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The impact of digitalization on society in the context of public services in Poland

Abstract: The aim of this article is to demonstrate the impact of digitalization on society in the area of public services in Poland. This issue must be recognised as extremely important, because digitalization is one of the elements driving the development of the national economy and contributing to its socio-economic development, as well as supporting the emergence of information society. The article presents the benefits and threats of digitalization of public services in Poland from a user perspective in the areas of administration, education and transport. The authors attempt to answer the question of how digitalization has changed the accessibility to public services in the areas mentioned, as well as how it affects society. The article is descriptive and analytical in nature and was developed on the basis of a literature review, as well as available statistical data from the Eurostat and CSO databases.

Keywords: digitalization; education; e-administration; information society; Internet; public services; transport

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INTRODUCTION

Nowadays, access to information is key, and digitalization leads to social changes and transformations. A new knowledge-based civilisation is being created before our very eyes (Dramski, Gutowski, 2010). The 1950s are considered to be the beginnings of digitisation, when, as a result of IT development, the concept of “digitisation” emerged (Brennen, Kreiss, 2016). And 20 years later, in 1971, Robert Wachal points out the social consequences of the “digitalization of society” (Wachal, 1971). This is the moment when the literature pays attention to the impact of digital media on various areas of life. These days, we live in an information society constructed as a result of this discussed phenomenon (Niewiadomski, Zirk-Sadowski, 2016). This is due to the improved flow of information, or electronically provided public services, to which this article pays particular attention.

It is worth noting that the belief that digitalization of public services is synonymous with modernity and part of the creation of information society is becoming increasingly widespread. This is influenced, for example, by the increasing number of people with access to the internet and increased opportunities for provision of such services by the government (Wilk, 2014). Information society is understood in various ways. However, all the features and definitions boil down to one common point. Such a society is characterised primarily by modernity, extensive telecommunications infrastructure, as well as a high level of development. These factors determine citizen access to information and other services (Dąbrowska, Wódkowski, Janoś-Kreso, 2009). Importantly, it has been pointed out that these are societies that are forged in countries with a high degree of technological development. Digitalization is part of the issue of innovation, which stimulates socio-economic development and has an important role in shaping the level of development of the economy, while affecting the conditions and quality of life of people (Firlej, 2016). In addition, information management, its quality and speed of flow are considered to be key factors for competitiveness in both industry and services. Such a rapid level of development determines the application of new techniques for the collection, processing, transfer and use of information (Truskowska-Wojtkowiak, Wojtkowiak, 2008). Information society is also defined as a social system in which all information mechanisms and resources determine the structure of social employment and increase social wealth. Moreover, they are the basis of civilisational orientation (Szewczyk, 2007).

In order to be able to use digital public services, every citizen must have access to the internet through a computer or smartphone. Taking into account these aspects, this article will discuss: internet access in the sense of connectivity, e-administration combined with the use of the internet, e-education as an element of human capital, and transport in relation to the integration of digital technology. Certain elements of the above-mentioned components were identified as important and closely linked with respect to digital technologies and therefore selected for analysis.

THE PROGRESSIVE DIGITALIZATION OF INFORMATION SOCIETY

The year 1994 is considered to be the starting point for the formation of information society in Europe. At that time, the European Commission made public the document *Europe and the Global Information Society*, which set out further prospects for the development of this type of society in the member states of the European Union (Skonieczny, Kroik, 2010). The level of digitalization within a given country is evidenced by factors that are based on infrastructure, e-business and e-commerce (Piecarka, 2017). Indicators of the digital economy include: digital input elements (technologies for inputting information), processes of digital processing (digital integration processes in the enterprise), digital output elements (links between digitalization and sales) and infrastructure (technology advancement). In turn, three indicators determine national digitalization development (Arak, Bobiński, 2016):

- the economic digitisation indicator: e-commerce, e-business, digital resources
- the business environment indicator: e-administration, open data, trust and security in the network
- the digital competence indicator: computer users, internet users, users of *cloud computing*/video and audio connections.

According to the McKinsey&Company report *Digital Poland*, the digitisation index was measured by assessing the supply of digital resources and demand for these resources using 21 indicators that are responsible for the digital advancement of a given country's economy (McKinsey&Company, 2016). Another measurement of digitalization is the DESI Index used by the European Commission. It consists of relevant indicators of Europe's digital performance. In addition, this index tracks the evolution of European Union member states against the background of competitiveness in terms of digital technologies (Pieczarka, 2017). It consists of five main components (European Commission, 2022a):

- Connectivity – fixed broadband networks, mobile broadband services, broadband speeds and prices;
- Human Capital – internet use, basic and advanced digital skills;
- Use of Internet – use of internet content by citizens, communication and transactions online;
- Integration of Digital Technology – business digitalization and e-commerce;
- Digital Public Services – such as e-administration or e-education.
- The key from the perspective of both the state and citizen is the use of digital technologies ensuring effectiveness and transparency in activities carried out by the state through public administration (Śledziwska, Levai, Zięba, 2016).

E-services are defined as “a new formula for providing services, and thus meeting internet use needs, from the moment the company contacts the customer (individual or institutional) to present an offer, through ordering the service, its provision and contact after the service has been performed.” Public administration services include, among others (Dąbrowska et al., 2009):

1. issuing, at the customer's request, documents confirmed by administrative decisions, permits and concessions,
2. entering data obtained directly from the customer into a registry (databases),
3. issuing permits and decisions within the meaning and procedure of the code of administrative procedure,
4. issuing permits and concessions related to economic activities regulated by the state.

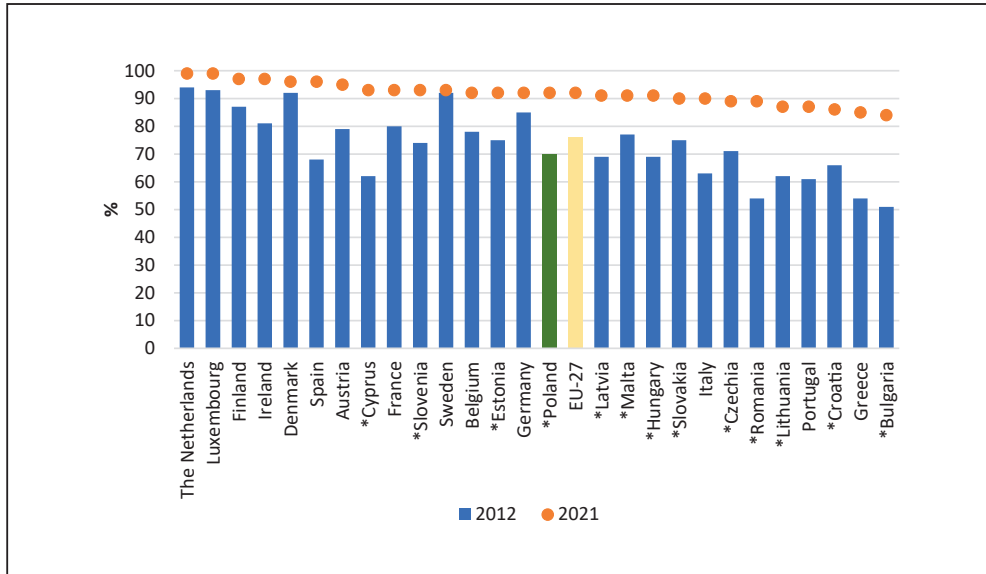
The digital transformation of an enterprise should affect three spheres of their activity or functioning (Niewiadomski, Zirk-Sadowski, 2016):

1. shaping mutual relations with customers by understanding their needs, introducing differentiated channels of communication with them and successively introducing solutions and innovations related to customer self-service,
2. internal operational processes that are related to the existing structure, work organisation and environment, combined with performance monitoring,
3. a business model based on the products and services that are delivered to specific markets.

In 2021, the European Union launched the seven-year Digital Europe programme for the period 2021–2027 with the aim of supporting processes related to the digital transformation of European society and economy. The programme also draws attention to the benefits for EU citizens and the faster diffusion and uptake of digital technologies in public and private spaces (Poliński, Ochociński, 2020).

The issue of information society should be directly linked to internet access. In 2012, online access in Poland was below the EU average, which amounted to 76% (Figure 1). At that time, Poland ranked 16th in the EU with only 70% of its population online. In 2021, Poland boasted a significant increase of 18 percentage points to 92%, occupying

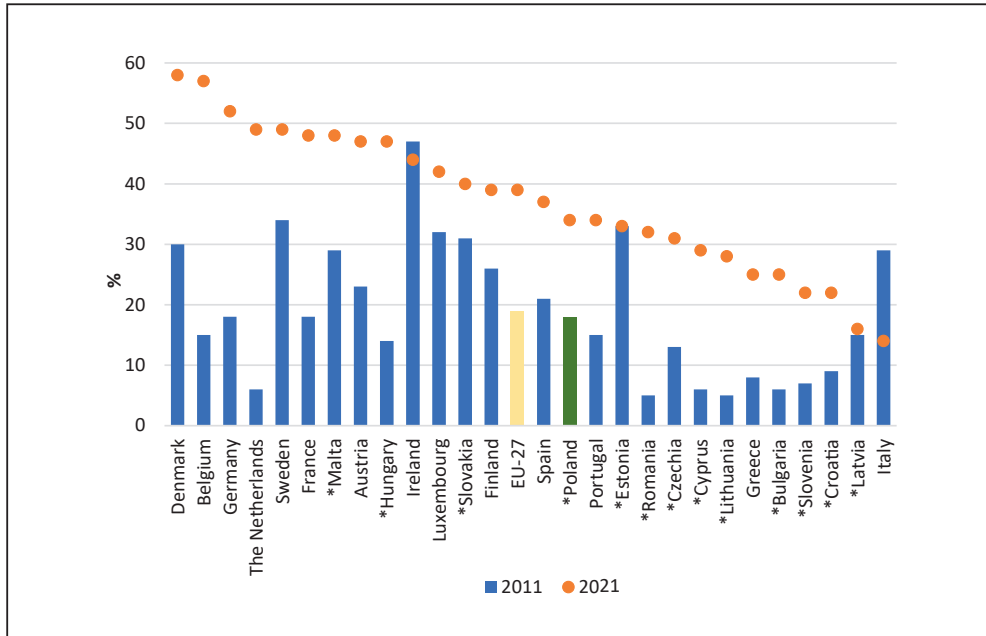
Figure 1. Equipping households in Poland with internet access compared to EU countries in 2012 and 2021 (internet access in % of the population)



Source: Own study based on Eurostat [ISOC_CI_IN_H]

* EU member states since 2004 or later.

Figure 2. Natural persons with mobile internet access (mobile internet access in % of the population)



*EU member states since 2004 or later.

Source: Own study based on Eurostat [ISOC_CI_IM_I]

12th place in the EU (the top half), which represented a significant increase in internet access. It is therefore clear that, in this respect, the situation in Poland is similar to that of Western European countries. The countries at the forefront of this ranking are Belgium, Luxembourg, Denmark and the Netherlands.

In the context of having access to the internet, it is particularly important to distinguish access via mobile devices, thanks to which users can connect to various applications on their smartphones. This is another driving force that supports the progressive digitalization of information society. In this way, internet access can be treated as a binding agent for the digitalization of public services.

This is why one of the indicators of information society is the percentage of individuals who have access to and use mobile internet via a laptop, notebook, tablet or mobile phone outside of home or work. The greatest progress has been made by Belgium, the Netherlands, Hungary, France and Denmark (Figure 2). The largest declines have taken place in countries such as Ireland, Estonia and Italy. Compared to the EU, Poland can boast an increase from 18% to 34%, and ranked 15th in 2019 in terms of access to mobile internet among natural persons. This result is below the EU average, which in 2011 and 2019 was 19% and 39%, respectively. The essence of this issue is that the more people have mobile access to the internet, the more they can afford to use digital public services, including mobile applications.

DIGITAL SERVICES IN GOVERNMENT

Digitalization is becoming ubiquitous and, as a result, the public sector, too, has to cope with the transfer of many offline procedures to online procedures. Although digitalization does not directly affect work in the area of information and documentation, it changes the way this information is handled and processed. It is a transformation that translates into saving time and costs and providing better customer service. It also meets many stakeholders expectations. However, it is crucial that the digitalization of public administration is well-planned in advance. This is because well-trained employees need to have the appropriate IT knowledge, which they can easily pass on to their subordinates. This requires the earliest possible involvement of all employees, and the success of digitalization depends on the people who implement it (Ogonek, Hofmann, 2018).

Importantly, the digitalization of administration is one of the most effective ways of reducing corruption in the public sector. Moreover, the higher the level of digitalization, the higher the quality of public administration. State authorities should therefore develop and implement appropriate strategies and policies for the integration of large-scale digital applications (Androniceanu, Georgescu, Kinnunen, 2022). A country that wants to meet the requirements of technological progress and public expectations must focus not only on digitalization and technological development through various subsidy instruments and incentives, but also on a public administration environment that is transparent and not corrupt. This is the path to reducing the size of the “grey zone” (Němec, Machová, Kotlán, Kotlánová, Kliková, 2022).

E-administration is an electronic public administration that facilitates the handling of all administrative matters electronically (Ejdys, 2018). It operates via and thanks to the use of digital technologies by the state in the administrative sector. Significantly, e-administration through public sector entities uses ICT (Information Communication Technology), the aim of which is to improve citizen access to public services (Kasprzyk,

2011). E-administration is also defined by the European Commission as the use of tools and IT systems to ensure better quality public services for both citizens and businesses. This issue also includes effective reorganisation of the organisation and all related processes, as well as behaviours, in order to improve the efficiency of public service provision. Effectively implemented e-administration is primarily intended to enable easier, faster and, importantly, cheaper interaction between the citizen and public administration (European Commission, 2022b).

In the context of e-administration, we should mention two digital systems that have been implemented and are functioning in Poland: *e-PIT (Personal Income Tax)* and the *mObywatel* (mobile citizen) application. They have significantly changed access to public services in Poland. The launch of the e-tax office was aimed at ensuring that taxpayers and contributors could efficiently handle all their tax issues. This means there is no need to visit a bank, post office or tax office to pay one's income tax (Szymanek, 2021). At the same time, the process of filling in all the required documentation is shortened thanks to the elimination of paper forms and the need for traditional mail (Zalewski, Krawczak, 2019). In addition, the risk of errors when filling in tax documents is minimised thanks to the use of algorithms that ensure the accuracy of completed fields (Fornalik, Ziętek, 2019). It is also often pointed out that citizen data, previously dispersed, have been integrated into a single system (Brzeziński, Lasiński-Sulecki, Morawski, 2018; Finansów, 2022). As of February 2019, taxpayers, thanks to the e-tax office, can use facilities such as the "Your e-PIT" service (*Twój e-PIT*), enabling quick, transparent settlement of tax obligations to the state. Another advantage is access to information about imposed fines. Moreover, citizens have access to tax data (Jendraszczyk, 2020) and all letters can be stored digitally. As you can see, there are a number of benefits. Logging in is also easy and accessible, because the user can log in from anywhere and using any device. The user can choose to log in via a trusted profile, the *mObywatel* application or with a PESEL number (a unique number assigned to each citizen within the Universal Electronic System of Population Records).

The second digital platform made available for use via a smartphone is the *mObywatel* application, which features several important functionalities integrating the most important and useful information for citizens in everyday life. Thanks to this application, a citizen can confirm his/her identity in many situations. Legislative work is currently underway that will allow this application to be fully aligned with an ID card in 2023, functioning as an electronic ID card. In addition, the citizen has access to their e-prescriptions and can fill them in a pharmacy after providing the correct code. Implementation of the e-prescription system at the beginning of 2020, i.e. just before the outbreak of the coronavirus epidemic (March 2020) in combination with the system of telemedicine and the possibility of issuing electronic medical leave instead of paper documents significantly affected the health and safety of patients at that time and also facilitated the management of medical procedures.

The *mObywatel* application also stores information that is relevant for car owners:

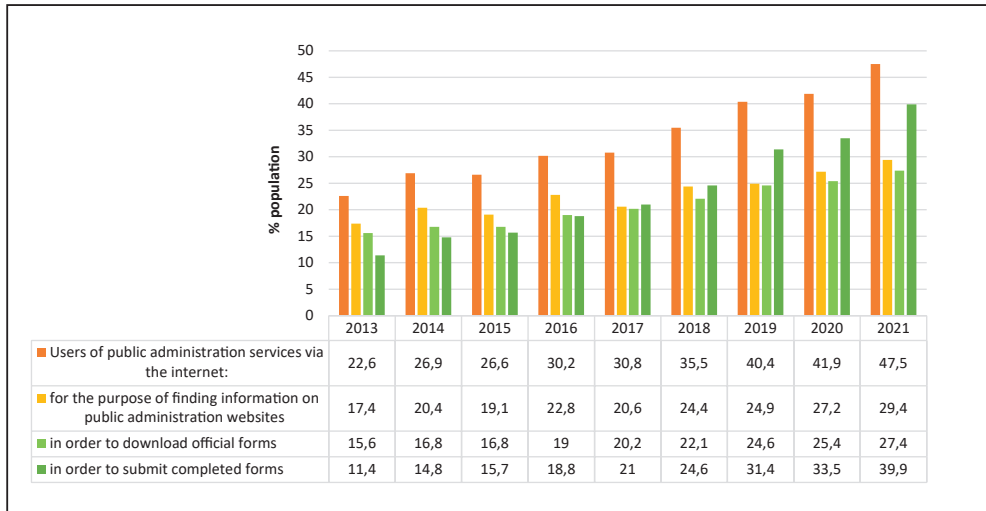
- information from the vehicle registration certificate,
- the validity of technical inspection,
- the validity period of third-party liability insurance for drivers,
- information on the number of penalty points for road traffic offences.

The application also has functionalities such as: *m-legitymacja* (university and school ID) entitling the bearer to the same discounts as a physical ID; a large family card (enabling fee reductions and discounts for large families); the possibility of reporting violations

that have an impact on the environment. It is also possible to attach an EU COVID-19 certificate (along with information about vaccinations, tests or illnesses).

Based on the described functionalities, the mObywatel application gives citizens a wide range of solutions in everyday life and is a technology that has significantly affected accessibility to public services in the above-mentioned areas.

Figure 3. Users of public administration services online in the last 12 months in Poland

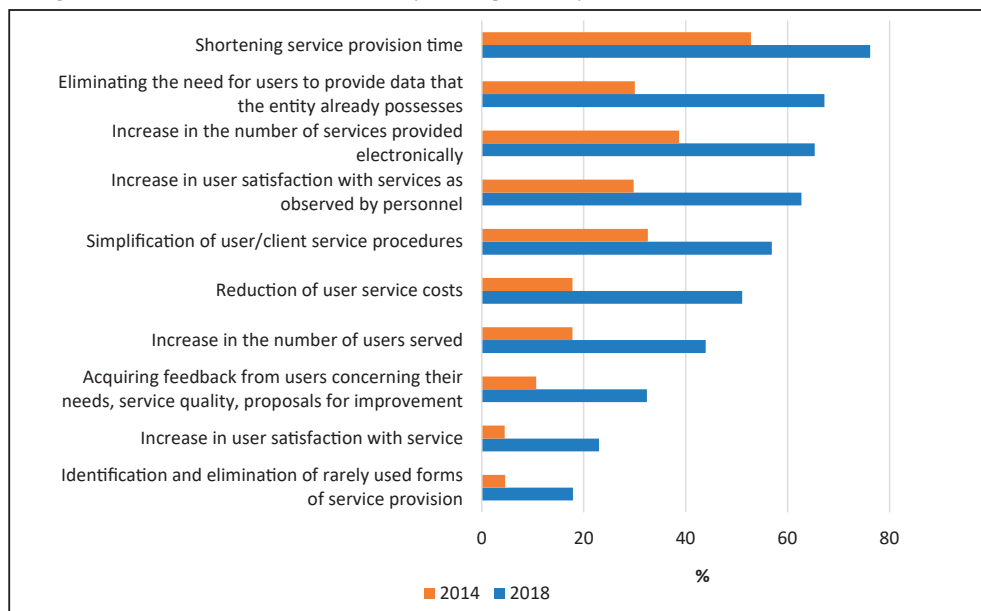


Source: Own study based on GUS (Central Statistical Office) reports from various years

In 2013, people using public administration services over the internet constituted almost a quarter of the Polish population between the ages of 16–74 (Figure 3). Over the past 8 years, there has been a more than twofold increase in the number of people who have used digital administration services. Until 2017, the most common use of e-administration was searching for information on relevant public administration websites, and the rarest was submitting completed forms. It is worth noting here that the opposite trend has been observed since 2017, when submitting forms became the most common reason for using e-administration services. In turn, downloading official forms has become the rarest type of use. These changes are the result of the introduction of an electronic signature in Polish law, which further encouraged the public to submit forms electronically (Act of 5 September 2016 on Trust Services and Electronic Identification, 2016). The high growth rate of completed forms, which increased after 2018 (ca. 6–7%), is notable. At the same time, the other two objectives of using e-administration are also growing from year to year, but at a slightly slower pace.

The research shows that the most important benefit for public administration entities was and remains the shortening of service delivery time (Figure 4). This means that the digitalization of public services saves time. In addition, the current study results indicate the need to eliminate the provision of data by users that the entity already has, or can obtain independently from other databases and systems. This was the second most frequently indicated benefit by respondents. The benefits of digitalization in public administration are not only visible to the stakeholders who visit public offices, but also to the entities that provide public services.

Figure 4. Benefits of public administration entities resulting from use of the internet in the process of providing electronic services in 2014 and 2018 (% of respondents)

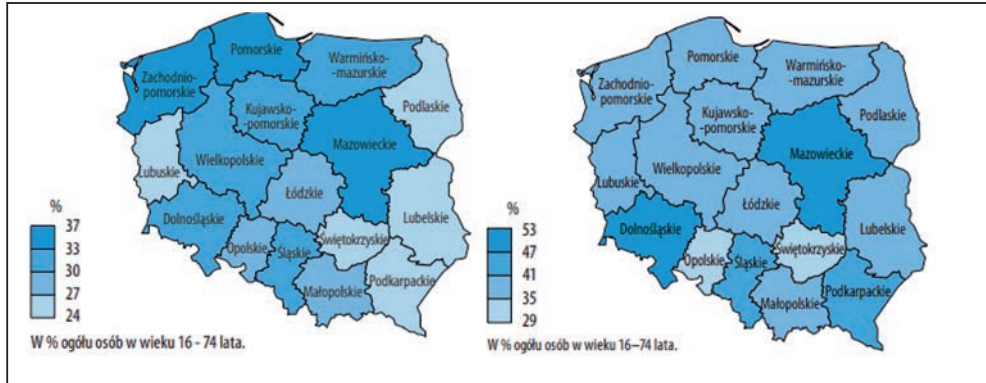


Source: Own study based on GUS data "Information Society in Poland. Results of statistical surveys from 2013–2017" and "Information Society in Poland. Results of statistical surveys from 2015–2019."

Changes in the number of people using public administration services online in 2017 and 2020 have also been observed within individual voivodeships (Figure 5). The eastern voivodeships of Poland have been characterised by a relatively low level of this phenomenon in 2017. These values oscillated around 25%. The same voivodeships made significant progress five years later, as the percentage of people between the ages of 16–74 using public administration services via the internet increased to 40%, a rate that was exceeded in the Podkarpackie voivodeship. The north-western part of Poland is also worth looking at, because it experienced slower growth within the discussed time frame. In 2017, voivodeships such as Zachodnio-pomorskie and Pomorskie reached the highest values of 33–37% of total respondents. However, after three years, these values increased minimally and did not change significantly.

The figures from 2020 oscillated between 35% and 41%. However, Mazowieckie and Dolnośląskie voivodeships led the way (47–53%). Opolskie and Świętokrzyskie voivodeships came in last (29–35%). Other voivodeships reported very similar results. However, only in two voivodeships did every second Pole in the surveyed group use public administration services online. There is a clear lack of full trust among citizens in official matters being handled via online platforms. This is the result of the conviction, especially among older members of society, that when dealing with a public entity, a paper document represents unquestionable confirmation that a matter has been addressed in the course of proceedings. This is also linked to the still incomplete digitalization of administrative procedures at many levels, despite growing public expectations in this sphere. That is why there are such high hopes in subsequent legislative initiatives intended to implement digital solutions to solve administrative issues.

Figure 5. Online users of public administration services in 2017 and 2020 in total % of users between the ages of 16–74 (in the last 12 months by voivodship)



Source: GUS Report “How do we use the Internet? 2017,” “How do we use the Internet? 2020.”

DIGITALIZATION IN EDUCATION

Education mainly concerns schools, universities and teachers who can transfer knowledge to their students, both directly and indirectly, using modern technological opportunities. During distance learning, a teacher is not only a source of knowledge and information, but also becomes an adviser to the person being taught (Bates, 1993). One of the many changes that has taken place in modern teaching is e-learning. The so-called e-education takes into account the aspect of lifelong learning and provides an opportunity to acquire knowledge for all those who want or need to continuously improve their qualifications. It is very often the only learning option for people who live outside large urban agglomerations or academic centres, as well as people with disabilities (Goltz-Wasiucionek, 2011).

Launched in 2021 by the European Union, the Digital Europe programme aims to promote easy access for the working population to advanced digital skills and training opportunities (Parlament Europejski, 2021). In addition, attention is paid to the need to provide support to students and citizens of all ages expressing the need and willingness to develop their qualifications through the possibility of acquiring and developing skills such as: training in *High Performance Computing* (HPC), big data analysis, *Artificial Intelligence* (AI), distributed technology registry technology (e.g. blockchain) and cybersecurity. Ongoing digitalization may in any case lead to a situation in which more than half of all employees will require greater up-skilling. In addition, every 10th employee will need training for more than a year (World Economic Forum, 2020).

E-learning has many advantages. The most important are mobility, interactivity and flexibility. For people conducting online training, the benefits include, among others, reduced costs due to no need for transport, and for those acquiring knowledge, the aspect of independent selection of the subject of instruction and an individual approach. The learner decides the extent of knowledge acquired on a given day, and the time they spend acquiring it. Moreover, they have the opportunity to return to and reread curriculum content saved in the course (Grabowska, 2018).

E-education is characterised by factors such as: a new educational space, because teachers and students can connect regardless of their current place of residence, as well as within the scope of asynchronous meetings, which can replace traditional meetings.

The educational process itself takes place on specially prepared educational platforms on the internet. However, proper preparation of didactic materials for an e-learning course by the teacher remains crucial. However, thanks to the possibilities offered by e-learning, many sources, including media, can be used for this purpose (Goltz-Wasiucioneck, 2011). Digital technologies in education make it possible to develop new skills, including the ability to efficiently search for and select information, as well as properly process it and practice using the remote communication format (Khryk et al., 2021). Research shows that, for example, the education of children struggling with autism using mobile applications improves their communication skills (Kagohara et al., 2013).

It is important for digital competences to be developed consistently, not only those of students, but also teachers, because they are gaining importance in life and on the labour market (Viñoles-Cosentino, Sánchez-Caballé, Esteve-Mon, 2022).

Creating the right virtual learning environment, as well as developing teaching materials, allows students to acquire knowledge faster and in a more appealing way. Importantly, it allows them to increase their involvement in the education process itself. Moreover, computer games are increasingly used for educational purposes. This enables the teacher to teach outside of the box with a wide range of teaching opportunities (Osaula et al., 2021). The educational platform may offer chat rooms and a virtual board, which can be used by both the lecturer and students to communicate and exchange information. This makes contact with the lecturer more efficient, and ensures convenient access to teaching materials. Other advantages of e-education include, above all, the reduction of travel costs to the university or school. However, when implementing the e-learning process, it is necessary to take into account the challenge of reconciling household obligations with home-based learning. People who do not have a separate room for study or work are exposed to this kind of serious inconvenience. That is why asynchronous meetings, which do not require direct online contact, seem to be a better option than remote synchronous meetings. Educational platforms offering this form of education are equipped with databases and enable efficient identification of users and their evaluation. But even within this format there are disadvantages: students must be self-disciplined and responsible, and the lecturer needs to provide efficient motivation for learners (Goltz-Wasiucioneck, 2011).

Digitalization in primary and secondary education has facilitated the introduction of IT systems to monitor learning progress through the use of e-learning management systems (LMS). Their implementation gives students greater awareness that parents can monitor their learning progress, which translates into increased motivation to study. At the same time, parents are kept informed about their children's learning outcomes. It is worth emphasising that the use of digital tools in the form of e-LMSs has improved teacher-parent communication. Electronic learning management systems allow educators and school authorities to generate a variety of statistics. This represents the realisation of the information society concept (Wróbel, 2009). It is notable that e-LMSs have made it easier for teachers to work, while enabling parents who lead an intensive lifestyle to gain access to current information about their children's learning progress (Piecuch, 2019). The mere incorporation of e-LMSs has become an integral element of information culture in the functioning of schools (Tomaszewska et al., 2014).

The learning outcomes and grades of students who are actively monitored by parents through e-LMSs are much better than those of those students whose are not monitored on an ongoing basis using electronic platforms (Wróbel, 2009). Although,

as A. Tomaszewska points out, students show less interest in the e-LMS than their parents and consult it less often (Tomaszewska et al., 2014).

The spread of the COVID-19 pandemic at the beginning of 2020 necessitated a transition from full-time to remote learning in all educational institutions. In 2021, about 15% of Polish residents were caring for a child who had to learn remotely. The vast majority of caregivers had a negative opinion about this learning and educational format. Moreover, as many as 80% claimed that their child learned much less during this period of distance learning than they could have at school. In turn, about 50% of caregivers believed that their child had to learn more on their own. These opinions allow us to state that, as a result of the coronavirus pandemic, the sudden transition from in-person to online teaching negatively affected the knowledge acquisition process by students. For this reason, the government was a strong supporter of a return to in-person learning as soon as possible, which was introduced while maintaining sanitary restrictions.

However, the pandemic has undoubtedly improved the tools that were required for schools and universities to be able to effectively conduct distance learning. A significant acceleration in education was observed in the aftermath of digitalization. However, in addition to having the adequate infrastructure, it was necessary to implement training for teachers who often displayed shortcomings in digital skills (López-Gracia, González-Ramírez, De Pablos-Pons, 2022). Moreover, current and future teachers must acquire new skills related to motivating students during distance learning. As you can see, e-learning presents a certain challenge for teaching staff (Kuźmich, 2012). The COVID-19 pandemic was a stimulus that drove certain changes in the educational system. And the solution to these changes turned out to be digitalization and technological progress via modern communication technologies (Nieżgoda, 2022).

DIGITALIZATION IN TRANSPORT

In speaking about the digitalization of transport, we should mention the growing popularity of mobile applications, which make life even easier for the public. The various technological improvements observed on a daily basis are in turn driving the development of mobile technologies (Kubiak, Skawińska, 2015). Today, mobile technologies play a key role in our daily lives (Łysik, Kutera, 2013). Users expect to have access to fast and reliable information not only in a stationary setting, but also on a mobile basis. This is facilitated by the phenomenon of geolocation, which ensures the availability of mobile internet in many locations (Badzińska, Kubiak, 2013).

Importantly, in the 21st century, ecological awareness is increasing systematically, leading more and more people to choose public transport, and thus increasing the share of people using various applications that facilitate the use of public transport. The emergence of these services was related to higher demand for public transport (Wróbel, Wojda, 2018).

The mobile device market is important for mobile applications. Thanks to growing sales of mobile phones equipped with operating systems enabling the installation of any application, this market is growing more dynamically. A certain symbiosis can be observed. Mobile phones, due to their complexity, multifunctionality and internet access,

are slowly becoming portable, handheld computers (Jaszkiwicz, 2012). They differ only in computing power due to their size (Lim, Lee, Kwon, 2012; Skowroński, Miłosz, 2017).

Mobile technologies are mainly used for activities such as booking reservations or buying tickets. It is also useful to integrate additional services with payment functions on the same device, as well as to use QR codes (Ferreira et al., 2017). Thanks to the so-called mobile ticketing, public transport is more accessible to the general public. This is due to the large number of apps that facilitate the rapid and convenient purchase of a city transport or railway ticket. It is important that every mobile application created for the transport sector has complete information, an intuitive interface, an updated schedule taking into account delays and transfers, and the ability to customise user preferences. Smartphone users increasingly prefer to use mobile apps rather than websites to make purchases or use the service of their choice. It is crucial for application developers to take into account user opinions and ideas to improve app quality. It is thus possible to respond to pressure to reduce pollutant emissions and eliminate car travel as much as possible to promote the use of public transport in larger cities (Di Pietro, Guglielmetti Mugion, Mattia, Renzi, Toni, 2015; Strenitzerova, Stalmachova, 2021). A kind of feedback loop is noticeable here, namely access and possession of mobile devices determines the development of services and mobile applications. In turn, they stimulate greater demand for devices (Kubiak, Skawińska, 2015). Digitalization thanks to expanding internet access creates a space in which interactive communication takes place, information is provided more quickly, and services are offered efficiently (Czaplewski, 2007).

In the case of rail transport, the benefits resulting from the implementation of digitalization are also observed on the part of both customers and carriers. This applies mainly to customer service and the operation of railway companies (Poliński, Ochociński, 2020). When it comes to the digitalization of the railway sector, the most significant elements are the radical change of current business models and philosophy, which makes it possible to create a certain added value for transport users. All this translates into the opportunity to implement new mobility concepts. Currently, several major trends in the digital transformation of rail transport can be observed (Pieriegud, 2017):

- Connected Commuter, a networked passenger who has access to the internet while travelling;
- MaaS, i.e. Mobility as a Service that is associated with easier travel planning;
- PMAas (Project Manager as a service), concerning the maintenance of rolling stock, which is based on data about the consumption of individual components sent on an ongoing basis by electronic systems, which improves the reliability of rolling stock;
- GoA4 (Unattended Train Operation), i.e. automation and interoperability of traffic control systems. This is a system in which vehicles operate completely without personnel (so-called 4 degrees of automation);
- Internet of Trains, thus increasing the safety of train traffic, reducing operating costs and improving the quality of offered services.

One of the key actions in the European Union's transport policy is to create an environmentally-friendly, intelligent and accessible transport system for every customer, including rail transport. This assumes implementation of the latest technologies in various areas of railway transport functioning, i.e. production, railway traffic control, line and point infrastructure management or organisation of the transport process and employment of highly qualified staff (Poliński, Ochociński, 2020).

In accordance with the opinion of the European Economic and Social Committee (EESC), “digitalization contributes to improving the efficiency and convenience of rail transport for both passengers and goods, but also exposes rail systems to cybersecurity risks.” Importantly, the EESC has encouraged rail transport to strengthen cooperation with other modes of public transport and develop a comprehensive and interoperable framework for mobility as a service (MaaS), thus ensuring affordable prices for all citizens and easy access to mobility and public transport as a service to the general public. He also drew attention to the creation of an open “plug and play” IT framework that would allow the sale of multimodal tickets in Europe. The most significant benefits associated with the implementation of the new technology (Opinion of the European Economic and Social Committee ‘Ensuring an inclusive sector transformation towards a digitalized railroad sector’, 2020) include:

- easier digital integration of different modes of transport,
- a more intensive flow of traffic and tracking information,
- easier access to services and information for passengers,
- more effective use of infrastructure capacity,
- greater predictability of driving time,
- an increasing level of automatic train handling, automatic train operation (ATO),
- improved data transmission on railway routes (also thanks to 5G technology).

Most of these benefits are linked to the transformation and reform of logistics chains. The EESC has identified two main threats, security and cybersecurity. It also pointed to the challenge of “the need for effective measures in the field of cybersecurity and readiness to resist cyber attacks, including handling large-scale events.” The further development of digitalization in rail transport is based on cooperation between railways and telecommunications operators. Examples include the new 5G networks, which are intended to create opportunities for the development of the railway sector by providing the Internet of Things and better information in real time.

CONCLUSION

We are still witnessing a vibrant information society that values above all fast and widespread access to knowledge and information. Moreover, these people put comfort first and recognise the advantages resulting from progressive digitalization in their lives. All this is possible thanks to infrastructural developments that ensure a fast and stable internet connection. Internet access has also increased in Poland over the recent decade.

It is well known that continuous learning is an important element in the life of every human being. E-education is an innovative approach to modern learning. Increasingly widespread educational platforms are only part of what can be achieved by technological progress, and this is made possible by digitalization. This enables continuing education not only for young people, but also for adult learners, who for various reasons cannot attend classes in person. Thus, one of the EU’s priorities is to build an open education platform that is attractive and accessible to everyone, regardless of where they come from, where they live and their age.

Since more and more people own mobile phones, which is directly associated with an increase in access to mobile internet, society can take advantage of the opportunities offered by smartphone apps. Accessibility to mobile devices allows for better mobile service provision to the public, facilitating, inter alia, the movement and use of diversified

public transport. Railways alone can become the basis for the development of a European digital identity linked to mobility.

On the basis of these deliberations, it can be concluded that progressive digitalization based on internet access is the driving force of a given country, city or local community. This creates opportunities and possibilities for further development. Thanks to progress based on digitalization, which has been taking place in many areas of life for several years, an economy is being created before our eyes, ensuring fast and efficient public access to resources such as information. This is one of the characteristics of information society. Undoubtedly, the technological progress and digitalization of public services observed in the 21st century will contribute to achieving higher living standards and facilitating the functioning of society.

At the same time, despite the benefits associated with the development of digital services, it should be remembered that older people are some of the most digitally excluded. As a result, they do not fully meet all their needs using digital public services to the extent that they could if they had the skills needed to navigate IT systems on a smartphone or a computer efficiently. Although, as presented in the article, internet access is systematically increasing, the inability to cope with various functionalities leads to digital exclusion, especially among elderly and ageing sections of the population.

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