INTEGRATION OF INFORMATION COMMUNICATION TECHNOLOGIES INTO PUBLIC ADMINISTRATION, APPLICATION AND IMPORTANCE OF INFORMATION TECHNOLOGIES AND DIGITALIZATION PROCESS IN THE AZERBAIJAN RAILWAY SECTOR

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The article discusses the integration of Information Communication Technologies into public administration, the application and importance of information technologies and the digitalization process in the Azerbaijani railway sector. The possibilities of using the capabilities of modern Information Communication Technologies to save customers' time by making information more accurate, creating conditions for faster and more accurate data transmission as a result of cross-country integration, correct and timely planning, online tracking of trains, etc., and analyzing the directions for more convenient use of the Internet by passengers and increasing customer satisfaction, and achieving functionality rules related to technological principles, have been investigated.

Keywords: Information Communication Technologies, railway sector, digitalization, infrastructure, integration.

INTRODUCTION

The use of digital technologies in transport management and the electronicization of transport infrastructure are among the main tasks facing the countries of the globalized world in the modern era. This can also be applied to Azerbaijan and its railway sector, which has become the center of a number of international transport corridors by taking advantage of its favorable geopolitical position.

Let us analyze the extent to which Azerbaijan Railways responds to modernity and innovative challenges and the extent to which information and communication technologies have penetrated this sector.

Studies show that the introduction of online ticket sales is one of the factors that directly leads to an increase in customer satisfaction. Thus, the customer can purchase tickets anywhere, at any time, without having to come to the box office. As can be seen, in this case, in addition to saving time, the passenger can also log in to his personal account and see the transactions and history he has previously made. This process creates economic efficiency, that is, in this case, we save paper consumption and at the same time protect nature.

The current era of a rapidly changing world is characterized by the development of Information Communication Technologies (ICT). ICT has already become one of the main factors affecting the development of society and has widely spread to all areas surrounding us.

Of course, the application of new technologies is not going smoothly all over the world. This depends more on the pace of development of each country and its available internal capabilities. At the same time, the extent to which ICT is applied depends on indicators such as the level of education of a country, intellectual potential, the value given to human capital, etc. This means the widespread use of artificial intelligence, automation of production, robotization, and the application of digital technologies in all sectors of the economy. In general, the new industrial revolution leads to the use of the newest, different and more convenient technological infrastructure in all sectors related to digitalization.

In the last decade, it has been observed that the role of electronic commerce in the world market has increased. In general, now the ability of countries to compete economically depends significantly on their effective use of information and communication technologies. Even countries have taken consistent steps to develop this area, as a result of which they have made it one of the priorities of state policy.

Currently, the field of information and communication technologies, which plays an important role in the socio-economic life of Azerbaijan, differs in terms of its level of development. Continuous measures are being taken in our country to develop and strengthen innovation-oriented activities in this field. If we make a generalization, we will see that the state is constantly carrying out reforms to improve the application of modern technologies and build a more informative society. The main directions of these reforms should be ensured by the effective implementation of economic measures. The main directions include: increasing state support for the development of the ICT field, studying and applying the experiences of other countries in organizing the information society and economy, expanding entrepreneurial activity in this field, allocating stimulating funds to entities engaged in ICT innovation activities, as well as assistance in the development of various new technological tools and mechanisms, etc. Most importantly, in order to properly implement important measures planned in the ICT field and increase the efficiency of activities, it is imperative to increase the level of training of personnel with high theoretical knowledge and certain experience [1].

The automation of processes in the fields of freight transportation, passenger transportation, traffic safety, human resources, finance, logistics and other

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areas on the railway continues. This, in turn, creates conditions for the automation of freight and passenger transportation processes, helping to make these processes more transparent, fast and accurate.

It should be noted that the digital transformation of railway transportation is considered one of the main criteria for ensuring the speed, flexibility and time standards of transportation delivery: The application of technologies in the digitalization of transport and railway transportation is one of the leading trends in the transport sector worldwide.

Digital transformation in railway transportation combines several important elements, including train management, information systems, navigation support, automated organization of movements, and others. One of the main indicators of digitalization here is the application of digital technologies for monitoring and managing train movements. In addition to automating processes, the transformation process also involves the digital organization of services provided on the railway.

According to expert opinions, as a result of the transformation, delays are regulated, and customer satisfaction and, thus, the profitability of the organization significantly increase as a result of convenient, desirable service and timely transportation operations. One of the main indicators of the digitalization of railways is the ability of customers to access the desired service from anywhere in 24/7 mode. At the same time, the use of advanced digital technologies in the organization of transport in order to protect customer data requires a high level of cybersecurity and protection from cyber threats.

The successful implementation of any technological innovations applied to railways should be directly reflected in the service provided to consumers. We are not talking only about passenger transportation, we are talking about digital management, which is also an issue that directly applies to freight transportation. So, today the most important issue is the implementation of control over cargo. That is, the parties sending, transporting and receiving the cargo do not necessarily have to be a certain state. These can also be transport companies of several states. If the process of transporting these cargoes takes place by rail, then of course all participants in this chain are interested in being able to establish control over the cargo in an advanced way. This at least creates conditions for the timely fulfillment of the obligations assumed by all parties and for planning work. That is, they can monitor in real time the location and stage of the transported cargo. This is also possible as a result of the application of digital technologies, including the use of electronic locks (electronic seals) equipped with a GPS navigation system.

Fig. 1. Integration of Information Communication Technologies in public administration.

Information struggle and the first step from war to technological innovation

Military clashes and wars taking place in the modern era give reason to say that superiority over the other side is achieved not only by the power of arms, but also by the power of information and technological advantages. The weak side in this area, no matter how strong it is in other respects, may face a heavy defeat. Information collection, seizure, operational response and other such processes create a great advantage in the information war waged with the enemy. During the 44-day Patriotic War, the Azerbaijani people were able to have their say not only on the front, but also in the information war, using the capabilities of ICT. Also, after the victorious Second Karabakh War, many works have been started in our lands liberated from occupation on a technological basis to implement urban planning. The basis of the reconstruction work is the "Smart Village" project, rich in technological capabilities. The main goal of implementing this project is to create conditions for people in rural areas so that they have easy access to all the services that the population can get in the city. At the same time, people in the village should be given the opportunity to earn more income and get employed. The third point is to create full conditions for ensuring access to public services for rural residents. That is, in the "Smart Village" concept, the difference between rural and urban areas in terms of service, income and access to public services is virtually eliminated.

"Smart agriculture" is a new concept that uses modern information and communication technologies to increase the quantity and quality of products while optimizing the human labor required for production.

The project, which will be implemented in 5 (five) components, consists of the areas of housing, production, social services, "smart agriculture" and alternative energy. Modern schools, kindergartens, polyclinics and electronic management centers will be built in these villages, and tourism infrastructure will be formed. All residential buildings, social facilities, administrative and public catering buildings, and the process of processing and production of agricultural products will be provided with alternative energy sources. According to this concept, the electronization of the process strengthens production capabilities. Thus, it is an automated system, controlled from a single center and where the entire platform is jointly managed, from the irrigation system to the cultivation of land and the collection of products, and also involves the application of the most advanced technologies and technotransfers. The integration of this system into other areas of rural infrastructure - alternative energy sources and a modern transportation system - will complete the concept of the "Smart Village".

All the listed services are an indicator of the new achievements we have made in digitalization and electronic services in our country. The reforms carried out, important programs implemented by the state and private sector form an important basis for building a digital economy. Azerbaijan, which has the status of the Energy and Transport Center of the region, has the opportunity to build a digital economy in a short time and become the Digital Center of the region by using existing resources and advanced world experience in the new era.

The digitalization of railways offers a wide range of potential services and applications in the short and medium term. There are new solutions such as passenger and freight information services, video surveillance, smart infrastructure, asset monitoring, signaling systems and automated train management systems. The overall goal is to increase the efficiency of operations and provide more efficient service to the customer.

The leadership in the supply and industrial technologies sector focuses on research and ICT with industry.

Provides financial opportunities for innovative technologies related to transport, digital infrastructure and technologies such as cybersecurity and network protection. Infrastructure is an instrument offering loans to finance the digital transformation of the mobility industry, which will build on the current European Fund for Strategic Investments (EFSI) and whose duration and capacity have been increased to €500 billion by the end of 2020.

Digitalisation requires an infrastructure that is responsive to new innovative technologies, which is why it is essential to lay fibre optic lines along the railway infrastructure. In this case, the internal railway network is strengthened, which enables the use of software tools, process automation, as well as a platform for IT equipment.

In recent years, thanks to digitalization, railway companies have significantly expanded the range of services they can offer their passengers: more informative websites, mobile booking, ticketing, timetables and real-time information, apps that provide advance travel planning and a combination of information and entertainment services on board (often referred to as infotainment).

The digitalization of booking and ticketing has many advantages. On the one hand, passengers have easier access to their travel details, which can be stored electronically on their smartphones or tablets. On the other hand, the costs of providing tickets are significantly reduced for operators, as they do not have to produce individual one-off tickets for each journey.

"BIBO" technology

"BIBO" technology offers efficiency in the formation of an air pollution control system, inadequate safety and management of hazardous air pollutants. Its innovative design allows for the safe replacement of contaminated filters without compromising the integrity of the controlled environment.

Figure 1 – The 'Be in/be out' scheme

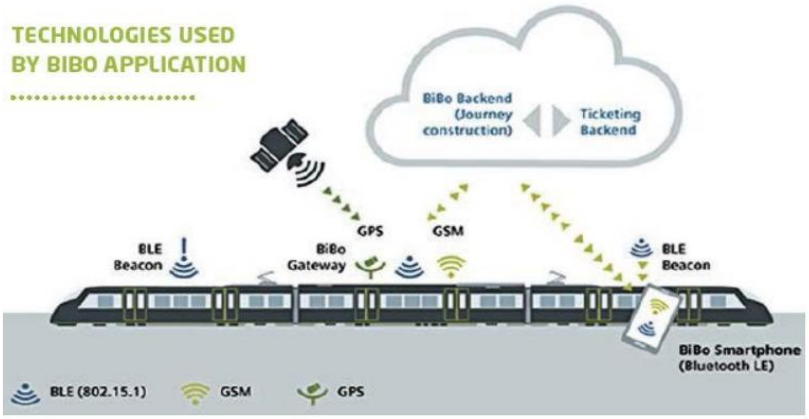

Fig. 2. Technologies used by the “BIBO” application.

Why is "BIBO" technology so important for air pollution control?

"BIBO" technology plays a significant role in air pollution control by overcoming one of the most critical challenges in maintaining a clean air environment: the safe replacement of contaminated filters. Traditional filter replacement methods often pose risks of exposure to harmful particles, but "BIBO" eliminates this concern.

In industries where air quality is at its highest, such as pharmaceuticals, biotechnology and nuclear facilities, even minor contamination can lead to serious consequences. "BIBO" systems ensure that the integrity of controlled environments is never compromised during filter replacements [2].

In addition, rail operators can use the stored travel data to assess travel patterns and then modify existing ones.

Future directions in information systems integration

Integration of government information systems is a strategic initiative that can transform public sector operations, rather than a technical exercise. The development of integrated systems, information sharing, and cooperation and coordination between government agencies would lead to increased efficiency, transparency, and service engagement [3, pg. 1-8].

The approaches and methods described – data integration techniques, APIs and middleware, and cloud-based solutions – can be applied in a variety of environments, as demonstrated by real-world examples from Estonia, India, the UK, the US, and Singapore.

The benefits of integration are self-evident: governments can align their processes across jurisdictions to reduce duplication and costs, while increasing transparency and making better decisions based on good data. However, the benefits come with challenges that need to be carefully managed. Outdated systems and data security concerns, not to mention resistance to any other change, are big reasons why it doesn't work.

These challenges must be addressed by governments through robust security measures, strategic change management, and phased implementation.

While the transformation brought about by the integration of information systems is already impacting the public sector, a number of technologies and trends are noteworthy that could drive it even further.

The combination of secure and decentralized blockchain is likely to be key ingredients in defining the future of government systems integration. Blockchain enables the exchange of information between different government agencies, providing a high level of transparency and security that is often lacking in traditional systems.

Principles for Governments' Adoption of Different Cloud Models

Public cloud. Governments use cloud services provided by third-party vendors such as Amazon Web Services (AVS) or Microsoft Azure (MA). Public clouds are cost-effective, but can raise concerns about data sovereignty and security.

Private cloud. Some governments choose private clouds, which offer greater control over data security and compliance, despite the higher cost.

Hybrid cloud. Hybrid cloud solutions combine public and private cloud environments, offering a balance between security and agility. This model allows governments to store sensitive data in private clouds while using public clouds for less sensitive applications.

Cloud platforms also facilitate information sharing and collaboration among government agencies, as cloud services provide centralized access to data and applications from anywhere, enabling real-time decision-making and resource allocation.

Service-Oriented Architecture (SOA)

Service-Oriented Architecture (SOA) is a design paradigm that encourages the development of modular services that can be reused across applications and systems. Each service performs a specific function—for example, capturing citizen records or processing payments—and can be used by other services through standard protocols [4, pg. 243-265].

Table 1.

A table of benefits and challenges of cloud platforms in Azerbaijan based on their methods of facilitating information exchange and collaboration between government agencies, enabling real-time decision-making and resource allocation

Serial number	Method used	Benefits	Challenges
1.	Service-Oriented Architecture (SOA)	Seamless real-time information exchange between government agencies, increasing transparency, reducing administrative costs	Ensuring security and data confidentiality in inter-agency information exchange
2.	Amazon Web Services (AWS)	Efficient service delivery, reduction of fraud in social assistance programs, simplified identity verification	Legal and regulatory issues related to data privacy and security
3.	Microsoft Azure (MA)	A unified approach to public service management, real-time monitoring and response, and data-driven decision-making	Managing the interaction of various systems, ensuring cybersecurity in a highly integrated environment

SOA is particularly useful for government integration because it encourages reuse. Services created for one agency, such as a service that processes visa applications, can be reused by other agencies (such as customs and border protection) without the need for duplication. SOA enables governments to adapt to new technologies, such as cloud computing, by integrating services from different platforms [5, pg. 1-8].

These methods and approaches provide governments with the tools to achieve robust, scalable, and secure integration of their information systems. By combining data integration methods – AVX, MA, and XYA – governments can increase their operational efficiency, reduce redundancies, and provide citizens with more transparent and accessible services.

As the scale and complexity of integrated systems continue to grow, so does the potential for cyber threats. Additional research and development channels must be established to strengthen future cybersecurity measures, particularly in the areas of identity management, data encryption, and threat detection. Governments therefore have a responsibility to invest in state-of-the-art cybersecurity technologies that will protect them from the risks associated with integrated systems, and to train their staff to use and manage these technologies. The integration of government information systems has transformed the delivery of public services. But the journey has only just begun.

Governments must remain agile and innovative, embracing new models and integration paths as they move with newer innovations in technology. By addressing some key challenges and leveraging future technologies, governments can create a well-integrated system that not only improves efficiency within their own homes, but also engages and gains the trust of citizens.

The integration of government information systems has a bright future, and through continued innovation and collaboration, governments will be able to meet the growing demands of citizens in the digital age while making their services secure, efficient, and transparent.

CONCLUSION

Against the background of the above-mentioned processes and technological aspects regarding the integration of Information Communication Technologies into public administration, the application and importance of information technologies and digitalization in the railway sector of Azerbaijan, it can be concluded that it is not necessary to contact passengers traveling on a train within or outside the country via mobile communication in order to obtain information about them. Thus, through a special application downloaded to the phone, it is possible to obtain detailed information in real time about which train the person is on, which part of the route, and when he will arrive at his destination. In general, the launch of any applications intended to improve all relations, whether electronic ticket sales or other services provided in the railway sector, should result in ensuring citizen satisfaction. At this time, the establishment of an effective feedback system on a single platform between the service provider and consumers, which is considered an important source for improving services, is of great importance. I believe that increasing the level of digitalization will help optimize the work process on railways, save money and time, and increase the competitive advantages and throughput of railway infrastructure. All of this ultimately serves to increase the quality of service and, thereby, consumer satisfaction.

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