SCIENTIFIC AND TECHNICAL RESEARCH ON THE 
EFFICIENCY OF ORGANIZATIONAL AND 
TECHNOLOGICAL PROCESSES OF INDUSTRIAL CLUSTERS 
RE-PROFILING

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https://doi.org/10.26782/jmcms.2020.04.00030

Abstract

Reprofiling industrial facilities allows companies to optimize their structure while also creating a competitive environment in the service sector. In addition, the portfolio of assets undergoes optimization during the reprofiling process. Because of the release of the production space, it would be possible to reduce the costs by preserving, selling, and leasing production space. Therefore, to achieve and strengthen a long-term competitiveness, companies are forced to adjust their activities with an emphasis on the changing demands of the period. The world is constantly changing, so it is very important to respond expediently and quickly to these changes. To date, international practice and experience of reprofiling in the Russian Federation have shown it as one of the most difficult managerial tasks. During this process, many restrictions, along with the unique characteristics of the company, in which it is conducted, should be considered. Consequently, it must be performed only in the presence of the clearly defined goals, the reprofiling concept, and an understanding of each stage and methods to be observed. The topic of this article is relevant since the model of the work performed during the reprofiling allows this process to go as smoothly and efficiently as possible, allowing the company to adapt to new market conditions. However, this issue is poorly covered nowadays. In fact, many sources consider the redesigning strategy only as a special case study of a restructuring strategy or as a strategy for updating the fixed assets. Therefore, regulatory documentation for capital construction projects as well as for reprofiling facilities should be improved.

Keywords: Construction control, Redevelopment of industrial areas, Reprofiling industrial facilities, Scientific and technical renovation, urban development.

I. Introduction

The main city-forming factors of large cities around the world in the XIX and in the first half of the XX century have been industry and transport enterprises. They have

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been the place of employment of 70-80% of the economically active population. Even trade, administrative and metropolitan functions, and the service sector had less influence on the formation of buildings and planning of the historical centers. On the one hand, residential areas have been located in the immediate vicinity of enterprises. Consequently, with the growth of production and infrastructure of transport hubs, the residential buildings have been placed inside the production zone. This issue has been true for all major cities in Europe and Russia.

By the middle of the 20th century, the structure of the urban factors has changed significantly. In fact, the number of people employed in the service sector, education, and banking sector has increased, the structure of industrial production and transport has changed, and society began to impose increasingly stringent requirements to the sanitary standards of the functioning of production facilities, and many of them have been forced to close. However, high-tech production appeared in large cities, which allowed to take the released workers. Finally, the share of the economically active population employed in the scientific and design centers and medical and educational institutions increased.

It is notable that withdrawal of some enterprises outside the major cities in Europe coincided with the perceived need for radical technical re-equipment. The Soviet Union has been at least 40-50 years late with these measures, which has been a reason for the General technical backwardness of our country.

On the one hand, intensive housing construction in large cities of Russia has led to the fact that workers often travel by public and private transport to the workplace from the "sleeping" areas in the direction of the center. On the other hand, reforming economy, transition to the market principles of the assessment of the enterprises efficiency, changes in the structure of the municipal economy, introduction of cadastral cost of the earth in various areas of the city, legislative registration of sanitary (ecological) norms of activity of the enterprises of the industry, transport and sphere of service, shortage of manpower, and low technical level of some productions led to the necessity of liquidation of a number of industrial productions or their urgent transfer outside the cities. Therefore, plans for gradual removal of industrial production outside the city have been limited, and their placement in small cities has been developed in the Soviet period for Moscow, Leningrad, Volgograd, and Sverdlovsk, but financial and material resources have been not allocated and the plans have been not implemented.

In Moscow, on May 2004, the city Duma adopted a Resolution on the legal status of "industrial territories" and on the status of "production territories". In this regard, the size of the rent defined financial benefits for enterprises. However, in cases when the enterprise is closed for certain reasons, among the options for further use of the vacated territory, industrial buildings and other structures, it is advisable to consider the possible adaptation of individual industrial buildings for social and public purposes. This will not only reduce the total cost of the development of the new urban area, but also in the shortest possible time to build social facilities, which are lacking in neighborhoods.
The issue of reconstruction of large cities and, in particular, industrial zones has been given special attention by the city authorities not only in Moscow, St. Petersburg, and other megacities, but also in industrial centers of Russia from Smolensk, Voronezh to Chelyabinsk, Magnitogorsk, Tomsk, and Novosibirsk. This is evidenced by the scientific and practical annual conferences in these megacities with the participation of leading architects, economists, and ecologists.

Moreover, a special place has been given to the research of the influence of the processes of reconstruction of the underground parts (strengthening of foundations and increase of subsurface space) and technological solutions to produce works aimed at the safety of adjacent buildings.

The peculiarity of the technology of work during the conversion of buildings has been determined by high tightness, which required the use of special means of mechanization.

When redesigning buildings, an important place should be given to the architectural aspects contributing to the transformation of the industrial buildings into a complex of modern buildings. In addition, the use of modern methods and technologies in the reconstruction of the facade surfaces allows to provide a modern appearance of the reconstructed areas in harmony with the existing quarter buildings.

It is widely accepted that all major cities emerged as centers of crafts, trade, and transport communications. Therefore, industrial enterprises concentrated on them during the capitalist development of the society. For example, in the XIX and XX centuries, industry has been the main city-forming factor for large cities. Therefore, functions of the administrative centers or stations affected the planning of cities and construction of the historical quarters; however, the growth of the urban population has been initially associated with the development of industries. Notably, one of the special groups of the urban formations has been sea and river ports, connecting the metropolis with the colonies, and later-providing trade turnover of various countries (London, Amsterdam, Rotterdam, Lisbon, Hamburg, and Marseille).

Hence, the residential areas have been located in close proximity to the employment place of citizens and as the production grew, volumes of transportation and trade, industrial enterprises, and objects of transport infrastructure have been placed inside the city. In fact, the concentration of production, growth of the output, and the number of the employed workers at individual enterprises led to the expansion of the residential zone. In addition, the rise of industrial production became more noticeable in the Central areas of cities, where administrative buildings, cultural, and social facilities, banks, offices, and residential buildings have been located.

With all the variety of the layouts of large cities in Europe, including Russia, there is a common feature associated with the influence of the main city-forming factors—alternation of the residential neighborhoods and industrial zones in the direction of historical (cultural and business) center to the periphery. "Dirty" production and by the standards of the past (wool-washing factories, paper-making plants, metal-melting shops, chemical plants, etc.) have been closed and moved to new territories. This happened, for example, in London, Hamburg, and Moscow. However, most of the
production remained within the city limits, modernized technologically, expanded the range of products, and increased its output. Of course, some productions changed their profile and became a part of more complex productions.

The dynamics of the growth of the territory and population, including those employed in the industrial production, trade, transport, and construction service seven large European cities (Berlin, Budapest, Vienna, Hamburg, London, Paris, and Rome) as well as Moscow, Nizhny Novgorod, Yekaterinburg, and Samara during the second half of the XIX and XX centuries. In the process of preparation of the thesis studied, large-scale maps of cities analyzed statistical information on the development of some industries, transport, and urban economy. However, indicators for different cities did not correspond by year but confirmed the thesis that new production and transport infrastructure facilities originated in new territories and left residential areas of old industries in their area.

Great Britain, as well as the Federal Republic of Germany, France, and Italy solved the environmental problems of their capitals and large cities simultaneously with the radical technical re-equipment of industrial enterprises. Therefore, achievements of the technical revolution in the mid-twentieth century, miniaturization of many machine tools, the automation of technological processes, robotization of conveyor lines, and individual posts required new production facilities. The cost of retrofitting the old workshops could be compared to the construction of the new production buildings. Therefore, withdrawal of industrial production from the city limited, for example, London and took place quickly and systematically, although the process of withdrawal of industrial enterprises and their partial reprofiling has already lasted more than 80 years.

Since the mid-twentieth century, London has become one of the centers of attraction of tourists worldwide. The city authorities responded by encouraging the construction of a large number of hotels, shopping complexes with spacious Parking lots on the outskirts, and multi-tiered Parking lots in Central neighborhoods. Then, industrial buildings and warehouses along the Thames began to be converted into restaurants, pubs, discos, and sports centers. On the site of some enterprises, there have been hotel complexes, and the former factory territory has been planted with trees and flowers. Examples included the Chelsea area, which has become one of the most expensive areas in London.

Over the past 50 years, the area of green space in London has increased by 20 km2, and many industrial suburbs of old London have become recreation areas. Deprived of some industries, long Dong remained the largest industrial center in the UK. Thus, the main industrial city-forming factor is now science-intensive production. Therefore, there is a tendency to reduce the number of the urban population. This is facilitated by the growth of labor productivity in almost all enterprises and transport, and new information technologies in trade, banking, and services.

Another major European capital – Paris also developed from the old center (the island of cite) to the periphery, alternating residential development with industrial enterprises. Since 1853, Paris systematically has begun to rebuild. Although
foundations of the current radial-circular layout have been laid in the second half of the XIX century, small enterprises, which have been the main city-forming factor, have been not rebuilt, and residential areas have been deprived of communal amenities and normal amenities. Only in the early 20th century, perestroika touched the outskirts of Paris.

In the 20s-30s in the suburbs on the site of the demolished old industrial and residential areas, there have been residential complexes of Pantin and Drancy. By the middle of the 20th century, Paris became the most important industrial center of the country, where 22% of the economically active population of France lived. Moreover, technical re-equipment of the enterprises of machine-building, chemistry, food, and printing industry at the expense of attraction of investments, including from-for the ocean, essentially increased the work productivity, allowing to liquidate a part from them, and the others having repurposed for new objects.

Like London, Paris in the 20th century is becoming a popular tourist center. However, the restructuring of the city, associated with the holding of five world-wide industrial exhibitions, two Olympic games, and placement of a number of international organizations, including UNESCO, allowed Paris to develop the infrastructure to receive a large number of guests. Now, the capital of France is visited annually by more than 20 million tourists. They are served only in the hotel sector by about 175,000 employees and, therefore, there are more than 2 thousand hotels.

It is notable that the experience of rebuilding Paris has been used in the European Union to boost Catalonia's economy and, in particular, to redevelop Barca-Lona. Thus, the city's preference for hosting the Olympic Games has been based on the political and economic considerations. Large investments in the renewal of industry, transport infrastructure, and preparation of the city for the Olympic Games allowed Barcelona for 10-12 years to become a modern industrial, cultural, and educational center and a center of tourism and recreation of the European level.

The principal historical circumstances, which distinguish Russia from the European developed countries are:

- Later formation on the path of industrial development,
- Revolutionary transformations of the social system, huge economic damage during the civil, and domestic wars and
- Long-term economic isolation from the Western world.

II. Literature Review

Scientific research in the field of improvement and adaptation of modern technologies and engineering methods of assessment of the load-bearing capacity and reliability of the buildings have been performed by specialists of RAASN under the leadership of V.A. Ilyichev [XVII], in MGSU. Kuibyshev under the leadership of Dr. Telichenko V.I. [XVIII] and under the leadership of Dr. Ter-Martirosyan Z.G. [XIX], and Ukhov S.B. [XVI]. Moreover, scientific and practical work has been carried out
under the leadership of Dr. Abramov I. [XI] and Oleynik P. [XIII], specialists of the Russian Engineering Academy under the leadership of Dr. Gusev B.V. [VIII], specialists of the International eco-logical Academy under the leadership of Dr. Fokov R.I. [XIV].

III. Methodology

Most of the industrial sites after the withdrawal of production have been planned to construct new residential, office buildings, and social facilities. Therefore, demolition of the old industrial buildings as well as soil reclamation is a financial burden for investors or city authorities. Hence, the city authorities, who put up for auction of the former industrial site, should take into account a number of specific features [XIX]:

- Building density of industrial sites, which is in a wide range from 8% to 60% (taking into account the main production buildings),

- The service life of the production buildings is calculated from 20 to 120 years [XI],

- The height of the span spaces, the size of the column grid, the number of spans, and the total length of the building,

- Structural design of the load-bearing and enclosing structures (columns made of brick, steel, reinforced concrete, beams and trusses made of steel, jelly-concrete, and even wood, floors and coatings of monolithic and precast concrete, brick, wooden panels, etc.), and

- Saturation of foundations for technological equipment and saturation of various communications (pressure and non-pressure pipelines, trays, cables, and through and semi-through collectors).

The structure of the passive part of the industrial funds can be judged by indirect indicators. These include open in the press data on changes in the number of workers and the volume of the output of some types of industrial products [III]. For example, in Moscow, the weaving industry grew from 1913 to 1940. In practice, it grew by 2.5 times, and the number of workers also increased by 2 times. It should be mentioned that these indicators grew 2.7 and 2.2 times from 1940 to 1970, respectively. Over the next 30 years, the indicators decreased and amounted to 1.4 and 1.3 times, respectively compared to the data of 1970. Thus, the result testifies to the extensive development of the industry in Moscow.

However, the consolidated indicators of the resource costs and time for disassembling the individual elements and structures of industrial buildings, structures and land reclamation or indicators of resource costs for conversion of industrial buildings with an assessment of the terms of work, and the terms of possible operation of the redesigned objects may be of practical interest to the experts in the field [XI].

As shown in the survey of 63 industrial sites in 23 districts of Moscow, it was decided to consider the industrial buildings of the past years and classify them only by the number of the storeys and structural design. In addition, tower-type structures were separately allocated.
Another study showed that single-storey industrial buildings remaining on the sites of
the village have a frame design with various external fencing structures, including the
self-supporting brick walls and panels based on the Foundation beams or hinged
panels [XII]. Moreover, the share of the single-storey frame buildings reaches 30-35%
of the total number of industrial facilities. These buildings are located as the
enterprises of mechanical engineering, electrical industry, metallurgy, automotive,
and some enterprises of the military-industrial complex. In addition, the height of the
frame buildings, which are subject to demolition or re-profiling, is 12-15 m, and the
spans are in the range of 12-24 m [XIII].

It should be noted that the foundations under the frame are almost always made of
concrete with a reinforcement of the supporting part and column footing. Therefore,
foundations for technological equipment have different depth of laying and are made
of reinforced concrete. Hence, we considered it appropriate to be used as a unit of
calculation - m3 of the building volume of the building just for the above-ground part
in order to determine the costs of various types of resources during demolition.

A separate group of industrial buildings are the brick multi-storey buildings,
including having columns of metal or brick. They accounted for at least 10% of the
total area of construction of industrial sites in Moscow. Of course, the height of the
buildings in three-six floors makes 15-25 m. They also have different constructive
decisions of overlapping from the floorings on the metal beams to brick the vaulted
and reinforced concrete [VIII].

In addition, the frame multi-storey buildings built in recent decades have been
designed to accommodate the production allowed in the neighborhood of residential
areas. They are located as the enterprises of light, food, printing industry, precision
engineering, instrumentation, electronics, and metalworking.

To assess the demolition costs of the industrial buildings with different designs and
ages, as well as technological methods of destructing the load-bearing and enclosing
structures, an expert assessment has been carried out, offering specialists-builders and
technologists to answer the questionnaire questions. The experts have been the
authoritative specialists with many years of engineering experience and have been the
heads of construction structures now. They have been also the top managers of the
commercial structures engaged in dismantling the building structures, buildings, and
structures in the Moscow region.

The research study structure is the sequence and the relationship between constituent
elements of the research project. Figure 1 depicts the sequence of the research steps,
which should lead to specific results.
Fig. 1. The scientific and technical research structure.

The main scientific research parameters include indicators such as factors, for which statistics will be collected on research subjects in our country, the number of facilities, based on which the analysis is conducted, as well as the theoretical justification of the data mathematical analysis method [XVI].

With regard to the study of domestic and foreign scientific and technical literature on the research topic, several factors influencing the construction and installation quality implementation during the reprofiling of industrial facilities have been chosen. Then, the factors have been divided into two groups of general quality implementation factors and factors inherent only in the reprofiling [XIX].

Common factors:

- The number of the surveys before the design [pcs],
- Design company working capital [10 million rubles/year],
- Contractor company working capital [100 million rubles/year],
- The number of sets of technological maps for the work period [pcs], and
- The level of staffing with the contractor company production capacities during the work [number of the equipment units, pcs],
- Qualification level of the contractor company construction staff [%],
- The total work duration [weeks],
- The influence of suppliers on the delays in the work (delays in the material supply, replacement of materials that have not passed input control) [shifts],
- The impact of funding on the work [shift] delays [V], and
- The amount of the contractor company funds allocated to ensure the quality control system [%].
Private reprofiling factors [XI]:

- Duration of preliminary permission reprofiling documentation registration [days],
- Degree of changes in the volume of the reprofiled facility degree [%], and
- The estimated construction and installation cost during the reprofiling [10 million rubles].
- However, 13 factors were chosen for further study [XIII].

To determine the required number of facilities subject to data collection to create a representative sample, we shall use Formula (1) provided in the article by T. Musatova and Zhelikhovsky D.O. entitled ‘Methodology for predicting the innovative project efficiency based on the expert assessments’, which was published in the online magazine ‘Modern scientific and educational problems’ (2015) [VIII].

\[ m = \frac{h^2 r_a r_o}{\Delta^2} \]  

where \( m \) is the minimum number of facilities,
- \( h \) represents the confidence factor,
- \( r_a \) refers to the proportion of the sample elements with this attribute,
- \( r_o \) is the proportion of the sample elements without this attribute, and
- \( \Delta \) is the non-sampling error.

Therefore, taking the confidence factor value equal to 90%, we will get:

\[ m = \frac{0.9^2 \cdot 0.1 \cdot 0.91}{0.12} = 7.29 \approx 8 \]  

Thus, to conduct a study with a known non-sampling error not exceeding 10%, statistical data should be collected from 8 industrial facilities on 13 factors [XIV].

In order to perform the collected mathematical statistical data analysis, the regression method (regression analysis) will be used in the work [XII].

Research demonstrated that correlation-regression analysis is one of the most common methods for studying the relationship between numerical values. In fact, its main goal is to find a relationship between two parameters and its degree with the subsequent equation derivation. Any analysis begins with the collection of information. Therefore, the larger it is, the more accurate the result will be. However, this study determined the amount of information using a mathematical formula (1). The correlation method and regression analysis involve finding a causal relationship. However, at the first stage, it must be understood that changes in the values may be due to some other value that has not been considered by the researcher, or the factors introduced into the study may not have any or have minimal effect on the parameter studied. Moreover, there can be non-linear relationships between variables. Hence, several study stages while adjusting the initial parameters should be conducted [XV].
There are three main cases of the use of this method:

1. Testing casual relationships between quantities. In this case, the researcher determines the variable values and finds out whether they affect the change in the dependent variable. In this regard, correlation-regression analysis allows us to detect a directly proportional linear relationship between these two variables and derive a formula describing it. Thus, values expressed in completely different units of measurement can be compared.

2. Finding a relationship between two variables without extending a causal relationship to them. In this case, it is not important which value the researcher calls dependent. Moreover, it may turn out that both are affected by a third variable, so they change proportionally [VI].

3. Estimation of one value based on another. This estimation is based on an equation, where the known numbers are substituted.

IV. Results

According to some studies, objects of capital construction (including separate buildings, constructions and town-planning formations of industrial appointment) belong to the category of construction production of the material subjects created by means of certain composite, technological, and construction receptions [VII], [XI], [XVII], [XVI], [XVIII], [XIX].

Actually, construction products in the format of buildings and structures for industrial purposes are the object environment of a long (long-term, determined by the service life) period of use. Therefore, the degree of compliance of the actual safety indicators and functional efficiency of the completed construction projects with the established design and regulatory values determines the quality of the construction products [II], [VI], [XII], [XV].

Hence, the main features of the construction products (especially unique and/or technologically complex production facilities) as a material object of the productive and reproductive activity are duration, labor intensity, and the amount of the costs required for its formation (construction) and subsequent operation [VIII], [XIII], [XIV].

Of course, one of the complex tasks is to ensuring the functional quality of construction products, the solution of which is implemented for a long period, during which there is a constant transformation of the properties and conditions of construction objects.

Notably, the considered period has been named a life cycle of construction production (including construction objects of industrial appointment) [IV], [V], [IX], [X].

Figure 2 depicts the life cycle of a construction object in the form of a temporal-logical structure characterized by a sequential change in the States included in the structure (stages, periods).
Fig. 2. Life cycle of the object of construction of industrial functional purpose.

It is notable that the life cycle of an industrial (production) construction object (urban development) has the form of a consistent, hierarchical, and strictly oriented structure, which includes the following main stages (periods):

- Mandatory stages,
- Construction surveys,
- Design,
- Construction (new construction, reconstruction, and expansion),
- Operation,
- Scheduled repair,
- Demolition,
- Possible stages,
- Preservation,
- Re-profile, and
- "Overhaul".

V. Discussion

Organization of the territorial and spatial distribution of the main functional processes of the modern post-industrial settlement system (cities and agglomerations) is multifactorial and complex in most cases. The modern urban structure (as a special form of displaying the material and spatial environment) functions in the format of an integral social and industrial complex and constitutes (together with engineering, transport, landscape, and environmental frameworks) a single object of urban design.

It is notable that the most frequent phenomenon is the presence of such a town-planning situation, in which, in some local part of the urban system, conditions are formed to ensure the state and/or sustainable development of one dominant function (the corresponding territorial zone is characterized as monofunctional).
The main features and sequence of the formation of the functional-territorial organization of the structure of the urban environment of the modern (post-industrial) settlement system (city, urban agglomeration, and metropolis) are provided here [VII], [VIII], [XIV]:

- At the initial stage of the evolution of the urban structure, formation of the structure of the industrial zone (industrial workplaces, various economic, and industrial purposes),

- At the main stage, functional and territorial structure of the settlement system is expanded by ensuring the established scale and capacity of the industrial production and the phased organization of residential areas intended for the residence of working personnel who ensures the performance of the production processes. However, the most common format of building a residential area (array) is located in the peripheral zone of the urban environment,

- At the final stage, the social infrastructure (including transport infrastructure and engineering communications necessary to ensure the processes of life) is formed.

The production part (functional-territorial zone) of the urban environment is represented by the objects integrated into a hierarchically ordered, multi-level system: "site of an industrial (production) enterprise → production node → urban production area → production zone of the city → production complex of the city (urban agglomeration)."

The composition and hierarchy of the subordination of the structural elements forming the industrial environment depend on the specific climatic, urban planning, and large-scale technological features of the industrial production and functional relationships with the space of the urban environment.

Industrial sites and zones included in the urban structure can be considered as the centers of gravity and urban elements of a special composite value (composite centers and dominant) are interconnected with other functional areas (primarily residential environment) of the relevant spatial and communications and links (open spaces, road network, and utility networks).

An effective organization of the use of the territory of the urban environment, suitable, and accessible for building construction facilities for industrial purposes is an urgent task for the existing, new, and reconstructed industrial zones. Moreover, the use of the urban environment to place the production facilities is directly related to the characteristics of a particular type of industrial industry, the scale of the need for production activities, and permissible level of negative impact on the environment.

In addition, the requirements of the development of some branches of management (real economy of the industrial period) led to the necessity of formation of such systems of resettlement, in which the structure and functioning of the industrial zones acquired the importance of the main (main) city-forming factor, to which the structure and functional-territorial balance of the territory available for building are put in hierarchical subordination [XVI], [XVIII], [XIX].

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However, a significant share of industrial zones in the balance of functional saturation of the territory of the urban structure clearly indicated an obligation to include the industrial zone in the composition and architectural planning decisions (on the organization of space and connections with other functional zones) of a single and integral urban environment. This circumstance is equally relevant to reorganize and develop the existing settlement system and accessible areas for urban development.

Furthermore, typological structure (scientific method of research, which is used for comparative analysis of the key features of industrial facilities) allows solving problems related to the definition of trends in the Genesis and prospects of the improvement of both types of industrial formations; that is the newly designed and existing facilities—with the use of appropriate logical forms:

- To establish the characteristics of objects as samples,
- To determine relationships between the classes of objects, and
- To formalize hierarchical subordination of objects.

Finally, the Genesis of the production function (space) is formed under the influence of the urban planning and social and economic factors. In fact, urban factors (functional purpose, location, density, and capital of the building) characterize the composition and scale of the industrial environment (space).

VI. Conclusion

With the beginning of the very first period of the life cycle (the period of "Research", see Figure 2), an information model of a construction object for industrial purposes has been formed, which became its conditional image and displayed the transformation of the functional, structural, and technological features of industrial education in all subsequent periods (mandatory and possible).

Updating the knowledge (information) of the parameters, indicators, and condition became a significant factor for making a decision on carrying out measures aimed at improving (restoring) functional and technological quality or re-profiling of the considered industrial education.

Information (in the most general and broad sense) is a way of interaction between the subjects of the investment activity in construction so that the cycle of data passing to the object of information application and formation of a reaction to the received data constitute the cycle of information circulation.

Ordered and organized in space and time, the movement of information forms the flow of information. Thus, information support (as a way of organizing information flows) becomes one of the resources determining the potential growth and quality of the formation of organizational and technological solutions in construction [VIII], [XI], [XIII], [XIX].

However, types of information flows between participants of investment activity in construction differ in the following main features:

- Purpose: Normative, functional, planning, reporting, instructional, and executive,
- Direction of the movement (hierarchy): horizontal (between the structural elements of the same level of responsibility) and vertical (descending and ascending between the structural elements of different levels of responsibility),

- Periodicity: constant, periodic, random, and

- Areas of circulation: only within the hotel structural element (internal area) between two or more (or all) participants in the construction industry (external area).

The above features include such a feature of the information flows as: the reliability of the data composition: documented (or recorded in the relevant sources) or undocumented (or not confirmed by any documents).

Features of the concept of information support of the organizational and technological solutions to restore functional quality or re-profiling of the industrial function of industrial education of the residential object [VIII], [XII], [XIV], [XVIII]:

- The structure of information support of renovation is formed for providing the necessary and relevant data to specialists who determine the composition and conditions for implementation of the necessary and sufficient measures,

- The information support includes such amount of data, which is determined by the current regulatory framework for construction and is mandatory in relation to the industrial object in question,

- The results of the accumulation and processing of data obtained in the previous life cycle periods are the initial information for decision-making in the framework of the strategy and the concept of re-profiling, and

The information model is an open system formed by the interaction of internal information elements (subjects and objects of information flows) with a dynamically changing external information environment.

The information model (information data flows) should provide an operational search, unambiguous identification, and comprehensive current characteristics of the technical condition (physical and moral deterioration) of structural elements, parts, and systems of the construction (production) facility.

The formation of the information support in the development of the organizational and technological sequence of re-profiling of industrial facilities is a complex, multi-stage process (especially in relation to the buildings and structures classified as objects of cultural and historical heritage and/or cultural and historical significance).

To form an adequate information model, various methods and techniques of data acquisition and processing are used [XIII], [XV], [XVII]:

- Historical-archival and bibliographic research related to the analysis of the features of the urban planning, architectural, structural, organizational, and technological solutions,

- Full-scale (field) studies (engineering and technical surveys), allowing to assess changes in the technical condition of the object in time to conduct a comparative
analysis with the data obtained from historical, archival, and bibliographic studies and recommend methods and organizational and technological techniques,

- Experimental (laboratory) studies, allowing to assess the parameters of the technical condition (on the basis of selected samples of construction and finishing materials), regardless of the presence or absence of the results of historical, archival, and bibliographic studies, and

- Predictive (numerical-analytical) studies, allowing estimating (with the help of appropriate models) the parameters of the technical condition in the conditions of partial or complete absence of other methods (historical-archival, full-scale, and experimental studies) to obtain data.

The field of practical activities related to the improvement of the quality of construction projects (e.g., in the course of re-profiling of industrial formations and reorganization of industrial zones of the urban environment) is quite diverse and allows the use of modern (innovative) architectural concepts, building materials, and technological methods of construction.

The formation of an information model of a construction object, characterized by as complete and reliable information as possible, allows optimizing the composition and efficiency of the organizational and technological solutions.

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