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PRINCIPLES OF FORMATION OF «SMART CITY»

The article considers the basics of the technology of Smart City. The development of «Smart Cities» is associated with a comprehensive study of the general system of settlements. The purpose of the study is the use of the system of indicators for the objective assessment of the territory, as well as the definition of the impact of each part on the overall assessment of the functioning of the «Smart City». The leading method of research is a comparative analysis of international ratings, surveys of experts and a comprehensive study of indicators. The article analyzes the work of specialists working in the field of research «Smart Cities» and technology. The purpose of this article, based on a wide range of available sources, is by comparing the most developed smart cities in the world, to express the general elements and principles of forming a smart city. For this purpose, a retrospective analysis of the transformation of the concept of «smart city» was conducted. performed and the main characteristics of the modern interpretation of the intelligent city are distinguished:

Keywords: Smart City, Smart Home, IOT, Energy, ICT.

Introduction

The creation of a smart city (the name comes from the English phrase Smart City) is a holistic scheme for connecting communication technologies and information with the Internet of Things, which helps to facilitate the management of urban processes and improve the concept of life for citizens.

The main tasks of a smart city:

- 1) monitoring and bringing up-to-date information to managers;
- 2) creating and maintaining feedback between management and residents;
- 3) putting in order the general situation.

One of the most important advantages of this system is an increase in the standard of living, convenience, and also requires a minimum of costs that arise during the entire work process. Achieving these positive results is a consequence of automated work that does not require the use of analytical skills.

The concept of a «Smart City» has arisen relatively recently, so it does not yet have a definite meaning. According to experts, the management mechanism is information about residents.

The smart city is constantly improving in its work, since the receipt and processing of data has become an ongoing process. With the help of built-in sensors, the process of receiving data from the population and electronic devices takes place. The study of the obtained information ends with optimization, which resolves ineffective situations.

Currently, in solving the problems of modernizing the economy and innovative development of Kazakhstan, information, knowledge, the widespread use of information and communication technologies, solving the problems of optimal use of natural resources, ecology, as well as the formation of a social environment are used.

Currently, there are various types of control systems Smart home, providing convenient use, while distinguishing stationary and remote control. Distinctive feature stationary is a relatively fixed position of the source control, because of which control is possible from one point of the house or apartment using wall panels or a personal computer; equipment remote type allows you to control your smart home from anywhere planets where there is access to the Internet or cellular communications.

Let's characterize the main modern features (functions) smart home, such as energy efficiency, security, controlled lighting and climate control. Energy efficiency. The energy saving function in the «Smart Home» is one of the main ones. In modern homes, various electrical equipment that consumes a significant amount electricity, while the networks often do not withstand high loads.

The energy management function makes it possible to organize the system priorities: by testing all connected equipment and discovering, that the reserve is exhausting its capabilities, it will turn off the device that was the lowest priority is assigned .

Energy management function allows you to significantly reduce energy costs, make a house energy efficient. It is also significant that with remote control the owner will always be able to virtually visit his own house and set up operation of energy consumption sources.

The energy saving function is somehow connected practically with all other subsystems of the engineering infrastructure of the «smart home»: with climate control, lighting, audio, video equipment, and therefore, it allows to increase the energy efficiency of the house in the complex.

Security. Home security is one of the historically the established imperatives. All modern security systems in «Smart Home» is built on the implementation of three essential functions – access control, security and fire alarms and video

surveillance, – what allows you to organize comprehensive protection of the building, as well as the adjacent him territory [4]. So, over the control of unauthorized intrusions two systems respond simultaneously – motion control and CCTV. Security systems are spreading, Integrated with TV, audio and video systems, with power supply of the building and territory.

The smart home can simulate the presence of the owners, which ensures fundamentally different quality of safety. To simulate according to the specified the scenario in the rooms periodically lights up and turns off the light, music begins to sound, etc., thereby creating the effect of the presence of the owners at home.

Lighting. Controlled lighting can significantly increase comfort and safety of living in the house. This is due to the possibility entering into the memory of the home control system of various lighting scenarios, that meet the wishes and mood of users. Pre-programmed scenarios control each light source in in accordance with the given algorithm, and, as in the interior as a whole, including every room in the house and outside. Solutions based on lighting control in the «smart home» are unusually diverse, starting from automatically adjusting the light in a certain place when any event and ending with remote control of light accompaniment of the event.

Climate control. Climate control helps create the most comfortable physical environment in a smart home. The idea of a climate control implies centralized heating control, air conditioning, supply and exhaust ventilation to maintain the most comfortable conditions in the premises, a given temperature level and humidity, fresh air supply. So, automation of heating allows control the microclimate not only throughout the house, but also to install individual parameters for each room, automatically adjust the operation of the equipment when the external temperature changes background, taking into account the presence or absence of the hosts. In addition, the system «Smart Home» allows you to remotely control heating and control serviceability of equipment.

Material and methods

Foreign and domestic articles about smart cities were analyzed. And also an analysis of Russian and Kazakhstan smart cities was carried out and the main aspects for their formation were identified.

Results and discussion

Some researchers believe that a «Smart City» cannot consist only of good infrastructure and sustainable energy supply, as well as human capital, contributions and citizen feedback. Together with the above studies, the rest of the articles are related to «Smart City». So, Pascual Berrone insists that logistics, transportation costs, travel time, human capital, investment activity and much more depend on this parameter. In this regard, a new approach to smart urban planning should target compact cities, well connected internally and with each other with

convenient access of citizens to all segments of the population. E. Dolgikh traces the relationship between the concept of «Smart City» and sustainable development that insists that it is unwise to run a city without «sustainability», because any decision made must take into account both social, economic and environmental benefits in the short and long term.

The vast majority of experts and specialists believes that the near future belongs to smart cities, smart homes and smart things. Now is the time for a thorough qualitative and quantitative analysis in order to modernization of urban infrastructure, taking into account the criteria of smart cities. Including the introduction of the term «smart city» into business circulation makes it necessary to specify it.

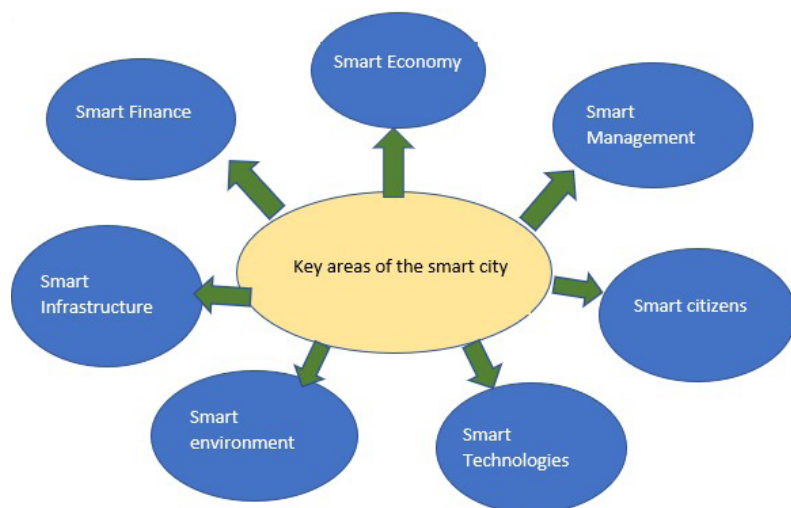
The term «smart city» was introduced relatively recently, and the unambiguous interpretation of this there is still no clue. The most common are summarized in table. 1.

Table 1 – Scientists' approaches to the definition of a «Smart City»

Author	Definition
Ablameiko M. Ablameiko S.	The use of modern technologies in urban spaces with active participation of citizens in these processes.
Author	Definition
Ivanov Z. Z. Ivanova Z. SH. Nikaeva R. M.	A city that uses communication and information technologies in the to increase the efficiency of resource use, improve the standard of living nor the quality of service for the city's population, as well as reducing the level of impact environmental impact
Krivenko A. A. Moor B. K.	The use of modern technologies in urban spaces with active participation of citizens in these processes
Stroev P. V. Reshetnikov S. B.	The modern concept of integrating information and communication technologies for urban property management in order to improve quality life of the population with the help of urban informatics technology, which increases efficiency of service and satisfaction of the needs of residents on the basis of three types of basic networks: communications, the Internet and the «Internet of Things» (Internet of Things, IoT)

Conventionally, three types of smart cities can be distinguished in Russia. The first includes those cities in which separate systems of the digital city are implemented, but a unified development strategy is similar systems have not yet been developed. The second stage of smart city development is the integration stage disparate intelligent city management systems into a single manageable system, for how the synergistic effect is achieved. New cities can be distinguished into a

separate cities where smart principles of organizing the urban environment are taken into account even at the design and construction stage. In Russia, among such examples are Innopolis in the Republic of Tatarstan and Innograd Skolkovo. It should be noted that in December 2017, a unique tool for smart cities NIITS. This research work was carried out by AO. National Research Institute of Technology and Communications. NIITS managed to create the main indicators to identify the level of development of smart city technologies in Russia cities. The indicators give a clear idea of which direction the city is going to take when developing a smart city strategy.



Picture 1 – Key areas of the «Smart City»

According to the innovation cities rating compiled by the Australian global innovation agency, the top 3 in the list of smart cities in the world are occupied by London, New York and Tokyo. In Kazakhstan, the authorities of Astana, Almaty and Shymkent have been actively involved in the implementation of Smart City technology for several years. «Smart cities» direction targeted at introduction of the smart city concept in the cities of Kazakhstan with the aim to increase quality of life and security of city dwellers is implemented in Kazakhstan within the framework of the state programme «Digital Kazakhstan». In 2018 the implementation of the projects Smart Astana and Smart Almaty was begun, pilot projects for testing of individual smart city elements in 17 country regions were launched, as well as a pilot Robopolis project launch was performed on the territory of EXPO.

Thus, it is planned to polish the environmental smart city directions in the Akmola and East Kazakhstan regions.

Currently the following stages of introducing a smart city in the cities of Kazakhstan are distinguished:

- 2017 – development of the Smart City concept;
- 2018 – introduction of universal solutions (cloud EDMS, paper free, etc.);
- 2019–2020 – introduction of industry-specific solutions (telemedicine, school management systems, etc.);
- 2021–2023 – interaction according to the principle of joint innovations.

In Astana the project «System of Complex Life Support» has been implemented since 2012. Part of these directions refer to the sphere of environmental protection. Segments of creation of a data processing centre, operational management centre and intelligent contact centre are functioning within the framework of the project. Initiatives in the direction of «Smart Street Lighting» [35].

In the city of Akkol of the Akmola Region a pilot project for the introduction of modern technologies Smart City Smart Aqkol [36], in which intelligent systems must ensure efficient functioning of city services, security and comfort of residents, is being implemented.

Kazakhtelecom JSC, where the data processing centre has been created, has become its infrastructure operator. The centre implements data collection from all systems of video surveillance, environmental monitoring, control and accounting of energy resources, road traffic management, fire safety operating in the city. Infrastructure of the situation centre allows organizing inter-agency interaction, demonstration of solutions for tactical and strategical city management, including work of public utility companies, aggregation of reliable and timely data about city resources and security.

Conclusion

Smart City elements in the cities of Russia and Kazakhstan are most common in the field of transport system, utilities, power, industry and security.

The level of development of Smart City technologies in selected cities of Russia and Kazakhstan at the moment is fragmented being represented by local solutions or individual subsystems. Among the key reasons the following can be mentioned:

- An insufficient level of cities' funding for the implementation of development projects, including due to cities' budgeting specifics,
- An insufficient level or lack of a legal and regulatory framework, regulatory procedures, requirements, opportunity for the introduction of digital technologies in the urban economy in relation to several issues,
- Too high depreciation rate of infrastructure, which does not allow for active introduction of new technologies and digital solutions within the framework of the

Smart City concept,

– Low level of readiness of technologies for the use in the process of introduction of Smart City elements enabling for efficient integration and processing of data of different urban economy sectors;

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«SMART CITY» ҚАЛЫПТАСТЫРУ ПРИНЦИПТЕРІ

Мақалада *Smart City* технологиясының негіздері қарастырылады. «Ақылды қалаларды» дамыту елді мекендердің жалпы жүйесін кешенді зерттеумен байланысты. Зерттеудің мақсаты – аумақты объективті бағалау үшін көрсеткіштер жүйесін пайдалану, сондай-ақ әрбір бөліктің «Ақылды қала» жұмыс істеуін жалпы бағалауға әсерін анықтау. Зерттеудің жетекшісі әдісі – халықаралық рейтингтерді салыстырмалы талдау, сарапшылар сауалнамасы және көрсеткіштерді жан-жақты зерттеу. Мақалада «Ақылды қалалар» мен технологияларды зерттеу саласында жұмыс істейтін мамандардың жұмысы талданады. Қол жетімді дереккөздердің кең ауқымына негізделген бұл мақаланың мақсаты - әлемдегі ең дамыған смарт қалаларды салыстыру, ақылды қаланы қалыптастырудың жалпы элементтері мен принциптерін көрсету. Осы мақсатта «ақылды қала» тұжырымдамасының трансформациясына ретроспективті талдау жасалды. орындалды және зияткерлік қаланың заманауи интерпретациясының негізгі сипаттамалары ерекшеленеді.

Кілтті сөздер: *Smart City, Smart Home, IOT, Energy, ACT.*

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ПРИНЦИПЫ ФОРМИРОВАНИЯ «SMART CITY»

В статье рассматриваются основы технологии *Smart City*. Развитие «Умных городов» связано с комплексным изучением общей системы населенных пунктов. Целью исследования является использование системы показателей для объективной оценки территории, а также определение влияния каждой части на общую оценку функционирования «Умного города». Ведущий метод исследования – сравнительный анализ международных рейтингов,

опросы экспертов и комплексное изучение показателей. В статье анализируется работа специалистов, работающих в области исследований «Умные города» и технологий. Целью этой статьи, основанной на широком спектре доступных источников, является сравнение наиболее развитых умных городов в мире, чтобы выразить общие элементы и принципы формирования умного города. Для этого был проведен ретроспективный анализ трансформации понятия «Умный город». Выполнены и выделены основные характеристики современной интерпретации интеллектуального города.

Ключевые слова: умный город, умный дом, интернет вещей, энергия, ИКТ.

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