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Design and digital transformation of the Moscow urban management system

The article deals with the goals, objectives, features, principles and factors of the implementation of the infrastruc-
ture project for the creation of the Centre of Management of the Urban Economy Complex (CMUC) as a center of
competence and application of communication and digital technologies. The problematic aspects of the functioning
of the housing and communal services (HCS) as the most important socio-economic system of the city economy
and one of the largest in the world are revealed. The strategic directions of digital transformation of the management
system of the housing and communal services of Moscow are formulated. The main organizational and methodolog-
ical approaches to the formation of the structure of the project of the Centre of Management of the Urban Economy
Complex are identified. The principles of forming an automated information system (CMUC) are substantiated in or-
der to ensure the interoperability of departmental information systems of enterprises and municipal organizations.
A problem-oriented interoperability model has been developed, the main components of which are the software and
hardware complex of the control center of the CMUC, data storage, including indicators of the state of housing and
communal services objects, ranking them according to a set of criteria. It has been proved that the aggregation of
big data allows you to make current and strategic management decisions online and to prevent possible incidents
on the basis of complex analytics, to level their consequences. The materials proposed in the article on the digital
transformation of the Moscow urban management system include the formation of the process of management de-
cision-making by the leadership of the CMUC based on the transformation of existing functions and the develop-
ment of new analytical tasks, monitoring data on the identification and implementation of work to eliminate defects,
damage, emergencies by city engineering services situations. Transformation of the housing and communal serv-
ices management system based on digital solutions can be carried out by a stage-by-stage transition to intermediate
models corresponding to different levels of digitalization.

Keywords: *digitalization, housing and communal services, control center, interoperability, decision making*

INTRODUCTION

Moscow is one of the most promising and dy-
namically developing megacities in the world
with modern and high-quality urban infra-
structure. A comfortable environment and high-quali-
ty maintenance of urban areas significantly influence
the development of the economy of a modern city.
Housing and communal services of Moscow, as
the most important socio-economic life-support sys-
tem of the city's economy include the operation and
repair of apartment buildings, roads, landscaping and
landscaping facilities, power supply systems, gas
supply, heat supply, water supply, sewerage and
drainage, and other facilities. The Moscow housing
and communal services sector at the present stage is
actively involved in the digitalization of the economy:
at the level of business processes of a technological
and managerial nature, at the level of interaction with
consumers and as a participant in the public services
sector, responsible for the quality of provision of utility
services. At the same time, the need for digitalization
of housing and communal services is associated with
the introduction of modern technologies and increas-
ing the requirements of service consumers for the
quality of housing and communal services.

However, today the positive influence of factors
increasing the digitalization of housing and communal
services faces many organizational and economic re-
strictions associated with rising costs caused by
the need to transform the infrastructure of "smart tech-
nologies" and attract investments. Housing and com-
munal services, like other areas that require digitaliza-
tion, have significant professional and production

limitations. In addition to known industry limitations,
these shortcomings are aggravated by the traditional
competencies of employed workers [1].

The quality of competencies for the development
of IT technologies and their use in the daily circula-
tion of providing quality services to the population
can be increased through the implementation of
a model of integration interaction between enterpris-
es and organizations in the housing and communal
services sector. The presence of a significant num-
ber of departmental information systems in a me-
tropolis does not make it possible to effectively use
the information integration of city services economy
in the digitalization of the housing and communal
services sector. Coordinated scientific, metho-
dological, organizational and economic methods for
incorporating digital technologies into management
decision-making in the housing and communal ser-
vices sector also require development [2].

CONTENT

In order to ensure the sustainable functioning of
the housing and communal infrastructure of Moscow,
for the first time in the Russian Federation, the largest
infrastructure investment and construction project was
implemented to create a Centre of Management of
the Urban Economy Complex (CMUC). The imple-
mentation of the CMUC is aimed at the digital transfor-
mation of the Moscow urban management system.

Over the 1.5 years of operation of the CMUC,
a regulated and coordinated interaction of all city ser-
vices and authorities has been built within the com-
mon information field in the CMUC. This made it

possible to increase the speed and efficiency of response to changes occurring in the city. The Control Center houses representatives of all engineering, technological, organizational and management divisions of Urban Economy Complex and government authorities. They supervise and monitor the functioning of systems and objects in real time. Data on accidents, incidents and critical events are automatically displayed on the video wall screen in the Situation Room. As a result, employees interact with each other as much as possible, quickly processing incoming information. All industry events are ranked according to the degree of criticality in the context of objects and departments, the scale of the incident is determined and a decision is made to eliminate problem situations [3–6].

RESULTS

When forming the automated information system of the Centre of Management of the Urban Economy Complex (CMUC), in order to ensure the interoperability of departmental information systems of enterprises and organizations of the urban economy, a problem-oriented model of interoperability of departmental information systems of enterprises and organizations of the urban housing and communal services was created with the creation of a unified intellectual center for strategic forecasting development of housing and communal infrastructure and ensuring the sustainable and reliable functioning of the city's life support system¹ [7, 8].

The Moscow Service 112 is located on the basis of the CMUC, which has increased the efficiency of its interaction with other services.

All parts of the capital's housing and communal services work process have been formed into a single information chain, provide a detailed assessment of the quality of work of all organizations in the sector and ensure the comfort and safety of residents of the capital. The Center employs almost 200 analysts from the State Budgetary Institution "MAC", who 24/7 conduct operational monitoring of the state of the complex's facilities, with an average of about 23.5 thousand events, and forecast the development of the situation [3, 9, 10].

CONCLUSION

The design and digital transformation of the Moscow urban management system includes the creation of a system of information and forecast support for management decision-making by the management of the Urban Economy Complex based on the transformation of existing functions and the development of new analytical tasks, including:

- monitoring data on the identification and implementation of work to eliminate defects, damage, emergency situations, technical condition of utility networks and public utility facilities, residential areas by city engineering services;
- ensuring interaction of the monitoring system with administrative and housing and communal city systems and databases, generating statistical data based on the information received;
- creating models that predict the operating modes of utility networks and production and technological infrastructure during the operational period of their life cycle;
- organizing participants in information exchange, their interaction with city resource-providing organizations in Moscow and federal-level services to coordinate activities for the sustainable and safe operation of urban management systems;
- improving the system for analyzing information and developing

regulatory documents, forecasting the revision and updating of standards [11–14].

The transformation of the housing and communal services management system based on digital solutions requires a phased transition of intermediate states, which include the service economy, the network Internet economy, and the Internet economy of artificial intelligence. For its implementation, the following methodological approaches are proposed with the definition of conditions and models for transforming the housing and communal services management system: selection of intermediate models corresponding to different levels of digitalization; structuring digital components corresponding to a certain intermediate digitalization model; algorithm for determining the stages of transformation of management processes in the housing and communal services system. The transformation of the housing and communal services management system can be interpreted as a controlled process, the purpose of which is to synchronize the strategies of digitalization and development of the housing and communal services sector [12, 13].

Scientific and practical recommendations for modelling regional information and digital management centers for housing and communal services using the example of the infrastructure project of the Centre of Management of the Urban Economy Complex (CMUC) of Moscow, as the basis for the digital transformation of the management system and mechanisms for testing technologies for new digital solutions in the housing and communal services system, can be used as best practices for replication by other regions and large cities with a fairly high digitalization index.

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Проектно-цифровая трансформация системы управления городским хозяйством Москвы

В статье рассматриваются цели, задачи, особенности, принципы и факторы реализации инфраструктурного проекта создания Центра управления комплекса городского хозяйства (ЦУ КГХ), как центра компетенций и применения коммуникативно-цифровых технологий. Раскрыты проблемные стороны функционирования жилищно-коммунального хозяйства (ЖКХ), как важнейшей социально-экономической системы экономики одного из крупнейших в мире городов. Сформулированы стратегические направления цифровой трансформации системы управления жилищно-коммунального городского хозяйства Москвы. Определены основные организационно-методические подходы к формированию структуры проекта Центра управления комплекса городского хозяйства. Обоснованы принципы формирования автоматизированной информационной системы (ЦУ КГХ) с целью обеспечения interoperability ведомственных информационных систем предприятий и организаций городского хозяйства. Разработана проблемно-ориентированная модель interoperability, основными компонентами которой являются программно-аппаратный комплекс ЦУ КГХ, хранилище данных, включающее показатели состояния объектов ЖКХ, ранжирование их по набору критериев. Доказано, что агрегация больших данных позволяет принимать текущие и стратегические управленческие решения в режиме онлайн и предупреждать на основе комплексной аналитики возможные инциденты, нивелировать их последствия. Предлагаемые в статье материалы по цифровой трансформации системы управления городским хозяйством Москвы включают формирование процесса принятия управленческих решений руководством Комплекса городского хозяйства на основе трансформации имеющихся функций и развития новых аналитических задач, мониторинга данных о выявлении и выполнении работ по устранению инженерными службами города дефектов, повреждений, аварийных ситуаций. Трансформация системы управления ЖКХ на основе цифровых решений может осуществляться поэтапным переходом к промежуточным моделям, соответствующим различным уровням цифровизации.

Ключевые слова: цифровизация, ЖКХ, центр управления, interoperability, принятие решений

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