

To the 100th anniversary of Academician V.M. Glushkov

CONTINUATION OF ACADEMICIAN V.M. GLUSHKOV WORK ON THE DEVELOPMENT OF MODERN INFORMATION & COMMUNICATION TECHNOLOGIES

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Background. The distinguished contribution of Academician V.M. Glushkov to the theory and practice of automated control systems' national-wide creation makes his achievements as the scientist and science organizer to be relevant and important. The world's scientific community celebrates his 100th anniversary this year.

Results. The significant achievements, prospective developments, recognized scientific schools of Igor Sikorsky Kyiv Polytechnic Institute in the most important areas of fundamental and applied scientific research in information technologies were noted. The leader of the current and advanced developments and achievements implementation in the information and telecommunication technology area in our university is ER ITS. That indicates the succession of generations, the proven foundation of the brilliant ideas' implementation, that are bequeathed to us by Academician V.M. Glushkov.

It is impossible to overestimate the legacy that Academician V.M. Glushkov left in national and international science and technology [1]. The world scientific community celebrates his 100th anniversary this year. According to the fair statement of Academician I.V. Sergiyenko [2-3], nowadays implementing the national-wide informatization program, we clearly see that V.M. Glushkov much earlier than most of his colleagues was capable to evaluate the importance and prospects of utilizing the computer-aided systems of control and simulation in various economy areas of the country. The outstanding contribution to the theory and practice of the automated national-wide control systems creation makes the achievements of the scientist and science organizer to be relevant and important.

Under his management, in 1966, the first personal electronic computing machine (PC) "MIR-1" as a specialized computing machine (a prototype of a computer) for engineering calculations was developed [1, 3].

In 1973, V.M. Glushkov supported and developed the revolutionary idea of creating a computer packet-switched network based on radio channels that enabled technical feasibility

to connect mainframe computers and remote user terminals on an equal basis over an area of tens of square kilometres [4].

Nowadays, the telecommunication industry is experiencing an era of rapid evolution, the potential of which has been accumulating over the last three decades. That evolution manifests itself in several important directions.

The tendency to merge previously independent technologies: information and communication should be considered as the main direction among the three mentioned above.

A truly prophetic statement belongs to academician V.M. Glushkov (1982): "Paperless informatics has been developing at an exceptionally fast pace <...>. The merging of telecommunications with machine informatics (implemented in computer networks and computing service centers with remote terminals) has already led to the emergence of a new term telematics. The most enthusiastic apologists of telematics predict that the day is not yond when ordinary books, newspapers and magazines will disappear. Instead, each person will carry an "electronic" notebook, which is a combination of a flat panel display and a miniature radio

transmitter. By typing the required code on the keyboard of this notebook, you are able (being located anywhere on our planet) to call up any texts, images (including dynamic ones) from giant computer databases connected over the network, that will replace not only contemporary books, magazines, and newspapers, but contemporary television as well. The progress of electronics industry, machine informatics and telematics is happening at such a rapid pace that fantasy in this field becomes reality literally in front of our eyes" [5].

In current times, the term "telematics" (telecommunications + informatics) is most frequently used as "infocommunications", which stands for the construction of informatics + telecommunications.

Direct continuation of the works started by Academician V.M. Glushkov are the modern information communication strategies and technologies related to the implementation of the global concept of information society development in Ukraine [6-7].

According to the Okinawa Charter of the Global Information Society [8], information and communication technologies (ICT) are one of the most essential factors influencing the formation of society in the twenty-first century. Their revolutionary impact affects the way people live, their education and work, and the interaction between government and civil society.

Everyone should have access to information and communication networks.

A key component of this strategy must be the progressive movement towards universal access for all. Therefore, the Internet as the pinnacle of "paperless informatics" has become the most dynamically developed branch of modern communications.

Nowadays, the Internet has turned into one of the essentials of human life. Currently, it is widely available on smartphones and other mobile devices.

In 2022 the Internet was used predominantly for communicating with other people, sending/receiving e-mails (77%), exchanging instant messages (72%), searching for information about goods and services (70%), making voice or video calls (66 %), and watching streaming TV or online video (65%) [9].

At the EU level in 2022, 24% accessed personal health records online, and another 18% used the Internet to access other healthcare services via a website or application instead of going to a hospital or visiting a private doctor.

Ukraine, following world trends, develops information and communication technologies, considering the latest world achievements. The structure of revenues generated by telecommunications services provided in Ukraine corresponds to global trends (Fig. 1) [10].

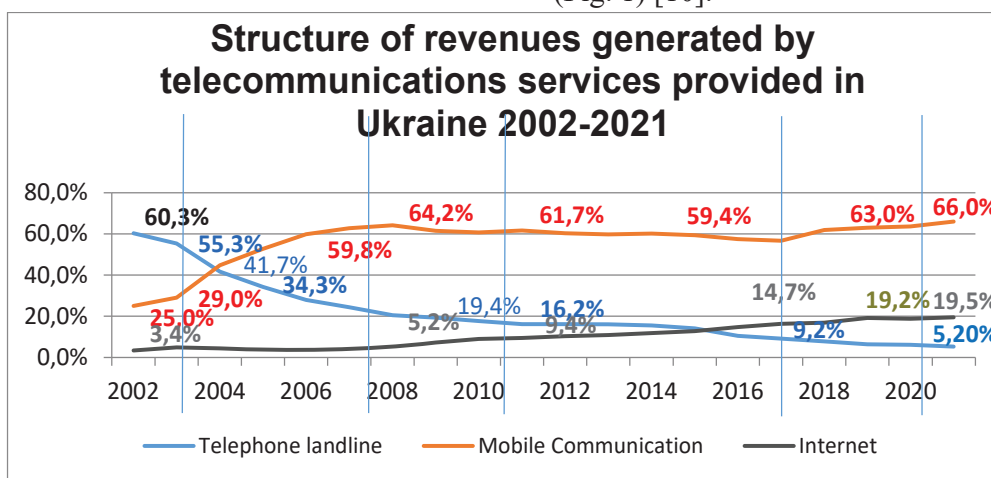


Fig. 1. Structure of revenues generated by telecommunications services provided in Ukraine 2002-2021

According to the number of Internet users, Ukraine occupies a worthy place in the world [11] (Table 1), in particular, in conformity

with the percentage of users to the total population.

Table 1. World statistics of Internet users as of May 2022.

Country	Internet users, million	Percent of the population
China	1010,7	69,8
India	833,7	59,5
USA	312,3	93,4
Japan	118,6	93,3
Germany	79,1	94,0
Ukraine	40,9	94,5

Being a graduate mathematician, V.M. Glushkov demonstrated an astounding foresight into the complex issues of economy management. Therefore, an equally important strategic trend is the predicted by V.M. Glushkov, the interrelationship between informatics and economy that becomes apparent under condition of the information society dynamics with the simultaneous development of the economy and electronic communications.

The development of an "information society" building paradigm, according to which information and knowledge are the main production results, is not feasible without scientific innovations in the field of information theory.

A real reflection of the mentioned paradigm implementation are the processes consolidated by the concept of "informatization" and directed to construct and develop a communication infrastructure that combines geographically distributed information resources.

One of the active participants in the process of development of modern telecommunication strategies is National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", which has significant achievements, advanced research projects, recognized scientific schools in the most important areas of fundamental and applied

scientific research in the field of information technology:

- Modern methods of information processing, principles of designing high-performance computing systems and networks, advanced technology of information processing, diagnostics, and managing complex organizational and technical systems.

- Hardware, mathematical and application software of digital systems of modern information technology; methodology and techniques of designing and construction of intellectualized information and network technologies, databases, and knowledge.

- Advanced telecommunication systems and technologies based on modern microwave and digital electronic equipment.

- Techniques of structural and parametric optimization of electrodynamic systems and creation of new radio technical, electroacoustic, microelectronic devices.

The implementation leader of modern and advanced developments and research in the information and communication field in our university is the Educational and Research Institute of Telecommunication Systems (ER ITS), which has long-lasting traditions of the scientific School development, that was created and headed by the founder and scientific director of ER ITS, academician of the National

Academy of Sciences of Ukraine, Dr. Sc., Prof. Ilchenko M.Yu. Since 1999, 6 doctors of technical sciences, 24 candidates of technical sciences became graduates of the scientific School.

The contribution of ER ITS' scientists to the development and propagation of ideas for building a modern information space in Ukraine was highly appreciated by the Presidium of the National Academy of Sciences of Ukraine. In the presence of Academician Paton B.E. professors Ilchenko M.Yu., Kravchuk S.O., Uryvsky L.O. received the V.M. Glushkov Prize diplomas of 2019.

A new stage in the scientific contribution importance growth of the young generation of researchers in the field of information and telecommunication technologies became the transition to training of Doctor of Philosophy (PhD) in the specialty 172 "Telecommunications and radio engineering". The first thesis defenses of the new generation of postgraduate studies graduates should take place in April 2023.

8 scientific groups driven by leading scientists are actively working in ER ITS. As usual, young scientists act as leaders of student scientific and technical networking groups.

According to the statistical data, ER ITS occupies a leadership position in Ukraine in the scope of highly qualified professionals training in the specialty "Electronic communications and radio engineering". The share of ER ITS in undergraduate admissions in 2022 was 13% of the volume of the state order of the Ministry of Education and Science of Ukraine for this specialty carried out by almost 40 universities of the country.

On May 22, 2019, the "Trembita" electronic interaction system started operating in Ukraine. 125 government services are available on the government portal and are fully automated. Public procurement, privatization, reports on technical assistance and state-owned enterprises - all these services are available online for every Ukrainian. "Our goal is a country in a smartphone," said President V. Zelensky. By 2024, 75% of the population

should be able to use reliable and secure eID tools, because more than 90% of the country's public services will work online [12].

This shows the succession of generations, the guarantee of implementation of brilliant ideas bequeathed to us by Academician V.M. Glushkov.

Conclusions:

1. The core of the scientific legacy of Academician V.M. Glushkov consists of important national economic objects:

- high-performance computing systems were created for the first time,

- implemented the automated national-wide economy management systems,

- reproduced the networks of data transmission by radio channels as prototypes of modern wireless communications,

- theoretical fundamentals of the paperless informatics establishment.

2. A direct continuation of Academician V.M. Glushkov work is the implementation of modern information and communication technology trends related to their implementation in Ukraine:

- the world concept of information society development,

- the close interrelationship of informatics and the economy, which implies, in particular, the simultaneous development of the economy and telecommunications,

- national-wide technological strategy "State in a smartphone",

- development of cybernetics as a science, including aspects of applied information theory.

3. Igor Sikorsky KPI, together with other scientific and educational institutions, take an active part in the modern telecommunications strategies development:

- through participation in the national programs of informatization,

- theoretical and hands-on development of means of data/information transmission by electronic communications,

– implementation of the NGN and FGN concepts in the educational process when designing the professional profile of a modern university graduate.

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Ільченко М.Ю., Кравчук С.О., Уривський Л.О.

Продовження справи академіка В.М. Глушкова у розвитку сучасних інфо-комунікаційних технологій

Проблематика. Видатний внесок академіка В.М. Глушкова у теорію і практику створення автоматизованих систем управління в національному масштабі робить досягнення вченого та організатора науки актуальними та важливими. Його 100-річчя із дня народження зустрічає у цьому році всесвітня наукова спільнота.

Результати дослідження. Відзначено вагомі здобутки, перспективні розробки, визнані наукові школи КПІ ім. Ігоря Сікорського в найважливіших напрямках фундаментальних і прикладних наукових досліджень у галузі інформаційних технологій. Лідером впровадження сучасних і перспективних розробок і досягнень в інформаційно-телекомунікаційній сфері в нашому університеті є НН ІТС. У цьому проявляється наступність поколінь, запорука реалізації чудових ідей, заповіданих нам академіком В.М. Глушковим.