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Issue Article

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ON THE IMPACT OF TRANSPORT ON THE EFFECTIVE SOCIO-ECONOMIC DEVELOPMENT OF RUSSIAN REGIONS. MESSAGE 1

Abstract*: In the article, the authors proposed a systematic approach to the study of the concept of "movement". We developed a systematic description of this concept, fundamental for the worldview, and determined a place for transport in the traffic system. Transport is a universal tool for the implementation of movement as self-movement, which serves as a sufficient argument to classify transport as a system-forming concept of worldview. It is necessary not only to correct the existing characteristics of transport associated with the limitation of transport by the function of moving goods, but also to supplement it with the function of organizing reality, which well shows its status in the reproduction of the movement of matter. Transport is a universal tool for creating spatial and temporal conditions for development in the system of movement of matter for the spatial and social development of the regions of the Russian Federation. In the article, the authors state: the concept of transport science, the basics of technical knowledge, the development and types of transport, the uniqueness of transport as a sphere of economic activity, the problems of transport, the current state of the development of transport in Russia, the stages of development, as well as the methodology of technical and transport sciences; considered the classical technology of research in technical sciences, the methodology of experimental research in technical sciences, in transport, including its technical operation.*

Key words*: comfort, spatial development, social development, regions of the Arctic Zone and the Far East, regions of the European part and Siberia, movement, the basis for the movement of matter, universality, organization, worldview, «public or social» transport, conceptual thinking.*
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Introduction

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Transport in a new format is considered as a phenomenon that is part of the basis of the systemic organization of reality. An analysis of the existing understanding of transport shows that the restriction of the content of the concept of "transport" by the industry engaged in the transport of goods within the exclusively social reality is in conflict with the initial premise of the definition of transport as a means of movement and the history of human transport, which began before the birth of differentiated production. The traditional understanding of transport as a means of movement within the social life of a person has developed under the influence of the significance of this component of the world for him. Such a limitation of the scope of reality reflected in the content of the concept of "transport" violates the logic of the formation of a scientific concept. The volume of phenomena, fixed by the content of the concept, must be equivalent to the content. If it is argued that "transport" is the subject of the definition, and "movement of goods" is its specific feature, then we must qualify "movement of goods" as a universal action. When the "movement of goods" is reduced to the movement of the totality of products of human activity itself, then the characteristics of transport should also be sequestered. That is, here we should no longer talk about “transport” as such, its universality, but about “public transport”, a component of which can be made “individual transport”. When the "movement of goods" is reduced to the movement of the totality of products of human activity itself, then the characteristics of transport should also be sequestered. That is, here we should no longer talk about “transport” as such, its universality, but about “public transport”, a component of which can be made “individual transport”. When the "movement of goods" is reduced to the movement of the totality of products of human activity itself, then the characteristics of transport should also be sequestered. That is, here we should no longer talk about “transport” as such, its universality, but about “public transport”, a component of which can be made “individual transport”.

The problem is that the logical analysis of the inconsistency of the existing understanding of transport shows the formal side of the imperfection of the definition, while scientific, like philosophical knowledge, requires subject certainty. It is necessary not only to bring the scope of the concept into line with its content, but also to find that in the world of actual existence that is the subject reflected in the construction of the concept, that is, to load the concept with real content so that it works normally in scientific knowledge, thanks to its concreteness.

Positive changes in the quality of goods require qualitative changes in engineering, technology, organization and management of production. Production must improve, which does not mean becoming more costly. Absolutely right, attention was drawn to one phenomenon that usually slips away in the bustle of the problem - the historicity of the economy. The way it is perceived now, the economy has not always been and will never remain. Economic life changes over time, which forces one to tune in to its changing existence. The modern economy is built on a market foundation and the laws of the market dictate its own rules. In the foreground are profit, competition, efficiency, unity of command. How long will this continue? Analysts say the symptoms of a new economic order are already on the rise. The next turn of the economic spiral will also spin around the market core, but the significance of the market will not remain total. The priority of market competition, aggressively marginalizing the "social sector", is not compatible with the prospect of economic development, as evidenced by the steady desire of social democracy in the West to turn the economy on the front for social security, a fair distribution of profits. The new economy is called temporarily "prudent". The current principle: “survival of the strongest, most adapted”, will replace “social production partnership - the manager and the manufacturer will become members of the same team. Mass production will give way to an organization corresponding to the implementation of the principle - "the manufacturer makes exactly what the consumer needs." A "thrifty" economy will be focused on resource-saving technologies and environmental friendliness of production. She demanded a new look at the root concepts. Therefore, the philosophy of quality must also change. We must be prepared for the coming events.

The quality of "it is written for generations" to be at the epicenter of both scientific and amateurish reflections at all times. The problem of ensuring the quality of activities is not just universally relevant, it is strategic. The dilemma in relation to quality is reasonable only within the limits of the opposition of the ratio of actions "immediate" and "indirect". The saying "it's all about him" owes its origin to quality. It is possible to “forget” about the problem of quality solely because any fruitful and luminous activity is ultimately aimed at improving quality. Quality is either "on the mind" or "implied". From the correlation in the dynamics of these projections, quality problems in creative thinking are built into an appropriate schedule that reflects the relevance and profitability of activities aimed at developing production.

The most significant and global in nature are international standards for quality management. The use of modern methods in them allows us to solve not only the problem of improving quality, but also the problem of efficiency and productivity. That is, today the concept of "quality management" is moving into the concept of "quality management".

Thus, solving the problem of increasing the efficiency and competitiveness of the economy, and ultimately the quality of life, is impossible without the implementation of a well-thought-out and competent industrial policy, in which innovation and quality should become a priority.

The results of studies conducted under the UN Development Program made it possible to measure the share of the "human factor" in national and global wealth: 65% of the wealth of the world community is the contribution of human potential, and only a third of the world's wealth comes from natural resources and the production structure. A quality-oriented strategy undoubtedly contributes to the growth of the very role of the subjective factor in the development of production, and to a more complete and comprehensive satisfaction of human needs themselves. The desire to "live according to reasonable needs", as well as the need to "work according to the possibilities", together with the communist ideal, no one dared to openly and officially cancel, realizing the absurdity of denying the essential forces of man. In the "hot" state, the problem of quality is sustainably supported by both the internal forces of active consciousness and external life factors. The highest function of consciousness is cognitive.

It is believed that by knowing nature, its quality, state of quality, quality levels are revealed, embodying new knowledge in production. Post-classical economic thought shifted quality towards consumption, trying to give production a “human face” - a person alienates himself in the production process, but this measure is forced and, in a systemic sense, is temporary, conditional. Labor is a kind of “terrible cauldrons” that Vanya the Fool had to overcome in order to turn into Ivan Tsarevich. And here it is absolutely justified to believe that the main thing in production is the result, not the process. Consumption regulates the market. Therefore, the demands of the market must dominate production. The task of society is to contribute to the development of demand in the market worldwide: to maintain a range of goods, to stimulate price stability, increase purchasing power, improve the quality of goods. E. Deming, calling the "network of deadly diseases" of modern production, puts in the first place "production planning that is not focused on such goods and services for which the market is in demand." Try to answer him. Production in the transition from industrial to post-industrial society of mass consumption is conceived as a function of the market. And the authors fill these properties of quality with criteria, namely:

- ideology of quality - the prospect of development of production;

- quality management is an integrated approach to solving the problem of quality;

- fashion and technical regulation - components of the quality of manufactured shoes;

- quality systems "ORDERING/5 S" and "THREE" NOT "- not only the basis of stability and production safety, but also a guarantee of quality;

- quality in the market is a paradigm of formation of production that satisfies the needs of the market;

- advertising is always at the service of quality;

- an excursion into the past as a guarantee of quality in the future;

- a model for assessing product quality - these are production priorities;

- forecasting the cost of quality when developing a new range of footwear is the key to its demand and its competitiveness;

- methodology for business visual evaluation of the product - a means of assessing the effectiveness of quality;

- improving the quality and competitiveness of domestic safety footwear;

- on indicators for assessing the quality of footwear - as a tool for the formation of demanded products;

- quality and market: a marriage of convenience and this is indisputable;

- the stability of the work of enterprises is the guarantor of the quality of the shoes they produce - all these aspects together provide a quality revolution that guarantees the manufacturer stable success in the market with unstable demand. The authors analyzed the possibilities of the policy and goals of the enterprise in the field of quality within the framework of the QMS in order to fight for defect-free production, for the reduction of defects and to guarantee consumers the high quality of manufactured products. The use of software for assessing the validity of the choice of innovative technological solutions for the production of priority products by domestic enterprises creates the prerequisites for its demand and competitiveness not only in the domestic market, but, most importantly, in its export. The need to improve the quality management system at domestic enterprises is due to the following important reasons:

firstly, it is an increase in the confidence of potential consumers in the products that will be produced by domestic enterprises;

secondly, it is an opportunity to significantly strengthen one's position in existing markets, as well as significantly expand spheres of influence by entering new domestic and foreign markets;

thirdly, this is a significant increase in labor productivity of any industrial enterprise, which is expected to introduce a QMS using effective management.

The choice of light industry enterprises as an object for assessing the effectiveness of the socio-psychological factor in the implementation of the QMS is due to the fact that these enterprises are characterized by the presence of highly qualified workers and specialists. Thus, the Policy of goals and objectives of the QMS will be implemented much more professionally and at a lower cost due to three main aspects: employee involvement, process approach and systematic approach. In addition, the personnel of light industry enterprises are more effectively able to realize the goals and objectives of the QMS also because control activities are more professionally carried out to fulfill the following situations: persuasion, execution of delegated powers, creation of conditions for increasing productivity and effective use of the business qualities of employees.

The task of increasing competitiveness is especially urgent for those enterprises that, due to external factors (increased competition due to globalization, the global financial crisis) and internal (inefficient management), have lost their competitive positions in the domestic and foreign markets. In response to negative processes in the external environment, the processes of regionalization and the creation of various network structures are intensifying, one of which is the union of commodity producers and the state.

Main part

The traditional understanding of transport finally took shape in the 19th century, when, reflecting the achievements of the industrial revolution, transport was identified with the technical means of transferring goods for various purposes and moving people. As a result, "transport" was assigned to the sphere of material production, distributing it objectively between technical creativity and economic theory, which was tantamount to a sentence to become the subject of self-supporting activity. Both in the 20 th century and in our time, the official interpretation of transport has remained unchanged, despite radical changes in the functioning of transport, indicating its special significance for social progress, personal development and, possibly, in the future, the preservation of life on Earth, meaning threats from accompanying its movement of cosmic bodies of natural origin.

If the reduction of transport to its technical form of expression can still be justified by the corresponding successes of science and technology, the obvious dominance in the history of transport of artificially created means and devices for changing the position of objects in space-time, then the silence of the influence of the transport factor on the nature of social and natural history can only be qualified as a lag of awareness from the real movement of life.

In Aristotelian logic, concepts are identical not only within the limits of available mental constructions, but also in general terms. Great thinkers are also not without sin, they are mistaken. After two and a half millennia, G. Hegel discovered the historical logic of the concepts themselves, showing that the concepts are dialectical. They are not only loaded with new content, but also change their volume from time to time, and, as a result, look new. “In rational logic (the logic developed by Aristotle, the sophists, the scholastics), the concept is usually considered as a simple form of thinking and, more precisely, as a general idea; as if the concept as such is something dead, empty, abstract,” wrote the German philosopher. And clarified:

"Of course, the concept should be considered as a form, but as an infinite, creative form." From the point of view of philosophy, the transformation of scientific, scientific and technical concepts is a natural phenomenon that requires increased attention. One cannot feel modern, much less strive to peer into the future, without realizing the significance of a dialectical approach to concepts, including those that seem perfect.

Philosophy itself has gone through a similar ordeal. Expanding philosophy from Nature to Man, Socrates and Plato, especially the latter, in order to “purify” and “concentrate” on the main thing, separated from it the “philosophy of nature” - “natural philosophy” (nature - philosophy). Subsequently, the more adequate term "natural science" appeared. Over time, under the influence of positivism, it was reduced to "science". Shakespeare's Hamlet says to Horatio: "There are many things around, Horace, that your science could not even dream of." W. Shakespeare used the modern term "philosophy". But already a late translation of the text is presented in the meaning of "science". The term "natural philosophy" is also found in the title of I. Newton's generalizing work "The Mathematical Principles of Natural Philosophy". Only at the turn of the XVII-XVIII centuries. the ingenious physicist came even closer to the term "science".

According to the mechanism of cultural development, concepts are revealed and preserved in encyclopedias. Let's trace the domestic history of the concept of "transport".

The originality of the concept of "transport" is associated with a collective, generalizing type of education. The relevance of the concept and its name have matured with the diversification of transport. It is unlikely that at the time of the existence of two types of technical transport - water and land on biological traction - it was necessary to generalize them. Apparently, the modern history of the concept began after the advent of railway traffic, that is, closer to the middle of the 19th century. The first of the classics of explanatory (interpretative) literature of Russian origin, the term "transport" was included in his famous Dictionary by V.I. Dahl is a contemporary of the discovery of public steam traction in the country. We read: “Transport frn. transportation of goods, delivery. Convoy, goods or supplies convoy. Transportation, cargo state-owned ship. Transfer of the total, in the account books from page to page. In gambling: transferring the bet to another card. It is mysterious that V.I. Dahl, explaining the term, expanded it sufficiently in socio-cultural terms, citing the financial, reporting office and the practice of card games, which are very popular in society, but ignored the technical transport novelty - the construction and operation of railways. By the end of the 1860s, Russia fully entered the "club" of railway powers.

It can be assumed that the process of the genesis of concepts takes place somehow indirectly, not coinciding in time with the increments occurring in objective reality. Dal lived in Moscow, St. Petersburg, the Baltic States; saw the advantages of rail traffic, was aware of its transport affiliation, but left rail transport out of the brackets of the definition of transport. It is clear from this story that in the formation of a concept and its metamorphoses there may not always be logically and historically justified changes. This is what seems interesting.

Half a century after the publication of the Explanatory Dictionary of V.I. Dahl, Russian culture was enriched by the Encyclopedic Dictionary of F.A. Brockhaus and I.A. Efron. Its authors found themselves in more favorable conditions. By the beginning of the 20th century, all the currently existing types of traditionally understood transport declared themselves. Air was added to the water, land. Steam traction ceased to be the only technical energy, a car was designed with an internal combustion engine, and an electric motor was created. Scientific theory and engineering thought began to approach space transport.

At the same time, Brockhaus and Efron fell into "perestroika" time. They needed to integrate the established experience of transport history and the trends of its continuation in the definition of transport. The choice in such a case is small: either to absorb as many characteristics as possible into the interpretation, or, realizing that you cannot collect everything, limit yourself to a concise explanation that sets the vector of understanding. They took the second path: "Transport, a set of means for the movement of goods, troops, etc." The definition of transport in it cannot be attributed to the merits of the Dictionary, even taking into account the difficulties of an objective order. It seems that the authors decided not to dive into the essence of the transport reality.

20th century made no significant changes to understanding of transport. This conclusion is confirmed by the definition of transport in the Modern Explanatory Dictionary of the Russian Language and the Big Illustrated Encyclopedia, divided into 32 volumes and claiming, not without reason, a qualified scientific analysis of published materials. The first source "corrects" V.I. Dahl. It turns out that the history of the term is not French, it is from Latin (transportãr - to carry, transport). The essence of the definition is the same - "a branch of the national economy associated with the transportation of people and goods." Additionally, the identification of transport with the cargo (batch) assigned to be transported by vehicles is involved.

"Encyclopedia" almost verbatim publishes the definition from the "Dictionary": "Transport, the branch of material production, which is responsible for the transportation of people and goods." Further, modes of transport are distinguished in some detail. There is an attempt to link the differentiation of transport with the quality of natural environments.”

Like 300 years ago, transport in the new millennium is entirely reduced to the branch of material production, its analysis is limited to systems of technical and economic reality. Political accents of transport development are subordinated to its technical interpretation. As a technical reality, transport is related to production and is determined based on the interests of economic activity in accordance with the criteria of economic rationality.

It is absurd to doubt that in Modern and Contemporary times transport developed in a technical form and is a part of material production. The question is: how appropriate is it to reduce the phenomenon of transport to this specific form, how does this form relate to the history of transport as a whole? Is it characteristic of part of its history or the entire history of transport? Is it possible, for example, to consider the feat of a warrior who ran a marathon distance in order to fulfill an order and deliver a report of victory as a type of transport service? Formally, everything here is consistent with the definition of transport, except for the mass character of the scale and the traditional production product, but war is a specific material phenomenon directly related to production, therefore, the execution of an order in any form should be attributed to the sphere of production management, production by defeating those who encroach on your well-being and freedom to carry out production. The warrior was formally a vehicle of biological nature, which also does not contradict the interpretation of transport.

Our appeal to the definition of transport in the historical past is explained by the desire to overcome the technical and economic dependence of the development of the theory of transport. The understanding of transport as the most important component of human development and social progress would be facilitated by transport science, but here we find ourselves in a stalemate: in order to understand transport, we need transport science, and in order to have transport science, we need a scientific understanding of its subject, i.e. transport . The philosophical context becomes more and more obvious, without which one cannot get out of this logical impasse.

Technical transport has radically transformed a person's life, changed the person himself and his attitude to the world. The fears of those who feared that railway construction for absolute monarchies would be worse than the guillotine came true. Monarchs have changed their usual status to decorative and representative, they serve history, demonstrate the inseparable connection of times, reassuring their compatriots. Production has become mass, entangled in its contradictions and attitudes towards natural laws that protect the natural order. Mass production is being formed on a new principle of organization – “lean production”. "Humanity is on the verge of a transition to a new civilization - a civilization of quality." Once again, the understanding of democracy as a systemic factor in achieving real harmony between the interests of the individual and society has changed. At first, democracy was slave-owning, - local. The great French bourgeois revolution defined the "three pillars" on which a true - universal democracy should be built: freedom, equality and fraternity. The monopolization of capitalism, the controlled diversification of property, and the dominance of speculative, finance capital have amended the formula of revolutionary democracy. Under the guise of developing democracy, the liberals have simplified the understanding of "equality" and "brotherhood", removing from capital the responsibility for their real embodiment in a society of "equal opportunities" and reducing "brotherhood" to social partnership.

A political excursion into the genesis of democracy is not our goal. This is just a means to promote the main idea of the article: why did everything in life - nature is no exception - changed under the influence of the development of transport, and the very interpretation of transport remained the same, although it has changed considerably over the past time of its very active history? How justified is such conservatism in scientific and philosophical thinking?

Meanwhile, the content and volume of scientific concepts imply their refinement - expansion, narrowing, conditional concretization. So, in the XIX century. "refined" Euclidean geometry, in the XX - Newtonian physics and Darwinian evolutionary theory. These corrections emphasized the objective truth of the teachings, making them even more scientifically built.

"Technical transport" is a product of science and engineering art. Arguments in favor of transforming the concept of “transport” will look more weighty if they include the metamorphosis of the concept of “engineer”, taking as the initial sign of “engineer” what a linguist with a degree in mathematics from Dorpat University V.I. Dal. Recall, according to Dahl, "engineer-scientist builder". Dahl contrasted the engineer with the architect and the architect, but spoke of "engineering as the art of the engineer."

The art of thinking and its implementation in a practical product by an engineer, according to V.I. Dahl, makes the engineer, as a professional, related to artists. IN AND. Dahl was not embarrassed by either the differences in vocational education or the specifics of work. He knew how to "see" at the root and look into the future. In our time, part of the social and economic activity is assigned to the field of engineering work. I.V. Stalin, not without reason, called the writers "engineers of human souls." The ancient Greeks called engineers those who, in their opinion, "deceive nature."

In the classical interpretation, there is no rigid attachment of an engineer, as, for example, transport, to the sphere of material production. An engineer is defined precisely as "scientific builder", i.e. a representative of scientifically equipped labor, aimed at changing the objective reality. Slave-owning democracy was local, but in relation to the free citizens of the polis, it was a professionally tailored political construction. The civil law of Rome still surprises specialists. The version according to which the history of engineering began not with technical, but with social creativity, is quite viable. It is not necessary to call socio-constructors engineers, we will give them the name "pre-engineers". There is a complex history of the concept, however, it is generally recognized. The trajectory of understanding transport, given its scale and functional uniqueness, should not be an exception - to serve as a factor in personal and social development at the same time.

In the sociocultural context, the identification of transport with a component of material production looks like an oversimplification of its understanding, even in general terms. Functions and status must be commensurate. The engineer objectifies the productive component of the social movement. The function of transport is much wider. Transport carries out the movement as such, is included in the movement as a universal factor.

Against the background of the absolutization of the technical understanding of transport, the definition of transport is perceived as confrontational. "Britannic(oh)". It is so unusual that we quote it almost in full: “... transport, in biochemistry, the passage of molecules and particles through cell membranes, acting as selective barriers, allowing some substances to pass through ... and retaining others ... The transport of these vital substances is carried out thanks to multiple systems. Through the membrane "holes" (open channels), diffusion (passive transport) of ions occurs directly into the cell; other ion channels use chemical changes to facilitate the diffusion of substances across the membrane, "pumps" force solutes to pass through the membrane even if their concentration is higher on the other side (a form of active transport). Primary active transport directly uses the energy released during cellular metabolism.

Authors of articles published in "Britannic(e)", as a rule, are well-known specialists, therefore, in whatever relation to the public understanding of their interpretation of the subject, the attitude towards it must be professional - comprehensively justified. The quality of the shift in the understanding of transport from artificial-technical to natural-natural in the essential analysis is not so high quality. Britannica offers a different perspective, a change in subject, but not functional, orientation.

In principle, understanding the functional essence of transport, there are significantly fewer changes in the approach, although there is a correction here as well. In the traditional, "technical" interpretation, transport is exposed as a means, in Britannic (e) transport tends to be identified with the factor in the implementation of movement. More importantly, Britannic is pushing the historical horizons of transport to the biochemical level. But even in this projection of the definition of transport, the author of the article in Britannic(e) is professionally restrained. At birth. It would be quite logical to consider transport from the standpoint of physical nature, which determines the quality of the movement of matter.

As long as the understanding of transport is opposed to natural reality, natural materials and processes in the scientific research of transport are allowed in an auxiliary, rather than basic quality, the doctrine of transport risks being left without modern scientific understanding. The post-non-classical stage in the development of science is relatively young, many of its features are still in the making, but the growing importance of the effect of synergy of systemic interaction in the sciences of nature, man and society can be judged quite definitely. In this connection, dialectics again comes forward in knowledge, contrary to the desire of the designers of vocational education to push it behind the scenes of the formation of the thinking of future specialists.

There is no transport science in the official international classifications. And it is not clear what exactly it is connected with. Either it has not yet matured enough to meet all the basic requirements of the reality of science; whether its current status of development has not passed the level inherent in applied scientific knowledge obtained by using the achievements of the existing recognized sciences; or someone, in a fit of professional ambition, arbitrarily switched the arrow of transport knowledge from the path to an educational and scientific discipline to the main scientific one. A historical view of how the construction of railway transport, the undisputed transport leader until the 1950s and 1960s, was “learned” suggests that development impulses were given from outside - from classical mechanics, physicists, metallurgists, chemists.

In a number of European countries actively embarking on the development of railway transport, Russia followed Great Britain, France, Germany, but we were the first to realize the science-intensive process, understood the significance of the scientific foundations of progress in railway construction. DI. Zhuravsky, whose thinking was formed by the outstanding mathematicians and mechanics Guryev, Bunyakovsky, Ostrogradsky, radically changed the approach to the construction of railway bridges; A.P. Borodin built in 1882 the first special locomotive scientific laboratory in Kyiv in the history of locomotive construction and operation of steam traction; NOT. Zhukovsky not only was the author of the theory of wing lift, but also made a significant contribution to the theory and its practical application in railway transport. Let us mention his articles: “On the movement of railway cars and steam locomotives on rails at the inversion”, “The operation of the Russian through and American non-through traction device when starting the train from its place and at the beginning of its movement”, “Traction force, travel time and tearing forces in the traction device and hitch with a broken, sharply variable profile"; N.P. Petrov deduced formulas for traction calculations. His formulas for the total specific resistance of a steam locomotive, the average working pressure of steam in the cylinders, made it possible to take steam locomotive construction under scientific control; S.P. Syromyatnikov brought, using the latest scientific discoveries, the efficiency of a steam locomotive to 10–10.5% versus 5–6%; A.N. Krylov made a practically revolution in shipbuilding due to the scientific theory of the keel and roll of the ship, etc. The revived railway transport not only required comprehensive scientific support, it also served as a locomotive, enticing scientific progress with its movement. The birth of technically space transport could not have happened before scientific thinking had matured, having reached certain conditions due to the loading with ideas, theories, methodological innovations, technical engineering solutions of “transport science”. K.E. Tsiolkovsky was fascinated by the construction of airships no less than by vehicles that made it possible to successfully move in outer space, precisely because he saw the prerequisites for understanding the scientific and technical problems of space exploration in the movement and assembly of air transport vehicles. Where there is space as a problem, there are universal scientific problems of the implementation of human movement in it through technical tools. The size of outer space naturally increases the number of such problems, because the problems of travel time are added to the number of problems related to distances. Time in space is measured by the lifetime of a person, which makes traditional transportation a meaningless technical means. There are two ways out of this impasse - to design a transport with a speed of "C", or to allow it to use "wormholes" in the structure of world space.Vehicles have learned to conquer time. Each next step on the path of transport progress was moving it into a new natural environment: earth - water - air - airless space. With the change in the "elements", the speed capabilities increased, and with them the horizons expanded, until the movement "stumbled" into the scale of deep space.

The main problemspace transport - not the acceleration of the vehicle, but the dimensions of space, measured by space units, qualitatively different from earthly, human ones. A spacecraft can serve as a passenger or controlled research vehicle only if it becomes like a physical particle with a speed of "C", or, as if a "drill" passes through the barriers of the qualitative structure of outer space, finds passages into parallel space and through it reaches the final goal, essentially reducing the time.

How feasible are these arguments? In the scientific aspect, they are consistent with the modern understanding of time, space and the movement of matter. They also do not contradict the dialectical-materialist interpretation of the structure of objective reality. There remains a scientific and technical perspective. The history of technical transport sets up an optimistic response. However, the decision of the "dispatcher" to light the "yellow" will also cause understanding. The essence of the matter, apparently, is that the technical development of transport - the current state of space is no exception, in the physical context has not yet reached those starting points from which it would be possible to start in the exploration of deep space and the universe as a whole. Separate successful experiments with the use of transport technology should not be absolutized.

The existing technical transport is built on the level of the achievements of mechanics and classical physics, which discovered the laws of the macrocosm - the world of terrestrial material phenomena. Space transport will be physically different. With certain costs, it is fair to call the current transport "mechanical", and the transport of the future - "physical". It will be built on the laws and requirements of mega and micro worlds. He will be even closer to the physical essence of nature, confirming the version that transport is not so much a means as a factor that ensures movement. An artificial mode of transport has a natural prototype, and the time will inevitably come when the "secondary" (artificially created) transport will be similar to the original one.

In both scientific and technical projects, there is an invariant frame of reference - life, health and the socio-cultural essence of a person. In the history of public transport - past, present and future - its human dimension is absolutely significant, that is, it does not allow derogations. Transport is a technical tool for the development of homo sapiens. All other manifestations of transport are also significant for us due to its systemic position in nature, but this is already an indirect connection.

The certainty of transport science should be sought in its subject basis. At one time, technical sciences in the form of an established scientific system were also absent until the 19th century; engineering was taught by "pure" physicists, chemists and mathematicians. Scientists and construction scientists needed to understand the real social scale of technology, its social and humanitarian significance. Technique from the totality of technical devices of various classes had to mature into a technical force that changes the world of human activity and the person himself. The new history of technology was a continuation of the Industrial Revolution, which established the foundations of modern production and democratic relations. Technological progress led to the development of mass production, mass production brought to the fore the development of technology and made technology an actual subject of science. In the 21st century, history repeats itself dialectically, transport again leads the social movement. Transportation science was the second plane of public awareness, while the development of vehicles remained the lot of engineering science in the 19th and most of the 20th centuries. The future of transport is at the intersection of physics and technical sciences, chemistry and technical sciences, biology and technical sciences, cultural studies and science. The role of fundamental natural science is growing in transport progress - this is how the conclusion that science is turning into a direct productive force in the development of society and the individual should be understood.

Transport science in its current form is not a phantom and not a scientific and educational discipline. Its status reflects the prevailing idea of transport. She herself realizes the transition to the science of transport, corresponding to the post-non-classical stage in the history of science. It can be interpreted as "Introduction to Engineering Science". That is why it is so important to define the concept of "transport", in its actual content. F. Engels was right in emphasizing the trend of increasing importance in scientific knowledge of methodology. V.I.'s warning also came true. Lenin that the main burden on philosophy will be in epistemology. The language of technical thinking is a drawing, the language of scientific thinking is a concept. Concepts must correspond to the actual reality and change following the expansion of the boundaries of scientific knowledge.

In the article, the authors set out: the concept of transport science, basic technical knowledge, development and types of transport, the uniqueness of transport as a sphere of economic activity, problems of transport, the current state of development of transport in Russia, stages of development, as well as the methodology of technical and transport sciences; classical technology of research in technical sciences, methodologies of experimental research in technical sciences, in transport, including its technical operation, are considered. To achieve certain results in his research activities, the researcher must master the "secret" of the method and possess the heuristic technology of scientific thinking. In this he should be helped by the results of research, whose main task is to provide a heuristic form of cognition with a system of strictly verified and tested principles, methods, rules and norms. This system is formed on the basis of objective laws and patterns of reality.

Paradoxically, the methodology of technical sciences is poorly reflected in the specialized literature. Numerous philosophical works focused on expanding the worldview horizons touch upon its issues only in passing, limiting themselves to a historical analysis of the role of natural science in the change of epochs in the creative activity of mankind.

These studies are devoted to the history and methodology of transport science, research technologies in the interests of transport. The key stages in the formation of the Russian transport branch of transport science are given on the basis of the most important achievements of domestic transport scientists, the influence of the most successful developments on the formation of Russian transport is illustrated.

The work reflects the current state of development of transport in Russia. The goals, content, methodology and technologies of research in technical sciences are outlined, the specifics of objects and methods for studying road transport are shown.

As a peculiar form of cognition, science arose in modern times (XVI-XVII centuries) in the era of the formation of capitalist production. Since that time, science begins to develop independently. But it is constantly connected with practice, receives from it tasks and impulses for development, and, influencing the course of practical activity, is objectified, materialized in it.

Science is a form of people's spiritual activity aimed at producing knowledge about nature, society and knowledge itself, with the immediate goal of comprehending the truth and discovering objective laws based on a generalization of real facts and their relationship. Science did not exist at all times and not among all peoples.

Unlike experiential knowledge (empiricism), science is not content only with the question "what", but also asks "why". Using analysis, science moves from the “whole” to the “particular”, and vice versa when applying synthesis.

Science uses induction to move from experience and observation to concepts, judgments, and conclusions, and deduction to move from the general to the particular, always testing one with the other.

At the end of the Middle Ages, the concept of "science" began to be replaced by the concept of "natural science". Since then, the possibilities of science have increased dramatically due to the fact that mathematics has become the second of the two main tools, and experiment, discovering and investigating patterns, its first tool. Even Kant judged particular sciences according to the extent to which they used mathematics.

Under the influence of experimental mathematical science, the European outlook changed and its influence on the spiritual life of other countries increased. This strengthening was especially due to the laying of a strict foundation for the technique that arose from medicine.

Further development caused a deeper division of science into specialties. The rationalism of science is based on the principle of the supremacy of reason, faith in the unlimited power of human knowledge. Having conquered science, the scientist went further and has now become the main form of education and upbringing. This turned a scientist into a specialist, and a higher educational institution into a place for training a specialist.

Scientific research is characterized by objectivity, reproducibility, evidence and accuracy. Three of its interrelated levels are distinguished: empirical, theoretical and philosophical. At the first stage, new facts of science are established and empirical regularities are formulated on the basis of their generalization. At the second level, patterns common to a given subject area are put forward and formulated, which allow explaining previously discovered facts and empirical patterns, as well as predicting and foreseeing future events and facts.

Therefore, the main components of scientific research are:

1) formulation of the problem;
2) preliminary analysis of the available information, conditions and methods for solving problems of this class;
3) formulation of initial hypotheses;
4) theoretical analysis of hypotheses;
5) planning and organization of the experiment;
6) conducting an experiment;
7) analysis and generalization of the obtained results;
8) verification of initial hypotheses based on the facts obtained;
9) the final formulation of new facts and laws, obtaining explanations or scientific predictions.
10) implementation of the obtained results in production.

For applied scientific research, an additional stage is allocated - the implementation of the results obtained in production. The structure of scientific research is determined by various combinations of the listed stages, which can be carried out in a different order with certain repetitions and changes. In some cases, certain steps may be missing.

Classification of scientific research can be done on various grounds. The most common is the division into fundamental and applied, quantitative and qualitative, unique and complex, etc. The mutual imposition of these classifications and their more careful division give a multi-stage classification hierarchy of scientific research.

An analysis of the activities of the institute of science in modern society gives grounds to assert that its main function is the production and multiplication of reliable knowledge, which makes it possible to reveal and explain the patterns of the world around.

Mathematization of science is the basis for improving machines, tools, processes in any production, establishing patterns of interaction between elements of machines, systems, optimizing technological processes and parameters of complex objects. That is why teaching mathematics and physics should be the basis for training engineers in any industry.

Speaking about the role of transport science in the national economy, in the development of production, we emphasize its avant-garde role not only in improving the technology already created, but also in raising new issues that need to be addressed in order to move to a higher level of transport development.

Thus, the improvement of production and even mass production of well-known products is impossible without the use of knowledge contained in the theories of mechanics, chemistry, physics and other sciences.

The knowledge in question is reliable information about the creation, operation and efficiency of the entire transport system.

Scientific knowledge in relation to transport science is a special type of knowledge accumulated by the activities of special representatives of the human society of scientists and characterized, first of all, by the possibility of comparison with some reality of the development of society.

So, the system of transport science includes knowledge about the objective reality studied by technical science, but the system itself can and should be the subject of study. The science that studies it is called the methodology of science. First of all, each science has a "hard core" - reliable knowledge that has been formed over the years. Further, science consists of the "science of the cutting edge", which includes both true, not yet consolidated, and untrue, not yet dead, knowledge. The third part of science that penetrates both the "hard core" and "the science of the cutting edge" is the history of science, which is unimportant from the point of view of particular issues, but significant when it comes to generalizations.

The "hard core" of science consists of:

- factual material drawn from empirical experience;
- the results of its initial conceptual generalization in concepts and other abstractions;
- data-based problems and scientific assumptions (hypotheses);
- laws, principles and theories “growing” out of them;
- philosophical attitudes;
- sociocultural grounds;
- methods, ideals and norms of scientific knowledge;
- thinking style.

Often the structure of knowledge is considered in dynamics: "problem - hypothesis - theory".

A problem is a form of knowledge, the content of which is that which is not yet known by man, but which needs to be known. This is knowledge about ignorance, this is a process between setting and decision.

A hypothesis is a form of knowledge containing an assumption formulated on a number of facts, the true meaning of which is not defined and needs to be proven. Knowledge is probabilistic in nature and requires verification of the grounds. The advancement of a new hypothesis is based on the results of checking the old one, even if they were negative (for example, in physics, the concepts of "phlogiston", "caloric", "ether").

Theory is the most developed part of scientific knowledge, which gives a holistic display of the regular and essential connections of a certain area of reality. Any theory must meet two requirements:

1) consistency (internal and external);
2) falsifiability (providing for the possibility of refutation or experimental verification).

In addition, each theory must have the main elements:

1. Initial foundations - fundamental concepts, principles, laws, equations, axioms, etc.;
2. An idealized object is an abstract model of the essential properties and relationships of the studied subjects);
3. The logic of the theory, aimed at clarifying the structure and changing knowledge;
4. A set of laws and statements derived from the main provisions of a given theory in accordance with certain principles.

The main functions of the theory:

1. Synthetic function - combining individual knowledge into a single, integral system;
2. Explanatory function - identification of causal or other dependencies, connections of a given phenomenon;
3. Methodological function - formulation on the basis of the theory of diverse specific methods, methods and techniques for solving problems;
4. Predictive function - a function that allows

you to evaluate the strength of the theory;

5. The practical function is the translation of the results of the theory into practice, both in terms of technology (direct production of new products) and intellectual (effective use of theory to create other theories); theory should be a guide to action.

The best theory should:

1. Communicate as much information as possible, i.e. have deeper content;
2. Possess greater explanatory and predictive power;
3. Be logically more rigorous;
4. Be more rigorously tested by comparing predicted facts with observations.

What are the criteria of scientific knowledge, its characteristic features? One of the important distinctive qualities of scientific knowledge is its systematization. It is one of the criteria of scientific character. Scientific systematization is specific. It is characterized by the desire for completeness, consistency, clear grounds for systematization. Scientific knowledge as a system has a certain structure, the elements of which are facts, laws, theories. Separate scientific disciplines are interconnected and interdependent.

The desire for validity, evidence of knowledge is an important criterion of scientific character. Justification of knowledge, bringing it into a single system has always been characteristic of science. There are different ways to justify scientific knowledge. To substantiate empirical knowledge in transport science, multiple checks, access to statistical data, etc. are used. When substantiating theoretical concepts, their consistency, compliance with empirical data, and the ability to describe and predict phenomena are checked.

The main methods of obtaining empirical knowledge in science are observation and experiment.

Observation is such a method of obtaining empirical knowledge, in which the main thing is not to make any changes in the studied reality during the study by the process of observation itself. In contrast to observation, within the framework of an experiment, the phenomenon under study is placed in special conditions. It is important to emphasize that empirical research cannot begin without a certain theoretical attitude. In the course of constructing a theory, scientists use various methods of theoretical thinking. In the course of a thought experiment, the theorist, as it were, plays out the possible behaviors of the idealized objects developed by him.

A mathematical experiment is a modern version of a thought experiment in which the possible consequences of varying conditions in a mathematical model are calculated on computers.

The methods and means used in different sciences are not the same. Differences in the methods and means used in different sciences are determined both by the specifics of subject areas and the level of development of science. However, in general, there is a constant interpenetration of methods and means of various sciences. The apparatus of mathematics is being used more and more widely.

Methods developed in one scientific area can be effectively applied in a completely different area. One of the sources of innovation in science is the transfer of methods and approaches from one scientific field to another.

The question of the structure of scientific knowledge deserves special consideration. It is necessary to distinguish three levels in it: empirical, theoretical, philosophical grounds.

At the empirical level of scientific knowledge, as a result of direct contact with reality, scientists gain knowledge about certain events, identify the properties of objects or processes of interest to them, fix relationships, and establish empirical patterns.

To clarify the specifics of theoretical knowledge, it is important to emphasize that the theory is built with a clear focus on explaining the objective reality of transport operation, describes directly real objects and is characterized by a very specific number of properties.

The theoretical level of scientific knowledge deals with the most abstract ideal objects and theories that describe a specific area of reality on the basis of fundamental theories.

The strength of a theory lies in the fact that it can develop, as it were, on its own, without direct contact with reality. Since in theory we are dealing with an intellectually controlled object, the theoretical object can, in principle, be described in any detail and obtain arbitrarily distant consequences from the initial ideas. If the original abstractions are true, then the consequences of them will be true.

The empirical and theoretical levels of scientific knowledge are organically linked. The theoretical level does not exist on its own, but is based on data from the empirical level. But it is essential that empirical knowledge is inseparable from theoretical ideas; it is necessarily immersed in a certain theoretical context.

In the history of science, there is a tendency to reduce all natural science knowledge to a single theory, to reduce it to a small number of initial fundamental principles. In the modern methodology of science, the fundamental unrealizability of such information is realized. It is connected with the fact that any scientific theory is fundamentally limited in its intensive and extensive development. A scientific theory is a system of certain abstractions, with the help of which the subordination of essential and non-essential properties of reality in a certain respect is revealed. Science must necessarily contain various systems of abstractions, which are not only not reducible to each other, but cut reality in different planes. This also applies to transport science.

Science is a system of human knowledge about the objective laws of the development of nature and society, and at the same time it is the activity of people in the course of the development of transport science, there are four trends: accumulation, systematization and use of the knowledge gained.

Integration of science with the progress of transport technology and transport production.

There are three stages in this process:

1. In the XVII-XVIII centuries. the main functions of science are generally considered: empirical (collection, description, establishment and systematization of facts) and theoretical (explanation, generalization and forecasting of trends and patterns), and therefore, science explained only the nature of phenomena that have already found their application in transport, and therefore transport science (if we can talk about transport science in this period) lagged behind the needs of transport (water and horse-drawn).

2. The emergence of specialized transport science, which begins to "catch up" with transport production, solving problems related to the implementation of existing needs in practice. There is a separation of transport science from the production work of transport workers. Invention in transport becomes a special (specialized) type of activity.

3. At the present stage, it is no longer transport science that relies on transport production, but transport production - on transport science. And although transport production still provides transport science with both the tasks to be solved and the means of scientific work, science is ahead of production, predicts and determines its transformations. Along with the empirical and theoretical functions, the functions of searching and substantiating the ways of practical use of scientific achievements in transport are being developed.

4. This trend is manifested in such factors as the growth of the capital-labor ratio of research workers, the automation of information, computing and design work, the increase in the share of materialized labor in the costs of transport science.

At the end of the 19th century, applied (industry) transport science, and then experimental design and design development, specialized, separated from institutions of a general scientific profile. This division of labor led to an increase in its productivity, a reduction in the period separating the promotion of a scientific idea from its implementation to the period of the creative life of one generation (15–30 years).

In the 1970s, implementation was singled out as an independent sphere of application of scientific work in transport, i.e. information services for transport production, technical assistance in the installation, adjustment, operation and improvement of transport systems, consultation and retraining of personnel, transfer of experience. The costs of introducing scientific and technological achievements in transport are usually 8–10 times higher than the costs of transport science itself. In addition, the research itself becomes more complicated and becomes more expensive. At the same time, the period of their possible use in all types of transport is sharply reduced, because the obsolescence of new technology and the revision of scientific concepts are reduced. Science ceases to be a free resource and turns into an unlimited but expensive resource.

This requires a transition in the transport industry from an extensive one (due to the creation of new scientific institutions, an increase in the number of personnel, and the involvement of resources from other industries) to the intensive development of science. The convergence of the sciences of nature (natural science) and society through their connecting link - the science of technology, including its organization (technology) in a broad sense.

It is at the junction of these two sciences that the most important discoveries occur, the application of which in transport can radically change the prevailing stereotypes.

In the economic practice of domestic transport, the experience of countries that pursued a targeted innovation policy during the 20th century, which was under continuous state protectionism, was very little used. The spread of innovations was very insignificant and, as a result, led to the formation of prerequisites for reducing the incentives for scientific research and for an innovation crisis in domestic transport.

Transport science is among the young in the spectrum of technical sciences, and transport has become its object only since the beginning of the 1930s.

Therefore, the theoretical foundations of technical sciences can be fully considered as the foundation of transport science.

Considering the development of the science of transport in relation to research for vehicles, it is necessary, first of all, to analyze their specifics, associated with their pronounced operational orientation.

When studying transport science in relation to other technical sciences, the following are distinguished:

- the purely operational goals of the research being undertaken;
- operational issues (i.e. operational coloring of the subject of study under study);
- implementation of research and innovative proposals put forward based on their results in the field of transport.

Accordingly, the studies of the transport branch of transport science determine the operational objectives, operational subjects and operational implementation of transport research. When all three characteristic elements of the methodology of the completed study are of a pronounced operational color, they speak of the operational nature of the study, whether it is a commissioned research work or an exploratory study.

The narrow-branch differences in the transport branch of transport science are entirely limited by the specifics of the transport itself, which is studied by modern transport science. Therefore, we can only talk about the features of scientific research carried out for transport by the methods of transport science, which in turn are due to a combination of the expressed operational problems of the formed socio-economic "order" for specific operational research and the unique nature of the objects of research in transport. This combination underlies the selection of research methods most suitable for transport science, and highlights the considered transport branch of transport science.

In operational research, a number of priority areas can be identified:

1. The study of transport objects and their aspects that directly determine the results of transportation.

2. The study of changes in the operational properties and characteristics of transport objects in the process and under the influence of operation.

3. Research of management processes and functioning of technical and organizational objects, the results of which are potentially realizable in the field of road transport and only as an exception - in industries that directly serve road transport.

In the most general form, the specifics of the methodology of research on transport can be determined by the following provisions:

1. The need to justify the relevance of the study of the operational aspects of the facility in the interests of the operating industry, taking into account its capabilities to implement the expected results.

2. The focus of research is on the study of a small sample of many operated similar objects of different families, manufacturers, duration of operation.

3. The need to confirm the applicability of the results of the study to a set of the same type of operated objects that differ in the spread of properties.

4. Obligation to prepare, based on the results of the study, an innovative project proposal applicable to the entire set of the same type of operated facilities or part of it.

5. The need for an economic justification for the applicability of the project innovation proposal.

The uniqueness of the operational nature of the research object in transport was predetermined by the combination of the production of these objects outside the operating industry under study, the mass operation of hundreds of thousands of objects of the same type, their multidimensionality and a significant spread of characteristics. For the same type of vehicles, spare parts, fuel and lubricants, production and technical base, the indicated spread is significantly higher than for the same type of railway, river or air transport facilities.

Transport is an exploiting sub-industry. Without producing the necessary resources for itself, it consumes the products of other branches of industry and uses the personnel trained for it. Moreover, these industries produce and modernize these products independently, relying mainly on consumer demand, only in isolated cases and only in some respects adjusting their activities based on the results of research by operators.

The activities of transport are focused on meeting the needs for transportation and rational use of the resources consumed in this case. Accordingly, research for transport is much narrower in its goals than in other branches of technical sciences, and even research in the interests of rail or air transport.

In terms of their objectives, research for transport is limited to purely operational issues and industry-specific opportunities for this operating industry to apply the results of scientific activities. As a result, objects for research in the interests of transport are also selected based on the use of its resources for subsequent innovative transformation and taking into account the specifics of the multiplicity and multidimensional nature of these objects. Research, the results of which the transport industry is unable to implement on its own, as a rule, does not receive its long-term direct support and is curtailed regardless of the results.

In the traditional sense, the methodology of science is the doctrine of the methods and procedures of scientific activity, as well as a section of the general theory of knowledge, in particular the theory of scientific knowledge (epistemology) and the philosophy of science. Moreover, the scientific method is understood as an ordered method of cognition, research, bringing the researcher closer to the truth. The system of operations, procedures, techniques, or their description for working with technical means or data, or for establishing facts, is called a technique.

In the applied sense, the methodology of science is a system (complex, interdependent and interconnected set) of principles and approaches of research activity, on which the researcher (scientist) relies in the course of obtaining and developing knowledge within a specific natural science or technical discipline.

In this paper, the methodology of sciences is considered precisely in the applied relation, using the example of one of its branches - the methodology of transport science.

The evolutionary development of the methodology and methods of science is based on tradition, which in turn serves as the foundation. However, it is not so much the methodology of science in its applied meaning that is undergoing development, but the understanding of its applications in the ever-emerging branches of technical sciences. Replenishment of ideas about the methodology of science and technical sciences in particular is an extremely slow process, in contrast to the replenishment of the amount of knowledge with the flow of new information that science provides. Today, the methodology of science is primarily aimed at solving such problems as:

- analysis of the structure of scientific theories and their functions;
- the concept of scientific law;
- procedures for testing, confirming and refuting scientific theories, laws and hypotheses;
- methods of scientific research;
- reconstruction of the development of scientific knowledge.

Despite the fact that methodological research is carried out on the basis of a wide variety of philosophical schools and trends, their results often do not depend on the philosophical orientation of the researcher and are of universal value.

As you know, the same term "science" refers to the totality of knowledge, and the type of activity, and the very field of scientific activity. As a field of activity, science is usually divided into fundamental and applied. Technical sciences as a whole are referred to the field of applied science.

The volume of funding for civilian scientific research in Russia as a share of GDP, and even more so in absolute terms, is less than 1% of the US figures. The object of research in the technical sciences are man-made technical objects, technologies and their properties. Technical objects are studied by technical sciences, first of all, in relation to their common fundamental aspects:

a) the purpose and effectiveness of the application;

b) structures or organizations;

c) functioning;

d) management;

e) operational properties;

f) the dynamics of health, wear, performance properties as the resource develops and aging in operation;

g) interaction with personnel and the environment.

Until the end of the 19th century, engineering and technical sciences were one and the same. The mass application of technology and industrialization led to the separation of technical sciences and the formation of engineering as a system of independent areas of activity in each of the areas of production and transport. Engineering in each of the industries has become massive. It is engineering that directs practical activity in transport. The authorities and the system of financing only regulate its balance by means of transport and territories.

Engineering (engineering) is looking for the most rational solutions within the framework of already tested, sufficiently confirmed knowledge within the limits allowed by regulatory documents. It is the normative documents (standards, norms, instructions, SNiP, regulations, technical regulations, guidelines, administrative regulations, registers, rules, registers, charters, etc.) that accumulate knowledge about technical objects.

This knowledge is obtained by the forces of technical sciences as a result of research.

Regulatory document - an official document of the established form, designated in a certain way, approved by the authorized state body within its competence in compliance with the procedure established by law, containing generally binding (or intended for use in a certain area or conditions) norms, designed for an indefinite circle of persons and repeated application. Unlike technical literature, normative documents are a carrier of data that have passed an examination according to state-established procedures and are allowed by state authorities to be used by engineering in practical activities. The role of the state in this case is to ensure the safety of practical activity and its consequences through the adequacy of regulatory documentation.

Differences in research and design methodologies also predetermine differences in their content. In the technical sciences, it is obligatory to work out the goals of the study, while the design goals are set from the outside even before it begins. Research may not be innovative in the broad sense of the term. Research can do without experimental research, and instead of theoretical constructions, include only calculations using known methods.

The applicability and effectiveness of research is almost always limited by the number of developed options for the object, the optimality of the designed object is sought and confirmed only for certain very specific implementation conditions and only for a limited number of possible implementations and executions of the object. The applicability of research results in technical sciences is much wider and is limited only by the limits of the investigated sets of object characteristics in the studied conditions.

A theory is a set of inferences that reflects objectively existing relationships and connections in an object and between the object and the environment.

A strict formal statement of the accepted research hypothesis in technical sciences is the basis of the theoretical part of the research, in which then mathematical models, quantitative descriptions of the studied aspect of the research object are created and studied.

From the point of view of mathematicians, the formal presentation of the accepted hypothesis is just a “mathematization” of the hypothesis, but in technical sciences this “a priori” stage often requires the greatest effort and deepening in understanding the object under study.

The main goal of the absolute majority of theoretical studies is to solve the following problems:

- studying the patterns of the objects under study;

- study of relationships in the functioning, structure, characteristics and properties of the objects under study;
- modeling of research objects, their characteristics or functioning;
- comparison of the equivalence of possible models of the object under study;
- solving problems of analysis, synthesis and optimization of the parameters of the objects under study, including new ones, synthesized or transformed. When conducting theoretical research, general logical and special methods of cognition are used, and most often in combinations. In one study, the combination of theoretical research methods is individual for each specific scientific problem and researcher. Of the general logical methods, the following methods are most often used:
- comparison - comparison of homogeneous objects according to the features that are essential for this consideration; analysis - the mental or physical division of an integral object into its constituent elements (features, properties, relationships) and the study of these parts, regardless of the whole;
- synthesis - a mental or physical connection of the constituent elements (features, properties, relationships) of an object into a single whole, taking into account knowledge about the constituent elements;
- abstraction - mental abstraction from a number of features (properties) of an object while highlighting other features (properties) that are of interest for solving a specific problem; analogy - the assumption of the similarity of certain properties of different objects based on the similarity of their other properties;
- generalization - the establishment of common features and properties of a group of objects;
- induction - the development of a general conclusion based on private premises;
- deduction - derivation of conclusions of a particular nature on the basis of general premises;
- modeling is the creation and study of a model that replaces the object under study, with the subsequent transfer of the information obtained to the original. The traditional approach to the theoretical study of a technical object, which has already become a classic, borrowed from natural science research, consists in a deterministic analytical description of the considered aspect of this object. The description is built on the basis of known fundamental regularities using the arsenal of the indicated general logical methods (abstraction, idealization, generalization, deduction, etc.) and previously accumulated knowledge about the quantitative and qualitative characteristics of the object. This approach is productive only for sufficiently studied (well-structured) objects, for example, not the most complex objects of theoretical mechanics. But for real, not yet fully studied objects,

By definition, an experiment (lat. experimentum - test, experience) is a method of cognition or a single set experience, the study of an object under controlled and controlled conditions by influencing it with other material objects with the possibility of repeatedly reproducing it when repeating the conditions of the experience. There are no purely experimental studies; in all cases, analysis, determining the goals of an experimental study, formulating a hypothesis, building a quantitative model or justifying a hypothetical expected result of an experiment are performed theoretically and precede each of the experiments. Experiment planning, comprehension and explanation of its results, development of proposals for their practical use also belong to the field of theoretical research. They are inevitably present in one form or another and in different proportions in every work, both “purely” experimental and theoretical, in every research work, or dissertation in technical sciences. After all, theoretical work is inevitably based on the results of previous experiments. In the technical sciences, experiment is of paramount importance.

Measurement- a set of operations performed to determine the quantitative value of the quantity.

The measurement transformation under the conditions of the uniqueness of the measurement equation and the possibility of the existence of its solution can be formally described in relation to the measurement of physical quantities at the macrolevel by the main measurement equation $Q = Nq$, where Q is the measured value; q is the unit of the measured value; N is a numerical value that defines the relationship between Q and q.

Measurement result error (measurement error) is the deviation of the measurement result from the true (actual) value of the measured quantity. The measurement error can be represented as the difference between the measurement result (the value of the physical quantity obtained during the measurement) and the true value of the physical quantity $N = x - Q$, where x is the measurement result (the value of the physical quantity obtained during the measurement); Q is the true value of the physical quantity.

Observations- this is the perception of information by instruments or human senses, ensuring its objectivity and controllability (including due to its repetition).

Survey- direct predominantly quantitative determination of the characteristics of the object under study with the participation or by the method of the researcher.

Tests- a technical procedure for determining one or more characteristics of technical objects in real or simulated conditions in accordance with established requirements, including through the actual application of a technical object for its intended purpose.

Statistical Research- collection and processing of statistical data on homogeneous objects, identification of statistical relationships in their structure, functioning and information exchange.

Expert research. One of the most responsible is the state forensic activity, which includes autotechnical and other engineering and transport expertise as classes.

Forensic examination- this is a study carried out on the basis of a court decision by a specialist (expert) of issues, the solution of which requires special knowledge in the field of science, technology, art, craft, carried out in the manner and within the time limits established by the current procedural regulatory legal acts.

Just as the objects of research in road transport are not homogeneous, the arsenal of methods for their study is also diverse. The objects of transport science are almost always of a multidimensional nature, borderline for different sciences and involved research methods. Therefore, unlike most other technical sciences, almost every study on transport uses the widest range of methods, both theoretical and experimental studies. This fully applies to the application of theoretical research methods in transport. The arsenal of methods for theoretical research of transport science in transport has no other significant differences.

For objects of research into the operation of road transport, a systematic approach is most often used, which is a general scientific methodology for setting tasks in the study of complex objects. In transport science, the role of the systems approach is twofold: it is not only a tool for the most general formulation of the research problem, but at the same time a means of finding the goals of the most rational and productive innovative transformation of the object under study as an improved part of transport. Classification of theoretical research methods in road transport:

a) a systematic approach;

b) statistical and probabilistic method;

c) modeling with the obligatory use of idealization and formalization methods;

d) project method.

e) abstract-logical methods of proof, analysis, synthesis, abstraction, deduction, idealization, ascent from the abstract to the concrete;

f) empirical method.

Usually, one study uses a combination of these methods. The combinations in which these methods are used in each particular study depend on its goals, object, scope, content, and on the preferences of the researcher. But the predominant application in modern transport science has received a systematic approach, a statistical and probabilistic method and modeling, if necessary, used in combination with other specified methods. Experimental studies are of particular importance for transport science.

Due to the specifics of the goals of research in transport, the multidimensionality and variability of the properties of its objects, their study without experiment, as a rule, is not carried out. It cannot be argued that theoretical studies are less significant for motor transport objects than experimental ones, but in comparison with other branches of technical sciences, their ratio in transport science in terms of novelty and volume of new results is more shifted in favor of the experiment. And it is the differences in experimental studies that determine the specifics of the methodology of transport science. The most specific for the applications of transport science in transport are operational observations, statistical studies and measurements. They are used more often than others both separately and in combination with each other and with other methods of experimental research. The same three methods are used more often than others, in particular, on the subject of transport. Research for motor transport, carried out at the intersection of technical sciences, is often carried out using highly specialized research methods unusual for transport science, borrowed from related branches of science, from metallography and gas spectroscopy to psychological tests of personnel. In transport, experimental studies, as a rule, are combined in each scientific work. For example, operational observations and automatic recording of processes are almost always combined with statistical studies and statistical processing of results, and tests with measurements. In one work, 3-5 types of experimental studies are often used in combination.

Operational Observations- a form of data collection on indicators of operation or operational functioning of transport facilities, for example, on production units of existing transport enterprises. Operational observations provide information about the performance, performance consequences, and performance properties of the item under study, including the evolution of these properties as the resource wears out. Operational observations are carried out directly on real production facilities in the process of their commercial use.

Measurements in transport research, as in other branches of technical sciences, they are most typical for the study of technical and technological objects. In the arsenal of methods of transport science, direct and indirect measurements, technical diagnostics and "diagnostic" methods of indirect assessment of the calculated parameters of the properties and states of technical objects and processes that are not available for any measurement are the most widely used. To perform measurements, both mass-produced, metrologically certified and verified universal-purpose measuring instruments, and on-board technical diagnostic tools, and new measuring installations, stands and instruments specially created for a specific study are used.

Significantly less often in the arsenal of experimental methods of transport science, surveys are used. This is an element, first of all, of expert studies of the state of complex technical, man-machine and industrial technological and organizational objects of transport. As a rule, technical objects are examined in a static state, in a non-operating state, and man-machine and industrial technological and organizational objects - in operating modes or in both states.

Tests of new technology are within the competence of the industry. Transport on its own conducts only operational tests (including comparative operational tests) of new equipment proposed by manufacturers for their operation, including maintenance, repair and diagnostics. Their purpose is limited to obtaining estimates of the degree of applicability and efficiency of the operation of vehicles and equipment in specific operating conditions. Operational tests usually cover a significant portion of the life of the tested objects before decommissioning (or major repairs, if any), but can also be carried out in several stages for each test object, at relatively long intervals of operation. Usually, for performance tests, requirements are preliminarily developed for compliance with which they are planned to be carried out.

Automatic registration It is used in all experimental studies of relatively fast processes, processes that repeat many times, and phenomena and processes hidden from observation. For example, experimental studies of the working processes of engines, brake systems, suspension, electrical equipment and automotive electronic automatic control systems are only feasible with automatic data recording. This fully applies to experimental studies of the working processes of electric and hydraulic drives of garage equipment, painting and drying booths, their electronic components, and the functioning of modern computerized technical diagnostic tools.

Conclusion

The methodology of science is an effective tool for obtaining new knowledge. Figuratively speaking, this is the "technological core" of cognitive activity in science.

Transport science is one of the few branches of technology in which the production and operation of the equipment it uses are divided into two independent production areas with their own scientific and engineering support. Therefore, the methodology of transport science as an operational branch of technical sciences has additional specifics in relation to the specifics of the methodology of technical knowledge.

Transport science is designed not only to ensure the improvement of transport, but also to form the initial requirements and data for the innovative improvement of the products of industries serving transport. In relation to transport, these industries are transport electrical engineering and telematics, petrochemistry and polymer chemistry, the paint and varnish industry, the production of garage equipment, technical diagnostic tools, etc.

There is no need to hope for a “miraculous transformation” in the understanding of transport and transport science. The current view of transport is rooted in the practice of economic policy, the architecture of economic planning has been laid out for it, in which transport is assigned a “working” place - to be in the “service” of production, but not the locomotive of its promotion. The history of the rise of Rome, Holland, Spain, Portugal, Britain, a little later than Germany, and the historical experience of the Russian State do not teach politicians. Even the birth of space transport has changed little in the political understanding of transport, and as long as political reflection is not built on the basis of general scientific thinking, scientific and philosophical ideas will remain wishes, but not imperatives.

The integration of economic science is realized unilaterally, it loses its specific methodological base, borrowing mathematical methods of analysis. They are certainly fruitful and no one doubts their effectiveness, however, the movement of economic science, in addition to the “quantitative” coast, also has a political one, on which the qualitative guidelines of the movement, regulated by world outlook, are built. Not transport should be subordinated to the development of the economy, but the economy should be developed on the basis of the modern understanding of transport as a system-forming factor in the movement of the world in general and social progress in particular. The history of man as a biological species and social form of human reality testifies that evolution was carried out thanks to the development of living space by mankind, moving first in physical space, and, as their own social space was formed, in it. Civilization is the product of this process. In the new millennium, the significance of space for the improvement of human life is even more relevant, therefore, no matter how high the value of social space is, it is necessary to go beyond this form and consider the problem of spatial development of the world with the help of transport, understood in a broad ideological context, as a priority in politics. And the most practical politics develop not as a systemic reaction to the action of forces from the existing reality of the world, but is built on the basis of the outstanding ability of homo sapiens consciousness to anticipate objective changes in reality. The methodology of science is an effective tool for obtaining new knowledge. Figuratively speaking, this is the "technological core" of cognitive activity in science.Transport science is one of the few branches of technology in which the production and operation of the equipment it uses are divided into two independent production areas with their own scientific and engineering support. Therefore, the methodology of transport science as an operational branch of technical sciences has additional specifics in relation to the specifics of the methodology of technical knowledge.

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Transport science in its current form is not a phantom and not a scientific and educational discipline. Its status reflects the prevailing idea of transport. She herself realizes the transition to the science of transport, corresponding to the post-non-classical stage in the history of science. That is why it is so important to define the concept of "transport", in its actual content. F. Engels was right in emphasizing the trend of increasing importance in scientific knowledge of methodology. V.I.'s warning also came true. Lenin that the main burden on philosophy will be in epistemology. The language of technical thinking is a drawing, the language of scientific thinking is a concept. Concepts must correspond to the actual reality and change following the expansion of the boundaries of scientific knowledge.

The consciousness of the immensity of Russia comes into our souls also thanks to rail travel. There are countless railway specialties - heat engineering, a specialist in diesel engines, in electromotive traction, in electrical networks, in logistics, signaling, in optimal configuration of trains and control over the weight load on the track; on railway bridges, maintaining crossings in accordance with safety requirements, etc. This is by no means a complete list of those areas where there is thought, professional knowledge and the will of a travel engineer. These professions do not exist on their own. They are linked into a system of successive and complementary areas of activity, where each of them "leads his part" in the orchestra, in the beating of the pulse, in the life of the railway.

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