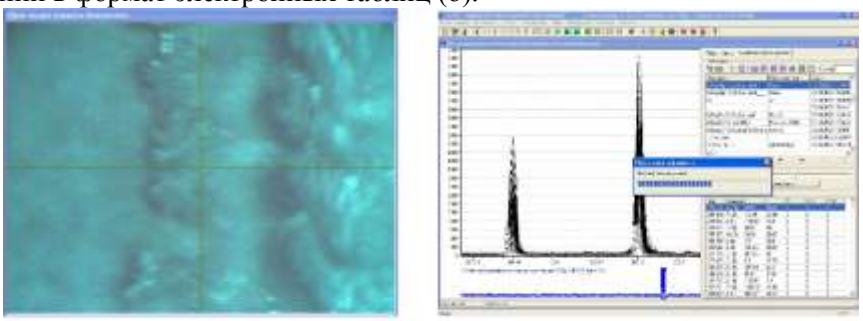
под углом 25^0 к падающему излучению [3]. Изменение параметров лазерного излучения осуществляется через программное обеспечение Laesspectrometer, которое дает возможность управлять параметрами лазера. Кроме того, имеется возможность проводить количественный анализ различных веществ как в твердой, так и в жидкой фазе и сохранять зарегистрированные спектры в формате MS Office Excel для последующей обработки [76]. В качестве примера, на рисунке 1, для демонстрации особенностей поверхности исследуемого образца приведено ее изображение, полученное камерой микроскопа (а), а также процесс перевода значения интенсивности спектральных линий в формат электронных таблиц (б).



а) б)

Рисунок 1 – Внешней вид поверхности образца (а) и рабочая стадия эксперимента (б)

Таким образом, спектроскопические исследования лазерной плазмы, образуемой вблизи мишени, при воздействии на нее сдвоенных лазерных импульсов, демонстрируют возможность контроля и управления компонентного состава напыленной структуры. Подбирая оптимальные условия проведения эксперимента, можно регулировать состав полученной нанопленки на поверхности образца. В частности, изменяя количество лазерных импульсов в серии, можно менять состав изготовленных нанокерамик, применяемых в микроэлектронике. Вместе с тем, использование качественного программного обеспечения облегчает проведение различного рода научных исследований и повышает ценность полученного готового продукта для дальнейшего использования в любой сфере деятельности.

СПИСОК ИСПОЛЬЗОВАННЫХ ИСТОЧНИКОВ

1. Гультяев, А. К. Проектирование и дизайн пользовательского интерфейса / А. К. Гультяев, В. А. Машин. - СПб. : Корона-Принт, 2007. - 239 с.

2. Атомно-эмиссионный многоканальный спектральный анализ: научное и практическое применение / Е. С. Воропай, К. Ф. Ермалицкая, А. П. Зажогин, М. П. Патапович, А. Р. Фадаиян // Вестн. Бел. гос. ун-та. Сер. 1. – 2009. – № 1. – С. 14–20.

3. XXVI Международная научно-техническая конференция «Современные средства связи» [Электронный ресурс]. – Режим доступа : http://bsac.by/pages/konferencii-2021-goda. – Дата доступа : 10.09.2022.

N.N.FLYACHINSKAYA

SYSTEMIC CHALLENGES AND OBSTACLES TO THE IMPLEMENTATION OF DIGITAL TECHNOLOGIES

Educational institution «Brest State Technical University», Brest, Republic of Belarus

Digitalization every year becomes more powerful and full of not only opportunities, but also risks. The introduction of digital technologies is a long process and can create challenges and endanger humanity. Lack of knowledge and insufficient methodologically scientific validity of their practical implementation leads to complex engineering, socio-political and socio-economic problems. Let's take a look at some of them.

Labor market disruption. Today's predictions that most work functions may become automated in the coming decades are not grounds for mass panic. However, progressive automation and the use of robotics will lead to a real replacement for physical/manual work. Due to the introduction of digital technologies, most existing jobs may disappear and people will be forced to retrain in order to remain able to work.

Digital polarization of space. The digital technologies of the Fourth Industrial Revolution are spreading much faster than the technologies of previous revolutions, which in some parts of the world are just

beginning to unfold. The least developed economies, consumed today by everyday problems, are not ready to understand the digital solutions that shape the future. The accelerated digitalization of the economy, the transformation of consumer behavior patterns and the improvement of the quality of life in the digital environment contribute to the growing urbanization of territories [1]. The concentration of the population in global metropolitan areas, as well as towns that are consumers of digital technologies, creates a threat of territorial digital inequality. Unfortunately, the introduction of digital technologies underlies the stratification of society, which entails the emergence of social classes of the digital elite and digital outcasts. Since the benefits of digital technologies are considerable and increase the number of people and the number of companies becoming consumers of them, an important challenge for developers is to increase access and provide all comers with such technologies.

The impossibility of ensuring social inclusion can neutralize the positive of digital technologies. For example, older people may not benefit from the implementation of «smart» health care, because they have a low level of literacy and insufficient digital skills to be equally and fully involved in digitalization processes. It is expedient to apply efforts in the direction of advanced training of older people. The challenge is to make this transition as flexible and fast as possible. Learning must be accompanied by the development of a new network of professional contacts and the provision of access to new opportunities to help overcome the difficulties associated with belonging to a particular community. It may also be expedient to expand the information and communication social infrastructure that can neutralize the territorial disproportions of digital development.

Lack of trust in digital technologies and uncertainty are the main challenges faced by users. They may be hesitant to use digital technologies because they are unsure of their potential to meet their own needs, and the information and evidence that can reduce this uncertainty is often difficult to understand. The development of digital infrastructure is subject to uncertainties far greater than for conventional innovative products. From the outset, no one knows the critical parameters of digital technologies or how they relate to the desired performance of future products, and potential users cannot always determine their needs in terms of using new technology. This problem requires a solution that lies not only in the education and skills of local residents, but also in a balanced approach to preparing and adapting the population to living in such cities, and making it attractive to the vast majority of residents.

Digital protectionism. Concerns about breaches of data privacy, property rights and security can undermine confidence in the digital economy. In response, countries resort to digital protectionism [2], which seems like a simple solution, but in fact threatens to increase costs and reduce access to digital services, which are vital for the economic development of any country and individual city.

Digital protectionism comes in many forms, from restrictions on cross-border data sharing, mandates for the use of local data processing facilities and demands, to local ownership, cross-border licensing requirements that are difficult to meet, and tariffs on cross-border “electronic transactions”. At the same time, excessive regulation prevents citizens and consumers from enjoying the benefits of the digital economy: access to digital goods and services, participation in global supply chains, participation in innovation, and access to information.

Note that the protection policy should be based on a risk-based approach. Data that is extremely sensitive and includes information relating to gender, health status, political preferences or religious affiliation should be subject to control. The risks of disclosing such data exceed all possible positives from their further use. On the other hand, cross-border flows of private or public data relating to various areas of the economy and social protection, healthcare, and education should not be restrained. Access to such data will enable responses to problems and gaps in societies.

Passivity to the expansion of broadband Internet access (BBA). Efficient and reliable communication networks and services are the foundation upon which the digital economy is based today. Broadband access is important in the development of digital infrastructure, and the demand for it is growing rapidly. All thanks to the use of the Internet to provide a wide range of communication services, the rapid increase in Internet traffic, the increase in the number of smartphones and other mobile devices, the connection of many smart objects via IoT (internet of things), and access to stored programs and data remotely.

The role of digital networks as an accelerator of development is recognized throughout the world, and because of their critical importance for economic development, social inclusion and environmental protection, the challenge is to make the Internet universal and accessible. However, in practice, only 53% of the world's population uses the Internet. About 4 billion people remain offline [3]. Gaps in Internet access and penetration persist, and a significant portion of the population is still unable to take advantage of the «bonuses» of digitalization. The challenges to overcome the «gaps» in access are multifaceted and are based

on solving major problems, in particular, encouraging investment, expanding broadband infrastructure in rural and remote areas, and modernizing networks.

Poor condition of existing infrastructure. One of the most important problems faced by most countries is the «aging» of infrastructure. Utilities (including water supply and sewerage) and roads have been built for decades. Reconstruction in «old» urban areas requires much more money than if the infrastructure is built «from scratch», especially since such facilities will fail sooner or later due to a long service life. Governments and cities and countries are forced to spend money on repairing and upgrading existing infrastructure before realizing the idea of building new installations to the specifications of digital infrastructures based on computerized systems (requires detailed planning and mapping to be effective in terms of cost recovery) [4].

High capital costs and insufficient funding. The COVID-19 pandemic has made clear the need to further increase investment in R&D. Investments are needed in the latest technologies, such as AI, that can be applied to the development of medicines and vaccines, as well as to the management of related services. Investment is needed, in particular in communications infrastructure, to close the wealth gap between cities and the most vulnerable and poor communities. Investments in digital technologies are the basis for strengthening the competitiveness of the business

In summary, the world is facing a range of challenges, from a global digital divide to potentially negative social impacts and complex regulatory issues. The growing «gap» in digital development between developing and developed countries could lead to income disparities and a «digital monopoly». These challenges and barriers can be overcome by developing and implementing comprehensive national digital strategies covering measures to increase competition in Information and Communication Technologies markets and improve access to the Internet; digital security and privacy risk management practices; reducing barriers at the company level and providing additional (not only public, but also private) investments; providing training mechanisms to improve the skills of employees; ensuring cross-border data flow. At the same time, it is important to partner with government decision-makers and the non-state sector, which has the necessary capital to deploy digital infrastructure and technologies, as well as experience in managing and implementing smart projects.

REFERENCES

1. Шваб, К. Четвертая промышленная революция: монография: пер. с англ. – М. : Изд-во «Э», 2017. – 208 с.

2. 5 ways to advance digital trade in the post-COVID world [Electronic resource] // World Economic Forum. – Mode of access : https://www.weforum.org/agenda/2020/06/5-ways-to-advance-modernize-digital-trade-in-the-post-covid-pandemic-world/. – Date of access : 09.09.2022.

3. Measuring digital development facts and figures 2021 [Electronic resource] // ITU. – Mode of access : https://www.itu.int/myitu/-/media/Publications/2022-Publications/Measuring-digital-development-2021.pdf. – Date of access : 05.09.2022.

4. Surveyors and smart cities – partners in technology [Electronic resource] // GPS World. – Mode of access : https://www. gpsworld.com/surveyors-and-smart-cities-partners-in-technology. – Date of access : 05.09.2022.

О.П.РЯБЫЧИНА[1], О.Р.ХОДАСЕВИЧ[1]

ОБЗОР СИСТЕМ МОНИТОРИНГА ПОГОДНЫХ И ДОРОЖНЫХ УСЛОВИЙ ПРОЕЗЖЕЙ ЧАСТИ

[1]*Учреждение образования «Белорусская государственная академия связи», г. Минск, Республика Беларусь*

Известна конструкция системы мониторинга состояния автомобильной дороги [1]. Эта система содержит многофункциональные погодные станции, установленные возле автодороги на всей ее длине, подключенные к электросети дороги и присоединенные выходами через компьютеры к сети Интернет. Многофункциональные погодные станции являются источниками метеоинформации (температуры, влажности, давления, скорости и направления ветра) через Интернет для водителей транспортных средств, с учетом которой водители выбирают пути движения транспортных средств к пунктам прибытия. К недостатку этой системы следует отнести ее узкие функциональные возможности и область применения.