



Алматы қаласы
Цифрландыру
Басқармасы

**STRATEGY "SMART ALMATY"
for 2020-2025**

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TERMS AND ABBREVIATIONS

IT Strategy	Information Technology Strategy 2020-2025
Digitalization	The process of translating data into a digital format and changing business processes with a focus on the integrated use of the resources of the entire infrastructure in order to optimize processes and increase effective indicators.
Targeted IT Architecture	Defines the “how it should be” IT architecture in terms of data architecture, application and technology architecture
IT community	Representatives of the industry involved in the development of information technologies in the city of Almaty
IoT technology (Internet of things)	mass introduction of smart sensors and digital measuring instruments, which will allow for autonomous interaction of hardware and software systems
Big data	the rapid spread of IT services in the country and the world as a whole has allowed us to generate a huge amount of structured and unstructured data that can be used in the formation of analytical information
Blockchain	technology of distributed data storage, which allows to ensure the accuracy of information without using third-party services
VR Virtual Reality	allows you to create three-dimensional digital doubles of physical objects, due to which an increase in the level of interaction with real objects is achieved
AR-Augmented Reality	this is adding virtual objects to a picture of the real world
AI-Artificial Intelligence	the introduction of machine learning-based artificial intelligence technologies will increase the accuracy and speed of processing bulk information
Robotization	the massive introduction of robots will allow for a given level of quality to produce typical operations in production
Digital modeling	digital design and modeling of technological processes, objects, products throughout the life cycle from idea to operation will simplify the process of creating objects
Mobile technology	the use of mobile technology to maximize the reach of people with a high level of smartphone ownership
Predictive (predictive) analytics	application of predictive analysis in order to develop balanced decisions
Internet of Things (IoT- Internet of Things)	The concept of a computer network of physical objects (“things”) equipped with built-in technologies for interaction with each other or with the external environment.
LoRa Wan Interaction Protocol	one of the standards of the LPWAN long-range energy-efficient network technology, designed for inter-machine interactions, collecting data from sensors, based on the technique of distribution of the spectrum of modulations (CSS).



The SMART ALMATY Strategy for 2020-2025 (hereinafter referred to as the IT Strategy) defines the role and application of digital and information technologies in achieving the strategic goals of the city through the involvement of all resources and the integrated development of the entire infrastructure.

In December 2017, the State Program “Digital Kazakhstan” was approved, aimed at accelerating the pace of development of the country’s economy and improving the quality of life of the population, as well as creating a digital economy of the future. The program provides for the transition to a digital state, including through the introduction of the concept of “smart” cities - “Smart city”.

The Smart city initiative is the implementation of conditions for creating cities convenient for citizens by improving urban infrastructure. The main goal of the initiative is to create an urbanized area in which the resources of city services and private initiatives interact and collaborate to ensure sustainable development of the city and create favorable conditions for residents and visitors of the city through implemented technologies in real time.

This IT Strategy is formed for a period up to 2025 and is revised on the basis of the need to update the lines of activity at the request of the population, business and the scientific environment.

The main format of interaction between the participants in the digitalization development initiative is the cooperation of state bodies with private organizations and the scientific environment, in which new improved technological solutions will be iteratively developed on the basis of a list of current problems provided by the state bodies that were voiced by the population of the city of Almaty.

The strategy focuses on the maximum use of all resources for the development of digitalization in the city of Almaty with the involvement of the human potential of the city, infrastructure solutions and technical sites at the level of Smart Point, Tech Garden and other incubators and accelerators.

The vision of the city administration of Almaty in relation to the digitalization of the city:

- Implementation of the concept of “Hearing State” due to the transparent and effective use of Digitalization tools;
- Creation of an innovative technological ecosystem by providing conditions for the development of IT entrepreneurship with strong links between business, science and the state;
- Development of the city’s own human resources through building links between educational institutions and commercial business;
- Strengthening the role of private business in the implementation of urban projects.

- The development of Artificial Intelligence technology through coordination with private business and higher education institutions.
- Development of a pilot zone for applying the LoRa protocol as part of promoting the development of the application of the concept of the Internet of things.

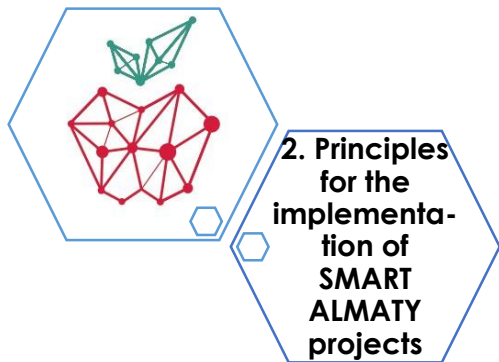
The goals of creating an IT Strategy are:

- 1) Formation of a single vision of the direction of development of Digitalization, taking into account the needs and resources of the city;
- 2) Revision and regrouping of portfolios of IT projects in the city system, taking into account the priority problems of residents through the development of Digitalization;
- 3) Approval of a roadmap for the implementation of IT projects in the city;
- 4) Approval of the methodology, regulations and functional interaction with other structural units of the city;

Mission:

Creation of a single regional center of expertise in the city of Almaty for the application of new technologies introduced in the world, with a focus on strengthening traditional development areas through the possibilities of Digitalization on the basis of educational institutions.





The principles for the implementation of SMART ALMATY projects determine the approach to the selection and formation of strategic initiatives for a gradual transition to a targeted architecture.

The following principles have been identified for the implementation of IT Strategy:

- 1) All actions on Digitalization and automation carried out by the IT community should directly or indirectly relate it to value for residents of the city of Almaty and other interested parties;
- 2) A balanced and progressively iterative implementation of technologies with a focus on the creation of Digital Culture in the city of Almaty through the support of each development cluster in the main areas: education, health, agriculture, industrial production, etc.
- 3) All activities of the state body and the IT community are aimed at providing value from automation and digitalization to the residents of the city of Almaty;
- 4) Implementation of infrastructure projects that will allow the IT community to create and commercialize new IT services in the open market;
- 5) Decrease in capital expenditures of the state through the use of a service model of informatization and public-private partnership in the implementation of infrastructure projects;
- 6) Use of standard technological (?) Solutions in government bodies and organizations;
- 7) Application of integration solutions when creating new information systems.
- 8) Attraction of the best practices on Digitalization from around the world.
- 9) Creation of a single communication space for all citizens.
- 10) Providing the maximum possible open access to dynamic indicators of the development of the city.
- 11) Stimulating the development of a cluster of creative industries through new opportunities for the application of digital technologies.
- 12) Implementation of the continuity program through the preparation and involvement of students of educational organizations at all levels in the Digitalization projects.

The current situation of Digitalization at the state level is presented by the State Digital Kazakhstan Program, approved by Decree of the Government of the Republic of Kazakhstan No. 827 of December 12, 2017 (hereinafter referred to as the State Program).



3.1 Analysis of the external environment and digital trends

3.1.1 Current Digitalization Situation in the Country

The main directions of the State program in which the contribution from the implementation of SMART ALMATY is expected are:

- **Digitalization of industries.** To implement this area in the traditional sectors of the city's economy, technological projects will be implemented that will increase labor productivity and lead to an increase in the capitalization of each area.

- **Transition to a digital state.** In the framework of this area, work will continue to automate the functions of state institutions using advanced information technologies.

- **Implementation of the digital Silk Road.** In pursuance of this direction, work will continue to develop a high-speed and secure infrastructure for the transfer, storage and processing of data.

- **Development of human capital.** In this direction, it is planned to introduce a succession program based on the adaptation of students of educational institutions in the practice of applying knowledge by creating mechanisms for involvement in the implementation of the Strategy projects.

- **Creation of an innovative ecosystem.** Within the framework of the direction, conditions will be created for the development of IT business and the application of innovations by organizing sustainable relations between the business environment, the scientific field and the state. The state will act as a catalyst for ecosystem formation through the implementation of infrastructure projects.

3.1.2 PESTEL analysis of IT Strategy prospects

To determine the prospects of IT Strategy, an analysis of external factors was carried out in six main categories (PESTEL analysis):

- P (Political) - Political and legislative factors

The high role of digitalization in the country's economy has been repeatedly raised by the First President of Kazakhstan Nursultan Nazarbayev, including in the Message to the people of Kazakhstan dated January 31, 2017. According to the Leader of the nation, the core of the country's modernization is digitalization. In addition, the State Program identified key indicators, the achievement of which will be achieved through the widespread use of information technology, namely the growth of labor productivity in the economy and the creation of at least 200 thousand new jobs by 2021 in the Digital Sphere.

- E (Economic) - Economic and market factors

The introduction of advanced information technologies allows businesses to provide services at a whole new level, which creates competitive advantages. Digitalization of economic sectors allows us not only to optimize the internal business processes of enterprises, but also to increase the level of interaction with end customers, starting from the direct needs of the business, creating our own loyal audience. In conditions of free market relations in Kazakhstan, customers are moving to those market players who are able to quickly and efficiently provide services and ensure maximum availability and simplicity using the opportunities of technological development. The economic development of the

city requires the emergence of new solutions and business models on the basis of which the development of new industries and types of services should intensify.

- S (Social) - Social factors

The development of digitalization projects should be based on providing a more affordable and convenient solution for each resident of the city. Also, new solutions should provide a comfortable environment for representatives of an inclusive society.

Implementation of charity projects with the availability of digital technologies will be able to increase the level of social assistance coverage. The introduction of information technology in the provision of targeted social assistance will help to apply an individual approach to the beneficiaries.

- T (Technological) - Main technological and digital trends

Based on the analysis of modern technologies, the following main technological trends were identified, which are considered in the IT Strategy on the feasibility of implementation and application in projects:

- - IoT technology (Internet of things);
- - Big data;
- - Block Chain;
- - VR-Virtual;
- - AR-Augmented Reality;
- - AI-Artificial Intelligence;
- - Robotization;
- - Cloud technologies;
- - end-to-end integration;
- - Digitization of data;
- - Digital modeling;
- - Mobile technology;
- - Predictive (predictive) analytics.

E (Environmental) - Environmental and Infrastructure Components

Digital technologies will make it possible to more accurately determine the origin and dynamics of the development of environmental problems in precise directions and provide an opportunity to evaluate the results of applied solutions to reduce environmental issues, which will improve the quality of life of city residents and increase the tourist attractiveness of Almaty. The introduction of "green" technologies along with digitalization projects will quickly collect the necessary information and make appropriate decisions.

L (Legal) - The legal framework for the promotion of IT projects

The maturity level of the legislative framework for the implementation of digitalization projects determines the basic conditions for the formation of the IT industry in the country. Our society has to determine the boundaries of personal information and the degree of its availability in solving common problems, the degree and objects of responsibility of automated systems, general rules for the interaction of people with automated systems.

3.2 Strategic goals and objectives of sustainable development of the city

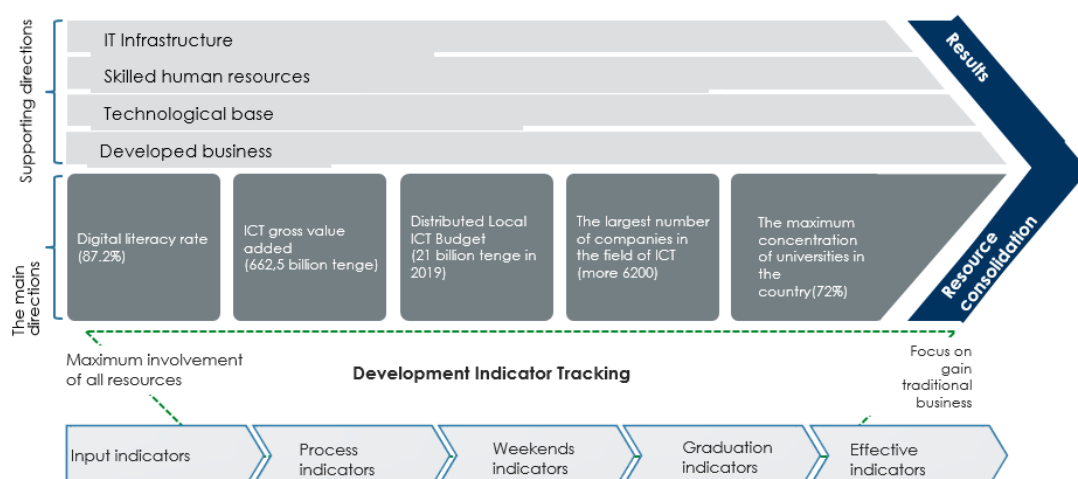
Strategic goals for 2020-2025.:

1. Increasing the level of confidence of residents of the city of Almaty by implementing the concept of "Hearing State" with the use of automation and digitalization;
2. Increasing the penetration of digitalization into the economy.
3. Improving the quality and accessibility of the Internet.
4. Creating favorable conditions for attracting investment in the IT industry.
5. The increase in companies represented in the ICT sector.

6. Development of our own research environment to stimulate the growth of the share of Kazakhstani research and development.

3.2.1 Current Situation of Digitalization of the City

The structure of the value chain based on the Michael Porter model, which allows you to determine the correct status and find the most optimal direction for development, is adopted as the basis for determining the current level of City Digitalization.



The main areas characterizing the current status of industry growth drivers are:

- 1) **High level of digital literacy of the population (87.2%).** This fact allows us to ensure the active involvement of wide layers of the population in the process of digital transformation of the city.
- 2) **The gross value added of** the IT sector is 662.5 billion tenge, which characterizes the high potential of the IT market for reinvesting financial resources in new projects.
- 3) **The distributed amount of the local budget** is 21 billion tenge (as of 2019). This fact characterizes the state's ability to stimulate the IT market through its own consumption of IT services to increase the efficiency of public administration.
- 4) **The high concentration of IT companies** in Almaty (6,200 companies as of 2019) allows for close interaction between the state and business in the Digitalization of the city to develop and implement optimal solutions for public-private partnerships.

Supporting directions for the development of the Digitalization level are:

- **IT infrastructure**, which is characterized by the presence of various types of data transmission channels in the city, server capacities, computer equipment, smartphones among city residents and more;
- **Qualified human resources** can cover the demand of the IT market in the formation of competent project teams;
- **The technological base** is presented in the form of the availability of proven technological solutions of the IT business with a confirmed level of effectiveness;
- **A well-developed business** allows you to implement competitive IT projects.

Input indicators	Process indicators	Output indicators	Graduation indicators	Performance Indicators
These indicators relate to the resources necessary to carry out activities, measuring the quantity, quality and timeliness of attracting resources. Politics, human resources, materials, financial resources are examples of input indicators..	Process indicators relate to indicators for measuring the implementation of planned activities. Examples include holding meetings, conducting training courses, and performing strategically necessary activities.	These indicators are more detailed "finished product" Examples include the number of distributed smart meters, covering the areas with solar panels, the number electric buses, infrastructure for charging electric vehicles, etc.	Measurement of intermediate results obtained as a result of the project. Indicators relate to "results". They are the result of both "quantity" ("how much") and quality ("how good") realized events. Example: the result of a house digitalization program may be the number of digitized dwellings as a percentage of the total number of households equipped with smart sensors.	Measuring the quality and quantity of long-term results from programs (e.g. a measurable change in the quality of life of citizens, a decrease in electricity consumption, etc.

Digitalization of the city is aimed at enhancing the development of growth in the profitability of traditional business. In order to maximize the involvement of all available resources and monitor progress in the quality implementation of digitalization projects, the relevant indicators are used in the development of the Smart City. The basis will be taken already approved indicators for assessing the standards used by European cities (Eurbanlab, 2014; ITU L1440, ITU L.1430).

Indicator Requirements:

- Relevance;
- Full value;
- Easy accessibility;
- Measurability;
- Reliability;
- The most understandable for citizens;
- Uniqueness;
- Independence of input.

To track Smart City projects, we have defined our own indicators. Summarized indicators are shown below and in italics.

Input indicators:

- Availability of data on real-time data transfer traffic on a city-wide and local level by district and residential complex
- Project costs / staff involved
- *Generalized indicators:*
 - *(development and implementation) of the Smart City strategy;*
 - *reasonable city expenses;*
 - *interdepartmental integration of structural units of the city administration within the framework of the Smart City projects;*
 - *Monitoring and evaluation of Smart City projects.*

Process indicators:

- The number of ways that citizens can interact with the city administration (for example, phone, mail, social network, media, etc.)

- Computer literacy programs for schoolchildren, students, the elderly, etc.
- Availability of ABC costing (separate accounting) based on the city's vital processes (for example, the cost of congestion, the number of digitized parking spaces with an estimate of the cost of each parking space, the assessment of food supply by groups of goods, and the monitoring of the total supply of critical products within the city)
- Unification of similar and identical processes within the city
- *Generalized indicators:*
 - *general cybersecurity status*
 - *confidentiality of personal data of citizens*
 - *increasing digital literacy*

Output indicators:

- Proportion of houses from the citywide house stock (?) Using smart home monitoring systems
- Proportion of households with smart meters (disaggregated by energy network / water supply)
- Percentage of electric vehicles (disaggregated by type or "city operated")
- Number of public electric vehicle charging stations
- Coverage of the integrated public transport tariff system
- Availability of a multimodal transit transportation application with integration with at least 3 services
- Number of vehicles registered in GIS tracks for rental of electronic bicycles and cars
- Share of public parking connected to the parking management system
- The proportion of traffic lights connected to an intelligent traffic control system
- Coating of road sensors connected to the control system
- Coverage of parking systems
- Share of municipal solid waste recycling through ICT measures
- Monitoring and prevention of severe natural disasters: rain / floods using ICT
- Wastewater discharge management / ICT pollution control
- The number of services integrated into a single operational center providing real-time management data. 1 point for each item: ambulance, emergency response / natural disaster, fire, police, weather monitoring, air quality.
- The number of technologies used to prevent crime, 1 point for each item from the following: live broadcasts from video cameras, taxi applications, software technology for crime prediction, etc.
- Number of platforms developed in the concept of open data (Big Data).
- *Generalized indicators:*
 - *online services*
 - *number of open data sets*
 - *quality of open data sets*
 - *the number of innovative hubs in the city*

Outlet indicators:

- Internet penetration rate
- The share of "smart buildings"
- The share of municipal energy networks with real-time information for customers
- The share of municipal energy networks that allow distributed generation
- Using Smart mobility applications
- Demand for e-bikes / car rentals

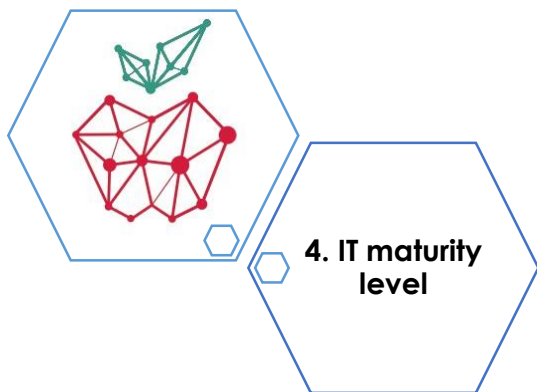
- Share of car owners who have devices suitable for launching the application
- Number of recharges at EV charging stations
- kWh rechargeable in EV charging stations
- % of the total revenue from public transport received through unified smart card systems
- *Summarized performance indicators:*
 - *High Speed Internet Access*
 - *access to the public WIFI Internet connection in parks, stops, etc.*
 - *number of activists involved in Smart City projects*

The current situation of Digitalization of the city is represented by a complex of projects that can be combined into a single digital landscape and integrated into the Smart City project matrix.

3.3 SWOT analysis of Digitalization status (strong weaknesses, challenges and threats)

Table 1. SWOT analysis

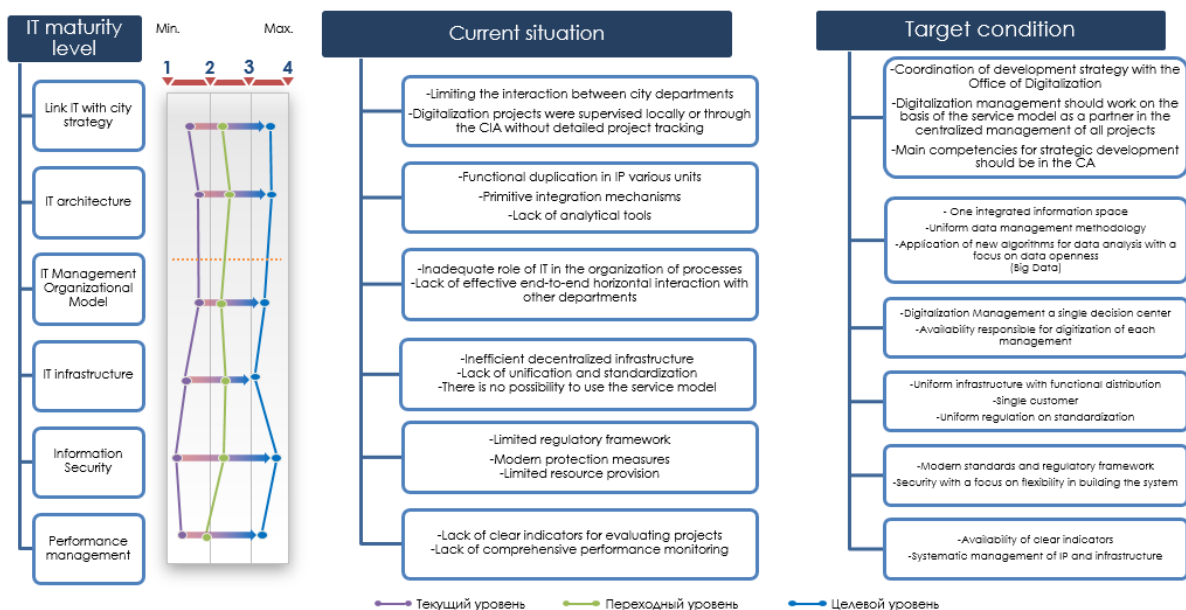
Strengths	Weaknesses
<ul style="list-style-type: none"> - Support of Digitalization projects by the city leadership; - Positive dynamics of the economic development of Almaty; - A high proportion of the working-age population and a high opportunity for development in the field of IT; - Availability of necessary conditions for self-realization of the population in the field of Digitalization; - The presence of a number of coworking centers for work and creativity, such as: Tech Garden, Smart Point, PIT Alatau, etc. - High concentration of higher education institutions; - The presence of a complex of research centers; - The functioning of a significant number of IT companies.. 	<ul style="list-style-type: none"> - Low level of integration of city information systems; - Low level of maturity of IT and information security management processes in government institutions; - Lack of a systematic approach to updating business process cards with the aim of the subsequent formation of requirements for automation and digitalization of these processes; - Problems of scaling and compatibility of the implemented software; - Low efficiency of transferring experience and knowledge to new employees as part of the knowledge management process; - Limited forecasting capabilities due to the low level of digitization of historical data, as well as insufficient focus on building a "plan-fact" reporting
Opportunities	Threats
<ul style="list-style-type: none"> - Implementation of the state program "Digital Kazakhstan"; - Development of the legislative framework in the field of informatization and digitalization; - The presence of human capital for the implementation of Digitalization initiatives; - Using the digitalization service model aimed at renting IT solutions. 	<ul style="list-style-type: none"> - An increase in cyber threats and the number of cyberattacks; - Loss / lack of key professional competencies during the implementation of Digitalization; - Lack of continuity of vision regarding Digitalization initiatives in personnel changes; - Inadequate level of change management, the likelihood of rejection by the population and implementers of Digitalization initiatives; - Insufficient allocation of funds for Digitalization initiatives in connection with the simultaneous implementation of other projects..



In 2018, for the first time in a pilot mode, a study was conducted on the level of digital urban development. Of the 40 megacities of the world, Almaty ranked 25th in the UN ranking, being the only city in Central Asia. Almaty was ahead of such megacities as Kuala Lumpur, Mexico City and Bangkok, whose population exceeds 8 million people.

According to IDC, the rating of Almaty as a “smart” city for 2017 was 1.7 points, which corresponds to the level of “market”. Given the accelerated technological development, it is proposed to determine a single roadmap for the development of digitalization projects involving all Almaty city departments, IT representatives -community and university.

3. IT as an amazing process tool



The assessment of IT maturity in Almaty is based on the following 6 criteria:

- 1) The relationship of IT with the strategy of the city.
In the current environment, there is a weak connection between digitalization projects and the achievement of the strategic goals of the city. There is limited interaction between the structural units of the city. Digitalization projects were supervised on the ground without detailed monitoring of project results by the city administration

The target state of the relationship is characterized by a direct correlation of Smart City projects with the goals of the city, approved in the City Development Strategy until 2050. As a result of centralized coordination of projects (Digitalization Department) and the allocation of CDOs in the structural divisions of the city, the coordination of initiatives with development directions will be achieved.

2) IT architecture.

Despite the implementation of the range of consulting work preceding the creation of the IT Strategy by IDC and KBTU, it is necessary to create an IT architecture with the emphasis on activity architectures, data, applications and infrastructure. Updated legislative standards and the methodology of architecture of state bodies were approved after the completion of consulting work. As a result, there is currently a duplication of functionality in information systems of various structural units of the city, the use of point integration mechanisms, and there is no analytical toolkit.

The target state is characterized by the presence of a detailed digital architecture, on the basis of which IT services are created in the areas of the Smart City project. A single integrated information space, a single data management methodology will be formed, using new algorithms for data analysis and subject to the concept of open data.

3) The organizational model of IT management;

The current organizational model has a low level of automation. There is no effective end-to-end horizontal interaction between departments.

In the target state, through the coordination of work at the level of the Digitalization Department and the determination of the Deputy Akim of the city responsible for IT in the city's structural units, an effective model of interagency interaction will be created.

4) IT infrastructure;

Currently, an inefficient decentralized infrastructure with a low level of unification and standardization has been formed. There is no possibility of using the service model of informatization.

The target state is characterized by a single infrastructure with the distribution of functionality, a single customer and the use of a single regulation on standardization.

5) Information security;

The current level of information security is characterized by an insufficient regulatory framework, outdated information protection measures and limited resource support.

In the target state, modern standards and regulatory framework will be applied. A single flexible information security architecture with the possibility of augmented add-on is organized.

6) Performance management.

Currently, the problems of performance management are the lack of clear indicators of assessment and the lack of comprehensive monitoring of project implementation.

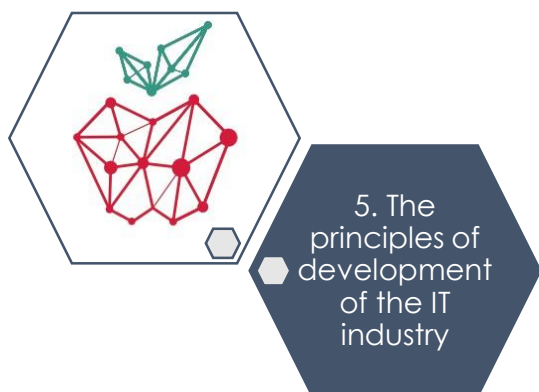
The target state is characterized by the presence of clear indicators and systematic management of IT projects.

When assessing the current level of IT maturity, the following disadvantages were identified:

- Inadequate interaction between city administrations;
- Duplication of functionality in the IP of various units;
- Primitive integration mechanisms based on the loading of basic forms;
- Lack of analytical tools;
- The insufficient role of IT in the organization of automation of business processes;
- Lack of effective end-to-end horizontal interaction between departments;
- Inefficient decentralized server infrastructure;
- Lack of unification and standardization;
- Limited use of the service model;
- Limited regulatory framework in the field of information security;
- Non-modern measures to protect information;
- Limited resource provision;
- Lack of measurable assessment indicators for projects;
- Lack of comprehensive performance monitoring.

The target state of IT should reflect the following level:

- Consistency of the city's digitalization strategy with the Almaty City Development Strategy;
 - The Digitalization Department should work on the basis of a service model for the centralized management of all projects;
 - The main competencies for the strategic development of IT Should be in the Office of Digitalization;
 - Unified project management and service management methodology;
 - A single integrated information space of city and population services;
 - Unified architecture and data management methodology;
 - The use of algorithms for data analysis with a focus on the use of open solutions, such as the Unified Data Warehouse, geographic information system, etc.;
 - The Office of Digitalization is a single decision-making center for the development of IT projects;
 - The presence of responsible persons for digitalization in each department;
 - The presence of a single telecommunications infrastructure
 - A single customer of ICT projects within the city
 - Development and application of common standards in the field of ICT
 - Introduction and use of measurable indicators of quality assessment;
 - Systematic management of IP and infrastructure.
 -
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Throughout the development of information technology since independence in Kazakhstan, the model of creating information systems with large capital expenditures for the hardware and software complex, licensed software and services for the development and configuration of technological solutions has been used to automate the functions of the state apparatus.

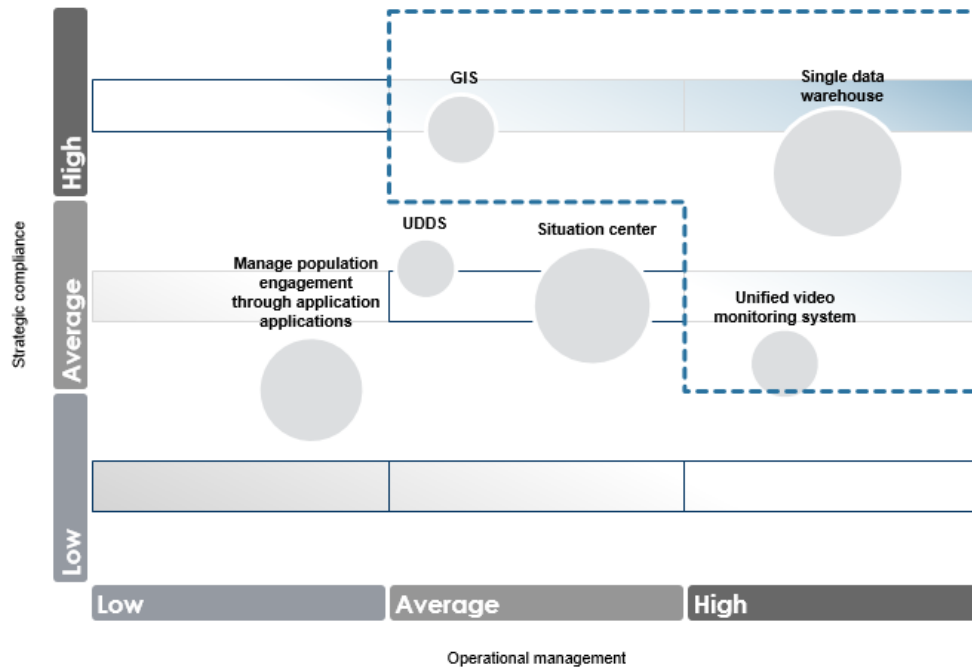
Taking into account the need to use more flexible service solutions that are quickly adaptable to ongoing changes in the field of digitalization, the informatization service model was identified by the legislation in the field of informatization..

The service model of informatization involves the rental of IT services in the open market from government on a long-term basis. In this case, the owner of the information system remains the commercial subject of the IT market without transfer of ownership to state bodies.

As part of the Informatization Service Model, it is planned to differentiate projects for implementation and development for project teams of technical universities, small and medium-sized businesses, start-ups, and large businesses based on applied solutions. Projects with a confirmed positive effect from the implementation will receive state support in terms of obtaining permits, providing the necessary arrays of open data, grants and soft loans for further scaling and other permitted measures of state support for entrepreneurship under the current legislation.

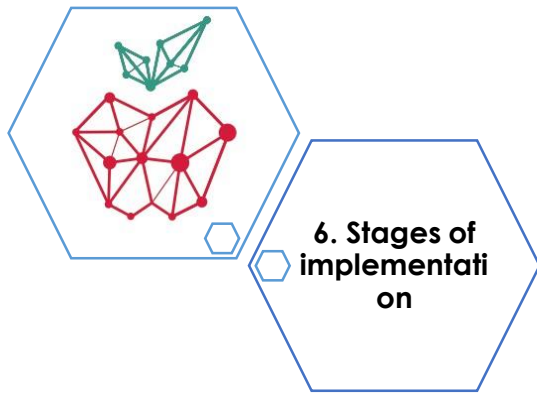
The implementation of IT projects with capital expenditures should be applied only for basic infrastructure projects that allow the formation of IT infrastructure for further sharing by various entities, such as government and subordinate institutions, IT companies, educational institutions, startup teams and other interested parties.

Infrastructure projects under this IT strategy include the geographic information system, the Unified Data Warehouse, the Situation Center, the Unified Dispatch Call Center, and the Unified Video Monitoring System.



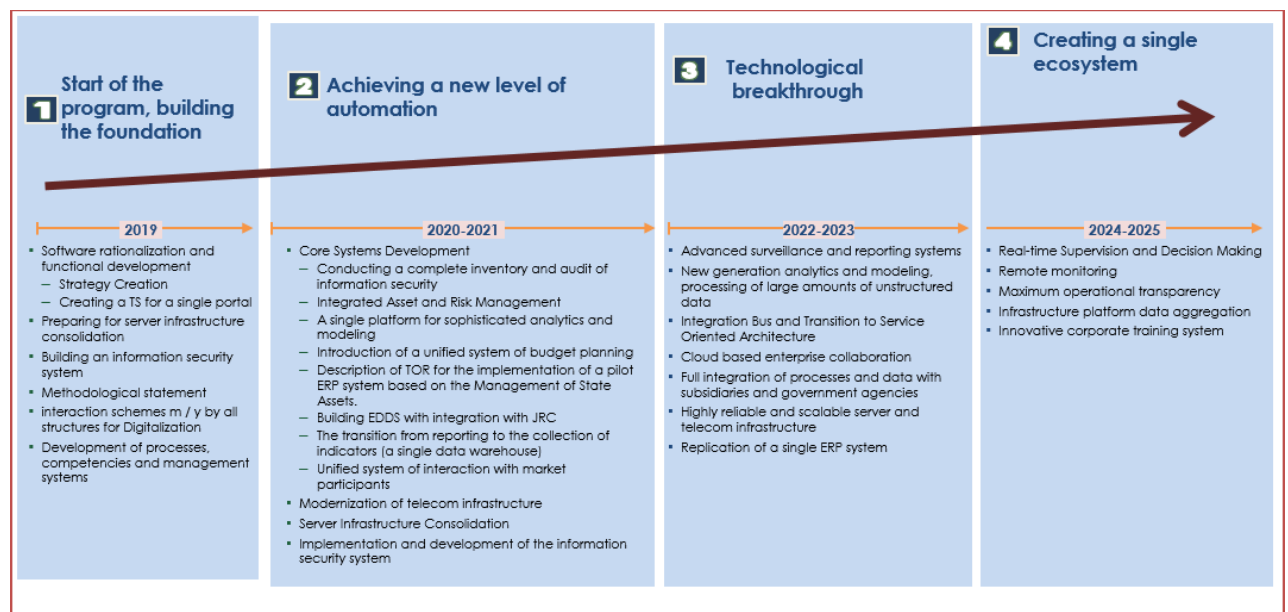
This set of infrastructure projects will allow for:

- Collection and analysis of large amounts of data on the dynamics of development of the city's economy sectors;
- Implementation of algorithms for analyzing large volumes of data to identify trends and dependencies when making management decisions;
- Development of reporting and analysis systems, with the ability to use data from all key information systems;
- Implementation of systems with the function of scenario analysis and predictive analytics;
- Creation of online applications for mobile devices that provide key information and the possibility of interaction in real time (all mobile);
- The use of a single geographic information platform with separated layers for complex analytics and modeling;
- Implementation of early response algorithms.



The IT strategy is based on the implementation of the following 4 main stages:

- 1) Start of the program and laying the foundation;
- 2) Achievement of a new level of automation;
- 3) Technological breakthrough;
- 4) Creating a flexible and efficient ecosystem covering all areas of the city's development.



Start of the program and foundation laying (2019).

- Software rationalization and functional development:
 - Creating a strategy;
 - Creating a vehicle for a single portal.
- Preparation for the consolidation of server infrastructure;
- Building a unified system of a service model of informatization for all city services;
- Building a unified (?) IS system (normative, methodological and technological);
- Approval of the scheme and methodology of interaction m / y by all structures for Digitalization;
- Development of processes, competencies and management systems;

Achieving a new level of automation (2020-2021)

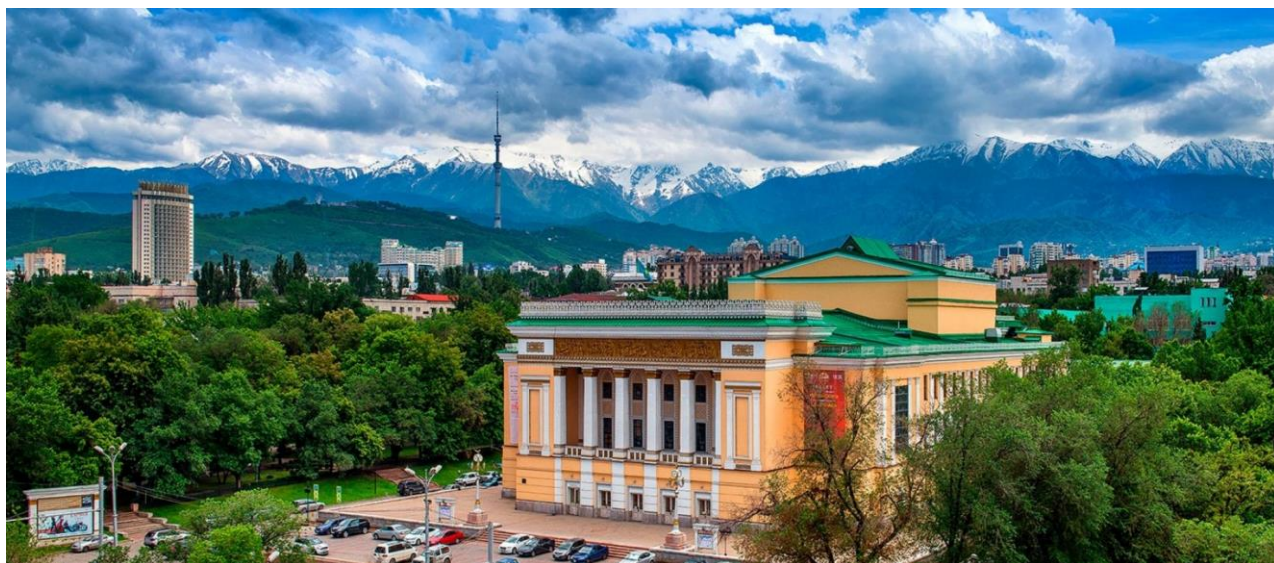
- Development of basic systems:
 - Conducting a complete inventory and audit of information security;
 - Integrated asset and risk management;
 - A single platform for predictive analytics and modeling;
 - Introduction of a unified system of budget planning;
 - Development of technical specifications for the implementation of a pilot ERP system based on State Asset Management;
 - Building EDDS with integration with JRC;
 - The transition from reporting to collection of indicators (a single data warehouse);
 - Unified system of interaction with market participants.
- Modernization of telecommunications infrastructure;
- Consolidation of the server infrastructure of the city;
- Introduction and development of the IS methodological system.

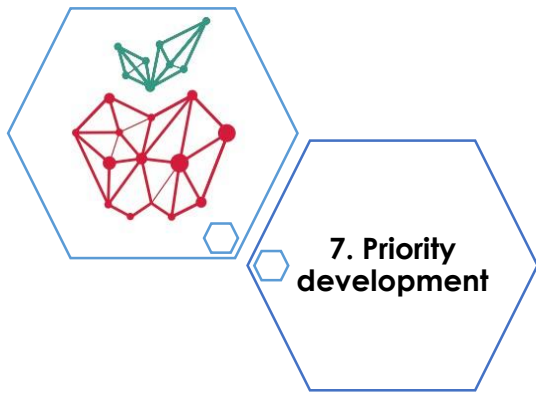
Technological breakthrough (2022-2023)

- Modern systems for monitoring and collecting feedback reports from city residents;
- Analytics and modeling of a new generation, processing large amounts of unstructured data
- Implementation of the integration bus and the transition to a service-oriented architecture
- Cloud-based enterprise collaboration system
- Full integration of processes and data between subsidiaries and government agencies
- Highly reliable and scalable server and telecommunications infrastructure
- Duplication of a single ERP system in other structural units of the city administration

Creation of a single ecosystem (2024-2025)

- Real-time supervision and decision making
- Remote monitoring of all city activity indicators
- Maximum transparency of operation
- Aggregation of data at the level of infrastructure platforms and ensuring the strategic interaction of all projects with each other
- Creating a single model of the city's digital double





The goals of the implementation of the Smart City concept in Almaty are to improve the quality and safety of residents of the city, solve problems associated with monitoring the environmental situation, increase transport mobility, optimize services in the field of education and healthcare, as well as use modern management tools to save costs.

In order to develop digitalization and create a comfortable environment in the city of Almaty, the city administration is developing a roadmap of projects and activities for short-term tasks for 1-2 years, medium-term and long-term activities up to 3 years and 5 years, respectively. For a more detailed monitoring of development indicators within the framework of the Smart City concept, it is proposed to introduce a system of tracking indicators.

Digitalization development projects must be treated as a solution to the consolidated collection of information on the status of the entire city development and the effective use of mobilization of all available resources of social, cultural, financial, natural resources.

Smart City projects should provide the following effects:

1. Improving the quality of life of residents, workers, students and tourists;
2. Significantly improve the interaction between management bodies with a focus on the citizen of the city, eliminate ineffective and optimize business processes;
3. Creating the conditions for the development of an innovative and green economy;
4. The development of active local democracy by involving citizens in the development processes of the city.

Based on the methodology of the Digital Density Index Accenture and Oxford Economics, the following main areas of development are distinguished:

1. The ability to create new types of goods and services;
2. Transformation of key business processes;
3. Implementation of mechanisms of the Internet of things;
4. Creating ecosystem conditions.

At present, Almaty faces the following tasks requiring solutions in the field of ICT:

Task 1. Further development of digitalization.

To solve this problem, the following initiatives will be implemented:

- creating a single digital space to improve the lives of Almaty residents;
- improving the accessibility and quality of services provided in all spheres of public life through the introduction of digital technologies;
- ensuring sustainable growth in the quality of life of citizens through the use of innovative technologies;
- effective digitalization of city life with a special emphasis on improving comfort and high quality housing and communal services;
- optimization of urban planning and development processes using next-generation analytics, Big Data and other digital technologies;
- development of opportunities for new communication technologies;
- convenient and affordable digital services for tourists and visitors;
- the growth of the gross regional product (GRP) of the city due to the digital transformation of the economy and the transition to Industry 4.0;
- development and support of the ecosystem of the digital economy of the city;
- the growth of labor productivity and the strengthening of market positions due to the digital transformation of the business.

Practical steps:

According to these decisions, it is necessary to determine a number of first-level projects that need to be addressed:

- 1) Definition of the working group represented by universities, the most active representatives of the IT communities of Almaty and employees of the city administration departments in order to develop digitalization projects. Description of the rules and conditions for the election of the data of the participants of the working group with the definition of their role and functional responsibilities.
- 2) Development of projects to provide open access to the Internet in public places - Open WiFi.
- 3) Development of the architecture of data flows and the integration of city information systems.
- 4) Creation and development of a single data warehouse integrated with existing information systems developed taking into account the concept of open data.
- 5) Development of adaptive IT infrastructure based on 5G technology through the expansion of the number and scope of pilot projects (currently it is planned to introduce pilot projects to introduce 5G technology in Alatau and Nauryzbaevsky districts).
- 6) The development of the geographic information system of the city of Almaty to provide data on the urban environment to state bodies and organizations, commercial and non-profit organizations, developers of software applications, startups and other interested parties.

Mid-term and long-term projects of the second level:

- 1) Digitization of the current and planned housing stock with the implementation of the calculation of "smart meters" to track the status of current and new housing, the amount of electricity consumed, etc.
- 2) Marking and indexing of existing data (according to the classification of structured and unstructured) with the ability to determine additional correlation between them based on big data analytics and the use of artificial intelligence technologies.

Task 2. Implementation of the initiatives of the “smart” city aimed at increasing investment attractiveness and economic efficiency.

To solve this problem, the following initiatives will be implemented:

- **smart energy:** the introduction of energy-efficient housing and utilities systems that can automatically adjust to consumers (various tariffs), electronic technologies for collecting electricity consumption readings by the population, remote control technologies for electricity consumption in the urban economy, electricity distribution and management systems (Smart and Micro Grid, AMR);

- **smart homes:** connecting all electronic devices to the Internet, the possibilities for their automatic regulation, the introduction of remote control systems and metering of housing and communal services;

- **smart transport:** automation of traffic systems; connection of all types of public transport to the navigation system; implementation of automated multimodal logistics systems;

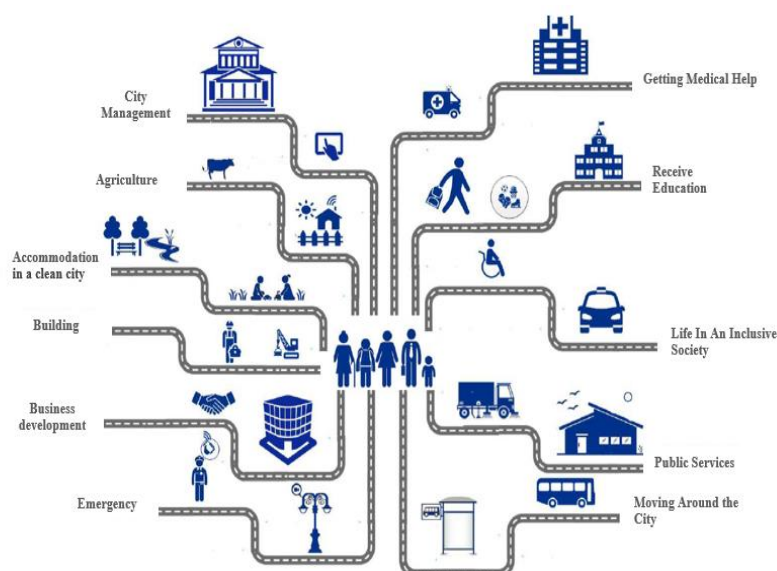
- **smart technologies:** the widespread adoption of the Internet of things; Free Wi-Fi coverage in public spaces the use of big data technologies for the analysis of transport, migration and other data;

- **smart healthcare:** the introduction of electronic recording technologies for doctors, electronic medical books, the popularization of wearable medical devices that measure vital human parameters, the development of telemedicine;

- **smart security:** the development of automated systems for video and audio recording of violations of the law; providing public spaces with video surveillance, the introduction of accident prevention technologies..

Practical steps:

To achieve the objectives in the medium term, a number of measures will be developed and taken, together with the SEC, to create a pilot site for the implementation of applied solutions with the further possibility of replicating Smart city / digitalization projects in Almaty.



Task 3. Implementation of the concept of “Hearing State” by increasing the level of involvement of city residents in problems that can be solved using digital technologies.

To solve this problem, the following initiatives will be implemented:

- ensuring the creation of trust between the administration and residents of the city;
- ensuring the transparency of the city administration by providing residents of the city with effective accountability;

- the creation of useful services for residents of the city;

- ensuring sustainable and iterative risk reduction from automation and digitalization.

Practical steps:

To implement the above initiatives, the city administration will take the following steps:

1.Re-design of automation tools used to provide public services by the city administration was carried out taking into account the wishes of city residents;

2.A project has been implemented to collect requests from residents of the city (portal and mobile application) according to the ITSM principle for recording current incidents, problems in one way or another related to incidents and problems that were discovered by residents of the city;

3.The analysis of incidents and problems that can be solved with the help of automation and digitalization is carried out. Identified decisions will be made by the Department of Digitalization on the Road Map of projects.

Task 4. Increasing the level of public and business involvement in digital transformation.

To solve this problem, the following initiatives will be implemented:

- involvement of business and citizens in city management processes through the creation and implementation of a voting and evaluation platform for digitalization projects;

- improving the efficiency and transparency of public administration through the use of Big Data analytics, Artificial Intelligence and other digital technologies;

- simplification of standard procedures performed within the framework of administrative processes of public administration through the introduction of end-to-end processes automated using blockchain technologies and smart contracts.

Practical steps:

In order to ensure the necessary level of involvement of the population and business and ensure equitable development for all participants, it is planned to approve the methodology for evaluating projects and distributing among the market participants under the rules and regulations of the digitalization department:

1) projects for development and implementation only by technical universities;

2) projects for the implementation of SMEs operating in the field of IT;

3) Projects for large IT companies;

4) projects for IT startups with possible support through investment and tax preferences, preferably for companies localized in techno-parks.

Task 5. Creation of a single platform for the development of human resources in the field of IT in the city of Almaty.

The development of human resources is the most important component of digitalization projects, and is seen as a long-term goal. Given the importance of the task, it is planned to create a platform on the basis of secondary and higher education institutions in order to improve the quality of training, accounting and development of specialists in the field of digitalization.

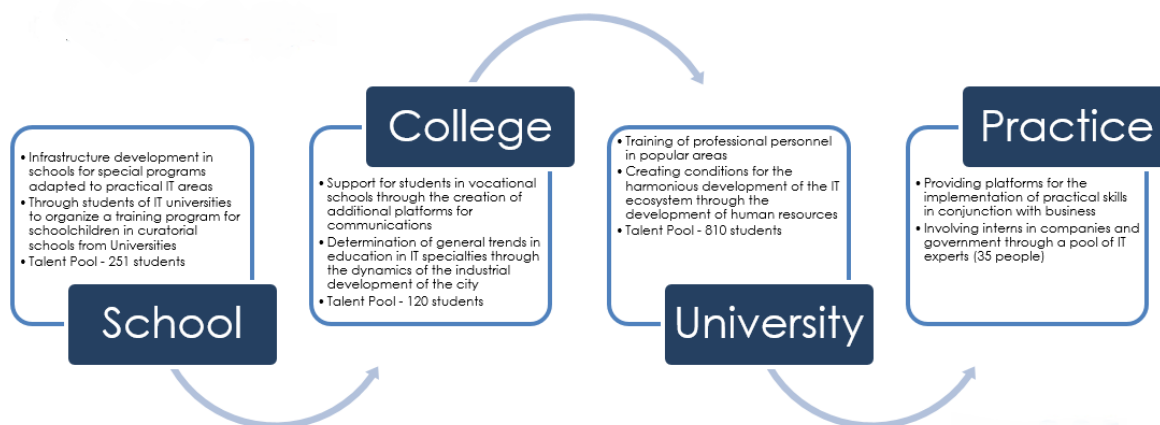
The main goals of the platform are as follows:

- Creation of a qualified base for the preparation of theoretical and practical skills among the younger generation;

- instilling interests in the development of new technologies;

- identification of the most talented representatives of citizens interested in the development of the city through a digitalization program;

- Creation of the most optimal conditions for the functioning of active and competent human resources in the field of IT in the territory of the city of Almaty;
- Creation of mechanisms for coordinating and tracking the processes of training young specialists for an adaptive environment in the framework of the development of IT infrastructure with determining the status according to the needs of specialties in IT within the city;
- Creation of a pool of successors and their profiling in order to provide targeted grants for education and development of competencies;
- distribution of business tasks and cases for each direction to identify the most advanced and capable personnel in the field through involvement in practical solutions throughout the city;
- Creation of common platforms for communication for all students through a single portal;
- Creation of an Atlas of professions on the basis of technical universities



Practical steps

The Department of Digitalization, together with the Department of Education, is considering the creation of a pool of mentors and successors in the field of IT. To implement the idea, the following activities are planned:

1) Formation of a list of IT experts represented in various areas of industrial development with ICT competency at the Almaty city administration level through the involvement of all companies and structural divisions directly or indirectly involved in digitalization programs;

2) Formation of the best IT experts represented in various areas of industrial development with ICT competence from all representatives of the city to engage them in smart city projects as consultants with a distributed form of motivation;

3) Formation of a list of talents in the field of ICT from university students and specialized secondary education institutions, as potential successors for solving practical problems of the development of the city on digitalization projects;

A general methodology for describing professional and communicative competencies is being developed by the digitalization department to identify programs for mentors and successors. This decision will allow you to quickly and efficiently resolve issues related to the development of Smart City projects using all human resources.

4) One of the drivers for the growth of competencies in the city will be the creation of an AI University (University of Artificial Intelligence), which is a common educational platform in the field of artificial intelligence based on a consortium of existing educational institutions in Almaty (KBTU, MUIT, KazNU, SDU, etc.).

The platform for the development of artificial intelligence will allow students to gain practical experience in implementing IT projects for the needs of the city. Successfully introduced city services will receive funding both within the framework of the informatization service model and through the market monetization of the services

provided. This fact will allow graduates of AI-University to continue their entrepreneurial activities in the field of IT instead of finding work in the labor market..

Task 6. Creating an innovative ecosystem.

One of the key goals of implementing the IT Strategy is to create an innovative ecosystem that allows all active participants to create new services as part of Smart City projects. The circle of participants is not limited and can consist of students of educational institutions, talented specialists without formal education, start-up startup teams and existing IT companies.

Currently, the city has an extensive range of positive factors that can be applied to create an innovative ecosystem:

1) The concentration of technical universities with their own infrastructure in the form of laboratories, computing power and access to knowledge ("MUIT", "KBTU", "SDU", "Satpayev University", etc.);

2) The presence of objects of research activities with the possibility of involving domestic scientists in the development of high-tech products;

3) Concentration of technology parks with developed infrastructure and the range of services provided to their residents (PIT Alatau, Tech-Garden, Smart-Point, Essentai Hub, etc.);

4) The concentration of IT companies (more than 6,200 organizations) that can attract private investment to create their own projects that are embedded in the overall architecture of Smart City.

5) A high level of digital literacy of the population, which will act as the end users of the created services.

Practical steps:

1) Creation of a single virtual communication platform with the union of educational institutions, representatives of the commercial sector and technology parks.

It is quite difficult for Kazakhstan as a whole, and the city of Almaty in particular, to compete in the production and export of physical goods to the international market due to many factors: lack of access to the world ocean for low-cost delivery, high production costs, etc.

However, in the creation of intelligent products, the city can take a leading position in the international market through the widespread use of the Internet and the provision of competitive prices for digital services. For example, in the field of architecture of buildings and structures, residents of the Tech-Garden technopark create "digital doubles" in the form of 3D models of buildings and implement turnkey solutions on the world market at a price 4 times cheaper than "western" companies.

With the concentration of all available resources from universities, technology parks and the state, project teams will only need their own time and creative energy to create new services. In these conditions, university graduates after receiving a diploma, instead of finding jobs, will continue to participate in the creation and provision of IT services for use.

One of the important drivers for the formation of an innovative ecosystem will be the publication of needs for IT services of state institutions for their own needs. The fundamental difference between the updated interaction model is the publication of a list of problems that need to be solved through digitalization, and not the formation of technical requirements for systems as it is now. To solve such problems, project teams will use various implementation options, which leads to the creation of conditions for the emergence of innovations. The choice of the best option for implementing an IT service will be based on performance and rental criteria.

Task 7. Implementation of the mechanisms of the Internet of things.

The concept of using the Internet of things was formulated in 1999 with the aim of ensuring, on the basis of radio frequency identification, the interaction of physical objects with respect to each other and external information systems. Based on the development

of technological solutions based on new interaction protocols, the emergence of a new generation of processors and cloud computing, the technology potential should reach the level of general maturity by 2021.

The spectrum of technology application applies to all physical devices, reporting the status of each object with a focus on inter-machine data processing. The level of autonomy of the sensors, the accuracy of measurement and range is fundamental.

For wireless data transmission, of particular importance in building the architecture of the "Internet of things" is efficiency at low speeds, fault tolerance, adaptability, and the possibility of self-organization. The Internet of things is a promising concept using new interaction protocols.

IoT technologies (Internet of things - data transmission through sensors at installed sites) are at the initial stage of development and in the future have very strong growth potential, are applied in all areas of the city's life, from utilities to healthcare, the LoRa protocol was created in January 2018 and because of its technological advantages, the most optimal for existing development. The creation of an applied educational laboratory in partnership with the main protocol developer will contribute to the development of the Internet of Things technology, not excluding the possibility of using other types of protocols, with the balanced involvement of enterprises located in the SEZ PIT Alatau, and will also create a new cluster in the city's economy with the necessary number of professional specialists namely according to the LoRa IoT protocol.

The city of Almaty should become the most adaptive to pilot applications for projects using this technology and, through the large competencies of large multinational companies, take a position as a center of expertise with its own personnel potential.

Practical steps:

To solve this problem, a number of the following actions are required:

1) Definition of the pool of applied tasks for the application of the technology of the Internet of things.

2) The signing of a strategic document of interaction with representatives of the LoRa Alliance to attract projects for the application of this protocol to the city of Almaty.

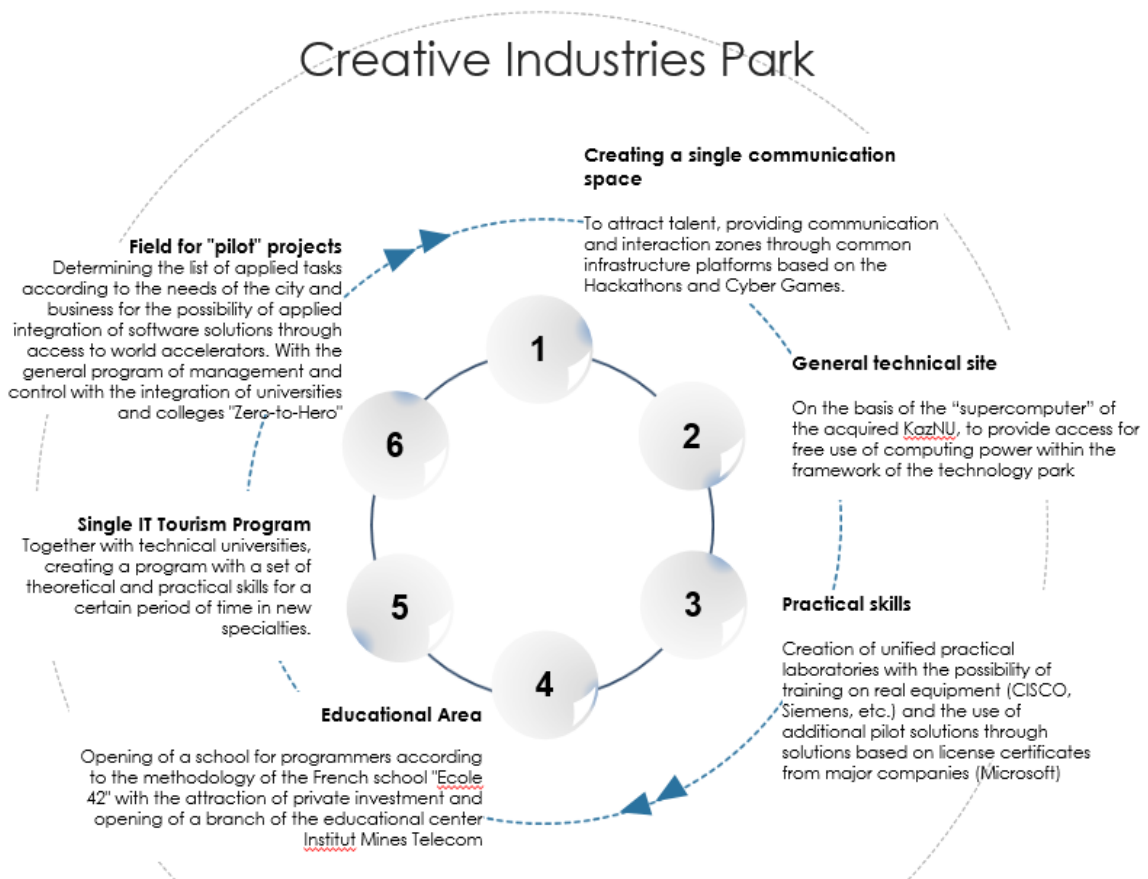
3) Creating a list of protocol integrators with an individual development plan for new companies with the ability to work in applied projects.

4) Definition of pilot zones within the city for adaptation and subsequent application of solutions.

5) Creation of an academy of training in the development of the Internet of things and the application of the LoRa protocol and other types of protocols with protocol developers based on the Artificial Intelligence laboratory in the Park of Creative Industries.

Task 8. Creation of a single virtual communication space and Artificial Intelligence laboratory based on the Creative Industries Park.

The creation of the Creative Industries Park is aimed at creating a unified communication platform for the formation of new trends in the development of projects with high intellectual added value. Localization of the park is planned in the Esentai City zone, one building with an area of 2200 sq.m is allocated for the development of digitalization projects, where the zone for the development of artificial intelligence will be localized on the basis of methodological support from the confederation of higher technical educational institutions.



The main goals of the Creative Industries Park are the following principles:

- Creation of a single communication space

To attract talent, providing communication and interaction zones through common infrastructure platforms based on the Hackathons and Cyber Games educational trainings and meetings with prominent figures in the field of digitalization

- General technical site

On the basis of the "supercomputer" acquired by KazNU, to provide access for free use of computing power within the framework of the technology park

- Practical skills

Creation of unified practical laboratories with the possibility of training on real equipment (CISCO, Siemens, etc.) and the use of additional pilot solutions through solutions based on license certificates of the largest companies (Microsoft, etc.). To ensure a complete ecosystem in order to attract talent and additional investments, it is proposed to create a technical platform based on the separation of platform functionality (platform sharing) with the integration of solutions of large vendors

- Educational site

Opening a school for programmers using the French Ecole 42 school methodology with private investment and opening a branch of the Institut Mines Telecom educational center - the largest R&D eco-system in France, uniting the top 3 technical universities (13,400 students, 1,500 researchers, 250 corporate partners from the largest companies in Europe produce over 100 startups per year).

- A single program for IT tourism

Together with technical universities, creating a program with a set of theoretical and practical skills for a certain period of time in new specialties.

- Field for "pilot" projects

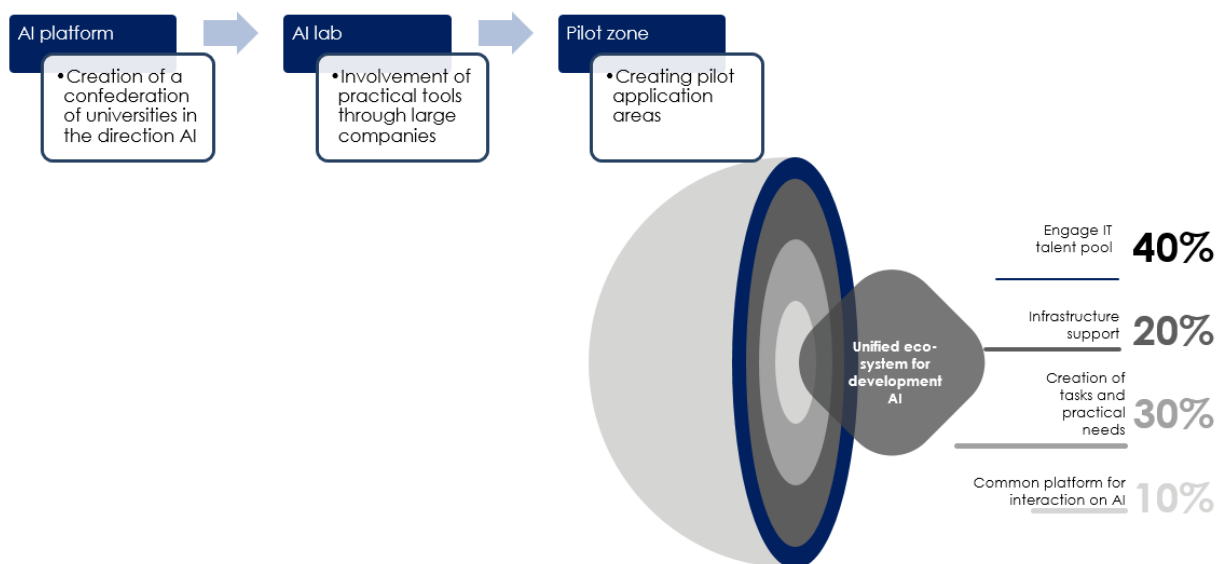
Defining a list of applied tasks according to the needs of the city and business for the possibility of applied integration of software solutions through access to world accelerators. With a common unified management and control program with the integration of universities and colleges.

Practical steps:

The basic principle of the eco-system will be provided by an educational platform on the platform with a focus on the development of artificial intelligence with the creation of a single knowledge base on the theoretical part in the form of a confederation of higher educational institutions and applied part in the form of representatives of the largest world manufacturers based on the development and application of new technologies.

In the park of creative industries, it is planned to integrate solutions that contribute to the development of the following areas:

- 1) Architecture and design
- 2) Cinema and animation
- 3) New media and digital culture
- 4) The development of computer games and cyber sports
- 5) Music
- 6) Fashion industry
- 7) Export office
- 8) Tourism
- 9) Online entrepreneurship



In addition, the largest accelerators will be involved to localize their solutions in the territory of the city of Almaty. Upon reaching a certain level of development, many companies in the world require confirmation of the survival of their model in other cities (Proof of Concept) with replication capabilities, given that the cost of pilot solutions in emerging markets is proportionally lower (in some cases, the difference can reach up to 12 times) the solution in the city of Almaty is interesting for large accelerators. The idea is to create application offices of the largest European, American and Chinese accelerators in

the city, so that through their competence to create conditions for the emergence of new solutions in the city with a focus on providing the most optimal and affordable service for citizens and strengthen the internal professional culture of doing digital business by improving traditional processes with the possibility of developing venture capital investments in regional startups based on the Creative Industries Park through an educational program. For their part, these accelerators can create possible solutions for the replication of projects in the city of Almaty on the territory of their countries and will strengthen the new business environment in the development of new technologies and new business models.





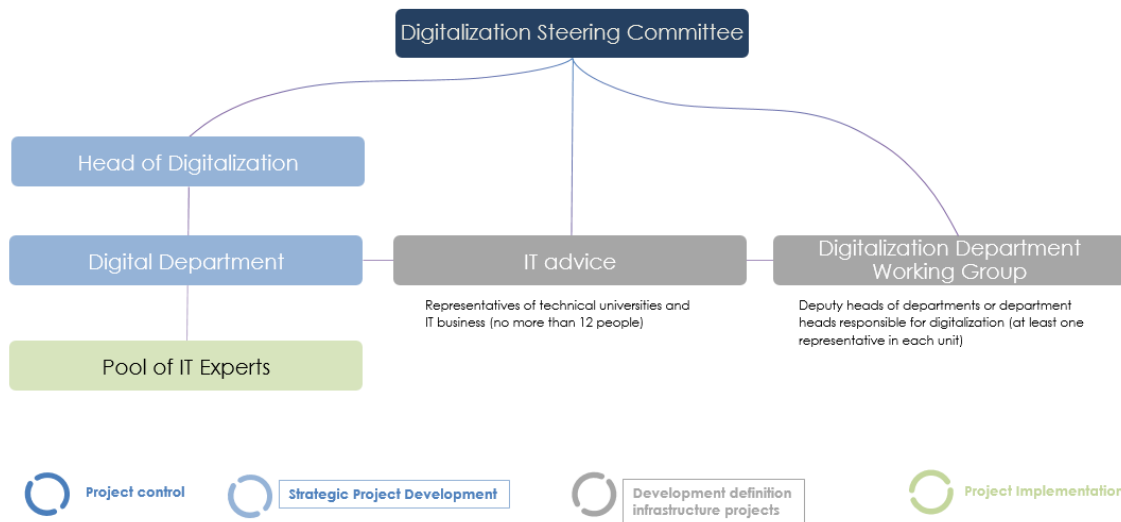
To implement the Smart City projects, it is planned to create the following organizational structure for the interaction of participants:

Level 1: Governing Council;

Level 2: Office of project and service management;

Level 3: Expert advice.

Digitalization Strategy Management Organization



The Governing Council is formed to address strategic issues related to the implementation of Smart City projects in the city's areas of activity. This council consists of the leaders of the Akimat of Almaty (akim of Almaty, deputy akim of Almaty, head of the digitalization department). Council meetings are held at least 2 times a year to agree on development priorities and hear reports on the progress of the implementation of Smart City projects.

The Project and Services Management Office is a center of excellence authorized to improve the quality, effectiveness and efficiency of providing services to residents and business functions through the development and implementation of new projects. OUPU performs this functionality using industry standards and best practices - applying them in a

unique environment. The composition of the Project and Service Management Office is made up of deputy city administrations in charge of business development issues (CDO - Chief Digital Officer), IT department staff (if any), and representatives of the digitalization department. The overall coordination of activities will be carried out by the Office of Digitalization

The value of the Service Management Office will be as follows:

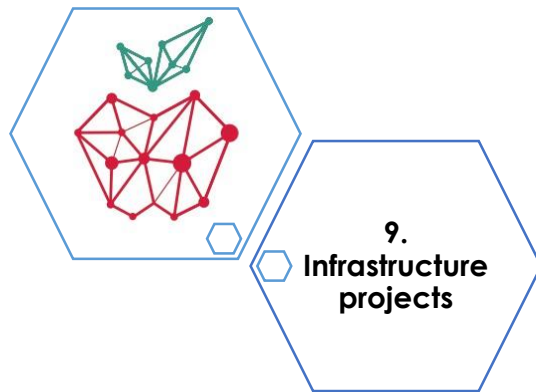
1. Centralized (general) capabilities;
 - Incident Management
 - Query Management
 - Problem management
 - Change Management
 - Management of quality assessment of services and projects

2. Special knowledge (center of competence);
 - Knowledge
 - Training and development
 - Promotion, marketing and cultural change
 - Tools and resources
 - Human resources

3. Quality assurance of services
 - SLA Compliance Check
 - Quality
 - Risks
 - Regulatory Compliance

An expert council is formed to adjust with the IT community the decisions made as part of the implementation of Smart City projects. The adjustment of Digitalization processes and assistance in setting the priorities for the development of the IT industry will be carried out through the involvement of members of the Expert Council formed from representatives of technical universities and commercial structures of the IT industry.





The main infrastructure projects will be the Unified Geographic Information System, the Situation Center and the Unified Data Warehouse.

Situational center of Almaty

A platform equipped with infrastructure for organizing interagency cooperation, demonstrating solutions for the tactical and strategic management of urban life, managing public services, aggregating reliable and timely data on urban resources and ensuring the safety of citizens with a focus on providing the maximum possible indicators of the dynamic development of the city in the public domain for the public. The task of the SIC is to provide the city leadership, subordinate organizations and departments with high-quality, operational and as complete information as possible to make more effective management decisions. Also, these data will be provided to citizens on a regular basis by visualization on the official portals of the city.

"Smart City" digital initiatives can be based on the City Management and Control Platform (CMCP), an information system with a different level of access for local executive bodies, city services, private and public organizations, which provides tasks for viewing and providing information as well as facilitating effective data analysis and timely decision making. The implementation of such a solution will allow the city to become a "platform for innovation."

The city management and control platform (CMCP) should be deployed using the Software as a Service (SaaS) model. It is assumed that the Akimat and city services intend to release data sets based on proactive / automatic consumption through application programming interfaces (APIs) / web services. Based on IT & OT & AI technologies, the city management and control platform (CMCP) will integrate information from various systems, aggregate, store and analyze data to effectively support urban services (smart-power supply; smart-water supply; smart buildings; smart-lighting ; smart transport, etc.) and making timely decisions.

An important condition is an extensible platform design - any department / city service, non-profit or public organization or other interested should be able to publish data through adjustable interfaces, which will allow the city data center (DPC) to become more responsive to the needs of the community. To do this, it is necessary to develop a standard agreement on the use of data, which users of the platform must agree with, as well as agreements on partnership and licensing of data.

Also, the city management and control platform (CMCP) will provide services such as visualization and map search based on GIS (Geo HUB), visualization, inventory and

management of real estate assets based on BIM technology (BIM HUB) with the ability to control the implementation of construction and optimize operation..

Unified geographic information system

(Geo HUB) - an Internet portal that forms the basis for the implementation of the Smart City concept based on solutions for visualization, analysis and access to information necessary for making managerial decisions.

The Geo HUB Internet portal will provide relevant and verified data on the urban environment to the local executive body (akimat), city services, enterprises, non-profit organizations, software developers, startups and other interested parties.

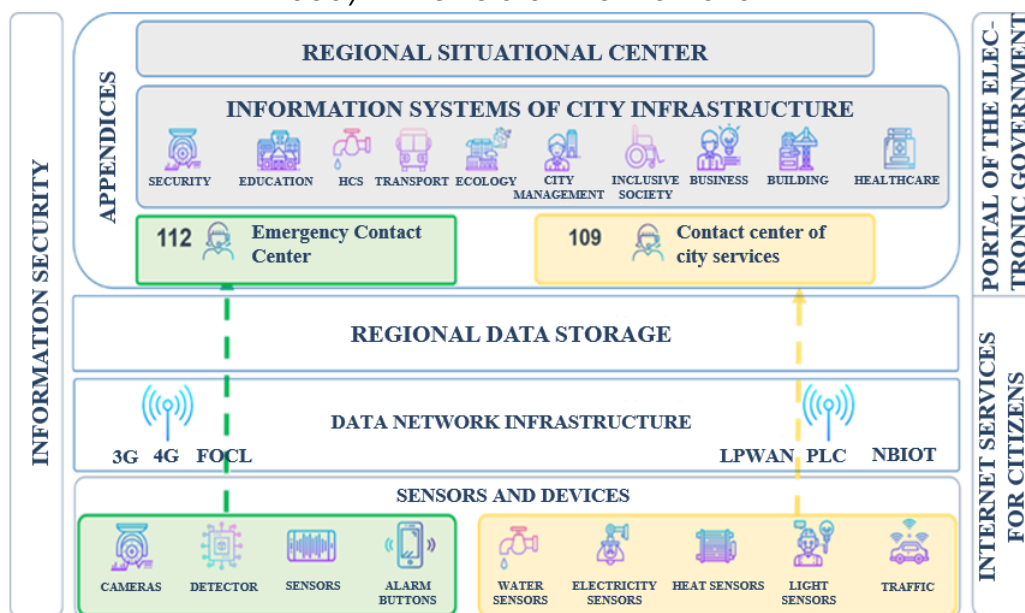
As the basic model of the Geo Hub IT architecture, it is recommended to use the Life as a Service (LaaS) model for centrally receiving and collecting files from various sources or locations (such as servers, applications, data collection devices, and etc.). The LaaS model involves “normalizing” and filtering data for reformatting and transferring it to other interconnected systems of the city management and control platform (CMCP) for processing as “proprietary” data that can be managed, displayed, applied or archived in accordance with predefined rules creation, exchange and storage of information.

Organizing the Geo Hub as a platform that serves as a single entry point for all city services using geospatial data will facilitate the exchange of data between departments, allowing stakeholders to create maps that are synchronized with each other. To do this, it is necessary to form a working group (WG), which will include the heads of departments under the akimat of Almaty, producing most of the urban geospatial data:

- Department of Architecture and Urban Planning of Almaty;
- Construction Department of Almaty;
- Office of Natural Resources and Nature Management of Almaty;
- Land Relations Department of Almaty;
- Office of the State Architectural and Construction Control of Almaty;
- Office for the control of the use and protection of land in Almaty;
- Department of Energy and Public Utilities of Almaty;
- Department of Agriculture and Veterinary of Almaty;
- Department of passenger transport and roads of Almaty;
- Finance Department of Almaty;
- Department of Tourism and External Relations of Almaty.

The purpose of the WG is to identify areas for work: to optimize interagency data interactions; conduct effective trainings for city staff on using the Geo HUB for analysis, visualization and application development; Complement CMCP with geospatial content provide application development, etc.

The architecture of the “Smart City” according to the methodology of the authorized body in the field of informatization



Single data warehouse

The concept of “Smart City” is aimed at improving the quality, productivity and interactivity of city services, reducing costs and resource consumption, improving communication between the population and the state. Digitalization of the city’s vital processes can significantly increase the accuracy and coverage of the data collected, as well as increase the speed of their analysis, which in turn allows you to more effectively manage the city, make decisions based on accurate data and create more comfortable conditions for residents and visitors of the city.

In connection with the growth of information volumes, data storage issues are becoming increasingly relevant. As the physical infrastructure of the centralized data warehouse on the urban environment, the city data center (DPC) will be used. At its core, a city data center is the brain of Smart City, whose neural connections form thousands of data collection devices (sensors and sensors) that aggregate information in real time. The information transmitted to the data center provides the tasks of analyzing and making informed decisions, as well as providing feedback and performing the necessary actions. It is the data center that creates the connection between the world of the physical and digital infrastructure of the city. To date, the use of local data centers.

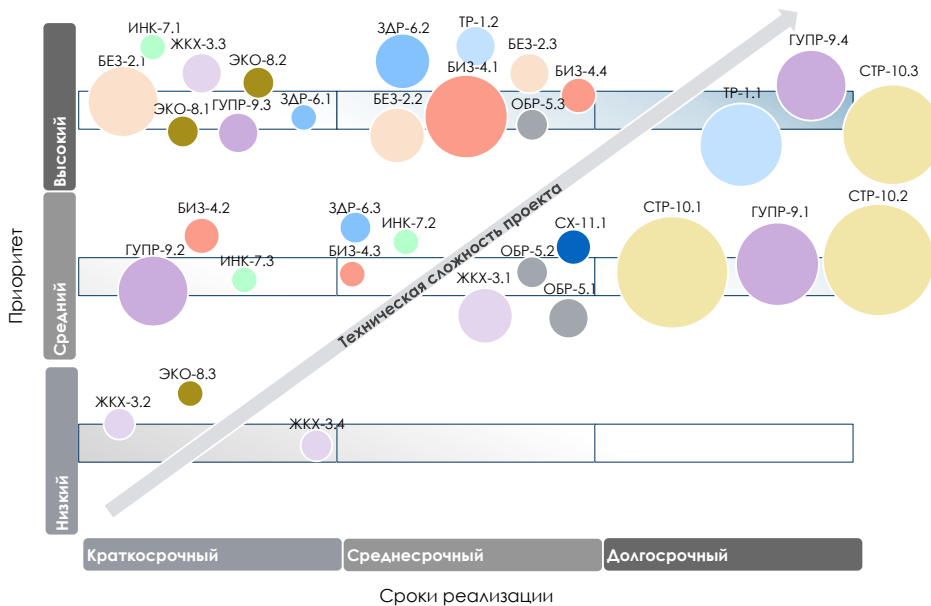
The organization of a centralized data warehouse on the basis of the city data center is necessary for the purpose of providing the Situation Center in Almaty, where the data will be analyzed and transmitted for work to the relevant city services. For the effectiveness of data analysis processes, it is planned to use the capabilities of an artificial intelligence system.

To ensure the functioning of the Situation Center, it is proposed to develop an intelligent city management and control platform (City Management and Control Platform; CMCP), which, along with the city data center (DPC), will create a comprehensive Smart City infrastructure ready for innovation and increase the efficiency of urban information resources for the provision of public services and management decisions.

10. Project Prioritization Matrix

To provide a logical connection for the fulfillment of the first tasks for the development of digitalization projects, it is proposed to determine the importance of projects and the technological complexity of implementation in a common matrix and coding projects in functional areas.

Основные проекты по направлениям («ледоколы»)



1. Транспорт (ТР)
2. Безопасность (БЕЗ)
3. Жилищно-коммунальное хозяйство (ЖКХ)
4. Бизнес (БИЗ)
5. Образование (ОБР)
6. Здравоохранение (ЗДР)
7. Инклюзивное общество (ИНК)
8. Экология (ЭКО)
9. Городское управление (ГУПР)
10. Строительство (СТР)
11. Сельское хозяйство (СХ)

10. Projects to increase Smart City performance

Transport	Healthcare	Education	Inclusive society	City government
<ul style="list-style-type: none"> • Public Transport Accessibility Pilot project for determining the passenger flow in public transport • Real-time access to information Creating a unified video monitoring system 	<ul style="list-style-type: none"> • Electronic medical records Integration of ONAY social cards with the ENP Ministry of Health • Telemedicine Development of a single cloud-based PACS for the city • Exchange of information between hospitals, pharmacies and other service providers Creation of a unified register of equipment with drugs (orphan drugs and drugs for chronically ill patients) • Medical staff Creating a talent pool for medical specialties for involving catalysts in projects 	<ul style="list-style-type: none"> • University graduates -Creating a talent pool at the level of technical universities -Creation of a roadmap for the implementation of the atlas of professions • School enrollment -Creating a talent pool at the lyceum level -Optional purchase of an integrated platform with computers, robotics and simulation cabinets -Introduction of a pilot project on the use of a unified schoolchild card with the possibility of payment in canteens in 92 schools • Distance education On the basis of KBTU the creation of lecture courses on IT specialties with open online access for the Kazakh-speaking population with elements of sign language translation • Creation of IT platforms at universities Pilot project for the development of Smart Campus in KazNU 	<ul style="list-style-type: none"> • Unemployment rate Creation of a database of graduates of universities with integration with the UAPF and State Clinical Hospital systems to automate the monitoring of the level of employment • Gini index (a statistical indicator of the degree of stratification of society) For segmented tracking of the population of the city, together with the City Clinical Hospital and the Ministry of Labor, the creation of a pilot according to the scoring system in Almaty • Social part -Creation of a single database of all socially unprotected layers of the population with the presentation of a single identification card with the possibility of submitting point proposals for individual assistance and development -Project for equipping panic buttons for all disabled people in Almaty 	<ul style="list-style-type: none"> • Electronic services The increase in the list of public services by the Ministry of Agriculture and the Ministry of Health • Wi-Fi Coverage Scale of the project to provide free access to parks • Availability and variety of data Transition of the SIC platform to an open solution with the possibility of public access to dynamic indicators of city development • Open data -Creation of UDS -GIS alignment with open access for all interested parties

11. Projects to increase the level of Smart City indicators

Ecology	Business	Security	Housing - Communal Service
<ul style="list-style-type: none"> • Air pollution Creation of a pilot project on a service model for monitoring air pollution in different areas of the city • Water quality Pilot project for assessing the quality of groundwater in the Bostandyk district • Green spaces per capita Updating the digitization of green spaces on the basis of GIS CIS for all new plantations 	<ul style="list-style-type: none"> • New start-up -Differentiation of Smart City projects -Creation of a new park of creative industry • International events For 2020, 8 major events on the development of ICT and two major events on digitalization are planned • Research and Development Solutions Research and Development Solutions • Tourism Together with universities on the basis of the creative industry park, the creation of short-term programs for the development of IT tourism 	<ul style="list-style-type: none"> • Crime SVM project in crowded places for 1000 cameras • Response speed Creation of UDDS • Fire frequency Project implementation on a service model for early tracking of fires throughout the city through cameras 	<ul style="list-style-type: none"> • Energy management using ICT Creating a pilot project on the basis of the Almaty General Plan building with the implementation of the BMS system • Waste production Pilot project on equipping garbage cans with sensors according to filling status • Street lighting Creation of a pilot project on a model of life cycle contracts for coverage on the LaRa protocol • Garbage removal Pilot project on equipping garbage cans with sensors according to filling status

No	Existing, developing and planned projects	Brief characteristic	Project duration	Priority
1	DIRECTION «INTERACTION WITH RESIDENTS»			
1.1	Access to information in real time	Creating a unified system for collecting, registering, processing, and feedback from city residents	short	high
2	DIRECTION «TRANSPORT»			
2.1	Access to information in real time	The creation of a unified system of video monitoring	long	high
2.2	Public transport accessibility	Pilot project to determine passenger traffic on public transport	medium-term	high
3	THE DIRECTION OF «SECURITY»			
3.1	Response rate	The creation of EDDS	short	high

3.2	Crime	Project on SVM in places of mass congestion of citizens for 1000 cameras	medium-term	high
3.3	Frequency of fires	Implementation of the project on the service model for early tracking of fires throughout the city	medium-term	high
4	DIRECTION «HOUSING AND COMMUNAL SERVICES»			
4.1	Energy resource management using ICT	Creating a pilot project based on the Almaty General Plan building with the introduction of the BMS system	medium-term	average
4.2.	Waste production	A pilot project to equip bins with sensors on the completion status of	short	low
4.3	Street lighting	Creating a pilot project based on the life cycle contract model for lighting on the LoRa Protocol	short	high
4.4	Garbage disposal	A pilot project to equip bins with sensors on the completion status of	short	low
5	THE «BUSINESS»			
5.1	New start-up	Creating a new creative industry Park	medium-term	high
5.2	International event	8 major ICT development events and two major digitalization events are planned for 2020	short	average
5.3	Tourism	Together with Universities on the basis of the creative industry Park creation of short term programs for the development of it tourism	short	average
5.4	Research and development solutions	Creation Of a University for the development of Artificial Intelligence on the basis of the Confederation of Universities	short	high
6	THE FIELD OF «EDUCATION»			
6.1	School coverage	Additional purchase of a comprehensive platform with computers, robotics and simulation rooms Implementation of a pilot project for the use of a single student card with the ability to pay in canteens in 92 schools	medium-term	average
6.2	Distance learning	On the basis of KBTU creation of courses of lectures on it specialties with open online access for the Kazakh speaking population with elements of Surdo translation	medium-term	average
6.3	Creating it platforms in universities	A pilot project for the development of a Smart Campus to the Treasury	medium-term	high
7	DIRECTION « HEALTH CARE»			
7.1	Electronic medical records	Integration of ONAY social card cards with the ENP Ministry of Health	short	high
7.2	Telemedicine	Development of a single PACS based on a cloud solution for the city	medium-term	high
7.3	Sharing information between hospitals, pharmacies, and other service providers	Creating a unified register of drug availability (orphan drugs and drugs for chronically ill patients)	medium-term	average
8	THE DIRECTION OF «AN INCLUSIVE SOCIETY»			

8.1	Unemployment rate	Creating a database of University graduates with integration with ENPF and GKB systems to automate monitoring of employment levels	short	high
8.2	Gini index (statistical indicator of the degree of stratification of society)	For segmented tracking of the city's population, together with the KGB and the Ministry of labor, the creation of a pilot for the scoring system in the city of Almaty	medium-term	high
8.3	Social part	Creation of a single database of all socially vulnerable segments of the population with the presentation of a single identification card with the possibility of submitting point offers for individual assistance and development Project to equip all disabled people in Almaty with panic buttons	short	high
9	DIRECTION «ECOLOGY»			
9.1	Air pollution	Creating a pilot project for a service model for tracking the level of air pollution in different parts of the city	short	high
9.2	Water quality	Pilot project on groundwater quality assessment in Bostandyk district	short	high
9.3	Green spaces per capita	Updating the digitization of green spaces based on GIS CIS for all new plantings	short	low
10	DIRECTION «CITY MANAGEMENT»			
10.1	E-service	Increasing the list of public services for the Ministry of agriculture and the Ministry of Health	long	average
10.2	The coverage area of Wi-Fi	Scaling up the project to provide free access in parks	short	average
10.3	The availability and variety of data	Transition of the CIC platform to an open solution with the possibility of public access to dynamic indicators of city development	short	high
10.4	Open data	Creating an EHD Alignment of GIS with open access for all interested parties	long	high
11	DIRECTION «CONSTRUCTION»			
11.1	BIM	Planning of construction sites, the formation of the relief; 3D design of the construction site;Проектирование несущих конструкций; The design of the internal infrastructure.	long	average
11.2	BMS	Automated building management system	long	average
11.3	Unified GIS	Maintaining the land cadastre; The maintenance of the urban cadastre; Maintaining an address register; Maintaining environmental inventories; Managing project documentation and services; Maintaining a real estate register;	long	high

		Administration and Maintenance of unified directories;		
12	DIRECTION «AGRICULTURE»			
12.1	Traceability of agricultural products	<p>The traceability system must provide information:</p> <ul style="list-style-type: none"> • results of veterinary, sanitary and phytosanitary controls; • on carrying out the necessary technological and control measures; • on interactions between subjects, with the signing of EDS; • accounting for detected product defects and measures taken to eliminate them. 	medium-term	average

It is assumed that the list of projects will be updated during the implementation of the strategy, depending on the status of integration of solutions.

Appendix No. 1. Getting medical help.

Functionality of short / medium-term initiatives:	
1.1 Medical Information System:	<ul style="list-style-type: none"> • Automation of medical and administrative activities in the implementation of the medical diagnostic process (patient registration, electronic queue, electronic triage, etc.) • Maintaining medical records in electronic form (maintaining electronic medical records - EMC) Personalized records of the provision of medical services • Comparison of the composition of the measures recommended by the treatment standards and the sequence of their implementation with the diagnostic and treatment appointments recorded in the MIS MO and their implementation • Information interaction of healthcare system organizations, participants in the diagnostic and treatment process in a single information space (LIS, PAX, etc.) • Interaction with administrative and business systems, including for the purpose of analyzing the real costs of providing medical services, both for the patient and for the structural unit of the Moscow Region
1.2 Ambulance management system:	<ul style="list-style-type: none"> • Receiving, registering, and dispatching calls • Automatic determination of the location of the caller • Automatic identification and direction of the closest ambulance team • Ambulance vehicle tracking • Managing patient's medical data • Integration with medical information systems • Maintaining reports and statistics • Inventory control of consumables • Fleet management
1.3 Telemedicine:	<ul style="list-style-type: none"> • Remote consultations and diagnostics of patients in real time • Broadcast of medical seminars, conferences and lectures by video conferencing system • Broadcast of surgical operations • Remote biomonitoring • Remote medical care for a patient undergoing treatment at home

1.4 Health passport:	<p>Unified database for storing patient's medical data, anamnesis, and medical history:</p> <ul style="list-style-type: none"> * Accumulation and structuring of patient health information collected by medical information systems * Collection, storage and exchange of patient's medical data * Archiving of medical data <ul style="list-style-type: none"> • Information interaction with the medical information system, laboratory information system, and image archiving and transmission system.
1.5 Smart recipe:	<ul style="list-style-type: none"> • Extract of a prescription drug benefit • Extract a recipe that is not linked to a specific brand /brand • Making payments to pharmacies after the patient confirms receipt of medicines
1.6 Image archiving and transmission system:	<ul style="list-style-type: none"> • Obtaining diagnostic images and relevant patient and research data from various types of diagnostic equipment <ul style="list-style-type: none"> • Automated transfer, storage, rapid exchange and further use of diagnostic research results • Managing the life cycle of medical images that are not linked to specific types of diagnostic equipment <ul style="list-style-type: none"> • Secure storage of images in a single storage, with the ability to access it from any location • Information interaction with the Medical information system
1.7 Activity Tracking:	<ul style="list-style-type: none"> • Physical activity monitoring • Setting the daily load • Monitoring sleep quality • Calorie consumption control
1.8 Laboratory Information System	<ul style="list-style-type: none"> • Collection, processing and transmission of data from laboratory equipment • Tracking the movement of samples and tests • Laboratory management • Internal quality control of measurement results • Checking and controlling the specification of raw materials and commodity products <ul style="list-style-type: none"> • Generating reports and statistics • Information interaction with the Medical information system
1.9 Transparent treatment:	<p>Providing patients with access to treatment information: rehabilitation programs, treatment plan, prescribed medications, nutrition programs, etc.</p>
1.10 Smart Routing:	<p>Building an optimal way to bypass medical offices in accordance with the needs of the patient</p>

Appendix 2. Get education.

Functionality of short - / medium-term initiatives	
<p>2.1 educational organizations management System (SMS):</p>	<ul style="list-style-type: none"> • Maintaining a Passport of the educational organization • Admission and registration of students • Reception and accounting of personnel • Staff development and recruitment • Book Fund accounting • Electronic library • Accounting and maintenance of the material and technical base, it infrastructure • Accounting and salary management • Formation of a budget request • Contract management • Cashless payment system in the dining room <ul style="list-style-type: none"> • Building and premises access management and control system • Photo and video recording system for violations • Formation of departmental reports
<p>2.2 managing training and personal recommendations:</p>	<ul style="list-style-type: none"> • Creating a schedule of training sessions • Automation of the overtime lesson plan • Automate homework verification • Electronic diary • Electronic journal • Formation of personal recommendations for the student

<p>2.3 Computer simulators:</p>	<ul style="list-style-type: none"> • Replacement of the object of research, specific objects, phenomena in order to study their properties, get the necessary information about the object <ul style="list-style-type: none"> • Performing professional tasks, practicing practical skills • Conducting experiments without direct contact with the actual installation, laboratory, or equipment, or in their complete absence • Real-time visualization of real-time production process situations • Real-time recording of actions during an operation • Automatic assessment of the level of knowledge and skills acquired through feedback • Predicting the results of real technological operations for trainees • Modeling sudden unexpected situations that occur during real work to consolidate the skills of performing the procedure
<p>2.4 Digital educational resources:</p>	<ul style="list-style-type: none"> • Maintaining reference books and categorizing data Centers • Publication of e-learning materials • Registration of users • Subscription to the DCS • View e-learning materials

2.5 education management System:

- Setting and monitoring educational standards, programs, plans, regulations, rules, and norms
- Maintain the classification of professions and specialties of technical and vocational UNIVERSITY
- Planning of the state order for training of specialists
- Planning of providing material and technical base of educational organizations
- Providing the educational organization with an updated CMC (including a special one)
- Accounting for educational organizations
- Accounting for issued licenses for educational organizations
- State certification of educational organizations
- Accounting OO accreditation
- Professional development of teaching staff
- Maintaining the profile of the student / teaching personnel
- Issuance of a certificate and assignment of a specialty or qualification
- The awarding of academic degrees and academic titles
- Accounting for deductions from the educational organization
- External evaluation of educational achievements
- Educational monitoring

Appendix 3. Life in an inclusive society.

Functionality of short - / medium-term initiatives:	
3.1 Available environment:	<ul style="list-style-type: none"> • An interactive map showing the locations accessible to people with disabilities • Creating a path for people with disabilities, taking into account the infrastructure • Monitoring for compliance with standards for ramps inside / outside the building and displaying on the map • Receiving messages from the public about accessibility
3.2 Employment:	<ul style="list-style-type: none"> • Integration of the disability accounting system and the electronic labor exchange • Automatic selection of vacancies for disabled people • Address automatic sending of the list of vacancies
3.3 Information and reference portal:	<ul style="list-style-type: none"> • Providing citizens with disabilities with up-to-date information about social support from the state • Legal and psychological advice is provided free of charge • Informing and providing legal and psychological assistance to people with disabilities
3.4 Charity platform:	<ul style="list-style-type: none"> • Specify to whom funds are transferred • Specifying the intended use of funds • Checking the intended use of funds • Implementation of blockchain technology
3.5 search for a volunteer:	<ul style="list-style-type: none"> • Creating tasks for the volunteer • Giving balls to volunteers • The ability to transfer points into tangible benefits
3.6 sports:	<ul style="list-style-type: none"> • Offers of sports opportunities; • Selecting a team for sports; • Online rental of sports grounds adapted for people with disabilities.

Appendix 4. Utilities.

Functionality of short - / medium-term initiatives:	
4.1 weather sensor System:	<ul style="list-style-type: none"> • Collecting weather data • Predicting the flow of surface runoff • Processing, visualization, and storage of weather information
4.2 Climate control:	<ul style="list-style-type: none"> • Regulation of the coolant temperature • Maintaining the set temperature mode • Saving heat energy by lowering the temperature of the coolant at night, as well as on weekends and holidays
4.3 Smart street lighting:	<ul style="list-style-type: none"> • remote monitoring of the status of fixtures; • adjusting the brightness of the lights, depending on weather conditions (rain, snowstorm, fog, bright moonlight, etc.); • remote lighting control; • planning and tracking tasks during the operational phase; • intelligent accounting and billing; • detection of failed electrical equipment; • notification of replacement of worn-out power lines.
4.4 Automatic transmission of meter readings:	<ul style="list-style-type: none"> • Automated data collection • Centralized accounting • Integration with security systems • Theft prevention
4.5 container fill Sensor:	<ul style="list-style-type: none"> • Ultrasonic technology • Measuring the level of garbage filling • Regularly send data about the fill level

<p>4.6 Automated control system of technological processes:</p>	<ul style="list-style-type: none"> • Formation of a complete database of equipment and standard reference information for its maintenance • Preparation of an action plan for maintenance and repair of equipment (TORO) • Organization of the bid company • Monitoring of equipment maintenance and repair processes • • Control of real costs in the context of objects and events <ul style="list-style-type: none"> • Fixing the main technological approaches to equipment operation (failures, downtime) • Working out the required maintenance activities on the database of the process control system • Ensuring that the necessary information is transmitted to the ERP • Assessment information on the MAINTENANCE and organization of corporate reporting
<p>4.7 home management Platform:</p>	<ul style="list-style-type: none"> • Inventory and analysis of existing and potential rental sites for advertising and other purposes; • Determining the price of each type of advertising and rental; • Choice of ways to receive and spend money from rent and advertising; • Approval of the terms of the agreement at the General meeting of owners; • Expenditure of rental funds and reporting on them.
<p>4.8 E-KSK:</p>	<ul style="list-style-type: none"> • Publication of documents (object passport) - inspection and audit reports, minutes of interviews, meetings • • Managing KSK employee data and access rights in accordance with the regulations <ul style="list-style-type: none"> • Managing objects that are in the service of a KSK or a service company • Managing people attached to the CSC, the implementation of feedback from the residents <ul style="list-style-type: none"> • Conducting surveys among residents; sending necessary messages, news, etc. • Conduct a vote among the residents (apartment owners) • Processing incoming requests and requests from attached residents • Reporting

	<ul style="list-style-type: none"> • Registration of incidents and requests • Appointment of a person responsible for the execution of the application (service personnel, electrician, plumber, etc.) <ul style="list-style-type: none"> • Informing the initiator of the application when registering, executing and closing the application • Confirmation of execution of orders / decisions of the incident • Settlement of housing disputes • Assessment of the quality of application execution / incident resolution • Return of the request / incident when the initiator refuses to confirm the execution and notification of the return • Redirecting applications that are not within the competence of the KSK to the city's information systems and akimat services <ul style="list-style-type: none"> • Generating receipts for a personal account • Participation in polls and voting • Collecting data on the existing infrastructure of the facility • Forecasting the technical condition • Search for defects • Determining the cause of defects • Determining whether repairs are necessary • Budget planning and execution control • Publication of documents (passport of the object)
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Appendix 5. Getting around the city (Transport).

Functionality of short - / medium-term initiatives:	
<p>5.1 Smart traffic lights:</p>	<ul style="list-style-type: none"> • Processing of primary information about traffic flows and certain individual road users received from various sources <ul style="list-style-type: none"> • Traffic flow modeling (mathematical and simulation models) • Traffic management: • Continuous monitoring and forecast of road status <ul style="list-style-type: none"> • Adaptive traffic management • Adaptive regulation of road transport and pedestrian traffic at pedestrian crossings <ul style="list-style-type: none"> • Giving priority to public and specialized transport without compromising personal transport <ul style="list-style-type: none"> • Optimization of the control algorithm • Operating a large set of algorithms suitable for any transport infrastructure
<p>5.2 photo and video recording System and video Analytics:</p>	<ul style="list-style-type: none"> • Automated collection of information about the parameters of car streams and the movement of individual cars from video streaming; <ul style="list-style-type: none"> • Real-time registration and recognition of the number of vehicles that fall within the viewing area, as well as their movement parameters and environmental indicators <ul style="list-style-type: none"> • Systematization and analytical processing of the received data <ul style="list-style-type: none"> • Identify and track the movement of vehicles with specified traffic parameters, including violators of traffic rules <ul style="list-style-type: none"> • Identification of alarming situations • Recording and predicting car traffic • Communicating the required information to users who have access rights <ul style="list-style-type: none"> • Online monitoring of environmental

<p>5.3 Lighting of pedestrian crossings:</p>	<ul style="list-style-type: none"> • Responding to the movement of drivers and pedestrians • Indication and lighting of pedestrian crossings depending on the response • Stop lighting after a road user leaves a certain range of the sensor • Solar charging
<p>5.4 Smart Parking</p>	<ul style="list-style-type: none"> • Automating the entry/exit of vehicles into the Parking space • Real-time tracking and consolidation of information about the status (presence or absence) of Parking spaces • Detection and notification of illegal Parking • Automatic notification of the number of available Parking spaces. Transmitting information to navigation systems, information boards, etc. • Automatic recognition of state registration marks and data export to the center • Automatic driver face recognition and data export to the center • Generating and uploading reports (statistics) • Billing for different types of visitors and Parking zones
<p>5.5 information System:</p>	<ul style="list-style-type: none"> • Audio and visual information for road users in real time • Broadcast news, reference, entertainment, and other content using geotargeting

5.6 dispatching System:

- Online vehicle location monitoring
- Displaying the location on an electronic map, presenting data on the status, parameters and routes of the vehicle in online mode
- Quick change of route tasks during route execution
- Prompt response when sending alarm messages when the alarm button is pressed, when peripheral control devices and sensors are triggered, if the vehicle leaves the specified zone, if the route assignment is violated, etc.
- Automated planning of route tasks, creation of control zones of any configuration (corridors, polygons, circles), assignment of route tasks to one or a group of vehicles (vehicles) manually or automatically according to the specified work schedule
- Control of exceeding the permissible speed and direction of movement of the vehicle
- Control of actual vehicle mileage and route task execution time

5.7 Electronic fare payment system:

- Automated control of passenger traffic with the ability to analyze the number and categories of passengers transported, routes and time of transportation
 - Variable and flexible tariff menu with the ability to create a large number of individual tariff plans.
 - The possibility of implementing an electronic ticket.
 - The ability to use all existing types of ticket carriers, including Bank cards with a transport application, transport contactless cards, social cards, universal electronic cards (UEC), and others
 - Support for all forms of cash and non-cash payment, including contactless Bank cards (PayPass, payWave), mobile phones (NFC) and SMS payment.
 - Support for multi-channel fare payment system and replenishment of e-wallets of transport cards (ticket offices, self-service terminals, mobile applications, Internet).
 - Fare registration and fare control can be performed by a passenger in a self-service format without the participation of a driver or conductor.

Appendix No. 6. Extraordinary incident.

Functionality of short - / medium-term initiatives:	
6.1 Intellistreet:	<ul style="list-style-type: none"> • Automatic lighting control • Alarm button • Audio / voice notification • Digital information panels • Environmental sensors (humidity, wind, temperature, gas)
6.2 video surveillance camera request Service:	<ul style="list-style-type: none"> • Electronic application • Recording a video file • Sending the requested video file
6.3 the Component of contact center in terms of security:	<ul style="list-style-type: none"> • Instant communication with the unified rescue service <ul style="list-style-type: none"> • Call registration and processing • The definition of priority call • SDK system • Two-way audio and video communication with the dispatcher <ul style="list-style-type: none"> • Automatic identification of the caller • Automatic determination of the location of the caller
6.4 Component of the situational and analytical center in terms of security.	<ul style="list-style-type: none"> • Data collection and analysis • Correlation and complex event processing <ul style="list-style-type: none"> • Continuous monitoring of objects and situations <ul style="list-style-type: none"> • Modeling of possible scenarios, forecasting • Assistance in making operational management decisions

Appendix No. 7. Business development.

Functionality of short - / medium-term initiatives:	
7.1 Smart contracts.	<ul style="list-style-type: none">• Perform safe and secure transaction without the participation of external intermediaries• Ensuring traceability, transparency, and irreversibility of transactions• Availability of information about the obligations of the parties and sanctions for their violation and automatic enforcement of all terms of the agreement
7.2 tourist flow management System and e-marketing:	<ul style="list-style-type: none">• Forecasting the future flow and attracting tourists based on the results of the analysis• Accounting for incoming and outgoing tourists, monitoring the congestion of places of tourist interest, analysis of the flow of tourists.• Profiling tourists by age, country, gender, etc.

<p>7.3 support for SMEs:</p>	<ul style="list-style-type: none"> • Registration of FEZ and industrial zone passports • Accounting, classification by type of economic activity of SMEs and their products; • Identifying and informing about inactive SMEs; • Consideration of applications for SME subsidies; • Consideration of applications for inclusion in the regional entrepreneurship support Map ; • Control over the intended use of allocated funds; • Monitoring the implementation of SME projects placed in the FEZ and the regional entrepreneurship support Map • Monitoring of ongoing projects included in the regional entrepreneurship support Map • Formation of promising projects • Registration and search for potential investors • Outdoor advertising management • Provision of unified reporting forms for SMEs and their acceptance • Analysis of the market regional products • Maintaining the NPA knowledge base
<p>7.4 Electronic visa:</p>	<ul style="list-style-type: none"> • Making a visa application • Payment of the fee for the visa stamp • Obtaining permission to enter the country
<p>7.5 Smart Ticket:</p>	<ul style="list-style-type: none"> • Publication of venues • Publishing events • The conclusion of the calendar of events • Creating and selling tickets • Offer digital or paper tickets • QR Reader for registering users for an event • Report on sales of tickets

7.6 Kazakhstan.Travel:

- Consolidation of information about all Kazakhstan places of tourist interest, tourist products and tour operators on one portal, with the ability to select the desired region, according to the criteria and types of tourism.
- Provision of accommodation services, selection of gastronomic places;
- Selection of guides and guides based on skills, experience, and knowledge of foreign languages.
- Selection of a virtual guide, with the ability to select famous personalities on the subject of the visited place of tourist interest;
- Formation of tourist routes , information about transport in the selected region, with the ability to purchase a single e-ticket for different types of transport;
- Mobile app and the info stand to duplicate the functions of this system

Annex 8. Construction of buildings.

Functionality of short - / medium-term initiatives:	
<p>8.1 Monitoring of construction and management of equity holders ' contracts:</p>	<ul style="list-style-type: none"> • Accounting for residential buildings under construction and information about the legality of their construction, data on the developer, General contractor, and engineering company for a specific construction object • Tracking the implementation of the project construction schedule • Maintaining a register of objects that have received permission to attract equity participation • Collection of copyright and technical supervision reports; • Operational accounting of equity agreements (including investment agreements) for each object; • Verification of the legality of the construction of the object • Checking the legality of the transaction (preventing double sales, selling a "non-existent " object) • Monitoring the intended use of equity holders ' funds • Receiving complaints about the quality and compliance with the terms of housing issuance • Evaluating and informing the public of the rating of developers, General contractors, and engineering companies.
<p>8.2 unified electronic trading platform:</p>	<ul style="list-style-type: none"> • Planning of the auctions the memory • Registration of potential buyers • Placing bids • Tracking the interest of potential buyers • General and personal information to the public about the electronic bidding of the storage unit • Search and provide data about the storage (accommodation, passport, estimated cost) on the GIS map • Acceptance of applications for participation in the auction • Receipt of payment • Preparation and conclusion of electronic contracts • Accounting for completed transactions • Report on results of trading

8.3 electronic library of NPA and consulting in the field of construction:

- NPA database and public services in the construction industry
- Development and publication of a memo on typical steps
- entrepreneur/ individual for the construction of a building or structure.
- International standards for design and construction of facilities
- Maintaining a database of frequently asked questions and answers, publishing explanations on the NPA
- Electronic catalogues of building codes
- Electronic catalogues of Snips
- Electronic catalogues of technological maps in construction, labor standards in construction, norms of costs of machines and mechanisms in construction and costs for transportation of construction materials, products and structures;
- Electronic catalog of regional prices for building materials, products and structures
- Database of new and innovative materials and their manufacturers
- Electronic register of standard projects of residential and public buildings intended for repeated implementation in subsequent construction
- Preparation and collection of proposals on problematic issues of architectural, urban planning and construction activities
- Public evaluation of NPA projects in the construction industry
- Publication of educational materials and training programs for training courses for the construction industry ITR
- Publication of the results of scientific research, experimental, technological and design work aimed at ensuring the reliability and safety of buildings and structures, their seismic resistance, as well as reducing socio-economic damage from possible earthquakes and other natural and man-made disasters

Annex 9. Accommodation in a clean city.

Functionality of short - / medium-term initiatives:	
9.1 monitoring the location of landfills:	<ul style="list-style-type: none"> • Geoinformation system • Satellite image of the earth's surface • Mapping • Data collection and processing
9.2 Intelligent sorting of waste:	<ul style="list-style-type: none"> • Automated garbage sorting line • Diagnostics and analysis of garbage composition • Sort of garbage • Briquetting for further processing
9.3 use of renewable energy sources:	Increasing the share of renewable energy sources (wind, hydro, solar, bioenergy, etc.).
9.4 water Treatment facilities:	<ul style="list-style-type: none"> • Water treatment systems and equipment for wastewater treatment and pumping • Mechanical cleaning • Complete biological wastewater treatment. Drains are cleaned in two-stage aerotanks with extended aeration and in secondary settling tanks • Additional cleaning, which is carried out on self-washing sand filters • UV disinfection
9.5 secondary use:	<ul style="list-style-type: none"> • Development/launch of processing plants • Secondary product production
9.6 CO2 disposal Service:	<ul style="list-style-type: none"> • Installation of trapping plants on pipes of industrial enterprises • CO2 capture and transport • Disposal of CO2 in reservoirs • Injection of CO2 into oil wells • Dilution of the oil (allow to increase production up to 15%)
9.7 Thermal waste disposal:	<ul style="list-style-type: none"> • Launch of waste incineration plants • Installing smart filters • Incineration of sorted and non-recyclable waste • Heat generation

Functionality of short - / medium-term initiatives:	
10.1 the Mechanism of control of feed:	<ul style="list-style-type: none"> • Preparation of feed balance for livestock; • Use technology for dosing of feed; • Monitoring of stock feed; • Notifying the farmer of feed residues for decision-making; • Automatic preparation of the application for purchase of fodder
10.2 Remote monitoring of livestock health:	<ul style="list-style-type: none"> • Real-time transmission of data on the state of animals; • Collect information about the behavior of each cattle: grazing, walking in the heat, pregnancy, illness, bull efficiency, calf delivery, calf conditions, location / route / early warning of theft or illness). <ul style="list-style-type: none"> • Notification of the farmer for prompt response and diagnostics • Transfer of information on the state of the animal in the coli MA RK; • Getting information about planned veterinary activities.
10.3 Automatic conclusion of animal examination:	Automatic generation and electronic submission of the conclusion of the laboratory of animal meat research after animal slaughter, with the possibility of providing it to other systems.
10.4 monitoring System soil quality:	<ul style="list-style-type: none"> • Monitoring of soil salinity and moisture; • Control of the metered irrigation mechanism; • Compact laboratories for soil sample analysis (2-hour analysis result), including drones; • Assessment of the soil bonus point; • Certification of the land plot; • Monitoring of crop rotation; • Monitoring of measures to restore soil fertility; • Transfer of information to the farmer and the state system.

<p>10.5 raw material safety monitoring Sensors:</p>	<ul style="list-style-type: none"> • Full climate control in storage facilities; • Storage temperature and humidity management; • Monitoring the level of carbon dioxide in rooms and containers; • Notifications to the farmer about the status of products.
<p>10.6 crop management System:</p>	<ul style="list-style-type: none"> • Keeping records of harvested crops; • Control over the unloading of grain crops; • Determination of the levels of profitability of space-based data; • Transmitting information to the farmer.
<p>10.7 agricultural machinery monitoring System (GPS):</p>	<ul style="list-style-type: none"> • Accounting for fuel consumption and other technical liquids; • Tracking the working hours of drivers and tractor mechanisms; • Determine the location of the tractor using GLONASS / GPS; • Monitoring of performance, operating modes, and condition of suspension mechanisms.