are offered in order to attract a buyer.

Patent-licensing sources of information are rights to use intellectual property or labor activity in a certain area of the economy.

Reference books are reference publications that are applied, practical in nature, have a systematized structure or are built alphabetically by article titles.

Bibliographic sources of information are book or magazine-type publications that include a scientific, systematized list and description of printed publications.

Handwritten documents include information carriers that have not undergone editorial and publishing processing and are not produced by printing (dissertations, scientific and technical reports, business accounting documents, etc.).

Dissertation – is a qualifying scientific work in the form of a specially prepared manuscript or published monograph. The dissertation prepared for defense must contain scientifically substantiated theoretical or experimental results, scientific provisions put forward by the applicant, and must also be characterized by unity of content and testify to the applicant's personal contribution to science.

Research report – is a scientific and technical document that contains systematized data on scientific and research work, describes the process or results of scientific and technical research. A research report is a handwritten work that is drawn up and reproduced in a limited number of copies (from three to five). The volume of the report can range from several sheets, which are drawn up in the form of a brochure, to several hundred sheets, which are drawn up in the form of one or several books.

Special types of handwritten documents are deposited works. Deposited are scientific works designed for a limited circle of users. Depositing is carried out centrally by scientific and technical information bodies, the functions of which in Ukraine are performed by the Institute of Scientific and technical and economic information. Information about deposited works is promptly provided in abstract and other journals.

Deposit is carried out with the aim of familiarizing scientists and specialists with manuscripts of articles, reviews, monographs, materials of conferences, congresses, meetings and symposiums of a narrowly specialized nature, which are impractical to publish en masse (as books, journals, brochures).

In scientific activity, the division of documentary sources of information into two categories is used: primary and secondary.

Primary sources of information have mainly new scientific and technical information, which are the result of scientific research, design and practical activities (reflect economic operations) or a new understanding of known ideas and facts. These include most books (with the exception of reference books), periodicals, scientific and technical reports, dissertations, deposited manuscripts, etc.

Secondary sources of information are the result of processing one or more primary documentary sources.

Secondary sources of information include bibliographic descriptions, annotations, abstracts, reviews, reference and information publications, translations, library indexes and card files.

A scientific document reflects a specific scientific situation at all stages of scientific research: from the emergence of an idea to the creation, verification of a theory and its practical implementation.

At the end of the 20-th century, the global Internet system was created – a worldwide association of regional and corporate networks that create a single information space through the use of standard information transfer protocols.

It should be noted that with the development of electronic media, the relevance of documentary sources does not decrease and the need for them also does not decrease.

The traditional means of transmitting and preserving information is the organization of documentary funds. The most common is the Universal Decimal Classification (UDC), which is used in more than 50 countries around the world and is legally owned by the International Federation of Documentation (IFD), which is responsible for the development of UDC tables, their status and publication.

A scientific journal is a journal containing articles and research materials of a theoretical or applied nature, intended mainly for specialists in a certain field of science.

By purpose, scientific journals are divided into: scientific-theoretical, scientific-practical and scientific-methodical.

Modern technologies allow searching for information on the Internet using search engines and in libraries.

The Internet is a global system of interconnected computer networks, the components of which are e-mail and the World Wide Web (abbreviation for World Wide Web). The main principle of using the Internet is openness.

The Internet consists of hundreds of loosely connected networks, and there is no single group of people or organization responsible for its operation. Many companies work on the Internet around the clock, while others connect their computers to the Internet temporarily. This is one of the most important advantages of the Internet – it can work when individual computers are not connected to the network or are damaged.

The World Wide Web is a globally distributed database of hypertext documents.

Documents that are planned to be made publicly available can be placed on each computer that has a permanent connection to the Internet. Then this computer becomes a Web server.

To view the content of the servers, the user must have a special program - a Web browser.

There are several methods for searching for the necessary information on the Internet. First, you should use catalogs of Internet resources that contain already grouped information in the form of links to Web servers.

Examples of such English-language catalogs are www.yahoo.com, www.altavista.com, www.google.com, www.meta-ukraine.com.

Through the Internet, you can find books, magazines, dissertations, abstracts and other literature necessary for scientific work.

The usefulness of this method is that you can work with library catalogs without breaking away from work. Before visiting the library to work with literature, a search for sources is carried out; this can be carried out in both systematic and alphabetical catalogs.

When searching for information in Internet libraries, the general rules for searching for information in electronic databases are used.

According to the chosen topic of scientific work, the researcher independently selects literary sources (books, brochures, articles), official documents, accumulates departmental materials on the topic and processes them. The procedure for working with literary sources includes a bibliographic search for literature on the topic of research, its study, recording of initial data and their use in the process of scientific research to create new knowledge.

Working with printed and electronic sources of information involves: general familiarization (familiarization with the content and a quick review of the source); careful reading by sections (highlighting the most important text); selective reading of the text (rereading the most important); drawing up a plan of the read material (posing problems); extracting from the read (more complete and clear – a quote and a bibliographic description indicating the pages from which the quote is taken); designing index cards (bibliographic index card, index card of excerpts, index card of abstracts, index card of foreign literature); comparing and critically evaluating the read (recording comments).

When working with printed and electronic sources of information, the researcher makes extracts of individual sentences or paragraphs. In this case, it is necessary to avoid accumulating material that does not relate to the selected topic and object of research.

Experience shows that approximately 30-40% of literary sources, initially selected by their title, turn out to be useless when working on the topic.

In the process of working with sources, one's own conclusions, assessments, generalizations, and predictions in the use of information appear. When extracts are made by hand, they must be written down and highlighted in the text with marks in the field in square brackets or written down in a different color. In this case, it is better to record individual provisions on sheets of paper on one side only, leaving large margins.

This allows, if necessary, to make additional inserts, parallel extracts from other books for comparison, as well as to express one's own opinion on this issue. For this purpose, you can use cards made of cardboard or thick paper, for example, which are convenient to group according to the homogeneity of the issues being studied. It is advisable to make color or font selections of notes.

However, in modern conditions, it is much better and more convenient to use a personal computer and special software – text editors, for example, Microsoft Word, to work on the text.

When using a computer, the process of initial accumulation of information is greatly simplified. Extracts can be made by hand, writing the text into an appropriate text file.

Another way is to scan large parts of the text with a scanner, and then, if necessary, edit and comment on it. You can also use programs for automatic translation.

Regardless of the medium (electronic or paper) on which the information from the literary source is recorded, it should be grouped according to homogeneous characteristics for use in the research process. Such a characteristic is most often the questions contained in the plan of the research topic.

It is convenient to group entries on paper cards in special file cabinets, but they should have cardboard dividers with indicators according to the research plan. When using computers, it is worth accumulating extracts in in separate files corresponding to the sections of the work. Then, in the process of secondary grouping of the material, the necessary text will be transferred to the main file of the scientific work.

During the study, the researcher processes a large number of literary sources, the information from which cannot be remembered or written out in full, therefore, it is necessary to use the following methods of recording information when processing it: annotation; summary; theses; abstract; quotation; synopsis; indexes.

An annotation is a brief characteristic of a book, article, manuscript, etc. By their nature, annotations can be reference and recommendatory, that is, those that contain a critical assessment of the work. Based on the requirements for the annotation, its volume can be from a few words to 10-15 lines.

A summary is a brief summary of the work read, which contains inferences and main conclusions.

Theses are provisions that briefly state one of the main ideas of a lecture, report, etc. Theses are presented in the form of logical judgments. Theses are divided into basic, simple and complex. Simple theses are written down when first reading the text (sometimes they are written down in the form of quotes). The main theses are often created on the basis of simple ones, by generalizing, reworking and excluding individual provisions.

A quote is a verbatim excerpt from a work by a certain author, which is given to confirm or refute the expressed opinion. By citing, the most important fragments of the author's text should be formalized.

An abstract is a shortened presentation of the content of a scientific work with basic data and conclusions. An abstract is not a mechanical retelling of the work, but a presentation of its essence.

Page-by-page indexes of sources. In the process of reading sources of information, you do not need to rush to immediately summarize what you have

read, but it is advisable to compile page-by-page indexes to the sources being studied.

Very often, such a means of processing sources is used as compiling a page-by-page list (index) of quotes that you are trying to write out. Then, having finished reading the book, you make extracts or compile a summary.

Science metric database – is a bibliographic and abstract database, a tool for tracking the citation of scientific publications. Science metric database is also a search system that generates statistics that characterize the state and dynamics of demand indicators, activity and impact indices of the activities of individual scientists and research organizations.

The effectiveness of scientific activity can be assessed using some qualitative and quantitative indicators. Qualitative assessments are based on expert opinions, but the subjectivity of such assessments reduces the reliability of the results obtained.

Quantitative assessments are based on published data, patent and other information, which include: the number of publications; analysis of their citation frequency (citation index); Hirsch index; impact factor of the scientific journal in which the works are published; the number of domestic and international grants, scholarships, awards received participation in the editorial boards of scientific journals, etc. Of the above indicators, science metric indicators have recently been of greatest interest, namely the citation index, Hirsch index and impact factor.

International practice of science metric research today is based on the use of science metric databases, which are bibliographic and abstract databases with tools for tracking the citation of articles published in scientific publications included in these databases.

In developed countries, science metric indicators are widely used to assess the productivity and significance of both individual scientists and scientific teams, when distributing finances at the stage of research planning, allocating grants, assessing the results of research of scientists and teams, attesting scientific

personnel and accreditation of higher educational institutions. Citation analysis allows us to get answers to the following questions:

1) what publications does a given author have;

2) where was this author or this article cited;

3) who else is publishing on this issue;

4) which journals publish articles on this issue;

5) which works have been published by this scientific institution. At present, a significant increase in the number and quality of scientific publications in foreign journals is necessary for:

1) improving the scientific qualifications of a scientist;

2) increasing the status of a scientist in the scientific community;

3) improving the “visibility” and “availability” of the author's scientific developments by placing his publications in international citation indexes (databases Scopus, Web of Science);

4) expanding the field of scientific activity of the scientist through acquaintance with foreign colleagues who are interested in his works, establishing informal and formal relations and, as a result, joint publications, international projects, grants, etc.;

5) increasing the effectiveness of one's own scientific activity according to the indicators of publication activity (number of publications and their citations);

6) increasing the rating of a higher educational institution by scientometric indicators;

7) expansion of the international scientific community.

Terminology. Citation index is a specialized information product that collects and processes complete bibliographic information about journal articles, abstracts and article lists of literature cited in articles. Such a database allows you to find both publications that are cited in a single article and publications that cite this article.

Citation rate (total citation, citation indicators, citation data) is an indicator of the “significance” of the works of a scientist accepted in the scientific world and

is the number of references (total) to the scientist's publications in refereed scientific periodicals.

The presence of scientists with a high index in scientific and educational organizations indicates high efficiency and effectiveness of the organization's activities as a whole.

The Hirsch index (h-index, Hirsch criterion) was proposed by Jörg Hirsch in 2005. The index is calculated based on the distribution of citations of a given researcher.

A scientist has an index h if h of his Np articles are cited at least h times each, while the remaining (Np - h) articles are cited no more than h times each. In other words, a scientist with an index h has published h articles, each of which has been cited at least h times.

It is important to remember:

• citations are data about journal articles;

• citation rates are calculated only for those articles (publications) that are in the database for which the calculation is made;

• citation rates include only what is indicated in the article bibliographic list. Choosing a journal for publication. When choosing a journal for publication, carefully study the information posted on the website of the publisher and the journal. The section “For authors” (Guide for Authors) describes in detail:

• requirements for articles, their volume and design;

• copyright. Usually, the author is allowed to use the published article for his/her personal purposes, namely when giving lectures, presentations and other speeches, sending the article to a narrow circle of colleagues, etc. In each individual case, this section should be carefully studied;

• in what form the author receives the article after publication. Usually, the author is sent a copy in PDF. If the author wants to receive a hard copy of the journal in which his/her article was published, he/she, as a rule, must pay the cost of the journal and shipping;

• the amount of the fee, if any;

• the cost of publication. There are journals that publish articles for free, but charge for color illustrations and other additional options. There are journals in which the amount of payment depends on the number of pages and additional options (color highlighting, etc.);

• the ability to publish an article in open access mode. In the normal publication mode, the article you published is available for reading to journal subscribers (individual and corporate), and there is also the ability to download the article for a certain fee.

But the author can issue open access for a fee, which significantly increases the citation index of the article.

Article structure for a foreign journal

1. Title (full title of the article).

2. Author (names of the authors of the article).

3. Contact (addresses of the authors).

4. Abstract (annotation/abstract).

Since interest in the article is determined through the annotation, it should be not only qualitative, but also such that it can interest the reader. The annotation should not be descriptive.

It should contain the results of specific studies that were covered in the article. It is important that the abstract serves as an independent source of information from the article. The purpose of creating an abstract is to present it as a reference tool that allows the reader to decide whether to read the full text of the article. The abstract should reflect only the information that is presented in the article.

The impact factor is calculated for 1 year, 3 years and 5 years. It can be considered as the average ratio of the number of citations of articles in the journal during the current year to the total number of articles published in this journal over the previous two years.

5. INTELLECTUAL PROPERTY

5.1. Basic concepts of intellectual property

In the broadest sense, intellectual property is legally protected rights to the results of human intellectual activity in various spheres of public life.

Legislation in the field of intellectual property ensures the interests of authors of works and other creators of intellectual property and services, granting them certain, time-limited rights that allow the latter to control the use of their works.

Moreover, these rights relate not to material objects in which the result of creative work can be embodied, but to the very creation of the human mind as such, that is, to the very idea of the object of protection.

It is the latter that is most difficult to control for the creator or the person representing his interests, when the author's ideas are not the object of legal protection [7].

Industrial property provides for the protection of inventions through patents, the protection of certain commercial interests through trademark and trade name legislation, as well as legislation on the protection of industrial designs, etc. In addition, the concept of industrial property includes the fight against unfair competition.

An invention is the result of the creative work of a person (author or inventor) in any field of activity of society, performed with the aim of solving technical or technological problems

In Ukraine, patents certify the right to an invention and a utility model. There are two types of patents for invention. A patent for an invention, which is issued based on the results of a qualified examination of an application for an invention.

And a declarative patent for an invention, which is issued based on the results of a formal examination and an examination for local novelty of an application for an invention.

According to the current legislation, legal protection is granted to an invention that does not contradict the public interest, the principles of humanity and morality and meets the conditions of patentability.

Any solution to the problem claimed as an invention must relate to one of the following objects:

- product (device, substance, strain of a microorganism, culture of plant and animal cells);

- method (method of manufacturing a product, parameters of this process, etc.);

- application of a previously known product or method for a new purpose.

Device – is a machine, mechanism, installation, part, assembly or a set of interconnected parts and assemblies.

Substance – is an artificially created set of interconnected ingredients, individual chemical compounds, objects of genetic engineering, compositions and products of nuclear transformation.

Strain – is hereditarily homogeneous cultures of microorganisms that produce useful substances or are used directly.

Method – is the process of performing actions on a material object or objects using other material objects.

Utility model. The object of a utility model can be exclusively the constructive implementation of a device.

The law also determines which results of human creative activity are not recognized as inventions. These include:

- discoveries, scientific theories and mathematical methods;

- methods of organizing and managing an economy;

- plans, conventional designations, schedules, rules;

- methods of performing mental operations;

- computer programs;

- results of artistic design;

- topographies of integrated circuits;

- varieties of plants and breeds of animals, etc.

An industrial design is the result of human creative activity in the field of artistic design, namely in that part of it that is visually manifested in the appearance of the product and characterizes its decorative and aesthetic solution, which in international practice is called “design”.

The right to an industrial design is protected by the state and certified by a patent. A patent is issued under the responsibility of its owner without a guarantee of its validity. The duration of a patent for an industrial design is 10 years from the date of filing the application.

The object of an industrial design, which is granted legal protection, may be a shape, pattern or coloring or a combination of colors that determine the appearance of an industrial product and are intended to meet its aesthetic and ergonomic needs.

This allows us to interpret the object of legal protection of an industrial design not in the form of the structure of a product, but as an image that is used or reproduced in such products.

An industrial design is an ornamental (decorative) aspect of a product, which is dictated solely by its purpose.

Industrial designs can be three-dimensional (models), planar (drawings) or combined.

The following cannot receive legal protection in Ukraine:

- architectural objects, except for small architectural forms (telephone booths, kiosks, tents), industrial, hydraulic and other stationary structures;

- printed products as such (the content of the text part of printed products is not patentable. However, the font configuration may be the object of protection);

- objects of unstable form, reproduced from liquid, gaseous, loose or similar substances, etc.

- As a rule, the essential features of an industrial design are arranged in a certain sequence:

- figurative solution of the object;

- composition and number of main compositional elements;

- shape of the product or (and) its part (volumetric characteristic, outline, silhouette);

- mutual arrangement of elements (compositional or layout solution);

- plastic solution of the object or its elements;

- color solution;

- decorative solution;

- material.

The right to obtain a patent for an industrial design is held by citizens or legal entities of Ukraine or foreign states and their successors. In particular, the right to obtain a patent for an industrial design is held by:

- the author or his successor;

- the author's employer or his successor.

The right to obtain a patent is held by both the author and his successors in title - any citizens and legal entities to whom the author has transferred the right to the results of creative work. Such successors may be heirs or other persons to whom the author's right is transferred by contract or will.

Protection of rights to an industrial design is not granted automatically. To obtain it, a person who wishes to have a patent and has the right to do so must submit to the Ukrainian institute of intellectual property (hereafter Institution) a properly completed application for the issuance of a patent for an industrial design.

Variants of an industrial design may be the appearance of products that belong to: one functional group; one class of the International Classification of Industrial Designs; similar in all respects and having differences in insignificant features; which are perceived visually, such as, for example, several chairs that differ from each other in texture, color of decorative fabric upholstery, etc.

A trademark is any designation or any combination of designations that are suitable for distinguishing goods (services) produced (provided) by different persons. The object of a trademark is words, letters, numbers, figurative elements, color combinations.

A trademark is protected by a certificate.

The following may not be protected, but may be included in a mark as non-protected elements, if there is consent from the relevant competent authority or their owners, signs depicting or imitating:

1) state symbols (flags, coats of arms, emblems);

2) official names of states;

3) emblems, names of international, intergovernmental organizations;

4) awards and other distinctions;

5) official control, guarantee and assay marks, seals.

A brand name includes a name, terms or designation. This is necessary to identify a company and its business activities.

In addition, brand names help to distinguish a company from other manufacturers of similar goods. Many countries have a system for registering brand names, although there are significant differences between them in terms of territorial principle, coverage of the territory, and also in terms of legal consequences of registration.

The indication of the origin of the goods can be simple and qualified. A simple indication of the origin of the goods, which is understood as any verbal or figurative (graphic) indication that directly or indirectly indicates the geographical place of origin of the goods (for example, "Made in Ukraine").

A qualified indication of the origin of the goods includes the name of the place of origin of the goods and the geographical indication of the origin of the goods. The first term means the name of a geographical place, which is used as a designation in the name of the goods, which originates from the indicated geographical place and has special properties, exclusively or mainly due to the natural conditions characteristic of this geographical place or to a combination of these natural conditions with a human factor characteristic of this geographical place.

Geographical indication of the origin of the goods, namely: the name of a geographical place, which is used as a designation in the name of the goods, which

originates from this geographical place and has certain qualities, reputation or other characteristics, mainly due to the natural conditions characteristic of this geographical place or to a human factor or to a combination of these natural conditions and a human factor. The indication of the origin of the goods is also protected by a certificate.

Copyright grants authors and other creators of intellectual works in the field of literature, music or art certain rights, which give the latter the right to authorize or prohibit, for a certain limited period of time, certain types of use of their own works.

In a broad sense, copyright includes provisions on the protection of copyright in the precise meaning of the word, as well as the protection of so-called "related rights" that arise for performers of works, recording studios, broadcasting organizations, etc.

5.2. Rights to intellectual property

Granting authors of intellectual property objects legal rights that protect their property interests plays an important role in the development of mankind. In advanced countries, any legislative act in the field of intellectual property is primarily aimed at protecting the rights of the owner, which are granted to him by the corresponding protection document.

By legislating exclusive rights for the author and his successor, the state simultaneously assumes obligations to ensure their implementation.

At the same time, the exclusive rights of owners of intellectual property objects allow them to carry out certain actions that enhance their personal interest in profiting from their use.

For example, the owner may transfer his exclusive rights to an intellectual property object that belongs to him to any other person in the manner prescribed by law.

The experience of the World Trade Organization has clearly demonstrated the need for flexible regulation of legal relations in the field of intellectual property.

In order to comprehensively stimulate the use of technical innovations, the creation of new literary works, etc., states should create the most favorable economic conditions for their creators.

One of the determining factors of this process is the possibility of transferring economic rights granted to owners of intellectual property objects to other person's hands.

This simultaneously contributes to the material interest of authors and stimulates them to further creative searches. For manufacturers who are in market conditions, this is a reliable way to introduce technical and technological innovations that allow them to increase their profits from the sale of new, improved products.

Along with this, the average consumer also benefits, who constantly receives goods of improved quality, with expanded functionality, increased reliability, and also consumes new works of art, literature, etc.

Moreover, in practice, the transfer of rights is carried out both in full and in part. The procedure for transferring exclusive rights is regulated by the relevant legislation of a particular country where such a transfer takes place.

However, here we are talking only about exclusive economic rights to intellectual property objects.

Various objects can be alienated in any way, for example, by sale, donation, etc. The legal form of the transfer of rights is an agreement on the transfer of ownership of a certain intellectual property object. Such an agreement certifies the transfer by the owner of his property rights to any other individual or legal entity. The possibility of such a transfer arises from the exclusive right of the owner of a certain intellectual property object.

That is, this provision covers all objects of industrial property, as well as copyright and related rights. In this case, the person who received the rights to the intellectual property object as a result of the above actions becomes the legal successor of the previous owner.

The exclusive economic rights of the previous owner are accordingly

canceled if the agreement on the assignment of these rights stipulates their transfer in full, or are limited, or other legal conflicts arise. All features of the transfer of rights must be stipulated in the agreement, which is drawn up in writing and must be signed by both parties.

Any intellectual property object is the same product as buildings, technological equipment, cars or food.

In addition, it is necessary to take into account that each of the intellectual property objects has its own life cycle. The validity of property rights to these objects is limited to a certain period.

Copyrights are valid throughout the life of the author and 70 years after his death. The validity of related rights is limited to 50 years from the moment of the first publication of the work.

For patents, the cycle is counted from the date of filing the application and is: for an invention – 20 years, for a utility model – 10 years, for a declarative patent for an invention – 6 years, for an industrial design – 10 years and can be extended, but not more than 5 years.

For a trademark certificate – 10 years from the date of filing the application and can also be extended.

Such an extension occurs each time for 10 years. It is undeniable that the extension of the term of validity of a security document does not occur automatically.

It requires a petition from the owner to the relevant Institution of the country or to those intergovernmental associations where the relevant object was registered. In addition, such actions are usually accompanied by the payment of a certain fee.

It follows that intellectual property objects, like any products, should not sit idle. After all, these objects represent a certain commercial interest only during their life cycle.

And it is obvious that the less time remains until the end of the legal protection of the object, the less profitable the transaction for the transfer of these rights.

Only property rights (exclusive economic rights) can be transferred to any intellectual property object, personal, non-property rights (the so-called copyright) are never transferred or inherited and are protected for life.

As a rule, there are three ways that the author or his successors can take to bring the work to the attention of consumers, the invention to production, etc. He can sell the work or invention he owns, or sell a license to use it, or transfer his exclusive rights on the basis of an agreement on the transfer of ownership of a certain intellectual property object.

Of course, this is not mandatory. The author can also produce his own invention or publish a novel, etc., for example, by creating a limited liability company for this purpose.

The issue of selling intellectual property objects, in principle, seems to be clear. Although these actions are not as simple as they might seem at first glance. They require extremely serious preparation, as well as a considered approach to choosing a potential buyer, the time of sale, etc. In this case, the author or his successor or heir, as a rule, proceeds from their own economic interests.

They can sell their exclusive property rights to the object they own (an invention, a musical or artistic work, etc.) to another individual or legal entity.

The author only has the right to the author's name, which can never be alienated.

An illustration of this can be, for example, any book where the name of the author of the work is indicated on the title page, and the copyright symbol © stands opposite the name of the publishing house that published the work.

This means that the author has sold or transferred in some other way his exclusive property rights to his own work to the publishing house. And now it takes care of this work, its distribution, etc.

And the author has retained the right to the author's name and to receive the appropriate remuneration, the amount of which is stipulated in the agreement between the author and the publishing house.

When transferring (alienating) property rights to an intellectual property

object by selling them, the former owner cannot retain any right to use it or establish any time or territorial restrictions on the rights, which are completely transferred to the successor.

Therefore, the decision to sell one's own rights should be made very carefully, having previously weighed all the possible consequences of such a step, having consulted with legal specialists, etc.

After all, there are other types of assignment of property rights to intellectual property objects.

5.3. Protection of the rights to intellectual property subjects

Protection against unfair competition is part of the system of protection of industrial property. An act of unfair competition is any act of competition that is contrary to honest practices in industrial and commercial matters. In particular, the following are prohibited:

- all actions that are capable of causing confusion in any way with respect to the enterprises, products of the industrial or commercial activities of a competitor;

- false statements in the course of commercial activity that are capable of discrediting the enterprise or products, industrial or commercial activities of a competitor;

- indications or statements, the use of which in the course of commercial activity may mislead the public as to the nature, method of manufacture, properties, suitability for use or quantity of the goods.

The following types of activities are classified as unfair competition:

- bribing a competitor's buyers in order to attract them to one's side as buyers;

- industrial espionage or bribing a competitor's employees in order to spy on a business or commercial secret;

- using or disclosing without permission the accumulated technical "know-how" of a competitor;

- inducing a competitor's employees to break employment contracts or to be dismissed from work for a competitor;

- threatening to sue a competitor for infringement of a patent or trademark, if such a threat is made in bad faith with the aim of reducing the competitor's turnover and to hinder competition;

- boycotting trade to hinder or prevent competition;

- dumping, i.e. selling below cost, with the aim of hindering competition, if dumping leads to precisely such a result;

- creating the impression that unusually favorable purchase conditions are offered, if this is not true;

- copying the goods, services, advertising and other characteristics of the competitor's commercial activity;

- encouraging a competitor to fail to perform a contract or to use such for its own purpose;

- advertising containing comparisons with the goods or services of a competitor;

- violation of provisions of laws that are not directly related to competition, with the aim of obtaining through such violation an unfair advantage over other competitors.

Usually, industrial property rights are fixed, for example, in patents and are obtained by filing a corresponding application with the patent office.

Such actions grant the patent owner exclusive rights in relation to the object of protection.

At the same time, protection against unfair competition is based not on the granting of rights, but on the firm conviction of society that actions that contradict honest commercial practice are unacceptable.

However, fair play in the market cannot be ensured solely by protecting industrial property rights.

There is a wide range of unfair actions in the world, such as those that arise from advertising that misleads the consumer or from violation of trade secrets, etc.

All these specific actions are usually not considered by laws in the field of industrial property protection.

In some cases of unfair competition, a connection can be traced between these two types of protection.

For example, in many countries, the use of trademarks that have not been registered is prohibited at all. This is considered unlawful on the basis of general principles in the field of protection against unfair competition. In a number of countries, such unauthorized use is known as passing off.

An example of this kind can also be found in the field of inventive activity. For example, if an invention is not disclosed and is not considered a trade secret, the performance of certain actions by a third party in relation to this trade secret is prohibited and treated as unlawful. Moreover, the performance of certain actions in relation to an invention that has not been published and patented or in relation to which the patent term has already expired may also be treated as unlawful in a number of special cases.

The question of what is unfair or dishonest is largely determined by the economic and social realities of a particular place and time. Legislation in the field of unfair competition depends on the changing circumstances and realities of the present.

On the one hand, it can define a strong legal framework, and on the other hand, it can provide a fairly flexible norm for the formulation and application of measures.

Legislation can be adjusted in the light of the specific and constantly changing social and economic conditions in a particular country. In addition, it can serve as an effective means of combating the types of unfair practices defined by the law that create problems in the field of trade.

6. LEGAL ASPECTS OF ACTIVITIES IN THE FIELD OF INDUSTRIAL PROPERTY

6.1. Regulation of relations in the field of invention

Protection of inventors' rights is not possible without patenting inventions. Only a patent guarantees its owner the exclusive right to use the results of his own creative work.

One of the three main components of providing legal protection for an invention is its patentability [7]. The law defines three main requirements that a patentable invention must meet:

- be new;
- have an inventive step;
- be industrially applicable.

A utility model meets the conditions of patentability if it is new and industrially applicable.

An invention (utility model) is defined as new if it is not part of the state of the art.

An invention has an inventive step if it does not clearly follow from the state of the art for a specialist.

The state of the art is determined by all sources of information publicly available in Ukraine and in foreign countries known before the date of filing an application for an invention (utility model).

An invention or utility model is recognized as industrially applicable if it can be used in industry, agriculture, healthcare and other sectors of social production.

The novelty of the proposed technical solution, when considering an invention, is checked by comparing it with all previously known solutions to similar problems in the world.

The degree of novelty of a technical solution to a problem can be different and is determined by the significance of the differences.

The next feature is the inventive step. In the official interpretation of the previous and this definition, the concept of "state of the art" is used. Determining the state of the art, that is, forming an idea of the current level of development of technology and knowledge about it is impossible without familiarizing yourself with all types of publicly available information, of course, not all, but only that part of it that concerns the technical solution that is claimed. In this case, all sources must be taken into account both in Ukraine and abroad.

And, finally, the last feature of the invention is industrial applicability. The objects of inventions can be a device and a method. In addition to them, the objects of the invention include: a substance, a strain of a microorganism, cultures of plant and animal cells, as well as the use of a device, method, substance, strain for a new purpose. In the following, we will consider the first two of the objects in more detail.

The object of a utility model can only be the constructive use of a device.

Each invention is dedicated to solving a technical problem. Therefore, the solution to this problem must be technical: the solution itself, not its formulation.

According to generally accepted rules, the inventor's property right is certified by a patent. The term of the patent is calculated from the date of filing the application and is: for an invention – twenty years, for a utility model – ten. It should be remembered that in Ukraine there is also a so-called declarative patent for an invention.

The basis for its issuance is a formal examination of the application and verification of the local novelty of the proposed technical solution in Ukraine. A declarative patent is issued for a period of six years; after which it must be subject to examination on the merits or canceled. However, this applies only to the property rights of the owner; the copyright of the author of the declarative patent is attached to him forever.

A utility model patent is also declarative. It is issued on the basis of a formal examination of the materials of the utility model application. A declarative patent for a utility model is issued under the responsibility of the owner without guarantees of the validity of the patent.

An application for a patent may be filed by the inventor or his heir, employer or legal successor of the inventor or employer. To designate all these persons, one term can be used – applicant. On behalf of the applicant, an application may be filed by a representative in intellectual property matters (patent attorney) or another authorized person.

An inventor is recognized as an individual whose work created the invention. The authorship of legal entities is not recognized by the Law.

The Law clearly distinguishes the inventor from other persons who provided him only with technical, organizational, material and legal assistance or assistance in conducting research work and preparing technical documentation.

If several individuals participated in the creation of the invention, all of them are recognized as inventors, and the procedure for using the rights belonging to them is determined by an agreement between them.

The right of authorship is a personal non-property right and belongs to the inventor. It is inalienable: it is not transferred to other persons and is protected indefinitely. This right does not pass to the successor, unlike property rights certified by a patent.

An invention created on behalf of an employer or in connection with the inventor's performance of official duties is qualified as an official invention.

If an application for an invention is filed by an employer, he has the right to obtain a patent, provided that the employment agreement (contract) between the inventor and the employer does not provide otherwise.

The employer may exercise the right to file an application only within four months from the date of receipt of a written notification from the inventor about the creation of the invention by him.

If the employer does not file an application with the Institution within the period specified by the Law, the right to obtain a patent is passed to the inventor.

The forms of applications for the issuance of patents for inventions and utility models are somewhat different. As a rule, the application materials must at least contain:

- an application for the grant of a patent for an invention with a qualifying examination or a declaratory patent for an invention (utility model);

- a description of the invention (utility model);

- a claim for the invention (utility model);

- drawings (if they are referenced in the description);

- an abstract.

If the description is in a foreign language, then in order to preserve the priority date of the application, its translation into Ukrainian must be received by the Institution within two months from the date of filing the application.

After the priority date is established, a notification is sent to the applicant, indicating the date of filing the application and its registration number. In the future, when corresponding with the Institution, the applicant must refer to the registration number of the application.

Priority is the precedence in filing an application, and it is usually established by the date of filing a correctly completed application with the Institution.

If an application for the grant of a patent for the same invention by a foreign applicant was first filed with the Patent Office of one of the states party to the Paris Convention for the Protection of Industrial Property, the applicant has the right to exercise the right of convention priority. This means that within 12 months from the date of filing the application, the applicant may file an application in Ukraine, indicating in the application that he intends to use the right of convention priority, indicating the filing date and registration number of the previous application, the state in which it was filed.

The application must be sent within 3 months from the date of filing the application to the Institution. Within the same period, a certified copy of the application, according to which priority is established, and its translation into Ukrainian are submitted.

According to the requirements of the Law, there is a certain procedure for Ukrainian citizens to file applications for inventions and utility models with patent offices of other states.

Before filing an application for obtaining a protection document for an invention (utility model) of another state, including an international application, Ukrainian citizens are required to file an application with the national Institution. In addition, the applicant must simultaneously notify the Institution of his intentions to carry out foreign patenting.

If the ban on foreign patenting has not been received within 3 months from the date of receipt of this notification to the Institution, an application for a foreign patent for an invention (utility model) may be filed with the patent authority of a foreign state. In necessary cases, the Institution may allow foreign patenting even before the specified period.

Otherwise, at the request of the Institution, the foreign patent may be canceled, and the applicant may incur administrative or criminal penalties.

Patent information is concentrated in the following sources: industry abstract journals; bulletins; funds of complete descriptions of copyright certificates and patents for inventions and utility models.

The flow of new patents for inventions and utility models is grouped according to certain characteristics. Each new product settles in a specially designated category. This system, which brought order to the patent multitude, was called the international patent classification, which contains sections:

F - Satisfaction of human needs;

B - Various technological processes;

C - Chemistry and metallurgy;

D - Textiles and paper;

E - Construction;

F - Applied mechanics, lighting and heating, engines and pumps, weapons and ammunition;

G - Technical physics;

H - Electricity.

Each section can contain 99 classes, which, in turn, are divided into subclasses, which are denoted by capital Latin letters.

Subclasses are divided into groups, which are usually denoted by odd numbers.

Groups are divided into subgroups and denoted by even numbers. This type of search, associated with a specific thematic direction, has the appropriate name – thematic.

There is another search method. It is used when the number of the protection document and the country of patenting are known.

This type of search is numerical. The necessary information is searched for using numbering indexes, where the numbers of protection documents are arranged in ascending order.

There is also the so-called name or company search, when documents belonging to a specific person or company are searched. In most cases, this type of search is found as one of the stages of the thematic search.

Search for similar patents. This type of search aims to identify patents obtained for the same invention among the protection documents of different countries. This is usually associated with export-import operations.

It is customary to start a patent search with specifying the task. Depending on the nature of the task, the type of search, the list of countries, its retrospective (depth) and the list of documents (author's certificates or patents) are determined. To search for patent information, in most cases, industrially developed countries of the world are chosen, such as Japan, Germany, the USA, Great Britain, and France. In addition, the search is also conducted in the country where this branch of technology is most developed.

The retrospective nature of the search depends on its purpose. Thus, at the stage of development planning, it is advisable to study descriptions of inventions for the last 7... 10 years, when conducting patent research before starting the development of a specific topic – 10... 15 years, when studying the patentability of technical solutions, as well as when filing an application for an invention – 50 years.

In the case of checking a technical solution for patent purity – for the term of the patent for the invention, which, as a rule, is 20 years in most countries of the

world. For a utility model, as you remember, the life cycle is measured in 10 years. It should be noted that not all countries have such a type of protection for a technical solution as a utility model.

The examination of an application for an invention is carried out by the Institution in accordance with the Law and the rules established on its basis.

In Ukraine, a system of so-called “deferred” examination of applications for the issuance of patents for inventions has been established.

The essence of this system is that the paperwork for the application consists of two stages:

- examination on formal grounds, which ends with the publication of information on applications for inventions accepted for consideration in the official bulletin of the Institution “Industrial Property”;

- examination of the claimed invention on the merits.

The examination of an application for an invention on formal grounds is also called preliminary.

It is carried out without a special request from the applicant within two months from the date of filing the application with the Institution.

During such an examination, the availability of necessary documents and compliance with the established requirements for their execution are checked. The question of the compliance of the claimed object with the conditions for granting legal protection is considered.

At the stage of examination on formal grounds, an invention application may be rejected for the following reasons:

- the invention does not meet the conditions for granting legal protection;

- the applicant for the invention did not submit a timely response to the examination request (according to the Law, this period is two months from the date of receipt of the notification by the applicant from the Institution);

- the materials sent by the applicant for the invention in response to the request from the Institution do not contain the necessary corrections and clarifications;

- additional or corrected materials, as well as a reasoned request for an extension of the response period, were received later than two months from the date of receipt of the notification by the applicant from the Institution;

- a decision has been made on the possibility of conducting an examination on the merits of the invention, and a request for its conduct has not been submitted within three years from the date of filing the application.

If the application for the invention has passed the examination on formal grounds, a notification is sent to the applicant.

If the Institution makes a decision to reject the application for an invention (CM), a notification of this is sent to the applicant.

If the application for an invention has passed the examination on formal grounds, the applicant is notified of the possibility of conducting an examination of the application for an invention on the merits.

At any time before the date of receipt of the decision to grant a patent, the applicant has the right to withdraw the application for an invention

At the request of the applicant or any other interested person, an examination of the application for an invention on the merits is conducted. The applicant may submit such a request within three years from the date of filing the application with the Institution.

Any interested person may submit a request for examination of the merits after the publication of information about the application accepted for consideration in the Official Gazette, but no later than three years from the date of its filing.

A document confirming payment of the fee for conducting an examination of the merits is attached to the request.

The examination of the application for an invention on the merits includes the following stages:

- verification of the claims;

- verification of the invention for compliance with the conditions of patentability.

The institution may request additional materials from the applicant, without which the examination is essentially impossible, and in these circumstances the applicant must submit them within two months from the date of receipt of the relevant request.

If the examination finds that the additional materials go beyond the scope of the invention disclosed in the submitted application, they shall not be taken into account.

If, according to the results of the examination, it is established that the claimed invention meets the conditions of patentability, the Institution shall issue a decision to grant a patent, which shall be sent to the applicant. Otherwise, the Institution shall issue a decision to refuse to grant a patent and a decision to reject the application shall be sent to the applicant.

Based on the decision to grant a patent for an invention and upon receipt of a document confirming payment of the fee, the Institution shall publish information on the grant of a patent in the official bulletin.

The simplest example of a description of the invention, formula and abstract submitted by the author to obtain a patent may be an application for DOUBLE-LAYER SOLE OF FOOTWEAR.

The invention relates to the footwear industry, namely to double-layer soles of shoes, and can be used for the manufacture of any type of footwear, both mass-produced and special.

It is well known that the quality of the sole significantly affects the consumer properties of footwear: ergonomics, strength, wear resistance. During the operation of footwear, different areas of the sole are unevenly loaded.

The greatest pressure falls on the toe, heel and bundle zones, respectively, these areas wear out much faster than others. This leads to premature failure of the footwear.

The use of a more durable material leads to a decrease in the elasticity of the sole, which results in discomfort and fatigue when wearing shoes.

Therefore, the main direction of improving the details of the bottom of footwear is to increase their strength and wear resistance while maintaining flexibility and elasticity.

A shoe sole is known (United States Patent No. 5572804. Shoe sole component and shoe sole component construction method, 1996) with elastic circular grooves arranged at a certain pitch, which cushion the foot when walking. This sole design increases its elasticity and flexibility, but does not solve the problem of wear resistance.

A two-layer shoe sole is also known (United States Patent No. 5572805. Multi-density shoe sole, 1996), the upper layer of which is made of a soft elastic material, and the lower layer is made of a strong wear-resistant material. The upper layer has a profiled surface in the shape of the foot, and the lower layer has a uniform thickness over the entire surface area. In the known sole, when the durable lower layer of the sole is worn in the toe, heel and toe zones, intensive destruction of the upper layer, made of a softer material, begins, which makes it impossible to use the shoe further.

The invention is based on the task of creating such a two-layer shoe sole, for which changing the shape of the elements made would ensure an increase in the service life.

The task is solved by the fact that in a two-layer sole, the upper layer of which is made of a soft elastic material, and the lower one is made of a strong wear-resistant material, according to the invention, the shape of the layers at the point of their connection corresponds to the features of the functional loads on individual areas of the sole.

The execution of the two-layer sole in such a way that the lower layer, formed of a wear-resistant material, has thickenings in the toe, heel and bundle zones, and in the upper, elastic, layer - the corresponding recesses, allows the wear-resistant material to remain in areas that are subject to intensive wear for a longer time, which increases the service life of the shoe.

From the literature, the author is not aware of the presence of thickenings on the lower layer of a two-layer sole and recesses in its upper layer at the junction of the layers to take into account the unevenness of the operational load over the area of the foot, which meets the criterion of the invention “inventive level”.

Fig. 6.1 shows the claimed two-layer sole, Fig. 6.3 shows its upper and lower layers.

The two-layer sole of the shoe includes an upper layer 1, which is in contact with the human foot, made of elastic material, and a lower, running, layer 2, made of wear-resistant material. The lower layer 2 of the sole contains thickenings 3 in the toe, 4 in the heel and 5 in the bundle zones, and the upper layer 1 of the sole contains recesses 6, 7 and 8, which correspond to the shape of the thickenings of the lower layer.

The sole is made of polymer materials by injection molding: first, one layer of the sole is molded, after which the next one is poured on top of it. The sole can be attached to the upper of the shoe (not shown in the drawing) either by molding or by any other method.

The claimed two-layer sole works as follows. During the operation of the shoe, the sole is worn unevenly: more intense wear occurs in the toe, heel and bundle zones.

By increasing the thickness of the lower wear-resistant layer of the sole in these places, the wear-resistant material is retained in them longer and intensive wear of the soft upper layer does not begin.

CLAIM OF THE INVENTION

A two-layer shoe sole, the upper layer of which is made of a soft elastic material, and the lower layer is made of a strong wear-resistant material, which is characterized in that at the junction of the layers, the lower layer has thickenings in the heel, toe and bundle zones towards the upper layer, and the upper layer has recesses corresponding to the shape of the thickenings in the lower layer.

ABSTRACT

Object of the invention: Two-layer shoe sole. Field of application: footwear industry. Essence of the invention: a two-layer shoe sole is made in such a way that the lower layer, formed from a wear-resistant material, has thickenings in the toe, heel and bundle zones, and the upper, elastic, layer has corresponding recesses, which allows the wear-resistant material to remain longer in areas subject to intensive wear. Technical result: increasing the service life of the shoe.

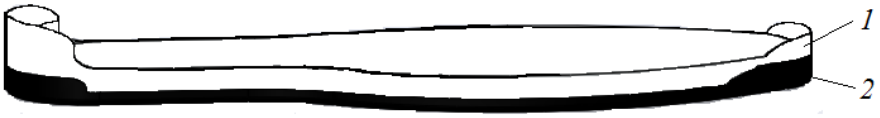

Fig. 6.1

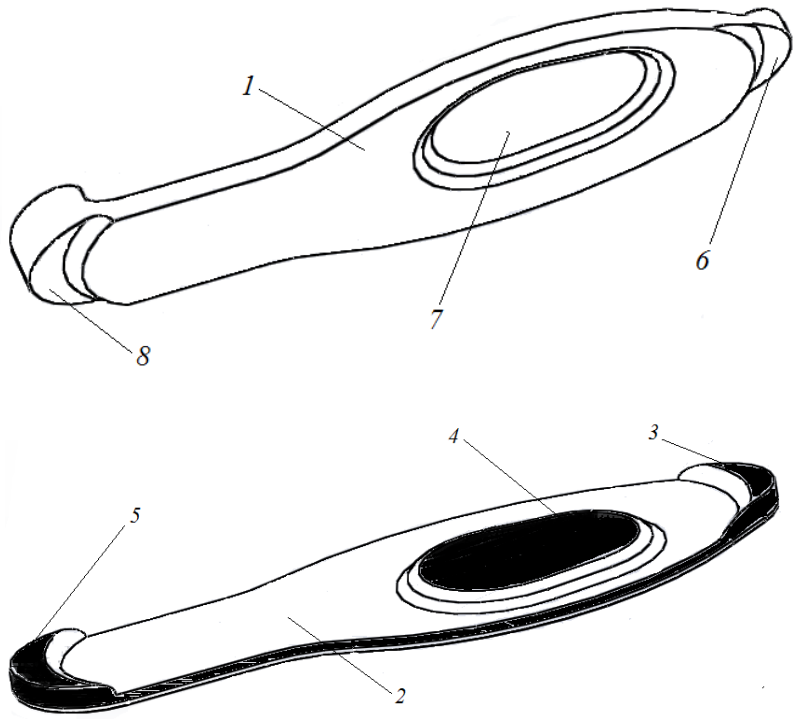

Fig. 6.3

In the context of Ukraine's entry into the global economic space, the nature of relations in terms of intellectual property is changing rapidly. In particular, if earlier the state had rights to the results of the intellectual activity of members of society with all the consequences that follow from this, now in Ukraine their

owner is the real author, who must take care of the legal protection and use of his product on the market.

The world practice of protecting the rights of intellectual property objects, in particular, industrial property, built on private interest, inspires hope for their rational use.

The term “patent” today is associated with exclusive rights to an industrial property object that operates within a certain country. In the production sphere it is the exclusive right to manufacture a patented object, and for trade, to introduce it into commercial circulation.

That is, to summarize, the main goal of legal protection of inventions can be formulated as protection against unauthorized access to material benefits from their use.

But we have already mentioned that a patent has clearly defined national borders and does not protect its owner in the territory of other states. But trade, as everyone knows, knows no limits and borders.

That is why the world institute for patenting inventions in other countries was introduced, so that it would be possible to protect the interests of their owners all over the world.

The procedure for patenting inventions in other states is carried out by their owners for a specific purpose:

- to protect their interests when exporting products.

- to protect them in foreign territories as the object of their own scientific and technical achievements.

- to capture new and expand existing markets for their products. And, finally, to comprehensively promote international cooperation in the scientific and technical, industrial, commercial spheres, etc.

The latter applies to joint ventures, international scientific and technical cooperation, etc.

Patenting objects is preceded by painstaking and purposeful work on in-depth study of the product market, selection of patenting countries, forecasting

possible future losses and profits, sources of financing necessary for patenting, advertising companies, etc.

Today, the issues of protecting intellectual property created during international scientific and technical cooperation and the work of joint ventures are gaining particular relevance.

The legal basis for such regulation should be specific agreements developed taking into account international agreements on scientific and technical cooperation signed by Ukraine.

However, the main strategy for obtaining protection should be based on three pillars:

- functional – the type of legal protection for a certain object (invention, “know-how”, etc.), the terms and patenting system that it is advisable to use;

- geographical – the choice of countries where it is advisable to obtain legal protection for the object;

- financial – the search for funds for carrying out patenting activities (payment of fees, maintaining the validity of the patent, etc.).

The choice of the type of legal protection, in turn, depends on:

- the object of legal protection;

- the features of the national legislation of the patenting countries.

It should be noted that not all countries are subject to legal protection for utility models.

However, there are still a large number of countries where they are protected (Austria, Bulgaria, Brazil, Venezuela, Vietnam, Spain, Italy, China, Korea, Germany, United Arab Emirates, Peru, Poland, Portugal, Somalia, Taiwan, Uruguay, Hungary, Philippines, Finland, Czech Republic, Chile, Yugoslavia, Japan, as well as post-Soviet states, except Georgia).

Also, when patenting objects, it should be taken into account that by choosing a utility model as the object, the applicant, as a rule, will spend less money and time. In addition, the issue of protecting one's own interests can be approached comprehensively.

This is especially important for export deliveries and the sale of a license. In such cases, as a rule, they try to protect their own product as much as possible.

Therefore, in addition to the object itself, they register, for example, a trademark; the design of the product is protected by a patent for an industrial design, etc.

As for the patenting system, the applicant must actually choose it himself. As a rule, these works are carried out with the help of patent attorneys accredited in the state of patenting. If it is necessary to patent an invention or utility model in only a few states, it is advisable to file applications with patent offices in each of these states.

This path is not the best, because it is associated with significant losses in terms of money and time. After all, you have to pay for the services of patent attorneys in each of these countries. However, in addition to the traditional scheme, there are other procedures. For example, applications can be filed in accordance with:

- the Patent Cooperation Treaty;
- the requirements of the European Patent Convention.

According to the first option - filing an application in accordance with the Patent Cooperation Treaty, there are two phases: international and national.

The international phase includes: filing an international application, conducting a search and international publication. In addition, at the request of the applicant, a preliminary international examination of the application may be additionally conducted. National phase is the procedure for consideration of international applications by the national patent offices of the countries where patenting is carried out.

The disadvantages of this system include the relatively high cost of services. As well as the inability to change the compiled list of patenting countries during the work on the project, which in practice happens quite often. Therefore, it is advisable to use it only if it is necessary to patent an object in at least four to five countries. This allows, as the experience of leading companies in the world shows,

to reduce costs compared to the traditional patenting scheme.

Patenting under the procedure of the European Patent Convention allows you to obtain a patent that will be valid in the territories of the countries specified in the application. The patenting procedure under this scheme is not cheap and can only be compared with the cost of 4...5 separate protection documents. However, it also has its advantages.

According to the requirements of the European Patent Convention, only one application is filed, in one language, and through one patent attorney, and a patent document simultaneously protects the subject matter in several countries party to the European Patent Convention.

In addition to the above, the patenting procedure can also be carried out under the systems provided for by other regional agreements, for example, the Eurasian Patent Convention, the African Intellectual Property Organization, etc.

Therefore, it should be borne in mind that the procedure for patenting industrial property objects in foreign countries is quite complicated and requires significant funds.

The decision to carry it out should be made only on the basis of a deep and comprehensive analysis of the market, one's own capabilities and, of course, serious grounds. Among the latter, a guarantee of export supplies of products or the sale of a license may be decisive.

6.2. Transfer of rights in the field of industrial property

One of the most common types of transfer of ownership rights to industrial property objects is the so-called licensing procedure.

Licenses are voluntary and compulsory. A voluntary license occurs when the owner voluntarily transfers his property rights to another individual or legal entity.

A compulsory license is used, as a rule, in very limited cases, and is necessarily accompanied by the mandatory payment of monetary compensation to the author.

It should be noted that in practice a compulsory license is a certain restriction of the rights of the owner. Therefore, the procedure for its granting is regulated by law and can be implemented only in two ways: administrative or judicial.

The administrative procedure is applied if this is required by the public interest or the interests of the country's national security.

Then the Cabinet of Ministers of Ukraine has the right, without the consent of the owner, to transfer the right to use the industrial property object to any other legal entity. The transfer of these rights must take place under the terms of a non-exclusive license.

In court, a compulsory license may be granted upon application by an interested party. Such actions may only occur when the owner or his successor has not used or has insufficiently used the industrial property object in Ukraine within three years after the patent was granted. In addition, these same actions may be applied in the event that the use of a patent for an invention has been suspended for a period of more than three years.

According to legal terminology, when exclusive property rights are transferred under a license agreement, the persons who are contemporaries of this agreement receive certain specific names.

The owner of exclusive rights who transfers them to another person is hereinafter referred to as the licensor, and the person to whom these rights are transferred is called the licensee.

One of the most common types of transfer of ownership rights to industrial property objects is the so-called exclusive license. An exclusive license involves the transfer by the licensor of its own exclusive property rights to a certain intellectual property object in full.

Under an exclusive license agreement, the licensor transfers the right to use the invention to the licensee in a certain scope, reserving the right to use the invention in the part that is not transferred to the licensee.

In this case, the licensor does not have the right to grant a license to use the

invention to another person in the same territory in the scope of the rights granted to the licensee.

A license agreement is considered valid if it is concluded in writing and signed by the parties.

The specified agreement enters into force with respect to any other person only after its registration with the Institution, namely from the date of publication of information about it in the official bulletin and its entry in the Register. Fees are paid for entering the specified information into the Register and changes to it at the initiative of the parties to the agreement.

In addition, in an exclusive license agreement, the licensor may limit the licensee's rights with respect to:

- the term of the agreement (which may be equal to or less than the term of the patent);

- the territory (a specific enterprise, region, country, etc.);

- type of use (only sale of the object or only its production, etc.);

A contract for the transfer of ownership of an industrial design is also carried out on the basis of a license agreement drawn up in writing, which enters into force after its signing by the parties and registration with the Institution.

The owner of the certificate has the right to issue a license to any person to use the mark on the basis of a license agreement. The license agreement must contain a condition that the quality of goods and services manufactured or provided under this agreement will not be lower than the quality of goods and services of the owner of the certificate and that the latter will monitor the implementation of this condition.

In legal terminology, when exclusive property rights are transferred under a license agreement, the persons who are parties to the agreement are given certain specific names. Thus, the owner of exclusive rights who transfers them to another person is called the licensor, and the person to whom these rights are transferred is referred to as the licensee.

The certificate holder has the right to place a warning label next to the sign

indicating that this sign is registered in Ukraine. In addition, the certificate holder who carries out intermediary activities has the right, on the basis of an agreement with a manufacturer of goods or a person providing services, to use his sign next to the sign of the specified persons, as well as instead of their sign.

As for other objects, the license agreement comes into force under the same conditions as in the previous cases.

Under a non-exclusive license, the licensor grants the licensee permission for a certain use of the intellectual property object. At the same time, he retains the right to use the object issuing licenses for this same object himself.

The legislation of Ukraine emphasizes some features of the use of a non-exclusive license for some intellectual property objects.

When concluding a license agreement for the use of the invention, the licensor transfers the right to the licensee, reserving the right to grant licenses to other persons, including the right to grant licenses to other persons.

A licensee who has received exclusive rights to a certain intellectual property object has the right to issue a so-called sublicense agreement to another person, usually in the scope of the rights granted to the licensee.

In this case, the legal relationship between the licensor and the licensee is preserved. The sublicensee simply does not enter into direct relations with the licensor. In this case, the licensee assumes all responsibility to the licensor for the implementation of the sublicense agreement.

The economic feasibility of a sublicense agreement lies in the fact that in this way the need for demand for goods and services in the territory of the agreement is satisfied if the licensee is unable to satisfy them himself.

The scope of rights granted to the sublicensee is determined by the scope of rights that the licensee would receive under an exclusive license, and usually cannot exceed them. Most often, such agreements are concluded in relation to inventions and trademarks.

In addition to the direct transfer of rights to an intellectual property object, another form of transfer of ownership is known. This is the so-called transfer of

ownership rights to a certain object into co-ownership.

That is, with the consent of the owner, one or more persons may become new co-owners, for example, of a patent for an invention or a trademark certificate, etc.

To do this, the owner of the security document must conclude with the future co-owner (co-owners) a corresponding agreement on the transfer of ownership rights into co-ownership.

An application for registration of such an agreement with the Institution is submitted by the owner of the security document. In addition to the above actions, a change in the composition of the co-owners of the security document is provided for. In this case, two situations may arise. In the first case, some of the co-owners of the security document may waive their ownership rights in favor of its other co-owners.

In the second case, some of the co-owners of the security document may waive their share of ownership in favor of third parties.

In both the first and second cases, a corresponding agreement is concluded between the old and new co-owners of the security document, which is signed by them.

The application for a change of owners in these cases is submitted on behalf of all co-owners. However, such applications are signed only by those co-owners who have waived their rights or are transferring them. After registration of the agreement, all new co-owners of the security documents have equal rights to use it.

The relationship between them is regulated by a special agreement. If such an agreement is not concluded, none of the co-owners can independently, without the consent of the other co-owners, perform any legal actions related to the transfer of their own rights to another person or the issuance of a license.

In world practice, there is another scheme for the assignment of rights to certain types of intellectual property objects.

Thus, in recent decades, the sale of goods, services and technologies under franchising has become widespread in countries with developed economies. The

concept of “franchising” comes from English language and is interpreted differently in special legal literature.

A franchise agreement is an agreement between a supplier of products or services, or the owner of a trademark or author of a work of art that is very popular.

In this case, the one who receives the rights (franchisee) assumes the obligation to trade the products or provide services under the name of the franchisor (the one who owns the products or services), while maintaining their level of quality.

Franchisee – is an energetic businessman, entrepreneur, manager. The term franchisor also comes from the English language, which means an organizer of affairs, the owner of a general license.

The current activities of the franchisee are completely independent, but his enterprise does not function as a separate entity, but acts as part of a single complex, united by the franchisor, who is the owner of the intangible assets of the enterprise, which belongs to the franchisee under the franchise agreement.

It should be recognized that the aforementioned intangible assets, or in other words, intellectual property, are the reason why hundreds of thousands of franchisee entrepreneurs agree to pay for the right to use the franchisor's scheme even in cases where they know all its characteristics in detail. Intellectual property in this case can cover a wide range of objects: from objects of industrial property to objects of copyright. With all their diversity, they must be protected by a certain security document or trade secret regime, precisely because they have judicial protection.

Therefore, potential franchisees are forced to conclude a property agreement for a fee. In this way, they provide themselves and their own business with a reliable advantage and a guarantee of stable existence and further growth.

There are some positives and attractions For the franchisor:

1. The opportunity to receive considerable benefits from the rapid expansion of their own business without resorting to loans and without taking on serious

financial obligations, because it is the franchisee who invests his share in the business and the associated expansion.

2. For the franchisor, the success of a franchisee – an independent entrepreneur who seeks to increase his own profits can be more profitable than operating his own enterprise or outlet with a manager who has not invested his own funds in this business.

3. Exercising greater control over the terms of sale of his own products compared to what the traditional path, which does not provide for such close interaction with customers, can give the franchisor.

4. Expanding the distribution network of his own goods or services, especially with the conclusion of franchise contracts, under which franchisees are obliged to purchase equipment and ingredients for the manufacture of the final product from the franchisor.

5. Gaining significant advantages in the case of international franchising development. Working together with a franchisee in another country, the franchisor studies in detail foreign legislation and the peculiarities of doing business in this country, learns about the requests of a foreign consumer, etc., that is, he gains knowledge, the theoretical development of which would cost him much more.

Another form of intellectual property is a tehnology that hase a patentable level of novelty but can not be publicated due its secret nature. “Know-how” is a set of technical, technological, commercial and other knowledge, expressed in the form of technical documentation, skills and production experience, necessary for the organization of a particular type of production, but not patented.

In principle, under certain circumstances, “know-how” may include:

- equipment, samples, components or spare parts, tools, etc.;
- methods, projects, process parameters or other data, instructions, etc.;
- unpatented inventions, calculations, drawings, etc.

6.3. Protection of industrial property rights

One of the main tasks that our state faced in connection with the country's integration into world and European structures was to bring the current legislation in the field of protection of industrial property rights into line with world standards.

It is generally recognized that industrial property objects are an important and integral part of the economic development of any state.

In Ukraine, protection against violations of exclusive rights to industrial property objects is also of great importance.

Legal means of protecting already acquired rights are provided for in the relevant articles of a number of Laws of Ukraine: on the protection of rights to inventions and utility models, industrial designs, marks for goods and services, topographies of integrated circuits, and are also stipulated in various national codes.

Actions by any person regarding the manufacture, offering for sale, introduction into economic circulation, use or import or storage for the specified purpose of an object protected by a patent are recognized as a violation of the rights of the owner of a patent for an invention or utility model.

Similar rules apply to other objects of industrial property. For example, the actions of any person to apply to a registered mark placed on the packaging of goods or in advertising another designation that is so similar to it that they can be confused are recognized as a violation of the owner's rights.

At the request of the owner of the patent or certificate, such a violation must be stopped, and the infringer is obliged to compensate the owner of the patent for the damages caused.

The person who purchased the license may also demand the restoration of the violated rights of the owner of the patent or certificate, unless otherwise provided for in the license agreement.

To protect the exclusive right, the owner must prove that his patent or certificate has been violated.

Thus, in cases of counterfeiting, that is, violation of rights to a patent or certificate, the central issue is the issue of collecting evidence of the facts of such a violation.

It should be understood that this process is very laborious. It is especially difficult to obtain evidence in cases of infringement of rights to such an object of invention as a method, since it is necessary to have access to the infringer's enterprise.

The above list of counterfeit acts is exhaustive, that is, any other acts cannot be prosecuted under the Law.

It should be noted that the listed acts are separate cases of illegal use of the protected object and have independent significance. In other words, any of the specified acts, for example, manufacturing, is already considered a violation of the Law.

The independence of the specified offenses lies in the fact that for each of them the owner of the rights can prosecute the infringer of his patent. Previously, the original forms of offenses were only unauthorized production of a product and application of a method.

But over time, as a result of market transformations associated with the specialization of enterprises, the development of cooperation, it became necessary to ensure effective protection of the product at all stages of its promotion to the consumer: production, storage, import, offering for sale, sale, etc.

It is necessary to take into account that each form of illegal use has its own characteristics.

For example, the fact of manufacturing a counterfeit product in itself is already an offense and does not depend on the subsequent introduction of the product into circulation.

However, it should be remembered that such production must be industrial in nature and be carried out for commercial purposes.

This is also quite appropriate for such a form of counterfeiting as the import of goods into the customs territory with a violation of intellectual property rights. This type of offense also does not depend on the further actions of the infringer in relation to such goods.

At the same time, as regards the storage of counterfeit goods, the presence of intent to carry out further actions (for example, offering for sale, selling) is decisive for qualifying it as an offense, because the fact of storage itself does not yet confirm the infringer's intentions to introduce the goods into economic circulation.

Therefore, it should be recognized that the correct qualification of the infringement of the owner's rights is of paramount importance for the protection of his property interests.

It should be borne in mind that not all actions that infringe the rights to an object can be considered introduction into economic circulation.

The manufacture of a certain product, for example, is considered introduction into economic circulation. Such an approach to the qualification of an offense can lead to a significant narrowing of the patent monopoly of the rights holder.

In addition, the concept of “prior use” in relation to inventions cannot be incorrectly applied, understanding by this the manufacture of prototypes or trial batches. It should always be understood that the term “prior use” has a clear legal meaning.

An exception to the patent monopoly is the use of an invention by a person who has introduced it in good faith and independently or has made the necessary preparations for this (prepared production).

This refers to a manufacturer who has come up with this invention himself, without knowing about the application, and has invested significant funds in its implementation.

7. ECONOMIC SIGNIFICANCE OF TRADEMARK FOR GOODS AND SERVICES

7.1. Legal protection of trademarks for goods and services

A trademark is a designation by which the goods and services of some persons are distinguished from the similar goods and services of other persons.

The main functions of a trademark include:

- individualizing, which consists in the fact that the trademark provides the necessary distinction between similar goods (services) of different manufacturers, allowing to recognize and remember by external signs the goods (services) produced by a particular enterprise;

- guarantee, which consists in the fact that the trademark acts as a guarantor of the quality of the goods known to consumers;

- advertising, which consists in the fact that, based on the psychological impact on the consumer, a stable interest in a certain product marked with a trademark and its manufacturer is ensured, which ensures such popularity, that is, the trademark is an indispensable element of advertising, with the help of which a connection between the product and its manufacturer is established.

In addition, the trademark also performs other auxiliary functions, including stimulating, psychological, and educational.

The right to a mark is protected by the state and protected by a certificate. Legal protection of a mark in Ukraine can be obtained only through its registration with Ukrpatent [7].

A certificate is an official security document issued on behalf of the state by the authorized patent office of Ukraine. The certificate certifies the ownership of the mark. The validity period of the certificate is 10 years and is extended, at the request of the certificate owner, each time for 10 years. The number of extensions is not limited.

In order to obtain a mark certificate, an application must be submitted to the Scientific Research Center for Patent Examination, drawn up in accordance with

the "Rules for drawing up, submitting and considering an application for the issuance of a certificate of Ukraine for a mark for goods and services".

To designate a protected trademark, the symbol - ® is used, which is placed to the right of it. If it is necessary to designate a trademark that is on registration, another symbol - ™ is used.

Legal protection in Ukraine is granted to a sign that does not contradict public interests, principles of humanity and morality and to which the grounds for refusal to grant legal protection do not apply.

The object of a sign can be verbal, pictorial, three-dimensional and other designations or their combinations, and they can be registered both in black and white and in color or a combination of colors.

A verbal sign is understood as a designation that has the form of a word (words) or a combination of letters that have a verbal character. Such signs are becoming increasingly widespread, since they have a number of advantages over other signs. These signs are easier to remember, easier to reproduce, and they are convenient to advertise, especially on radio and television.

A figurative sign has the form of an image of a specific character or a composition of lines, spots, figures of any shape and color on a plane. For example, ornaments and symbols, images of animals, birds, stylized images of various objects, sometimes with the inclusion of letter elements.

A three-dimensional sign is a composition in the form of figures (lines) or their combinations in three dimensions. An example of such a sign is: figured soap, original type of packaging, vial, bottle, cigarette box, etc.

A combined sign has the form of a combination of elements of a diverse nature: most often these are verbal and figurative compositions.

Other objects of signs. Other objects of a sign can include sound, light, light-sound and other designations.

In international practice, along with the distribution of signs according to the form of their representation, individual and collective signs are distinguished.

An individual sign is a designation registered in the name of a separate legal

or natural person engaged in entrepreneurial activity.

A collective sign is a sign of a union, economic association or other voluntary association of enterprises (hereinafter referred to as the Association), intended to designate goods produced or sold by them, which have common qualitative or other general characteristics.

A collective sign must meet all the requirements for individual signs. In this case, a collective sign is the object of the exclusive right of the Association, and not the right of each enterprise that is part of it. Enterprises participating in the association may use a collective sign as the only means of designating goods or use it along with their individual trademark.

The Association, as the owner of the collective sign, has the right to control its use. The terms of use of a collective mark must be reflected in a special legal document, called the statute of a collective mark.

According to the degree of familiarity, marks are divided into ordinary and well-known.

An ordinary mark is any new original designation of goods (services) that meets all the conditions for granting legal protection. In particular, a necessary condition for its protection is state registration of the designation.

A well-known mark is a designation that is known to a wide circle of consumers due to its use to designate certain goods. According to the articles of the Paris Convention, in the states party to the Paris Convention, such trademarks are granted legal protection without registration in national offices.

These are trademarks that depict:

- state coats of arms, flags and emblems;

- official names of states;

- emblems, abbreviations or full names of international, intergovernmental organizations;

- official control, guarantee and assay marks, seals;

- awards and other distinctions.

However, the designations mentioned above may be included in the sign as

elements that are not protected, if there is the consent of the relevant competent authority or their owners.

According to a special agreement, the “red cross” was also removed from the register of trademarks. The Olympic symbol was also removed from the register of trademarks in accordance with the Nairobi Treaty on the Protection of the Olympic Symbol.

Also, removed from the register of trademarks are designations that:

- have no distinctive character;

- are commonly used as designations of goods and services of a certain type;

- indicate the type, quality, quantity, properties, purpose, value of goods and services, as well as the place and time of manufacture or sale of goods or provision of services;

- are commonly used symbols and terms;

- are misleading or likely to mislead as to the goods (services) or the person who manufactures the goods (provides the services);

- are identical or similar to such an extent that they can be confused with marks previously registered or applied for registration in Ukraine in the name of another person;

- are well-known marks;

- are brand names that are known in Ukraine and belong to other persons;

- are certification marks.

Identical trademarks are those that generally considered to be identical.

Similar signs are generally considered to be those which, despite different constituent elements, create the same visual impression (or are phonetically close to word signs), and in the event of registration may cause consumers to doubt the manufacturer of the goods.

Certification marks are signs that serve only as a reference to the compliance of the quality of goods or services with certain standards.

Surnames, first names, pseudonyms and derivatives thereof, portraits and facsimiles of people known in Ukraine shall not be registered as trademarks without

their consent. Names of works of science, literature and art known in Ukraine or quotations and characters from them or their fragments shall not be registered as trademarks without the consent of the copyright holders or their successors in title.

A trademark does not have distinctive character if it belongs to:

- trademark consisting of only one letter, number, line, simple geometric figure, which do not have a characteristic graphic design;

- realistic images of goods, if the sign is applied for registration as a trademark for designating these goods;

- three-dimensional objects, the shape of which is determined exclusively by a functional designation;

- commonly used abbreviations;

- trademark that have been used in Ukraine for a long time by several manufacturers as trademarks for goods that have a common quality or other common characteristics.

Commonly used symbols, in addition to those associated with a certain activity, also include conventional signs used in science and technology, designations of chemical elements, mathematical symbols, for example, a symbol such as an integral.

This group also includes trademarks devoid of originality, which are based on the image of an object characteristic of a given industry. For example, for the garment industry - an image of a needle with thread or items of clothing, a human figure; for mechanical engineering – an image of a gear, for a design bureau – an image of a compass, etc., since such designations, due to the frequency of use, cannot individualize the product and its manufacturer, can easily be confused by consumers and practically do not differ from each other.

Commonly used symbols and terms are an obstacle to the registration of a trademark only in the case when the trademark is applied for goods belonging to the same industry as the commonly used symbols and terms.

Any person, association of persons or their successors in title has the right to obtain a mark certificate.

An application for the issuance of a mark certificate may be submitted personally by the applicant or through a representative in intellectual property matters (patent attorney) or another authorized person.

7.2. Registration of a trademark for goods and services

The application must concern one trademark (unity requirement). The application is drawn up in Ukrainian and must contain:

- an application for registration of the trademark, signed by the applicant or his authorized representative;
- an image of the designation applied for;
- a list of goods and services for which the applicant requests registration of the trademark, grouped according to the International Classification of Goods and Services (ICGS);
- a document on payment of the application fee, drawn up in accordance with the requirements of the “Regulations on the Procedure for Payment of Fees for Actions Related to the Protection of Rights to Inventions, Utility Models, Industrial Designs and Marks for Goods and Services”;
- a power of attorney to a patent or other authorized person, if necessary;
- other necessary additional documents.

All of the above documents are sent to the Institution for state examination.

Examination of the application means the process of examining the application materials and the designation itself for compliance with the requirements set forth in the Law and the Rules, for the purpose of registering the designation as a mark.

The examination of the application consists of the following stages:

- setting the date of application submission;
- examination of the application on formal grounds;
- examination of the application on the merits;
- making a decision on issuing a certificate or rejecting the application.

After setting the date of application submission and in the presence of a document on payment of the relevant fee, the Institution conducts an examination of the application on formal grounds.

The formal examination establishes the compliance of the materials of the submitted application with the established requirements and the scope of the rights claimed by the applicant.

If during the examination it is established that the application does not meet the set requirements, the applicant is sent a notification about the need to clarify or correct the application materials within a two-month period from the date of receipt of the specified notification by the applicant.

The examination of the application on the merits consists in the fact that the Institution checks whether the designation applied for registration can be a trademark, whether it is not in conflict with already existing trademarks, whether the applied designation has distinctive character, whether it does not contradict public interests, principles of humanity and morality, i.e. whether this designation meets the conditions for granting legal protection.

The result of the examination of the application on the merits is the adoption by the Office of one of two decisions:

- on registration of the trademark;

- on rejection of the application.

If it is established that the designation applied for registration does not meet the conditions for granting legal protection for the entire list of goods and services or part thereof, the Institution issues a decision to reject the application.

If a positive decision on registration of the sign is made, state registration of the sign is carried out and the corresponding certificate is issued.

An example of a sign for goods and services, the description of which is provided for obtaining a registration certificate, is shown in Fig. 7.1.

Fig. 7.1. Trademark for goods and services (trademark)

The developed trademark is a combination of signs. It contains a figurative element and a word.

The figurative element is a schematic image of the sun, consisting of a circle and six triangles surrounding it.

Under the figurative element on the left is the inscription in Latin letters SOLAR, made in the font Ar Destine.

The sign is made in the form of a black and white image.

The description must also indicate the class to which the mark belongs according to the international classification.

The Nice Agreement concerning the International Classification of Goods and Services for the Purposes of the Registration of Marks currently has 14 articles.

The classification includes a structure of classes of goods and services, which consists of 42 classes, of which goods are divided into 34 classes and services into 8 classes. Goods are grouped into classes according to the types of materials from which they are made, as well as their functional purpose or industry purpose.

The names of goods or services appearing in the class headings are general names relating to the industries to which the goods or services belong. Therefore, to clarify the classification of each individual good or service, you should use the alphabetical list.

The alphabetical list contains the class headings for goods and services. In addition, it contains a list of classes with explanatory notes. The alphabetical list is presented in the form of two identical four-column tables on each page. For each good or service, the tables indicate in the columns:

- the class number to which the good or service belongs;

- the serial number of the name of the good or service in the alphabetical list of each of the language versions of the Classification (U – Ukrainian, E – English, F – French);

- the name of the good or service in Ukrainian, English and French;

- the base number of the name of the good or service.

The list of names of goods and services within a class can be considered a determinant of the content of the classes, that is, a list of conditional headings of the classes.

This list is a full translation of the names of goods and services given in the alphabetical list of goods and services into the text in the original. For example, class 07 includes machines and machine tools; engines (except those intended for land transport), and class 12 includes vehicles; means of locomotion by land, water, air.

The explanatory notes to class 07 indicate that this class includes, in particular, engine parts and electric cleaning machines and apparatus. As for class 12, the explanatory notes state that it includes, in particular: engines for vehicles; connectors and transmitters for vehicles; hovercraft.

For example, on page 109 - Bicycle engines - are classified in class 12 and have the serial number D 0032. And internal combustion engines (Anti-knock agents for fuel) are classified in class 01 and have the serial number D 0033. Engines for land vehicles, respectively - in class 12 and have the number D 0034. Engines for boats - class 07, D 0035, ship engines - class 07, D 0037, etc.

8. BASICS OF COPYRIGHT AND RELATED RIGHTS

8.1. The concept of copyright and related rights

Copyright relates to works of art (poetry, novels, music, paintings, films, etc.). Most european languages use a term copyright, which literally means the right to make copies. The term “copyright” actually emphasizes the main action, which in relation to literary or other artistic works can only be performed by the author himself or with his permission [7].

This refers to the reproduction of a literary or other work, such as a book, painting, sculpture, photograph or film, etc.

The term “copyright” focuses primarily on the personality of the author of the work of art, which emphasizes the fact that the legislation of many countries recognizes that the author has certain legal powers in relation to his work, for example, to prevent its distorted reproduction, which can only be done exclusively by the author himself or with his permission.

At the same time, other rights, such as the right to make copies, may be exercised by other persons, for example, a publisher who has received a license from the author for this.

The development of creativity is a natural process and does not recognize any artificially constructed frameworks and restrictions. However, the rights of authors, disseminators of information and, of course, the countries of their residence must somehow be protected from piracy and unauthorized duplication of original works.

A person who has created a literary, musical, scientific, artistic or other work that is protected by copyright in Ukraine or another country is considered its author throughout the world.

The direct authors of works protected by copyright in Ukraine, as well as their heirs, are granted certain rights. They become the owners in Ukraine of the exclusive right to personal use of the work or to grant the right to use it to other persons on agreed terms.

Accordingly, the owner is free to make decisions regarding the use of his work. The author of the work may allow or prohibit:

- mentioning his name during the public use of the work, if he, as the author of the work, wishes to remain anonymous;

- reproduction of works;

- public performance and public communication of works;

- public demonstration and public display;

- any re-publication of works, if it is carried out by an organization other than the one that made the first publication;

- translations of works;

- adaptations, arrangements and other similar changes to works;

- inclusion of works as components of collections, anthologies, encyclopedias, etc.;

- distribution of works by first sale, alienation in another way or by leasing or rental and by other transfer before the first sale of copies of the work;

- making their works available to the public in such a way that its representatives may access the works from any place and at any time of their own choosing;

- leasing and (or) commercial rental after the first sale, alienation in another way of the original or copies of audiovisual works, computer programs, databases, musical works in musical notation, as well as works fixed in phonogram or videogram or in a form readable by a computer;

- import of copies of works.

According to the Law, a work is protected by copyright from the moment of its creation. Therefore, in principle, there is no need to perform any additional formalities related to its registration or deposit as mandatory conditions for obtaining legal protection.

A person who has copyright can use the copyright notice to notify about his rights, which is placed on each copy of the work and consists of the Latin letter C in a circle - ©, the name (title) of the person who owns the copyright, and the year of the first publication of the work.

However, in the event of disputes under contracts that affect the property rights of the author of the work, the latter may at any time (during the term of copyright protection) register it in official state registers.

The author or copyright owner may protect his rights to a work in administrative and judicial proceedings, insisting on an inspection of the premises in order to identify traces of the production or storage of illegally made “pirated” copies of the original work protected by copyright.

The owner may obtain a court injunction against such activity and demand compensation for damages caused by loss of material benefit and recognition of authorship.

Copyright is the right that belongs to the author of the original work that he created. It combines two main groups of rights: property and personal non-property rights of the author. Property rights are the exclusive right to use the work, to authorize or prohibit the use of the work by other persons, etc.

Personal non-property rights include the author's right: to demand recognition of his authorship by properly indicating the author's name on the work and its copies and for any public use of the work, if this is practically possible; to prohibit the mention of one's name during the public use of a work if he, as the author of the work, wishes to remain anonymous; to choose a pseudonym, to indicate and require the indication of a pseudonym instead of the author's real name on the work and its copies and during any public use thereof; to require the preservation of the integrity of the work and to oppose any distortion or other change of the work or any other encroachment on the work that may harm the honor and reputation of the author.

Many works of art and culture protected by copyright (for example, printed publications, sound recordings, films, etc.) must be brought to the mass consumer, in particular by means of communication, and this requires significant funds. Therefore, authors often sell the rights to their works for an appropriate fee to individuals or companies that have everything necessary for the sale and distribution of artistic products.

The fee may be made in the form of a one-time (lump sum) payment, or deductions for each copy sold or each use of the work (royalties), or combined payments.

Property rights may also be transferred or assigned by the author or other person who owns the copyright to another person, on the basis of issuing a license to this person to use the work.

The amount and procedure for paying the author's remuneration for the creation and use of the work are established in the author's contract or in contracts concluded on behalf of copyright holders by collective management organizations with persons who use the works.

The assignment of copyright and the issuance of a license are formalized by an author's contract. The author's personal non-property rights cannot be transferred to other persons in any way. The author's personal non-property rights include:

1) to demand recognition of his authorship by properly indicating the author's name on the work and its copies and during any public use of the work, if this is practically possible;

2) to prohibit the mention of his name during the public use of the work if he, as the author of the work, wishes to remain anonymous;

3) to choose a pseudonym, indicate and require the indication of a pseudonym instead of the author's real name on the work and its copies and during any public use of it;

4) to demand the preservation of the integrity of the work and to oppose any distortion, distortion or other change of the work or any other encroachment on the work that may harm the author's honor and reputation.

Related rights are rights belonging to performers, producers of phonograms, producers of videograms, heirs of these entities and persons to whom related property rights have been legally transferred, as well as broadcasting organizations and their successors in title.

The objects of related rights, regardless of their purpose, content, evaluation, method and form of expression, are:

- performance of literary, dramatic, musical, musical-dramatic, choreographic, folklore and other works;

- phonograms, videograms;

- broadcasts (programs) of broadcasting organizations.

A related right arises as a result of the fact of performing a work, producing a phonogram, producing a videogram, publishing a broadcast of a broadcasting organization.

No formalities are required for the emergence and exercise of related rights. Related rights of foreign legal entities and individuals are protected in accordance with international treaties of Ukraine.

Related rights differ from copyright in that they belong to owners who are considered intermediaries in the production, recording and distribution of works. The connection with copyright is caused by the circumstances that the three categories of owners of related rights are auxiliary links in the process of intellectual creativity, since they assist authors in publishing their own works to the world community.

Thus, a musician performs a musical work written by a composer; an actor plays a role in a play written by a playwright; phonogram producers record and distribute songs and music written by composers, performed by musicians and singers; broadcasting organizations, through their stations, bring these works and phonograms to numerous radio listeners and television viewers.

8.2. Regulation of copyright relations

The regulation of copyright relations involves, first of all, the conclusion of a copyright agreement, according to which the copyright to an intellectual property object can be transferred by the author or his heirs to another person. The agreement specifies exactly which rights are transferred and to what extent.

A copyright agreement can be drawn up in two different ways. One of the mentioned methods provides that an exclusive right to use a given intellectual property

object is transferred to another person. The exclusive right allows this person to use the work. In addition, such an exclusive right provides that the person to whom it is transferred can authorize or prohibit other persons from using this work in the manner established by the agreement, specifying the limits of such use.

If the author, or other person who owns the copyright to a work, transfers the exclusive rights under which the work is used, he or she may use the work only if this corresponds to the parts of the exclusive rights not transferred under the agreement.

Another way to draft a copyright agreement involves the transfer by the author or other owner of the rights to the work to another person of non-exclusive rights to use the work. In this case, the person to whom the non-exclusive rights are transferred may use the work only within the limits and in the manner specified in the agreement.

In the case where non-exclusive rights to a work are transferred, the author, or another person transferring the rights, may use the work without restrictions and transfer to other persons non-exclusive rights to the work.

8.3. Protection of the interests of copyright holders

The legislation provides for compensation for direct material losses, as well as recovery of profits, for violation of copyright or related rights, the court shall impose a fine on the guilty in the amount of 10 percent of the amount awarded in favor of the plaintiff.

The payment of compensation determined by the court may reach 50,000 minimum wages established by the legislation of Ukraine, and shall be used instead of the above-mentioned compensations. The sum of fines shall be sent to the relevant budgets in accordance with the procedure established by law. The violator of copyright and related rights shall also be obliged to compensate persons who have copyright and related rights for moral damage in the amount determined by the court.

The court may issue a decision on the seizure or confiscation of all counterfeit copies of works, phonograms, videograms or broadcast programs, which are established to have been produced or distributed in violation of copyright and (or) related rights, as well as means of circumventing technical means of protection.

This applies to all clichés, matrices, forms, originals, photonegatives and other objects by means of which copies of works, phonograms, videograms, broadcast programs are reproduced, as well as materials and equipment used for their reproduction and for the manufacture of means of circumvention of technical protection measures.

By court decision, seized counterfeit copies of works (including computer programs and databases), phonograms, videograms, broadcast programs may be transferred to this person at the request of the person who is the subject of copyright and (or) related rights and whose right has been violated. If this person does not require such transfer, then the counterfeit copies shall be destroyed, and the materials and equipment used to reproduce the counterfeit copies shall be alienated.

The producer of phonograms (videograms) has the exclusive right to use phonograms (videograms) in any form. At the same time the producer of phonograms (videograms) also has the right to receive remuneration for its use, regardless of its method.

Violation of copyright and related rights entails liability in accordance with the current administrative, civil and criminal legislation of Ukraine.

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Навчальний посібник «Наукові дослідження та інтелектуальна власність» розрахований на студентів всіх спеціальностей другого (магістерського) рівня освіти і спрямований на формування компетентностей, які забезпечують готовність до професійної діяльності в сферах наукових досліджень та інтелектуальної власності.

У навчальному посібнику наведена детальна інформація щодо сучасних методів наукових досліджень, проведення і обробки результатів експериментів, подачі заявок на патенти і знаки для товарів та послуг. Розглянуті питання, пов'язані з публікацією отриманих результатів наукових досліджень, підготовкою і захистом кваліфікаційної роботи, а також з набуттям, управлінням та захистом прав інтелектуальної власності.

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