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Engineering Project Management in the Telecommunications Industry

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Abstract: The research aims to develop proposals for improving methods of managing sharing projects in telecommunications. The study identifies problems in developing the production potential of telecommunications companies amid high traffic growth rates and the number of consumers. It examines the features of the sharing economy as a new economic model and its application in the B2B segment. The possibilities of applying the principles of the sharing economy in industry engineering projects, the effects obtained, and the problems are shown. The types and features of projects for the joint use of telecommunications infrastructure by operators are considered. Rigid and flexible project management methodologies and their application in telecommunications are discussed. A comparative analysis of approaches to managing sharing projects in the telecommunications industry is carried out. The results of the study allow identifying optimal approaches and developing recommendations for managing telecommunications sharing projects and increasing the efficiency of their implementation.

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1 INTRODUCTION

The scale of digital transformations in the economy is directly linked to the level of telecommunications development, which serves as the technological foundation for digitalization (Platunina, G., 2023, Salutina, T., 2023). The highest rates of growth in information needs and the number of users of various digital services and products in B2B and B2C markets force operators to pay great attention to developing production potential.

In the structure of operational expenses of telecom operators, the main share is occupied by costs associated with network operation, and considering the high cost of modern telecommunications equipment, capital expenditures for network development are also quite high. Meanwhile, scientific and technological progress contributes to the reduction of technology life cycles, which further exacerbates the problem of ensuring the economic efficiency of investments (Kukharenko, E., 2022). Therefore, the search for new opportunities and ways of technological renewal is one of the urgent tasks for telecommunications companies.

2 PROBLEMS OF DEVELOPING THE PRODUCTION POTENTIAL OF TELECOMMUNICATIONS COMPANIES

The scale of digital transformations in the economy is directly related to the level of telecommunications development, which plays the role of a technological basis for digitalization (Salutina, T., 2023). Modern networks form a digital space in which any user can receive an unlimited list of communication services almost anywhere. High rates of scientific and technological progress in telecommunications stimulate the innovative activity of industry companies in the field of modernizing communication systems and networks. The increase in traffic volumes and the number of users requires constant infrastructure updates.

Experience in the development and operation of telecommunications networks shows that the main investments of operators are in network infrastructure. Given the high cost of equipment, the rapid growth in the number of users, data transmission volumes, and the emergence of new technologies, companies' costs associated with the development and maintenance of their own network can be measured in the hundreds of millions of dollars. Moreover, these costs include not only the cost of equipment but also the costs of renting premises and communication channels, as well as the cost of maintenance and operation of infrastructure elements. At the same time, companies do not always manage to ensure full utilization of the introduced production capacities or reduce the period of their development. Therefore, companies may have free unused production capacities (for example, fiber-optic communication lines, load capacity of communication towers, etc.), which indicates the insufficient efficiency of the investments made and will negatively affect such an important operational indicator as return on assets in the future.

Thus, optimizing costs for the development and maintenance of a network with the required quality is an important way to improve the efficiency of telecommunications operators' business (Kukharenko, E., 2023). The success of its solution affects the efficiency and financial stability of the company, the quality, availability, and competitiveness of the services provided.

The current situation forces companies to look for new opportunities and ways to solve the problem of technological renewal and development of production potential. Scientific and technological progress provides companies with a wide range of digital technologies and solutions to improve the efficiency of their production and investment activities (Gorodnichev, M., 2019, Kukharenko, E., 2021, Salutina, T., 2021, Sergeeva, M., 2022), but other innovative approaches also remain relevant. One of the approaches is the use of the principles of shared consumption.

3 APPLICATION OF SHARING ECONOMY PRINCIPLES IN INDUSTRY ENGINEERING PROJECTS

The sharing (collective) consumption economy or the sharing economy is an economic system based on the joint use of resources (Botsman R., 2010). This model assumes collective use of goods or services without owning them. The ideology of shared consumption appeared recently but has already gained universal recognition in different countries, interest in it grew especially during the pandemic. The development of the sharing economy is associated with the transformation of consumer consciousness and behavior, when direct sole ownership of a product ceases to be the goal of purchase.

The sharing economy model is also actively developing in the B2B segment. The search for optimal approaches to organizing business in the context of digital transformation has forced enterprises to pay attention to the advantages of the sharing economy, which offers, in fact, alternative approaches to managing production resources (Acquier A., 2017). Involving untapped resources (real estate, equipment, personnel, financial assets) in circulation contributes to increasing the efficiency of their use, creates additional sources of income. The presence of conditions under which free resources are used irrationally determines the need to use the sharing economy for the sustainable development of business, increasing the flexibility and adaptability of the enterprise to a dynamic market environment. In addition, inclusive forms of management are expanding.

The demand for the sharing economy model is observed in various industries, in energy, telecommunications, construction, medicine, agriculture, and the transport industry (Kukharenko, E., 2019, Kukharenko, E., 2022). The principles of the sharing economy are implemented at different stages of technological chains, specialized services are created for the joint use of raw materials, materials, vehicles, and waste management tasks, etc.

The opportunities of the sharing economy model are especially evident when used in telecommunications. This is due to the high capital intensity of the industry and the large-scale production base of operator companies. Collective use of resources and assets allows companies to use their potential more effectively and solve the problem of the shortage of certain types of equipment or financial resources.

Implementing the principles of the sharing economy in the business model of operator activities has led to the emergence of new types of engineering projects in the industry, so-called sharing projects. Examples of companies' interaction within the framework of the sharing economy concept include projects for creating multi-operator networks, MVNO, cloud technologies, and the joint use of telecommunications infrastructure by companies. Let's take a closer look at the latter projects.

In different segments of the telecommunications market, the technological and organizational principles of the strategy for the joint operation of networks differ. Let's consider the radio access network (RAN) strategy in mobile communications. The development of promising mobile communication networks involves large-scale investments, so cost optimization issues are very relevant for operators (Volodina, E., 2021).

RAN-sharing is a strategy in which several cellular providers jointly use radio access infrastructure to provide communication services to their customers. The main idea of RAN-sharing is to reduce the costs of building and maintaining the network, increase network capacity, and improve customer service quality.

There are two main approaches to implementing the RAN-sharing strategy, which depend on the level of shared infrastructure (Figure 1).

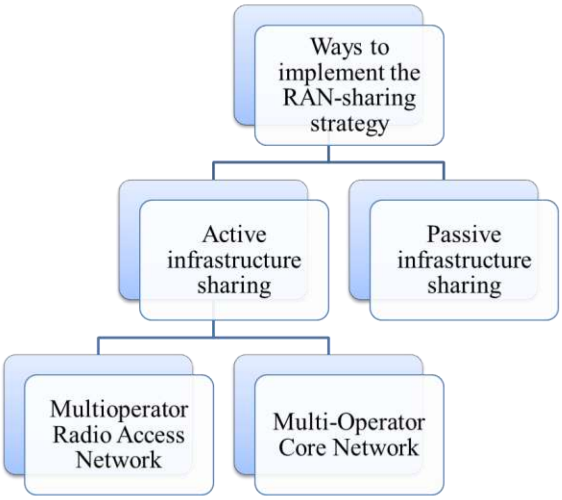

Figure 1: Ways to implement the RAN-sharing strategy.

Passive infrastructure sharing. Different operators use passive network elements, including communication towers and antenna supports, antenna-feeder devices, connection points, telecommunication racks, power sources, and other equipment. With this approach, infrastructure operators play an important role, creating a unified engineering infrastructure for the placement of base stations at their own expense and providing it for the use of telecom operators.

Active infrastructure sharing. When implementing this approach, operators jointly use equipment that forms the radio signal, resources of the radio access subsystem, and the transport network. In this case, there are two main variants of active infrastructure sharing:

- MORAN (Multi-Operator Radio Access Network) — operators share the radio network (base stations) but use their own frequency resources. Independent network deployment allows each operator to individually manage the quality of services, significantly reduce operating and capital costs, and strengthen their competitive position in the mobile communications market.

- MOCN (Multi-Operator Core Network) — operators share not only the radio network but also the frequency resource. The approach предполагает joint network deployment, but each operator independently serves its subscriber base and provides services under its own brand.

RAN-sharing has several advantages for both cellular providers and end users:

- Reducing capital (CAPEX) and operating (OPEX) costs. RAN-sharing allows providers to reduce the costs of building and maintaining radio access infrastructure. This includes the costs of purchasing and installing base stations, antennas, data transmission equipment, and other communication means. Providers can also share the costs of network management and maintenance, leading to a reduction in operating expenses for each participant.
- Increasing network performance. RAN-sharing allows increasing network capacity and efficiency by increasing its capacity and optimizing the use of resources. This enables providers to provide better service, improve coverage, and offer new services such as high-speed internet, video calls, and streaming video.
- Increasing availability. RAN-sharing allows providers to achieve better network coverage and availability in remote and hard-to-reach areas. This is especially important for sparsely populated and/or rural areas where building separate networks can be economically unfeasible. RAN-sharing helps reduce barriers to access to communication, contributes to the development of digital infrastructure, and reduces the digital divide.

Despite all the advantages, RAN-sharing also has limitations that should be considered when implementing it:

1. Management complexity. Sharing a network between multiple providers requires a comprehensive management and coordination system. Providers must develop effective mechanisms for resource sharing, frequency allocation, and data flow management. This can create difficulties, especially when integrating different communication technologies. Implementing RAN-sharing projects requires new interaction models from operators.

2. Confidentiality and security. RAN-sharing means that several cellular providers use the same infrastructure, which can create risks regarding the confidentiality and security of data. Providers must take steps to protect personal information and prevent unauthorized access to the network and to use modern tools and solutions (Kukharenko, E., 2023).

3. The difficulties of project coordination. Splitting a network between multiple providers may require complex negotiation and agreements between them. This can take significant time and resources. Additionally, decisions on network sharing must consider the different interests and strategies of each provider.

RAN-sharing represents an effective strategy for enhancing the efficiency and performance of cellular networks. It allows providers to reduce costs, increase network performance, and provide better service to their customers. However, successfully implementing RAN-sharing requires addressing issues related to management, security, and coordination.

4 APPROACHES TO MANAGING SHARING PROJECTS IN TELECOMMUNICATIONS

The development of new technologies and business models stimulates the innovative activity of industry companies. Modern telecommunications projects are diverse and characterized by several features. They are implemented in conditions of active competition and high market volatility, have a complex structure, and require substantial investments (Kukharenko, E., 2025). Project developers must consider their high technical complexity, numerous risks, and the complexity of technically integrating various systems and equipment, which complicates the process of implementing new solutions. Alongside infrastructure modernization projects, companies implement operational development projects characterized by high flexibility, uncertainty of customer requirements, and the need to constantly improve functionality. High rates of scientific and technological progress in the telecommunications industry require highly qualified engineers to deploy, operate and modernize modern communication systems (Platunina, G., 2025).

Effective management of telecommunications projects requires the use of modern methods and principles that allow for considering the specifics of the digital environment, rapidly changing technologies, the growing digital literacy of customers, and the individualization of needs for digital products and services. Thus, to successfully implement telecommunications projects, it is important not only to use modern approaches and tools but also to adapt them to the specifics of operator activities.

The methodological base of project management is constantly being improved and updated with new approaches and tools. Industry companies widely use both traditional approaches and new flexible methodologies. Let's consider the appropriateness of applying these approaches to managing sharing projects.

Waterfall or cascade model is one of the oldest and most traditional project management methodologies. The model assumes a clear and consistent implementation of the project stages, starting with planning and ending with implementation. The Waterfall approach is suitable for small sharing projects with clearly defined requirements.

The process approach proposed by the Institute of Project Management and outlined in the PMBOK guidelines is universal. PMBOK is a classifier of processes, instructions, rules and procedures described based on the systematization of successful project implementation practices by various companies. The proposed tools and methods can be adapted to managing sharing projects, especially if it concerns large-scale projects for building telecommunications infrastructure.

Agile is a flexible project management methodology that allows adapting to changes in requirements and conditions during project implementation. Agile is especially useful in sharing projects, as it involves an iterative approach to product development and implementation. In a sharing economy environment, where user requests and market conditions change rapidly, Agile allows companies to quickly adjust their strategies and offer new solutions.

Scrum is one of the Agile methodologies that focuses on short sprints and constant feedback from users. Within the framework of sharing projects, Scrum allows for quickly testing new features and services, adapting them to consumer needs, and eliminating possible errors at an early stage. This is especially important when creating digital platforms for shared resource use, where meeting user experience is crucial.

Lean Project Management is a methodology aimed at minimizing costs and increasing process efficiency. In sharing projects, this method helps optimize resource use, which is especially important when managing large volumes of data and digital platforms. Lean allows focusing on creating maximum value for the end user at minimal cost.

Kanban is a visual project management system that allows tracking task completion in real-time. In the context of sharing projects, Kanban helps manage the flow of tasks related to platform development and support, as well as user service. This is especially useful for large projects where it is important to control the workload of employees and prevent bottlenecks in the production process.

PRINCE2 is a process-oriented approach to project management that focuses on structured control and resource management. In sharing projects, PRINCE2 can be used to manage large infrastructure projects, such as developing telecommunications networks supporting shared platforms.

5 RESULTS OF THE STUDY AND RECOMMENDATIONS

The results of studying the features of sharing projects and the practice of their implementation by various companies allow us to analysis the appropriateness of using different project management methods (Table 1) and develop recommendations for applying modern approaches to managing RAN-sharing projects.

Table 1: Comparative analysis of methods for managing sharing projects.

Methodology	Application in Sharing Projects
Agile	Optimal for developing digital platforms
Scrum	Used for developing new service features
Lean	Suitable for optimizing operational processes
Kanban	Applicable for operation management
PRINCE2	Suitable for large infrastructure projects

As mentioned earlier, RAN-sharing projects come in various types. For MORAN projects, the following stages and recommended management methods can be outlined (Table 2).

Table 2: Recommendations for applying methods to manage RAN-sharing projects.

Stage	Recommended Methodology
Analysis of current infrastructure and assessment of the possibility of modernizing the existing network to support shared use	PRINCE2, Lean
Assessment of potential partners	PRINCE2, Lean
Development of a network modernization project to support RAN-sharing	Agile, Scrum, Lean
Financial and economic justification	PRINCE2, Lean
Development of interaction regulations and regulatory documents	PRINCE2, Lean
Implementation and launch	Agile, Scrum, Lean

When choosing an approach to project management, it is also important to consider that telecommunications companies operating in the sharing economy face several challenges:

1. Technological challenges — creating and supporting digital platforms through which shared resource use is carried out requires significant technical skills and investments. In particular, companies face problems with platform scaling, integrating new technologies (e.g., artificial intelligence), and ensuring user data security.

2. Regulatory barriers — sharing projects often face legislative restrictions. Many countries have strict requirements for licensing and certifying digital platforms, which can slow down the introduction of innovations. Companies must adapt their processes to legislative requirements, which requires additional resources and time.

3. Data management and confidentiality — sharing platforms generate vast amounts of user data, causing problems with data storage and processing. Companies must ensure strict data protection measures, requiring significant investments in cybersecurity and risk management.

4. Competition and user retention — telecommunications companies operating in the sharing economy face high competition. Users can easily switch to other platforms if services do not meet their needs. This requires companies to constantly improve their products, making flexible project management methodologies critically important.

6 CONCLUSIONS

The sharing economy represents an economic concept based on the joint use of resources. The demand for the sharing economy model in telecommunications is associated with the high capital and resource intensity of the production process. Combining efforts in implementing individual projects opens up broader opportunities for the innovative development of industry companies. Collective use of resources and assets allows companies to use their potential more effectively.

Sharing projects in telecommunications are diverse and require a flexible approach in choosing project management methodology. The task of optimizing production costs does not lose its relevance for telecom operators in the current conditions of rapid development of telecommunications technologies but becomes even more urgent.

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