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Modern technologies in social security systems

Digital transformation in public administration
European experiences: Poland, Finland, Italy, Ukraine

- e-administration
- digital government
- information and communication technologies
- platformization
- datafication
- blockchain
- electronic payment services

ZUS ZAKŁAD UBEZPIECZEŃ SPOŁECZNYCH

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Dear readers,

here we present an issue of our journal devoted to the application of new digital technologies within social security institutions.

Digital technologies have been developing dynamically for several decades and are used in many spheres of the economy and public administration. Their use is constantly expanding along with the increase in user demand and the development of this field. These technologies are entering new spheres, offering the implementation of new tasks, with subsequent experiences causing their further development and expansion both in terms of the scope and possibilities of their appliance.

The reason for such a dynamic development of digital technologies is their participation in increasing company efficiency, in economies, as well as the role they play in public institutions and the entire state administration. Beyond doubt, it is currently difficult to imagine anyone functioning without them. It can also be said with a high degree of certainty that their role will continue to increase in the future.

In this publication, we focus on the implementation of new technologies in a select group of institutions – those connected with social security. Of course, they function in a much broader institutional context: being on the one hand a part of e-government, while on the other hand – and in different countries to different degrees – they are related to the private sector, for example to those paying contributions.

The challenges faced by these institutions have been and are of the different kind. First of all, their task – as an institution of public trust – is effective and lawful customer service to mainly beneficiaries, but also to the contribution-generating employers. New technologies make it possible to improve customer service by accelerating the case-handling process and reducing the number of wrong decisions made. The client is able to deal with their cases directly, online. The aim is also to be able to settle the matter once and for all, so that they do not have to report multiple times presenting the self-same documents, ones that ideally should be protected, but available to social security institutions if necessary. Official cases are also to be dealt with online in an increased instance. Undoubtedly, the pandemic has increased the demand for the use of digital solutions enabling social security institutions to operate remotely.

Recently, work has also been carried out on such solutions to respond to the whole of an individual client's needs, even if the individual benefits or services are being provided by different institutions. To achieve this goal, it is necessary to build integrated databases (so-called datafication) for use by various institutions; a departure from silo collection and the processing of ever increasing data. This planned change is a huge challenge for many countries and institutions.

Another role for the functioning of social security institutions, apart from servicing the beneficiary, is financial management; collection of appropriate contributions from payers, protection of institutions against errors and abuse in this area. Contribution payers are also customers of social security institutions, even if they do not receive benefits, and it is important to ensure that they are able to fulfil their obligations rightly and efficiently.

The degree of technology development and application varies across national institutions, and is influenced by many factors, mainly the level and scope of digitization in a given country, but also by other, less obvious factors, as indicated in the article by Niko Väännänen from Finland. In this publication, we present the various experiences of institutions in a select few countries to show both the existing differences and underlying common trends. Such a fundamental common direction is adopted in the pursuit of a wider and most effective use of these constantly evolving technologies.

The issue consists of two parts. The first, in two texts, presents the background and nature of the development and application of digital technologies, in particular in public institutions, including social security institutions. This part builds the context for the subsequent articles. The second part was devoted to the presentation of digital solutions in social security institutions in selected countries, *i.e.* in Finland, Poland and Italy.

In addition, the issue includes two texts directly related to the topic, *i.e.* an article by Hlib Filipchuk on the implementation of new technologies in Ukraine and a text by Jakub Górka about e-payments in e-administration on the example of the ZUS project.

In their introductory article, Katarzyna Śledziewska and Renata Włochy take up the topic of the use of technology in public institutions. They outline the basic and latest technological solutions, cloud solutions, artificial intelligence and blockchains. These instruments offer enormous opportunities to act quickly and efficiently with the use of huge amounts of data. Focusing on the specificity of the functioning of public institutions, the authors emphasize that, in general, decision-makers in these institutions are less prone to risk, *inter alia*, due to subsequent elections and possible political change. In addition, the authors say, public institutions are characterized by a "silo" structure that hinders or prevents the free flow of data, especially important when using artificial intelligence. They indicate that it would be possible and beneficial for citizens to change the direction from a hierarchical method of management towards a new paradigm based, on the one hand, on platformization, and, on the other hand, on datafication, which makes it possible to recognize citizens' needs and respond to them. The authors do not disregard the fact that the application of new technologies, in particular relating to the use of a large amount of citizen data, may lead to the risk of excessive control and therefore should be monitored. The possibilities, barriers and threats mentioned in the text also apply to social security institutions.

Another general article deals with the application of new technologies in social security systems. The author – Raul Ruggia-Frick – primarily takes up the issue of new technologies from the perspective of using a huge amount of data. He points out that it is precisely access (and very fast at that) to data that enables the introduction and management of complex social security systems and the transformation of services. Social security institutions are increasingly using big data and artificial intelligence to analyze the growing amount of data and to support employees by automating actions and decisions. R. Ruggia-Frick talks about the variability of emerging concepts, such as artificial intelligence, the definition of which is still fluid. As director of social security at the International Association of Social Security Institutions (ISSA),

he also presents recommendations on the use of new technologies in order to achieve high management standards. He proposes building well-defined strategies – related to the use of new technologies – to achieve the goals set for the institution. Further articles are devoted to domestic Polish solutions.

Gertruda Uścińska, president of the Polish Social Insurance Institution (Zakład Ubezpieczeń Społecznych, ZUS), discusses the application of new technologies in this entity. She points out that their explicit development begins in 2016, but the state of the pandemic has contributed to the acceleration of this process. The author, indicating that new technologies began to be used in ZUS as far back as the early 2000s, focuses on their development in the last five years. She discusses the key e-projects of ZUS, such as the Electronic Services Platform (Platforma Usług Elektronicznych, PUE), which is a tool facilitating access to the information and services provided by ZUS. It should be noted that PUE is constantly being transformed to meet new needs. Subsequently, the e-Contribution (e-Składka) solution was introduced, which has made it possible to organize the number and status of insurance accounts, or e-ZLA – electronic sick leave. ZUS was one of the first in the European Union to implement the Electronic Information Exchange System for Social Security (EESSI).

The previously introduced electronic solutions have become particularly useful during the COVID-19 pandemic lockdown period. Their modern structure and access to large amounts of data have made ZUS one of the most important entities implementing government aid programs. E-services have also developed significantly: e-visits and e-reservations have been implemented. It is planned to rebuild the Electronic Services Platform to further improve customer access to all services. Support will be provided by the electronicisation of documentation, here equally in contacts with external entities.

N. Väännänen presents the issue of digitization in social security in Finland. He points out that, unlike many other situations when public institutions introduce modern technologies lagging behind those of the private economy, the digitization of the public sphere in Finland is fast and efficient.

The author discusses the factors supporting the development of information technology in Finland. First, modern technologies have been present in Finland for decades; an example being the company Nokia, which for several years was a leader in the development of mobile telephony. Secondly, the author points to the importance of Finland's low population density and the proportion of elderly people in the society. Various social services can be provided thanks to new technologies. Third, the inhabitants of Finland have a high degree of trust in public administration, which prevents citizens from protesting about data sharing; for they believe they will be safe and used for the right purpose. Fourth, Finland has a very extensive system of social benefits, often universal and covering a large part of the population. Therefore, computerization has long been seen as an extremely helpful tool for the proper handling of these complex systems. Digitization is treated by the Finnish government as a priority due to, on the one hand, the possibility of achieving greater material efficiency, and on the other hand – better service to the citizens.

The article by Valeria Bonavolontà and Massimilian D'Angelo shows that innovations in public institutions arise in the context of the digital transformation that the entire European Union is undergoing. In Italy, the Social Security Institution (Istituto Nazionale della Previdenza Sociale, INPS) is at the forefront of innovation in public institutions. Currently, INPS is implementing its strategy for 2020–2022, which changes the paradigm of its operation and assumes the creation of a modern model of services for citizens, business and other administration institutions.

In the next text, the author, H. Filipchuk, presents selected aspects of digitization in Ukraine. The author has indicated that the authorities of this country are strongly motivated to implement computerization and have taken up this initiative very quickly. It could even possibly be argued that the pace was too fast, which has resulted in insufficient data security.

Digitization is clearly accelerating in the public sector, including social security institutions. Plans and strategies are being prepared.

J. Górka writes about the importance and forms of e-payments, which are also very substantial for the functioning of social security institutions. The article compares the e-payment service designed by ZUS with similar services provided in Polish public administration and in selected European countries. On the Polish market, these services show many similarities in terms of the model of their provision, with differences in this area being seen between individual European states. It is worth noting that some countries have a highly dispersed system of public services, and some are transforming their public administration towards building a one-stop shop for citizens and entrepreneurs to simplify communication with e-administration and in dealings with official matters. The article by J. Górka contains a multifaceted description of the e-payment service designed at ZUS, presents the process of preparing ZUS for its launch, along with an indication of the problems related to its implementation.

The text shows the state of development and application of digital technologies. The basic message is that institutions are in a constant process of development and change, one that is still not fully predictable. However, it is impossible to imagine any further development of the functioning of social security institutions without new technologies.

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The specificity of the digital transformation of the public sector

In this article we focus on identifying the specificity of digital transformation within the public sector. The aim of the article is to present the main mechanisms resulting from the introduction of digital innovations that have changed the functioning of the public sector. Starting from a discussion on the technological requirements of digital transformation, we briefly characterise the use of computers and the Internet in public administration, resulting in the development of e-services and administration. The main part of the article is devoted to discussing the specificity of the implementation of the new digital technologies in public administration, focusing mainly on artificial intelligence and blockchain technologies. Our thesis is that the impact of innovative digital technologies on the operation standards and structure of public administration should be analysed through the prism of interrelated mechanisms of datafication and platformisation, characteristic for the digital economy. The adopted methodology, which is based on an analysis of the subject literature and an analysis of new technology implementations in public administration in EU countries, indicates the pilot, random and non-transformational nature of these implementations, partly due to the lack of well-established methodologies to study and assess the maturity of digital transformation within the public sector.

Key words: artificial intelligence, blockchain, digital, e-services, public sector, transformation

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Technological aspects of digital transformation

The acceleration of the digital transformation of the economy, society and the state is due to the increasing use of interrelated technologies, which can collectively be referred to as digital technologies. They are used to collect, store, process and analyse data continuously produced by consumers and citizens, private organisations and public institutions, by people and machines, who/which are more and more often permanently connected to the Internet. In other words, it is a specific group of information and communication technologies that we propose to refer to as "intensifying technologies". This is because they strengthen the impact of those ICTs (information and communications technologies) whose diffusion has laid the foundations for the digital economy, and can therefore be referred to as "foundational technologies". First and foremost, computers are such foundational technologies – complex computing machines working on the basis of algorithms. Over the last few decades, computers have become increasingly efficient and powerful, while becoming smaller and therefore more mobile, all thanks to advances in chip miniaturisation. Another epochal invention, the Internet, has ensured communication between individual computers. Finally, several years ago, smartphones appeared on the market – the multifunctional devices being in fact miniature, Internet-connected computers, constantly downloading and sending data. Miniaturisation has also contributed to a decline in price and a resulting surge in the use of sensors, devices that pick up signals from the environment and convert them into data. The volume of digital data coming from digital devices has started to grow exponentially.

A parallel progress in the area of connectivity has enabled the development of two key "intensifying technologies": cloud computing solutions, which allow one to increase computing power by using the computational potential of external servers; and the so-called "Internet of Things", which consists in connecting devices equipped with sensors within the Internet. Through the cloud, an organisation can use disk space and computing power (Infrastructure-as-a-Service, IaaS); applications and software (Platform-as-a-Service, PaaS, and Software-as-a-Service, SaaS); communication solutions (Communication-as-a-Service, CaaS) and the infrastructure that integrates programs and applications running in different operating environments (Integration Platform-as-a-Service, iPaaS). In fact, everything can become a cloud service (Everything-as-a-Service, XaaS).[1] The Internet of Things makes it possible to collect real-time data on the entire life cycle of a product, from production through use to recycling; it also makes it possible to create digital twins of machines and systems, *i.e.* digital replicas that allow changes to be made to their functioning on an ongoing basis.

1 S. Vennam, *Cloud Computing*, IBM.com 18 August 2020, https://www.ibm.com/cloud/learn/cloud-computing (online access: 21.12.2020).

Artificial intelligence and blockchain

Artificial intelligence (AI) is a lofty term proposed in the 1950s by one of the pioneers of research into "thinking machines"; in fact, it is a group of technologies based on the use of algorithms. These algorithms can be rule-based, *i.e.* they can follow the "if a certain condition occurs, perform a certain action" guidelines imposed by the programmer, or they can self-improve using statistical rules. In this case we are dealing with machine learning: computers work without being programmed first. However, the effectiveness of such algorithms depends on access to large data sets, which have only become available with the development of the Internet and the diffusion of digital devices.

In 2012, "intelligent" algorithms created by Google X Lab learned to recognise cats in photos; however trivial the subject may seem, it was an excellent example of the potential of artificial intelligence, currently being developed for such purposes as biometric identification and the creation of autonomous vehicles capable of analysing the environment in real time and responding to changes in it accordingly. Complex, multi-layered algorithms, somewhat resembling the structure of the human brain, are able to detect connections and correlations in large data sets: each subsequent layer of the algorithm strengthens the result of the analysis made in the previous layer. Such neural networks enabling deep learning proved their capabilities in 2016 when a program created by Google-linked DeepMind beat a human master at the ancient Chinese game of "go", a much more complex game than chess. The program, fed by a database of historical games played and provided with the rules of the game, reached master level in three days by playing a million games against itself. The next iteration, AlphaGo Zero, is equipped only with a database of games; by testing various solutions, the program has developed rules of play to beat both human and computer champions.[2] This is an example of reinforced deep learning, highlighting the cognitive potential of algorithms. For the sake of argument, it should be added that the widespread use of such algorithms is still limited due to the enormous cost of their operation (resulting from the need to clean and customise databases and the cost of electricity needed to process the data).[3]

The increase in computing capabilities of computers thanks to cloud solutions has enabled the development of blockchain technology. A blockchain is a cryptographically secured, distributed data record, a kind of "digital ledger that operates within a decentralised network of independent computers that update and maintain it in a way that proves the records are complete and authentic".[4] The blockchain's operating protocol is based on an innovative algorithm that enforces the consensual entry of subsequent

2 D. Hassabis, D. Silver, *AlphaGO Zero: Starting from scratch*, DeepMind 18 October 2017, https://deepmind.com/blog/article/alphago-zero-starting-scratch (online access: 21.12.2020).

3 K. Greenewald, K. Lee *et al.*, *The Computational Limits of Deep Learning*, 10 July 2020, https://arxiv.org/abs/2007.05558 (21.12.2020); W. Knight, *Prepare for Artificial Intelligence to Produce Less Wizardry*, Wired 7 November 2020, https://www.wired.com/story/prepare-artificial-intelligence-produce-less-wizardry/ (online access: 21.12.2020).

4 M.J. Casey, P. Vigna, *The Truth Machine: The Blockchain and the Future of Everything*, New York 2018.

data into the register on all computers belonging to the network. Each of them records the data independently but in a coordinated way, exactly the same as the other computers. The algorithm then cryptographically seals the new block, making it impossible to change the information it contains.

The technology was originally used to create cryptocurrencies such as bitcoin, but the potential benefits of using it to maintain protected and reliable data records were quickly recognised. A blockchain can be used to confirm the identity of individuals and organisations, confirm the reliability of data obtained from various sources, confirm ownership of resources and for decentralised data processing. Currently, blockchain solutions are being tested primarily in the financial sector, *e.g.* for balancing payments between banks, bypassing intermediaries and in near real time.[5]

Datafication and platformisation

In the 1990s, data began to be mass-produced by Internet users, which was used by technology companies to build new business models. They were based on the production of new kinds of goods and services: fully digitised (so-called digital information goods, such as ebooks or digital music, games or films) or combining material and digital elements (so-called smart products). Datafied goods and services were becoming a rich source of data about their users. Advanced, self-learning algorithms, cloud computing and the Internet of Things are making it possible to collect, process and analyse these abundant data faster and cheaper, and these data are becoming one of the primary factors of production. The information obtained from them influences the way organisations operate, with ever greater and more precise knowledge of their customers and partners. This process of deriving value – economic, social or political – from abundant data sets through sophisticated analytical tools, most often using intelligent algorithms, can be referred to as datafication.[6]

We are dealing here with a self-perpetuating mechanism: the more data, the better calibrated and "smarter" algorithms that can learn from growing data sets. Implementing AI-based solutions serves two primary purposes: analysing large data sets to make predictions, which in turn supports decision-making processes; and automating processes and tasks.[7] There are new and increasingly personalised, *i.e.* tailored to users' expectations and needs, products (goods and services), as well as new business models based on the expanding networks connecting people, systems, machines and organisations. Platforms use data to precisely connect market parties, and build their competitive advantage on the skilful use of network effects.

5 *Ibid.*

6 V. Mayer-Schonberger, K. Cukier, *Big Data: A Revolution That Will Transform How We Live, Work and Think*, New York 2013.

7 A. Agrawal, J. Gans, A. Goldfarb, *Prediction Machines: The Simple Economics of Artificial Intelligence*, Boston 2018.

Under the influence of datafication, the internal operating models of organisations are also changing towards those that prioritise the use of data and intelligent algorithms ("data-first, AI-first") in management, procedural and production processes.

Production processes (we mean in this context both the production of goods, but also the provision of services by economic entities, public institutions or non-governmental organisations) are subject to increasingly far-reaching automation in all areas where people have so far been engaged in performing tasks which were routine and repetitive, and therefore inherently translatable into logical procedures, in other words – algorithms. It is worth emphasising that this applies not only to processes requiring manual labour, but also to those that were traditionally performed by white-collar workers. The so-called Robotic Process Automation (RPA) includes various types of bots and other computer programs. The simplest bots have to be programmed top-down to perform specific tasks. Self-learning bots, based on machine learning algorithms, use databases of historical and current examples to train sequences of tasks performed by human employees. Even more advanced cognitive bots use machine learning and deep learning algorithms to capture correlations and regularities from structured and unstructured data, autonomously finding task sequences amenable to automation. Bots are capable of performing routine and generally tedious tasks on their own for human employees: reading and sending emails and analysing them for relevant information; logging into and reading databases; filling out forms; collecting statistics from social media and scouring the web for data.[8] At a more general level, bots are able to extract data (*e.g.* from PDF documents), integrate data from different sources (*e.g.* personal data and data from public registers), convert data into different formats required by different institutions and integrate them into available databases.

The implementation of technology entails operational and organisational changes: the internal structure of the organisation is being transformed in favour of a flatter (especially given the middle management level is being depleted) and more flexible one (project teams with variable staff composition, increasingly internationalised, instead of rigid divisions into departments or sections). Organisations – not only companies in the technology sector, which is the core of the digital economy, but also in sectors considered traditional, from industry through services to agriculture, but also to NGOs – are being platformised, becoming elements of broad production ecosystems. The spread of digital technologies is translating itself into organisational and process changes, becoming the basis for digital transformation. Countless, diverse, dispersed and uneven digital transformation processes are changing the functioning of companies, markets, consumers, employees, the state, by building a new kind of economy, based on the interrelated processes of datafication, intelligent automation, platformisation and personalisation – the digital economy.

Under the influence of new technologies, the state and its institutions composing the public administration, its structure and the model of its operation, especially the way of

8 Deloitte, *The new machinery of government. Robotic Process Automation in the Public Sector*, 2017, https://www2.deloitte.com/content/dam/Deloitte/nl/Documents/public-sector/deloitte-nl-Robotic-process-automation-in-the-public-sector.pdf (online access: 21.12.2020).

satisfying the needs of citizens, are also changing. It is worth remembering that the basic function of the state administration since the beginning of time has been to collect, store, analyse and use data on phenomena and processes occurring on the territory of the state and its inhabitants. The state is a repository of enormous datasets. However, a large part of them still remains undigitised and therefore cannot be used in the datafication process. This is one of the reasons why the process of the digital transformation of public institutions differs significantly from the analogous process taking place in companies and other private sector institutions. Moreover, when starting to implement new technologies, decision-makers must take into account the interests of many social groups and political parties, while focusing on the broader public interest (which, of course, may be defined differently depending on the world-view). Reduction of labour costs and greater efficiency of internal processes or productivity are not the only measures of success; preventing the discrimination or exclusion of particular groups of citizens is equally important.

Decision-makers in public institutions are also less inclined to bear the risks inherent in the implementation of large infrastructure projects, especially since the duration of a project is often limited by time of successive elections.[9] Public institutions are also usually much more conservative, which is expressed, *inter alia*, in their reluctance to introduce new systems. As a result, they often struggle with the so-called technological organisational legacy, resulting from the burden of outdated IT infrastructure. Another barrier to the implementation of new digital technologies is the siloed nature of data available to the public sector: data are collected in incompatible formats, still often on paper, and according to incompatible methodologies. Meanwhile, artificial intelligence technologies in particular need adequate, abundant and high-quality data on which algorithms can be trained.[10] The scale of implementation projects is also an obvious challenge. It is worth remembering in the context of the examples of digital transformation in Estonia or Singapore, which are often held up as a model: the scale and complexity of changes introduced in a country with 1.3 million citizens or even 5.7 million citizens differs from the scale and complexity of changes in a country inhabited by tens of millions of people.

ICT deployment and e-government development

In the first decades of computerisation, public administration in highly developed countries did not lag behind the private sector: it was public institutions that bought the first PCs, perceiving digitisation as an opportunity to improve analytical processes, and later introduced local networks (LANs) hoping that the transition from paper to electronic

9 K. Desouza, T. Makasi *et al.*, *Chatbot-mediated public service delivery: a public service value-based framework*, "First Monday" 2020, 25(12).

10 J. Tobin, *Predictive and Decision-making Algorithms in Public Policy*, House of Lords Library, 3 February 2020, https://lordslibrary.parliament.uk/research-briefings/lln-2020–0045/ (online access: 20.12.2020).

document circulation would facilitate communication. However, the lack of competent staff with sufficiently advanced IT skills was a growing problem; private organisations generally offered much higher wages. As a result, outsourcing IT services, combined with the implementation of IT systems purchased from external suppliers, has become the norm.[11] During the 1990s, the inherent conservatism of bureaucratic organisations and their reluctance to depart from once implemented systems and formats, or even to update them, became more and more evident. This phenomenon, sometimes referred to as the institutional legacy burden, meant that individual institutions, and even departments or divisions within their internal structure, were locked in specific silos: their IT systems did not cooperate with each other, and incompatible data formats did not allow for the exchange of information and knowledge.[12] The negative consequences manifested themselves, *inter alia*, in the lower quality of the decision-making process, difficulties in coordinating the administrative apparatus and a lower quality of public services (*e.g.* in terms of the time and effort a citizen had to devote to verifying his/her identity with various institutions and harmonising and completing his/her data).

Governments and public administrations have been less conservative in their use of the Internet, which soon began to be used as a new channel of contact with citizens, firstly to present information and then to allow two-way interaction between the public and public institutions. Over time, selected public services have also been delivered *via* the Internet. In public and academic discourse, the term "e-government" emerged, understood as "the use of information and communication technologies to provide government services to citizens and businesses more effectively and efficiently."[13] In other words, the specificity of e-government lies in the delivery of e-services with varying degrees of sophistication and involving citizens to varying degrees. At its most basic edition, an e-service amounts to posting information on a procedure or required documents on the institution's website. A slightly more advanced service allows one to download the necessary forms and then to start the procedure remotely (after confirming the identity of the applicant; its finalisation, however, takes place in the office in direct contact). E-service reaches the transactional level, when it is completely carried out remotely. It is increasingly common for citizens to have access to services tailored to their specific needs (personalised): forms are *e.g.* pre-filled with data already held by the public administration and a virtual assistant suggests what steps should be taken to finalise the procedure.

The development of digital public services in the European Union is measured by the DESI (Digital Economy and Society Index). It is worth noting that despite the selective introduction of transactional and partially personalised e-services such as electronic tax returns, Poland is on the last positions in the ranking.

11 J.W. Cortada, *The Digital Hand*, Vol. 3, *How Computers Changed the Work of American Public Sector Industries*, New York 2007.

12 F. Bannister, *Dismantling the Silos: Extracting New Value from IT Investments in Public Administration*, "Information Systems Journal" 2008, 11(1).

13 e-Government Knowledgebase, https://publicadministration.un.org/egovkb/en-us/about/unegovdd-framework (online access: 20.12.2020).

Table 1. Digital public services indicators in Poland in comparison with the EU

	POLAND						EU
	DESI 2018		DESI 2019		DESI 2020		DESI 2020
	value	place	value	place	value	place	value
E-Government users (% Internet users needing to submit forms)	45 (2017)	23	49 (2018)	25	54 (2019)	21	67 (2019)
Pre-filled forms	48 (2017)	17	54 (2018)	17	58 (2019)	16	59 (2019)
Online service completion	81 (2017)	21	84 (2018)	20	87 (2019)	20	90 (2019)
Digital public services for businesses	70 (2017)	25	75 (2018)	24	75 (2019)	25	88 (2019)
Open data	N/A		N/A		78 (2019)	7	66 (2019)

Source: compiled on the basis of Digital Economy and Society Index (DESI). The maximum value of each index is 100

It is worth noting that a more dynamic development of e-services is conditioned by the implementation of cloud solutions by public administration as a technological platform for their delivery. They make it possible to scale services: to involve more institutions in the cooperation and to extend the distribution to more recipients. The use of cloud solutions also avoids the main barriers that stand in the way of digital transformation in public administration, including the costs of overcoming technological legacies and the costly cyclical updating of hardware (computers and servers). A leader in this field is the UK, which introduced a Government Cloud First policy in 2013 in the development of public services; also in the United States, public administration routinely uses Microsoft Cloud for Government.[14]

The use of cloud services generally means that their basic infrastructure (powerful servers and data centres) is located outside the territory of a given country and is controlled by large technology companies, the vast majority of which are American. An increasing number of countries see this as a threat to sovereignty as traditionally understood, whereby the government exercises control and custody over the affairs of its citizens. A new dimension of sovereignty is emerging – data sovereignty, based on the idea that data should be processed and stored in the same country where they were generated. There is also a new European initiative to build a data ecosystem integrating distributed cloud services provided by many individual providers, called Gaia-X.[15]

14 Government Digital Service, Government Cloud First policy, 3 February 2017, https://www.gov.uk/guidance/government-cloud-first-policy (online access: 20.12.2020).

15 Gaia-X, https://gaia-x.eu/ (online access: 20.12.2020).

Implementation of intensifying technologies in public administration

Estonia is the most frequently cited case study of digitisation processes taking place in public administration. In this small country almost all public services (99%) are available online. In 2001, the Estonian government launched the first version of the X-road platform, which provides all public institutions, companies and citizens with the ability to integrate databases and exchange information. X-road connects more than 1,300 information systems and enables the delivery of more than 2,700 services. Copies of data are kept in the cloud outside the country's borders, better protecting them from potential cyber attack. Citizens can access a wide variety of public services (such as e-Voting, e-Tax Board, e-Business, e-Banking, e-Ticket and e-School) through a digital identity card, with the digital identity verified through a special code and yet another code to confirm transactions (*e.g.* entering into a contract). Estonia is also blazing new trails in the use of blockchain technology to secure data in the health system, court registers, mortgage registers, business, inheritance and the judiciary. It is estimated that Estonia saves 1,400 years of human labour and 2% of its GDP annually by implementing digital solutions.[16]

Few countries achieve a similar level of sophistication. The prevailing view among digitisation researchers is that currently public administrations implement new technologies reluctantly and in a reactive manner, responding to specific challenges or problems and partly to passing fashions.[17] Technologies serve to improve basic functioning, but their implementation rarely leads to operational or organisational changes. This is also reflected in the subject literature: one of the meta-analyses showed that of a selection of 1,438 articles on the implementation of artificial intelligence-based solutions published between 2000 and 2019, only 59 dealt with implementations in the public sector.[18] Discussions of the anticipated benefits of the potential implementation of particular technologies, derived by analogy to the benefits enjoyed by private sector organisations, dominate, while there are few empirically anchored evaluative analyses based on actual implementations.

The narrative on the implementation of Internet of Things solutions in public administration is a good illustration of this state of affairs. The deployment of sensors in public spaces makes it possible to collect data to optimise transport management (*e.g.* traffic management thanks to sensors placed at road level or drones), municipal management (waste management thanks to sensors indicating how full the containers are), but also the way healthcare or public administration functions. Smaller countries – such as Singapore – are also testing the more advanced capabilities offered by the Internet of Things, such as the creation of digital replicas (digital

16 PwC, *Estonia – the Digital Republic Secured by Blockchain*, 2019, https://www.pwc.com/gx/en/services/legal/tech/assets/estonia-the-digital-republic-secured-by-blockchain.pdf (online access: 21.12.2020).

17 O. Ali, A. Shrestha *et al.*, *Cloud computing technology adoption: an evaluation of key factors in local governments*, "Information Technology & People" 2021, 34(2).

18 G. Misuraca, C. van Noordt, *AI Watch – Artificial Intelligence in public services: Overview of the use and impact of AI in public services in the EU*, Luxembourg 2020, p. 11.

twins) of the entire urban infrastructure and its surroundings, enabling a rapid response to threats and crises. However, all these solutions are still in the testing or implementation phase, or have the character of limited piloting.[19] The authors of the articles thus dwell on the potential opportunities offered by this technology, from the ability to manage infrastructure systems in real time to the personalisation of services for the population based on data collected in real time.

In the remainder of this chapter, we will look in more detail at the implementation of two technologies considered to be flagships for digital transformation: artificial intelligence and blockchain.

Artificial intelligence

In December 2018, the European Commission established AI Watch, a kind of think tank (knowledge service) dedicated to monitoring the development, deployment and impact of artificial intelligence in Europe. In 2020, a team of AI Watch analysts presented the results of a mapping exercise identifying 230 public sector artificial intelligence deployments in European countries.[20] The largest number of applications was identified in the area of General Public Services (76/230), Economic Affairs (40/230) and Healthcare (41/230). The majority of deployed AI applications support the decision-making process (38%, 87 out of 230 cases); one in five applications supports law enforcement (*e.g.* to detect violations through social media monitoring) or supports internal management systems (*e.g.* analyses in HR departments). Only in 12 cases was artificial intelligence used in systems for the delivery of social benefits (*e.g.* in Latvia, the verification of benefit claims was automated).[21] The types of applications of artificial intelligence in the mapped projects are shown in Figure 1.

Beyond its purely descriptive value, the analysis has shown that the vast majority of applications are incremental and technical in nature, and do not involve a transformational change in the functioning of public administration. However, the most important conclusion reached by the authors of the report was as follows: the promising successes of small-scale pilots and successful experiments do not guarantee translation into stable and useful implementations in a given institution, let alone in a wider public administration.[22]

Barriers and challenges in the process of introducing artificial intelligence are illustrated by the experience of implementing the most frequently used AI functionalities – chatbots and virtual assistants. Chatbots are able to answer frequently asked questions in natural language (*i.e.* the language that people use in everyday conversations). More advanced chatbots are able to guide the user through the administrative procedure and provide personalised problem-solving support.[23] According to the Estonian vision of creating digital

19 K. Jonsson, O. Velsberg, U.H. Westergren, *Exploring smartness in public sector innovation – creating smart public services with the Internet of Things*, "European Journal of Information Systems" 2020, 29 (4).

20 G. Misuraca, C. van Noordt, *AI…*, *op. cit.*, p. 13

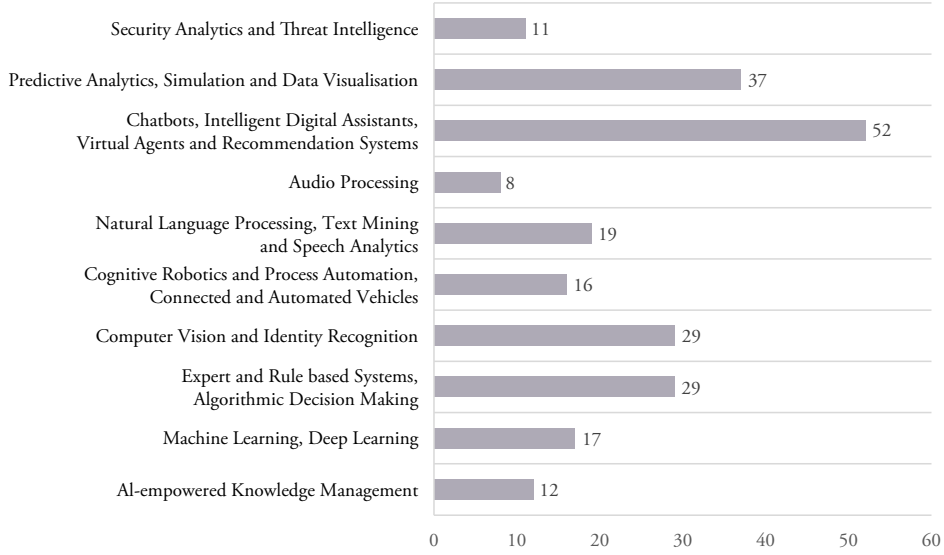
21 *Ibid.*, pp. 24–26.

22 *Ibid.*

23 K. Desouza, T. Makasi *et al.*, *Chatbot-mediated public service delivery: a public service value-based framework*, "First Monday" 2020, 25(12).

services for citizens, announced in 2019, the chatbot will be the single contact channel for an interoperable and distributed (for security reasons) network of artificial intelligence-based applications, called #KrattAI.[24] The Estonian government intends to limit investment in interfaces of other types, such as websites. Services will be further personalised based on data about the individual user; in other words, the chatbot will not repeat vague phrases containing generic information, but will tailor its answer according to, for example, the age and gender, or even the interests of the questioner, based on a package of information gathered from a variety of sources, including social media. Users will be able to use it in order to authorise various actions, such as submitting applications, making payments or changing their data. The advantages of such an integrated solution for the citizen are illustrated by the Estonian government with the story of a citizen who, while having her morning coffee, encouraged by a virtual assistant, renews her passport by authorising the transaction with her biometric data. The interaction with the bureaucracy is minimal, anticipatory (the absence of a valid passport would prevent the citizen from using already purchased tickets; it is also an example of the integration of data from public and private sources, in this case from an airline operator) and unobtrusive. "Our digital government is so pleasant and easy to use" is the thought that is supposed to appear in the citizen's mind after the interaction with the administration is over.[25]

Figure 1. Types of AI applications in public administration in Europe



Source: G. Misuraca, C. van Noordt, *AI Watch – Artificial Intelligence in public services: Overview of the use and impact of AI in public services in the EU*, Luksemburg 2020, p. 23

24 *Factsheet: AI – "kratt" strategy*, e-estonia, https://e-estonia.com/wp-content/uploads/2020-april-facts-ai-strategy.pdf (online access: 21.12.2020).

25 *#KrattAI: the next stage of digital public services in #eEstonia*, kratid.ee 24 February 2020, https://www.kratid.ee/visionpaper (online access: 21.12.2020).

Therefore, the implementation of chatbots brings the promise of personalisation and intelligent automation that is comfortable from the perspective of the user of public services. From the perspective of the administration, there is hope for the release of officials from tediously repetitive and predictable interactions with customers to solve specific and non-obvious problems that require the use of contextual knowledge, which artificial intelligence will not be able to cope with for a long time, and on the other hand – an increase in service efficiency as a result of the automation of routine processes. This could bring about the structural changes reminiscent of those occurring in companies: flattening the management structure and opening up to partnerships with other institutions operating on a similar basis.

A 2019 analysis of the functioning of chatbots used in public institutions in Latvia and in municipal offices in Bonn and Vienna, however, showed that this technology has so far shown little transformational potential. For example, WienBot, installed in 2017, although it answers a whole range of questions about specific public services, it does not enable the citizen to deal with the matter directly. Using Garner's typology cited above, they allow for the introduction of a level of information and to some extent interaction, but not transaction. In each of the three cases analysed, chatbots provided information but did not enable matters to be dealt with, they did not provide integrated information and only in the case of Latvia were the researchers able to observe organisational changes involving the redeployment of officials to other, more complex tasks.

> If there is no sufficient amount of data sharing between public organizations, citizens will still be required to provide the same kind of information multiple times. Filling in the same kind of information on a government form is – with or without a Chatbot – a tedious and annoying task. Just having a Chatbot is not going to make this procedure any more satisfactory. If the public sector truly wants to gain maximum benefits from emerging technologies, such as Chatbots, it will require massive public reform, a change in administrative culture and a strong reflection on the current organizational practices.[26]

In other words, introducing technological innovations without changing the rules of the entire administration is reminiscent of the biblical pouring of new wine into old wineskins.[27] In the case of the aforementioned #AIKratt, it will be necessary not only to solve the technological problem of current and accurate voice recognition in Estonian, but also to make the operation of the applications created by different public institutions more consistent, and to coordinate the exchange of data on citizens. Building citizens' trust in the "black box" of technology is also a key challenge. Experiments conducted in Japan on the use of chatbots showed that citizens were more willing to talk to chatbots

26 G. Misuraca, C. van Noordt, *New Wine in Old Bottles: Chatbots in Government – Exploring the Transformative Impact of Chatbots in Public Service Delivery* [in:] *Electronic Participation*, eds. N. Edelmann, O. Glassey *et al.*, San Benedetto del Tronto 2019.

27 *Ibid.*

about waste management than about custody issues.[28] These results are interesting in that Japanese society shows an extremely high level of positive attitudes in the area of modern technology implementation.[29] Successful implementation of the technology must therefore be based on a foundation of citizen trust in government, supported by an open information policy on how chatbots work and how to use and secure the data they collect.

Blockchain

Blockchain, which in the simplest terms is a distributed, cryptographically secured and transparently controlled database, may find numerous applications in the practice of public administration. First of all, it can support notary functions, *i.e.* it can be used to authenticate all kinds of documents, from birth and death certificates through passports and visas to mortgage registers. It can also facilitate the process of sharing data between various institutions, locked in technological silos – the registers created on its basis are, in principle, transparent and verifiable by all entities involved in its maintenance. Finally, through so-called smart contracts, blockchain enables process automation. Theoretically, blockchain can be used to organise elections: each vote cast can be securely encrypted and the whole procedure transparent to all participants.[30] The implementation of blockchain solutions may increase the security of interactions and transactions between the citizen and administration, creating a foundation for citizens' trust in digital public services.[31]

Despite this promising potential, examples of the practical application of this technology in public administration are few; in 2019, experts from the Joint Research Centre (JRC) identified only a dozen of them across Europe. In Estonia it is the most widely used, with blockchain solutions called Keyless Signature Infrastructure (KSI) to ensure the security of public databases.[32] The Exonum system in Georgia is used to provide additional security for mortgage registers archives; in Malta, blockchains are used to validate academic credentials (the technology is used in Japan for the same purpose[33]); Sweden's Chromaway is used to secure and accelerate real estate transactions. In the

28 N. Aoki, *An experimental study of public trust in AI chatbots in the public sector*, "Government Information Quarterly" 2020, 37(4).

29 K. Devlin, B. Stokes, *Despite Rising Economic Confidence, Japanese See Best Days Behind Them and Say Children Face a Blank Future*, Pew Research Center, 12 November 2018, https://www.pewresearch.org/global/2018/11/12/sentiment-about-the-state-of-the-economy-trade-and-prospects-for-the-future/ (online access: 20.12.2020).

30 A. Dhillon, G. Kotsialou *et al.*, *Long Read: How blockchain can make electronic voting more secure*, LSE USAPP – American Politics and Policy blog 25 September 2020, https://blogs.lse.ac.uk/usappblog/2020/09/25/long-read-how-blockchain-can-make-electronic-voting-more-secure/ (online access: 20.12.2020).

31 B. Franczyk, M. Hernes *et al.*, *Digital Transformation of Public Administration Through Blockchain Technology* [in:] *Towards Industry 4.0 – Current Challenges in Information Systems*, eds. M. Hernes, D. Jelonek, A. Rot, 2020.

32 S. Cheng, M. Daub *et al.*, *Using blockchain to improve data management in the public sector*, 28 February 2017, https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/using-blockchain-to-improve-data-management-in-the-public-sector (online access: 20.12.2020).

33 J. Clavin, S. Duan *et al.*, *Blockchains for Government: Use Cases and Challenges*, "Digital Government: Research and Practice" 2020, 1(3).

Netherlands, a blockchain-based pension payment system is being tested at a central level, and in the Dutch city of Groningen, a system for redistributing benefits to low-earning employees is under tests.[34] In 2017, the UK also ran a pilot programme to use blockchain in its benefits distribution system.[35] In Poland, blockchain is being used, among others, in the creation of a shared services centre in Toruń to accelerate and streamline electronic documents workflow.[36]

The conclusions drawn from the analysis of existing applications are not optimistic. In most cases, there is a critical gap between the capabilities of the technology at its current stage of development and the scale and complexity of the administrative systems in which it is attempted to be deployed. Projects with a limited number of partner institutions, centralised management and an external partner with relevant competencies to deal with technological issues have achieved a high level of maturity. JRC analysts concluded that blockchain implementations, so far, are neither transformative nor disruptive:

> We have not observed the creation of new business models, the emergence of a new generation of services nor direct disintermediation of any the public institutions involved in the provision of governmental functions.[37]

Legal regulations and the lack of interoperability standards between institutions also stand in the way. The most likely scenario is the use of blockchain to secure so-called data-at-rest, archived but not used on an ongoing basis (personal records, records of transactions or contracts). On the other hand, data in constant use will be secured and authorised by means of simpler and cheaper methods, *e.g.* identity verification by means of a trusted profile confirmed by online banking login data.[38]

Datafication and platformisation of public administration

A review of the use of new technologies in digital government demonstrates that digital transformation – in its technological, operational and organisational aspects – is a much more complex and staggered challenge than for private sector organisations.

34 G. Misuraca, C. van Noordt, *op. cit.*

35 L. Kello, I. Martinovic, I. Sluganovic, *Working Paper Series – No. 7: Blockchains for Governmental Services: Design Principles, Applications, and Case Studies*, Centre for Technology & Global Affairs, December 2017, https://www.ctga.ox.ac.uk/sites/default/files/ctga/documents/media/wp7_martinovickellosluganovic.pdf (online access: 20.12.2020).

36 R. Karaszewski, J. Modrzyńska, P. Modrzyński, *The Use of Blockchain Technology in Public Sector Entities Management: An Example of Security and Energy Efficiency in Cloud Computing Data Processing*, "Energies" 2021, 14(7).

37 J. Berryhill, T. Bourgery, A. Hanson, *Blockchains Unchained: Blockchain Technology and its Use in the Public Sector*, "OECD Working Papers on Public Governance" 2018, 28, p. 26.

38 C. Crittenden, M. Sistla, *Blockchain, Digital Identity and Health Records: Considerations for Vulnerable Populations in California*, Citris Policy Lab, 2020, https://citrispolicylab.org/wp-content/uploads/2020/10/2020-Blockchain-ID-homeless-final.pdf (online access: 21.12.2020).

Technological implementations must be accompanied by a precise strategy for their use in terms of existing and planned organisational processes and the implementation of organisational change. Process design consists in integrating and managing processes as a complex system of interdependent activities. Process integration takes place in many areas of the activities of public institutions, from document circulation within offices, through management processes, to the life cycle of the very services provided to citizens, from production, through the supply chain and the product life cycle. As processes become more integrated and standardised, they begin to form a unified system where data are shared, processed and consistent across the management layers of the institution and in the way services are delivered to citizens. Organisational change comes from a change in the structure of the organisation, which is becoming more horizontal and open, and a change in the way human labour is used. Developing digital competences and skills among staff at all levels of the organisation and fostering a new organisational culture that moves away from hierarchy towards project-based working becomes crucial.

If these changes are not taking place, we can talk about selective and limited digitisation processes based on pilot implementations of technologies, about epidermal digitisation rather than digital transformation. However, it is necessary to analyse the perspectives for the digital transformation of public administration. First of all, however, as in the case of companies, the implementation of new technologies and organisational changes related thereto may be accelerated as a result of a crisis, requiring non-standard solutions. Such a role was certainly played by the coronavirus pandemic, which forced a shift to remote working and the electronification of a whole range of public services. COVID-19 has accelerated digitisation processes, highlighting the benefits of faster analysis, more in-depth and precise knowledge of real-world phenomena and processes, and better prediction in a world full of unpredictable crises. Secondly, digital transformation efforts are guided by a specific normative objective of reforming public administration and, more broadly, the entire state management apparatus. The digital transformation is expected to result in the emergence of a digital government, whose properties were described by OECD experts working on the Digital Government Policy Framework as follows:

- digital by design, *i.e.* it has a purposeful digital architecture;
- data-driven public sector. Data are treated as a strategic asset; used to plan, implement and evaluate public policies;[39]
- government as a platform;
- in principle, it makes public data available and ensures transparency of policy processes (within the limits set by law and public and state interest);
- user-driven administration;
- proactiveness.

39 Organisation for Economic Co-operation and Development, *Strengthening digital government*, OECD Going Digital Policy Note, OECD 2019, www.oecd.org/goingdigital/strengthening-digital-government.pdf (online access: 21.12.2020).

Table 2. Stages of digital transformation

	Stages of digital transformation		
Change path	**Digitisation** of public administration (technology in administration)	**E-government**	**Digital government**
Overarching goal of technology implementation	To improve cross government activities and information management.	The use by governments of digital technologies, particularly the Internet, to achieve efficiency and productivity.	Datafication and platformisation of the public sector for the public interest, based on the reintegration of hitherto fragmented government functions and the holistic satisfaction of citizen needs.*
Specific objectives	Focus on efficiency (cost savings) and productivity.	Focus on efficiency and productivity in delivering tailored public services to individuals.	Emphasis on governance focused on openness, transparency, citizen engagement and trust in government, as well as efficiency and productivity.
The role of the citizen	Citizens are passive recipients of top-down designed services.	Citizens gain influence over the quality and design of services.	Citizens have a significant influence on the design of services, their quality and how they are delivered.

* S. Bastow, P. Dunleavy *et al.*, *New Public Management Is Dead – Long Live Digital-Era Governance*, "Journal of Public Administration Research and Theory" 2005, 16(3); R. Davies, *eGovernment. Using technology to improve public services and democratic participation*, European Parliamentary Research Service, 2015, https://www.europarl.europa.eu/RegData/etudes/IDAN/2015/565890/EPRS_IDA(2015)565890_EN.pdf (online access: 21.12.2020).

Source: modified and expanded table from the OECD report *Digital Government Strategies for Transforming Public Services in the Welfare Area*, 2016, https://www.oecd.org/gov/digital-government/Digital-Government-Strategies-Welfare-Service.pdf (online access: 21.12.2020)

In a nutshell, it can be assumed that digital government is based on the principles of datafication, *i.e.* the ability to derive value from data, and platformisation, resulting from and at the same time strengthening the possibility of datafication by changing the internal organisational structure and the relationship with the environment.

In the case of organisations of all kinds, the datafication translates into the ability to tailor the product/offer to the user's needs (thanks to data collected on an ongoing basis about the user and the way the product is used); in the case of public administration, this means the personalisation of public services. The idea of a state acting like Amazon, suggested by Deloitte in 2017, implies that the state will aim to provide citizens with the

same quality and comfort as platform companies. This requires the creation of a holistic digital experience that is unlimited as to time, place and device; the introduction of digital identification mechanisms through which citizens are able to log in to any service; and the development of data-sharing mechanisms.

The second main consequence of datafication is the possibility to optimise internal decision-making processes and to reorganise organisational processes, *e.g.* ways of involving human labour. One consequence of datafication is the increasing automation of tasks previously handled by employees of public institutions.[40] In Romania, the Ministry of Labour, Family and Social Insurance used RPA to distribute benefits to self-employed workers; the program, implemented within a month, allowed 96% of 285,000 benefit claims to be automated, with the whole process taking 36 seconds instead of the 20 minutes required by a human worker.[41] The use of algorithms allows for the introduction of algorithmic management, realising the ideal of impersonal, efficient, effective and theoretically disinterested administration, as conceived by the German sociologist Max Weber. However, there are multiple risks involved: algorithms may operate on the basis of fundamentally discriminatory rules, as was the case with the system for categorising the unemployed used in Poland. Machine-learning algorithms may be trained on poorly calibrated or incomplete datasets, and thus become a tool for structural discrimination.[42] Algorithmic management therefore requires the introduction of additional constraints and controls on the part of officials and, above all, transparency as to how the scheme is constructed, especially if it is to be operated by artificial intelligence.

Equally a consequence of the implementation within public administration of new technologies is the ensuing structural change – the transformation of hierarchical government-administrative structure into a horizontal platform structure. Individual institutions and public offices are prioritising the use of data by introducing common interoperability standards. Government works on a network of common APIs (application programming interfaces), open standards and databases, leveraging economies of scale in building public services.[43] A pioneering approach to the concept of government in the context of using new technologies was proposed in 2011 by Tim O'Reilly in his article *Government as a Platform*. O'Reilly noted that government is often treated like a vending machine: citizens put money into it (taxes) and in return they get services. Government, on the other hand, should be seen as the manager of a bazaar – a vast ecosystem of interconnected private organisations and public institutions that provide

40 P. Fettke, M. Hamberg, C. Houy, *Robotic Process Automation in Public Administrations* [in:] *Digitalisierung von Staat und Verwaltung*, eds. S. Halsbenning, M. Räckers *et al.*, Bonn 2019, pp. 62–74.

41 E. Knutt, *Take out the tedious: robotic automation in government*, Global Government Forum, 14 October 2020, https://www.globalgovernmentforum.com/take-out-the-tedious-robotic-automation-in-government/ (online access: 20.12.2020).

42 K. Sztandar-Sztanderska, M. Kotnarowski, M. Zieleńska, *Czy algorytmy wprowadzają w błąd? Metaanaliza algorytmu profilowania bezrobotnych stosowanego w Polsce*, "Studia Socjologiczne" 2021, 1 (240), pp. 89–115.

43 R. Pope, *A working definition of Government as a Platform*, digital HKS – Medium, 22 July 2019, https://medium.com/digitalhks/a-working-definition-of-government-as-a-platform-1fa6ff2f8e8d (online access: 20.12.2020).

services to users. The latter can freely choose between services and their providers. This approach means leaving to the government the function of providing the institutional architecture, the core applications and coordinating their work.

> In the technology world, the equivalent of a thriving bazaar is a successful platform. If you look at the history of the computer industry, the innovations that define each era are frameworks that enabled a whole ecosystem of participation from companies large and small. How does government become an open platform that allows people inside and outside government to innovate? How do you design a system in which all of the outcomes aren't specified beforehand, but instead evolve through interactions between government and its citizens, as a service provider enabling its user community?[44]

Table 3. Impacts of datafication and platformisation of government/public administration

Manifestations of datafication and platformisation	Benefits and opportunities	Threats and challenges
Administration gains access to citizens' behavioural data through the ability to integrate previously dispersed public and private data sources.	Administration has more precise knowledge about actions, expectations and needs of citizens. Administration better diagnoses social, economic and political problems and challenges. Personalisation of public services: services are precisely, flexibly and anticipatively adapted to the expectations and needs of citizens.	Potential for greater control over citizens' activities: *e.g.* the government is able to actively discourage citizens from engaging in activities that are deemed incompatible with the government's desired social, economic and political order. The risk of a datafied, maximally effective state surveillance over citizens. The risk of power asymmetry: an authority knows more about citizens than citizens know about the authority. The risk of increasing the exclusion of citizens who are unwilling or unable to use digital systems and devices.
Administration and government are using communication tools more and more effectively based on available data on citizens.	Implementation of digital technologies enables better and faster communication as well as information and knowledge transfer between citizens and the administration. Change in the relationship between citizens and government towards greater democratisation, citizen participation and influence on governance.	Difficulties are emerging in setting coherent policy goals in a context of growing complexity and the need to take into account the interests, expectations and needs of many social groups openly articulating their needs. The dangers of exclusion in accessing information are gaining strength.

44 D. Lathrop, L. Ruma, *Open Government: Collaboration, Transparency, and Participation in Practice*, Sebastopol 2010.

Manifestations of datafication and platformisation	Benefits and opportunities	Threats and challenges
Government routinely uses digital technologies in decision-making.	Strategic rationalisation of public policies thanks to the growing analytical and predictive potential provided by AI technologies. Faster response to crises and the ability to anticipate them thanks to predictive potential. Algorithmic management ensures faster and more efficient decision-making and delivery of public services.	Algorithmic governance may rely on algorithms programmed to intentionally or unintentionally discriminate against specific social groups or working on incomplete, skewed in certain respects or poorly calibrated databases. Technological dataism/ solutionism: a belief in the priority of data in decision-making combined with an increasing reduction of human decision-making input.*
Government uses digital technologies to automate tasks and internal processes.	Automation improves efficiency and reduces the cost of delivering public services. Tasks automation frees clerical staff from tedious and repetitive tasks, allowing them to focus more on creative or customer service tasks.	The automation of some tasks may lead to technological unemployment in public administration.
Structural changes in public administration lead to a kind of unification of the structure and operation of institutions, offices and teams, which facilitates cooperation among them and cooperation with private entities and citizens, in various configurations.	The government opens up to private-public partnerships, which increases the possibilities to deliver and personalise public services. Greater flexibility, ability to make structural changes more quickly.**	Structural fragmentation/ decentralisation of the public service delivery system occurs, making coordination difficult. Risk of dependence on external public service providers.
The government adopts a policy of sharing data with other entities.	Citizens gain a sense of, and tools for, the control of actions of the government. Private organisations and citizens themselves can use open data to create new ways of delivering services and new public services.	Open data can be used for commercial purposes, disregarding social interests. Open data may be used to the detriment of state interests (*e.g.* by hackers, the intelligence services of other countries).

* J.S. Pedersen, A. Wilkinson, *Big Data: Promise, Application and Pitfalls*, Cheltenham 2019.

** Fujitsu, *Government as a Platform*, 2015, https://www.fujitsu.com/uk/Images/government-as-a-platform.pdf (online access: 21.12.2020).

Source: own study

The implementation of new technologies enabling platformisation and datafication carries the potential for a comprehensive reform of the way public services are delivered. An example of a consistent restructuring of the hierarchical structure of government and administration is provided – in addition to Estonia – by the UK. The Government-as--a-Platform (GaaP) website outlines a vision of

> a common core infrastructure of shared digital systems, technology and processes on which it's easy to build brilliant, user-centric government services.

This infrastructure is made up of generic functionalities, the building blocks that allow new services to be created, such as for confirming identity (Verify), sending messages (Notify), making payments (Pay) and cross-team service creation (Design system).[45] Figures for 2020 show that GOV.UK Notify sent 1.6 million messages, while GOV.UK Pay accepted 7.1 million payments, which went to 160 public sector organisations. As a result of such wide-ranging organisational changes, public administration is taking shape as a digital platform ecosystem supporting the creation of new, cheaper and more useful services for citizens. The relationship between the state and the citizen is also changing towards one that is focused on collectively building solutions.

Summary

For over a decade, intensifying technologies such as cloud solutions, artificial intelligence and blockchain have been changing the paradigm of how organisations of all types operate. Operational and business models that prioritise data and the technologies for their collection, processing and use allow one to build competitive advantages derived from the ability to personalise product, optimise management and respond more quickly to change. This applies primarily to technology companies, especially those that are also platforms, but more and more often also to companies operating in traditional sectors. The state and its institutions are also increasingly bold in their approach to digital transformation, aiming to improve the accessibility and quality of public services for citizens. At the same time, the government can manage public affairs more efficiently by deriving value from the vast data resources at its disposal.

The digital transformation can result in a shift from a paradigm of government/public administration previously conceived as a hierarchical organisation, focused on achieving top-down governance objectives, to a paradigm of digital government, platformised and datafied, open to citizens' well-recognised – thanks to abundant data analysed by intelligent algorithms – needs. A mature digital transformation of public services can lead to very tangible benefits: the integration of processes and their optimisation and the integration of data, resulting in more efficient management and administration based on data; a different organisation of the administration's work, a new quality of communication and new personalised services. At the same time, there are constant dangers on the horizon related to such applications of new technologies, which will intensify processes of discrimination or exclusion, or ultimately increase the state's control and power over the citizen, leading to a kind of authoritarian surveillance. Hopes for tangible benefits from digital transformation must therefore be combined with a pragmatic awareness of

45 O. Davies, G. Freeguard, M. Shepheard, *Digital government during the coronavirus crisis*, Institute for government, 2020, p. 42, https://www.instituteforgovernment.org.uk/sites/default/files/publications/digital-government-coronavirus.pdf (online access: 21.12.2020).

the technological, operational and organisational barriers and an understanding of the potential risks and threats, manifested both by decision-makers, employees of public institutions and, above all, by citizens themselves.

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SOURCES

- Agrawal A., Gans J., Goldfarb A., *Prediction Machines: The Simple Economics of Artificial Intelligence*, Boston 2018.
- Ali O., Shrestha A., Osmanaj V., Muhammed S., *Cloud computing technology adoption: an evaluation of key factors in local governments*, "Information Technology & People" 2021, 34(2).
- Aoki N., *An experimental study of public trust in AI chatbots in the public sector*, "Government Information Quarterly" 2020, 37(4).
- Bannister F., *Dismantling the Silos: Extracting New Value from IT Investments in Public Administration*, "Information Systems Journal" 2008, 11(1).
- Bastow S., Dunleavy P., Margetts H., Tinkler J., *New Public Management Is Dead – Long Live Digital-Era Governance*, "Journal of Public Administration Research and Theory" 2005, 16(3).
- Berryhill J., Bourgery T., Hanson A., *Blockchains Unchained: Blockchain Technology and its Use in the Public Sector*, OECD Working Papers on Public Governance: No. 28, Paris 2018, https://doi.org/10.1787/3c32c429-en.
- Casey M.J., Vigna P., *The Truth Machine: The Blockchain and the Future of Everything*, New York 2018.
- Central Digital and Data Office, *Government Cloud First policy*, 2017, https://www.gov.uk/guidance/government-cloud-first-policy (online access: 21.12.2020).
- Cheng S., Daub M., Domeyer A., Lundqvist M., *Using blockchain to improve data management in the public sector*, McKinsey Digital.com 2017, https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/

using-blockchain-to-improve-data-management-in-the-public-sector (online access: 21.12.2020).
- Clavin J., Duan S., Erickson L.C., Janeja V.P., Joshi K.P., Yesha Y., Zhang H., *Blockchains for Government: Use Cases and Challenges*, "Digital Government: Research and Practice" 2020, 1(3).
- Cortada J.W., *The Digital Hand*, Vol. 3, *How Computers Changed the Work of American Public Sector Industries*, New York 2007.
- Crittenden C., Sistla M., Blockchain, *Digital Identity and Health Records: Considerations for Vulnerable Populations in California*, Citris Policy Lab, 2020, https://citrispolicylab.org/wp-content/uploads/2020/10/2020-Blockchain-ID-homeless-final.pdf (online access: 21.12.2020).
- Davies O., Freeguard G., Shepheard M., *Digital government during the coronavirus crisis*, 2020, https://www.instituteforgovernment.org.uk/sites/default/files/publications/digital-government-coronavirus.pdf (online access: 21.12.2020).
- Davies R., *eGovernment. Using technology to improve public services and democratic participation*, European Parliamentary Research Service, 2015, https://www.europarl.europa.eu/RegData/etudes/IDAN/2015/565890/EPRS_IDA(2015)565890_EN.pdf (online access: 21.12.2020).
- Deloitte, *The new machinery of government. Robotic Process Automation in the Public Sector*, 2017, https://www2.deloitte.com/content/dam/Deloitte/nl/Documents/public-sector/deloitte-nl-Robotic-process-automation-in-the-public-sector.pdf (online access: 21.12.2020).
- Desouza K., Makasi T., Nili A., Tate M., *Chatbot-mediated public service delivery: a public service value-based framework*, "First Monday" 2020, 25(12).
- Devlin K., Stokes B., *Despite Rising Economic Confidence, Japanese See Best Days Behind Them and Say Children Face a Bleak Future*, Pew Research Center, 2018, https://www.pewresearch.org/global/2018/11/12/sentiment-about-the-state-of-the-economy-trade-and-prospects-for-the-future/ (online access: 21.12.2020).
- Dhillon A., Kotsialou G., McBurney P., Riley L., *Long Read: How blockchain can make electronic voting more secure*, LSE USAPP – American Politics and Policy blog 2020, https://blogs.lse.ac.uk/usappblog/2020/09/25/long-read-how-blockchain-can-make-electronic-voting-more-secure/ (online access: 21.12.2020).
- e-Estonia, *Factsheet: AI – "kratt" strategy*, https://e-estonia.com/wp-content/uploads/2020-april-facts-ai-strategy.pdf (online access: 20.12.2020).
- Fettke P., Hamberg M., Houy C., *Robotic Process Automation in Public Administrations* [in:] *Digitalisierung von Staat und Verwaltung*, eds. S. Halsbenning, M. Räckers, D. Rätz, D. Richter, E. Schweighofer, Bonn 2019.
- Franczyk B., Hernes M., Rot A., Sobińska M., *Digital Transformation of Public Administration Through Blockchain Technology* [in:] *Towards Industry 4.0 – Current Challenges in Information Systems*, eds. M. Hernes, D. Jelonek, A. Rot, 2020.
- Fujitsu, *Government as a Platform, Fujitsu Services 2015*, https://www.fujitsu.com/uk/Images/government-as-a-platform.pdf (online access: 21.12.2020).

- Gaia-X, https://gaia-x.eu/\ (online access: 21.12.2020).
- Greenewald K., Lee K., Manso G.F., Thompson N.C., *The Computational Limits of Deep Learning*, 2020, https://arxiv.org/abs/2007.05558 (online access: 21.12.2020).
- Hassabis D., Silver D., *AlphaGO Zero: Starting from scratch*, DeepMind.com 2017, https://deepmind.com/blog/article/alphago-zero-starting-scratch (online access: 21.12.2020).
- Jonsson K., Velsberg O., Westergren U.H., *Exploring smartness in public sector innovation – creating smart public services with the Internet of Things*, "European Journal of Information Systems" 2020, 29(4).
- Karaszewski R., Modrzyńska J., Modrzyński P., *The Use of Blockchain Technology in Public Sector Entities Management: An Example of Security and Energy Efficiency in Cloud Computing Data Processing*, "Energies" 2021, 14(7).
- Kello L., Martinovic I., Sluganovic I., *Blockchains for Governmental Services: Design Principles, Applications, and Case Studies*, CTGA Working Paper Series: No. 7, Centre for Technology & Global Affairs, Oxford 2017, https://www.ctga.ox.ac.uk/sites/default/files/ctga/documents/media/wp7_martinovickellosluganovic.pdf (online access: 21.12.2020).
- Knight W., *Prepare for Artificial Intelligence to Produce Less Wizardry*, Wired.com 2020, https://www.wired.com/story/prepare-artificial-intelligence-produce-less-wizardry/ (online access: 21.12.2020).
- Knutt E., *Take out the tedious: robotic automation in government*, Global Government Forum, 2020, https://www.globalgovernmentforum.com/take-out-the-tedious-robotic-automation-in-government/ (online access: 21.12.2020).
- Lathrop D., Ruma L., *Open Government: Collaboration, Transparency, and Participation in Practice*, Sebastopol 2010.
- Mayer-Schönberger V., Cukier K., *Big Data: A Revolution That Will Transform How We Live, Work and Think*, New York 2013.
- Misuraca G., van Noordt C., *AI Watch – Artificial Intelligence in public services: Overview of the use and impact of AI in public services in the EU*, Luxembourg 2020.
- Misuraca G., van Noordt C., *New Wine in Old Bottles: Chatbots in Government – Exploring the Transformative Impact of Chatbots in Public Service Delivery* [in:] *Electronic Participation*, eds. N. Edelmann, O. Glassey, T. Lampoltshammer, G. Misuraca, P. Panagiotopoulos, P. Parycek, B. Re, San Benedetto del Tronto 2019.
- Organisation for Economic Co-operation and Development, *Digital Government Strategies for Transforming Public Services in the Welfare Area*, 2016, https://www.oecd.org/gov/digital-government/Digital-Government-Strategies-Welfare-Service.pdf (online access: 21.12.2020).
- Organisation for Economic Co-operation and Development, *Strengthening digital government, OECD Going Digital Policy Note*, Paris 2019, https://www.oecd.org/going-digital/strengthening-digital-government.pdf (online access: 21.12.2020).
- Pedersen J.S., Wilkinson A., *Big Data: Promise, Application and Pitfalls*, Cheltenham 2019.

- Pope R., *A working definition of Government as a Platform*, Medium.com 2019, https://medium.com/digitalhks/a-working-definition-of-government-as-a-platform-1fa6ff2f8e8d (online access: 21.12.2020).
- PwC, *Estonia – the Digital Republic Secured by Blockchain*, 2019, https://www.pwc.com/gx/en/services/legal/tech/assets/estonia-the-digital-republic-secured-by-blockchain.pdf (online access: 21.12.2020).
- Sikkut S., Vaher K., Velsber O., *#KrattAI: the next stage of digital public services in #eEstonia*, Kratid 2020, https://www.kratid.ee/visionpaper (online access: 21.12.2020).
- Sztandar-Sztanderska K., Kotnarowski M., Zieleńska M., *Czy algorytmy wprowadzają w błąd? Metaanaliza algorytmu profilowania bezrobotnych stosowanego w Polsce*, "Studia Socjologiczne" 2021, 1 (240).
- Śledziewska K., Włoch R., *Gospodarka cyfrowa. Jak nowe technologie zmieniają świat*, Warszawa 2020.
- Tobin J., *Predictive and Decision-making Algorithms in Public Policy*, House of Lords Library, 2020, https://lordslibrary.parliament.uk/research-briefings/lln-2020-0045/ (online access: 21.12.2020).
- United Nations, *e-Government Knowledgebase*, https://publicadministration.un.org/egovkb/en-us/about/unegovdd-framework (online access: 21.12.2020).
- Vennam S., *Cloud Computing*, IBM Cloud Learn Hub, 2020, https://www.ibm.com/cloud/learn/cloud-computing (online access: 21.12.2020).

Specyfika transformacji cyfrowej sektora publicznego

W niniejszym artykule skupiamy się na wskazaniu specyfiki transformacji cyfrowej w sektorze publicznym. Celem publikacji jest przestawienie głównych mechanizmów wynikających z wprowadzania innowacji cyfrowych, zmieniających funkcjonowanie sektora publicznego. Wychodzimy od omówienia technologicznych uwarunkowań transformacji cyfrowej, krótko charakteryzujemy zastosowania komputerów i internetu w administracji publicznej skutkujące rozwojem e-usług i administracji. Główną część artykułu poświęcamy omówieniu specyfiki wdrożeń nowych technologii cyfrowych w administracji publicznej, skupiając się głównie na technologiach sztucznej inteligencji i blockchaina. Stawiamy tezę, że wpływ innowacyjnych technologii cyfrowych na standardy funkcjonowania i strukturę administracji publicznej należy analizować przez pryzmat powiązanych ze sobą, a charakterystycznych dla gospodarki cyfrowej mechanizmów datafikacji i platformizacji. Przyjęta metodologia, która bazuje na analizie literatury oraz analizie wdrożeń nowych technologii w administracji publicznej w państwach UE, wskazuje na wciąż pilotażowy, wyrywkowy i nietransformacyjny charakter tych wdrożeń, częściowo wynikający z braku ugruntowanych metodologii do badania i oceny dojrzałości transformacji cyfrowej sektora publicznego.

Słowa kluczowe: sztuczna inteligencja, blockchain, transformacja cyfrowa, e-usługi, sektor publiczny

Raul Ruggia-Frick

Applying emerging data-driven technologies in social security. Country experiences and ISSA guidelines

The application of ICT (information and communication technologies) is enabling the implementation of increasingly comprehensive social security systems throughout the world as well as the transformation of social security services.

In particular, the so-called data-driven innovation enables social security institutions to improve products, processes and organisational methods. In this line, social security institutions are progressively applying emerging technologies, such as Analytics, Big Data, and Artificial Intelligence. While the pairing of analytics and big data allows for the performing of sophisticated analyses on increasingly large databases, Artificial Intelligence enables for automating processes and assisting staff in tasks requiring human decisions.

However, the application of such emerging data-driven technologies brings with it many challenges, mainly the complexities of combining the adoption of not fully tested technologies with the required stability of critical operational processes and differences in the application of development processes.

This paper addresses these issues and presents an overview of emerging data-driven technologies and their current application in social security institutions. It also presents guidelines supporting the application of data-driven technologies in social security developed by the International Social Security Association (ISSA).

Key words: analytics, artificial intelligence, big data, digital governance, social security

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Introduction

The application of information and communication technologies (ICT) enables the implementation of increasingly comprehensive social security systems throughout the world and the transformation of social security services. At the same time, the so-called data-driven innovation is enabling social security institutions to improve products, processes and organisational methods. It can also meet global social policy challenges in areas including health and the social protection needs of vulnerable populations. In recent years, the accumulation of institutional data in addition to external data obtained through inter-institutional collaboration is enabling the development of Big Data systems.

Social security institutions are progressively applying emerging technologies, such as Analytics, Big Data, and Artificial Intelligence (AI) to put data-driven innovation into practice. Although the potentials of these technologies have not yet been fully tested nor explored, they are already enabling relevant outcomes in key social security areas such as addressing error, evasion and fraud as well as developing proactive approaches and automated solutions to improve social services.

Nevertheless, their adoption conveys many challenges mainly related to the differences in the application development processes – based on data management rather than in software development – and because they require specialised staff and quality data. Furthermore, their application in social security requires putting into practice institutional innovation strategies that combine the adoption of not fully tested technologies with the required stability of critical operational processes. For that, institutions need digital governance frameworks prioritising business requirements and developing an innovation roadmap. To help meet such challenges, the International Social Security Association (ISSA) has developed Guidelines on Information and Communication Technology.[1]

This descriptive paper addresses these issues and presents an overview of emerging data-driven technologies applied in social security. The main goals of the article are to review the current adoption of these technologies by social security institutions, highlight key challenges and present existing guidance material, notably ISSA guidelines supporting institutions in their technology adoption journey.

The remainder of this article is organised as follows. The following section presents emerging data-driven technologies, their application in social security and related ISSA guidelines. This is followed by Governance considerations and an overview of Digital governance frameworks. Finally, conclusions are presented.

1 International Security Systems Association, *ISSA Guidelines on Information and Communication Technologies*, Geneva 2019.

Emerging data-driven technologies

Developing a data-driven administration

The concept of data-driven administration in the public sector has been developed in recent years. The Organisation for Economic Co-operation and Development (OECD) defines it as:

> A data-driven public sector recognises that data are an asset, integral to policymaking, service delivery, organisational management and innovation.[2]

More specifically, a truly data-driven public organisation applies data to transform the design, delivery and monitoring of public policies and services. The OECD also highlights the importance of applying sound Data Governance to capitalise on the value of data to deliver better services and policies.

Data-driven administration approaches can be applied to social security, where data constitutes the basis for operations and decision making. Data play a crucial role, as most current operations and management decisions are based on data about enrolled persons, their working activities, their contributions and the received benefits. Accurate and reliable data are, therefore, the basis for effective social security systems.[3]

Consequently, Data Governance and Management have become key disciplines for social security institutions, involving not only technological aspects but also business-related ones, especially data governance and data quality. Developments in this area consist of implementing master data and decision support systems in social security institutions across the world.[4]

Implementing data-driven administration requires technologies for managing and analysing data as well as for implementing solutions through data rather than traditional software development processes. Some of these data-driven technologies, such as Analytics, Big Data and Artificial Intelligence, are new or emerging. Such emerging technologies are enabling institutions to implement value-added functionalities and social security services, taking advantage of the growing social security data.

Analytics and Big Data

The pairing of analytics and big data allows social security institutions to take advantage of their increasingly large databases to perform sophisticated analyses ranging from detecting unusual phenomena to developing predictive models.

Data analytics can support social security institutions to improve their administrative effectiveness and efficiency by enabling them to understand the past, trace the cause

2 Organisation for Economic Co-operation and Development, *The Path to Becoming a Data-Driven Public Sector*, OECD Digital Government Studies, Paris 2019, https://doi.org/10.1787/059814a7-en.

3 International Security Systems Association, *Managing social security data*, Geneva 2016.

4 *Ibid.* and *idem*, *ISSA Guidelines on Information…, op. cit.*

of events, predict what are likely to happen, and suggest actions that could be taken. Institutions could apply data analytics in a wide diversity of areas, including healthcare, detecting and preventing error, evasion and fraud, proactive social policy and programme design, actuarial projections, improving service delivery, among others.

Data analytics is mainly based on an institution's data and could potentially include external ones which, after ensuring quality, are analysed in order to gain insights using various analytic approaches, in particular:

- Descriptive analytics, which tries to answer "What happened?". It provides an understanding of the past transactions that occurred in the organisation.
- Diagnostic analytics, which tries to answer the question "Why or how did it happen?". It involves an understanding of the relationship between relatable data sets and the identification of specific transactions along with their behaviour and underlying reasons.
- Predictive analytics, which tries to predict "What, when, where can it happen?" based on past data. Forecasting techniques can be used to predict, to a certain extent, the future outcome of an activity. These predictions can be applied to inform and influence proactive measures.
- Prescriptive analytics, which recommends a range of possible actions as inputs such that outputs in future can be altered to the desired solution. In prescriptive analytics, multiple future scenarios can be identified based on different input interventions.

This way, Descriptive, Diagnostic, Predictive and Prescriptive analytics provide different types of support for complex decision making.[5] Furthermore, the application of Prescriptive analytics should be aligned with the organisational management strategy to effectively create value by transforming data-driven analytical models into decisions.[6]

In turn, Big Data analytics leverages very large volumes of data usually going beyond individual institutional transactions.[7] Big Data is characterised by the 4 V's: Volume, Variety, Velocity and Veracity.

For instance, a potential source of Big Data would be medical home devices monitoring patients' vital signs. Big Data analytics requires a revisit of data analysis techniques in fundamental ways and at all stages, from data acquisition and storage to data transformation and interpretation. In particular, the task of collecting and analysing data is at the heart of the Big Data analytics pipeline.

In spite of the potential of Big Data, there are also a number of challenges and drawbacks, notably: data source fragmentation in siloed government systems, poor data quality and inconsistencies across silos, the impact of analytical processing on the performance

5 D. Frazzetto, T.D. Nielsen *et al.*, *Prescriptive analytics: a survey of emerging trends and technologies*, "The VLDB Journal" 2019, Vol. 28(4), pp. 575–595.

6 T. Brandt, S. Wagner, D. Neumann, *Prescriptive analytics in public-sector decision-making: A framework and insights from charging infrastructure planning*, "European Journal of Operational Research" 2021, Vol. 291(1), pp. 379–393.

7 K. Vassakis, E. Petrakis, I. Kopanakis, *Big data analytics: applications, prospects and challenges* [in:] *Mobile big data*, 2018, pp. 3–20.

of operational systems, and trade-offs between providing up-to-date information and not interfering with operational systems. This last issue can be addressed by real-time computing techniques, which enable analytical processes to be applied to transactional databases and systems, without impacting the performance of operational systems.[8]

The ISSA Guidelines on ICT[9] provide orientations for applying analytics in social security through a specific chapter that includes the following guidelines:

- Guideline 53. *Institutional framework for applying data analytics*. The institution establishes a framework for the application of data analytics, which defines the main procedures, duties and responsibilities, as well as technical standards.
  The framework should comprise the following activities: (i) Data lifecycle management, which comprises: data identification, data acquisition and filtering, data extraction, data validation and cleansing; (ii) Developing metadata mapping databases to business concepts; Data modelling aligned with business objectives; (iii) Managing the data repository and data warehouses accessible to business users; (iv) Data analysis and model development responding to business needs; (v) Performance measurement evaluating business-oriented outcomes of data analytics; (vi) Interoperability with institutional Master Data and business information systems.
- Guideline 54. *Descriptive analytics – Understanding the past*. The institution applies descriptive analytics to look at data and to analyse past events for insight on how to approach future decisions.
  Descriptive analytics examines the institution's data and past performance. The most robust use of descriptive analytics is using data exploration tools and developing alerts when certain criteria or trends emerge.
- Guideline 55. *Diagnostic analytics – Explain the cause of it all*. The institution applies diagnostic analytics to look towards the processes and causes of an event instead of the result.
  Diagnostic analytics can provide an answer to questions such as "How can we avoid this problem?" and "How can we replicate this solution?".
- Guideline 56. *Predictive analytics – What is likely to happen*. The institution applies predictive analytics to develop preventive approaches and related measures based on predictive models at strategic, operational and tactical levels.
  The term "predictive analytics" describes the application of statistical or machine learning techniques to create a quantitative prediction about the future through a predictive model. Predictive models alone do not create business value, but rather need to be effectively deployed into business decision-making processes.
  Potential areas of application are: preventing error and fraud, the proactive launch of social programmes and services based on preventive approaches targeting vulnerable population groups, and predicting service demands including budgeting, *etc*.

8 R. Van Leent, *Emerging technologies enabling data-driven policy and practice*, SAP Institute for Digital Government, 2018.

9 International Security Systems Association, *ISSA Guidelines on Information…, op. cit.*

- Guideline 57. *Prescriptive analytics – What action to take*. The institution applies prescriptive analytics to obtain decision options on how to take advantage of a future opportunity or to mitigate future risks.
  Prescriptive analytics differs from predictive analytics in that it does not stop at showing a likely outcome, but continues to present suggested actions. Prescriptive analytics incorporates a feedback loop in which descriptive and predictive models are combined to influence one another and direct the trends instead of simply detecting them.
- Guideline 58. *Analytics of big data*. The institution assesses the adoption of big data analytics, which consists of applying analytics techniques on such very large data sets. The most common big data analytics techniques are association rule learning, classification tree analysis, genetic algorithms, machine learning, incremental learning algorithms, granular computing, feature selection, regression analysis, sentiment analysis, and social network analysis.
- Guideline 59. *Machine learning on big data – Supporting decision making*. The institution assesses the application of machine learning techniques on big data to support decision making. The main goals are reducing the time between data collection, analysing it for relevant information, and using the outcome to make well-informed decisions.
  Machine learning algorithms are quite adaptive in nature. The more data you feed, the more they learn and their predictive modules become more precise and the results become more accurate than applying other techniques. Therefore, big data and machine learning may support social security managers planning new social programmes.
  The main types of machine learning techniques for decision making support are: Inductive learning in which models are built from the generalisation of examples; Deductive learning in which deduction is applied to obtain generalisations from a solved example and its explanation; Genetic learning in which algorithms are inspired in the theory of evolution are applied to find general description to groups of examples; Connexionist learning in which generalisation is performed by the adaptation mechanisms of artificial neural networks.

A growing number of social security institutions have been applying analytics and big data to address relevant social security functions.

Addressing evasion and fraud are some of the main applications of analytics. Social security institutions are applying discovery and profiling techniques for detecting evasion and fraud in contribution collection as well as in the delivery of benefits, particularly in detecting complex fraud operations. In addition, institutions are developing their capacity on Business Intelligence and Analytics as reported by the National Social Security Administration of Argentina (Administración Nacional de la Seguridad Social), the Public Authority for Social Insurance of Oman, the Social Security Administration of USA, Social Security Technology and Information Company (Empresa de Tecnologia e Informações da Previdência Social) of Brazil. Furthermore, Big Data and analytics is utilised for developing preventive approaches as well as for improving programmes and services.[10]

10 *Idem*, *Applying emerging technologies in social security*, Geneva 2019.

In the context of the COVID-19 crisis, the application of analytics has enabled institutions better to evaluate the health and social impact of the pandemic and improve decision-making processes.[11]

Table 1 summarises application experiences. Other ISSA reports provide further detailed descriptions.[12]

Table 1. Application experiences of analytics and Big Data

Approach	Projects	Institutions
Discovery	Detection of complex fraud manoeuvres and no-take-up Analysing beneficiaries' "itineraries" for service improvement	National Family Allowances Fund, France
	Detecting evasion and fraud in contribution collection	Federal Administration of Public Resources, Argentina Social Insurance Bank, Uruguay General Treasury of Social Security, Spain Central Agency of Social Security Bodies, France
	Detecting complex fraud operations involving registration, contributions, and benefits delivery	National Social Security Institute and General Treasury of Social Security, Spain
	Detecting fraud in unemployment benefits	National Employment Office, Belgium
	Detecting fraud in temporal disability benefits	National Social Security Institute, Spain
	Detecting fraud in work injury and accidents claims	National Employment Accident Insurance Institute, Italy
	Detecting fraud in family benefits	Department of Human Services, Australia
	Detecting fraud in registration, contribution collection, occupational diseases and unemployment	General Organization for Social Insurance, Saudi Arabia
Prevention	Institutional Big Data system covering insured persons and beneficiaries developed in the context of a Digital Transformation programme. System's capabilities range from fraud detection to supporting the prevention of chronic diseases especially diabetes mellitus and hypertension	Mexican Social Security Institute, Mexico
	National Big Data system covering Health and Social Security data, supporting health preventive measures	National Health Insurance Service, Korea

Source: innovative practices carried out by ISSA members

11 *Idem*, *The use of analytical technology in social security systems during the pandemic – Experiences from Latin America*, Geneva 2021.

12 *Idem*, *Ten Global Challenges for Social Security – Africa*, Geneva 2017; *idem*, *Ten Global Challenges for Social Security – Americas*, Geneva 2017; *idem*, *Ten Global Challenges for Social Security – Asia and Pacific*, Geneva 2018; *idem*, *Ten Global Challenges for Social Security – Europe*, Geneva 2019; *idem*, *Ten Global Challenges for Social Security*, Geneva 2019; *idem*, *Compendium of Innovative approaches*, Geneva 2019.

Artificial Intelligence

Artificial Intelligence aims to interpret events and to support decisions as well as to automate actions. AI systems make decisions when predictions are sufficiently accurate and the risk of error is sufficiently mitigated.

While AI initially used logic-based techniques, it evolved to using techniques that leverage Big Data, such as Machine Learning. In fact, in terms of the underlying technical disciplines, AI is an "umbrella" area that continues to evolve such that the boundaries of AI are not quite clearly defined. In fact, there is a continuum of data-driven innovation techniques ranging from Business Intelligence, Analytics and some approaches of Artificial Intelligence. In particular, Machine Learning is a type of Artificial Intelligence extending predictive analytics which can be used to refine predictive models over time.[13]

Advanced Machine Learning algorithms are composed of many technologies used in unsupervised and supervised learning (such as deep learning, neural networks and natural-language processing) and guided by lessons from existing information. Thus, Machine Learning allows AI applications to become progressively more accurate in predicting outcomes, without being explicitly programmed by learning autonomously from previous applications and outcomes. This enables recommending interventions that have proved to be successful under similar circumstances in the past.[14]

The selection of AI techniques should be based on the adequacy to the actual case scenario. For instance, while Deep Neural Networks (aka Deep Learning*)* are appropriate for text and image analyses and processing Internet of Things (IoT) data, other techniques such as Rule-based systems or traditional machine learning enable the solving of many other problems.

The large spectrum of AI applications ranges from low-intelligence scenarios like rule-based automation to higher-end intelligence capable of non-deterministic and evolving decision making. More concretely, AI can be broken down into five levels of sophistication[15]:

- Reactors, which are based on simple rules but can respond to some limited changing contexts (*e.g.* basic drones);
- Categorizers, which can recognise types of objects and can deal with them through simple actions within a controlled environment (*e.g.* warehouse robots);
- Responders, which enable support for others' needs by figuring out questions and situations (*e.g.* driverless cars, personal assistants);
- Learners, which are capable of solving complex problems by gathering information from multiple sources (*e.g.* IBM Watson applications);

13 R. Van Leent, *Rise of the Machines*, SAP Institute for Digital Government, 2019.

14 *Ibid.*

15 Gartner, *Build the AI Business Case. A CIO's Guide to Building the Strategy and Business Case to Implement AI in the Enterprise*, 2018.

- Creators, which may be initiating a paradigm shift. As the application of creators may have an important impact on humans' relationship to technology, they require profound thought before development.

AI application could not only automate processes but also augment human capabilities for decision making by providing high-performance information classification and prediction functionalities. In this vein,[16] points out that AI currently stands for "Augmented Intelligence" for social security agencies.

Some expected trends on AI are:

- Improve communication among persons by improving natural-language processing through contextual interpretation.
- Deepen and broaden integration with IoT applications, such as home movement detection sensors for long-term care.
- Further improvements on autonomous agents and intelligent devices.

Key success factors for AI application are data availability and quality, understanding the nature of developing AI solutions as well as skilled staff. While AI outperforms humans in certain complex cognitive functions such as image recognition in radiology, it requires huge datasets for training the systems.[17] In addition, AI's "business logic" is based on the representation of a decision model rather than on a procedural algorithm. In this line, model testing – which requires large datasets – also constitutes a key factor and challenge for AI application.

The application of AI in social security is promising but also challenging. From a business application perspective, the greatest challenge to AI success is the operationalisation of AI as part of an automated business decision-making system.

In addition, the transparency and "explainability" of the AI application constitutes an important issue, especially regarding decisions that impact people and/or involve relevant risks (*e.g.* economic, environmental, *etc.*).[18] However, there is a trade-off between explainability and accuracy/performance in AI techniques because black-box models are more accurate than Interpretable Models. Briefly, the former provides a lower number of false positives and negatives than the latter. This trade-off could be tackled by assessing the need for explainability when selecting techniques and by enabling business stakeholders to choose (explainable *versus* accurate). In any case, stakeholders should always have access to training data.

Finally, there are other security and data protection issues that also constitute relevant challenges for AI applications. While security threads may involve poisoning/contaminating training datasets, complying with data protection regulations may be compromised if data is used for purposes other than those for which it was collected.

The formidable power unleashed by AI has limitations in the scenarios to which they could be successfully applied and the types of problems which could be tackled. Firstly,

16 R. Van Leent, *Rise of..., op. cit.*

17 B. Lake, T. Ullman *et al.*, *Building machines that learn and think like people*, "Behavioral and Brain Sciences" 2017, Vol. 40, E253.

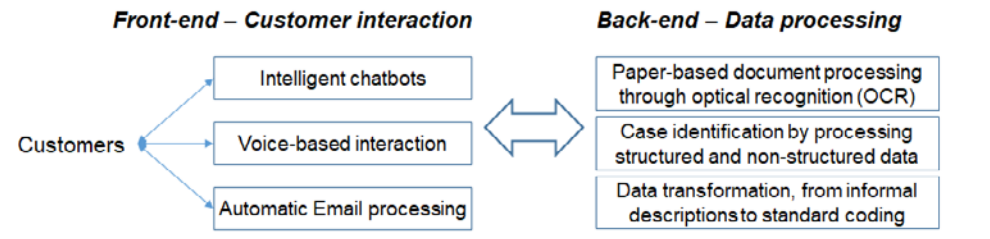
18 F. Xu, H. Uszkoreit *et al.*, *Explainable AI: A brief survey on history, research areas, approaches and challenges*, CCF international conference on natural language processing and Chinese computing, 2019, pp. 563–574.

the critical requirements for quality data may constitute a barrier for applying AI in scenarios without enough quality data (*e.g.* new types of images or IoT information). Similarly, weaknesses in HR capacity for preparing and training the AI systems may also constitute a barrier for such application. As regards the nature of the problems that could be tackled, AI may be able to tackle narrow types of problems. However, when the application areas are broader, the use of AI may not be feasible, especially when this requires interpreting a totally unknown environment. Furthermore, AI may not be capable of considering contextual elements that were not included in the training.

Finally, when compared with humans, AI lacks "judgement criteria" and intuition capabilities, which are usually based on long time experience, broad contextual information and on non-linear reasoning. In addition, it is not capable of exercising critical or ethical judgment or exercise empathy.

Beyond analytics, the emerging use of Artificial Intelligence in social security institutions is enabling the automation of more proactive and automated social security services.[19] This application is enabling one to improve customer services through automated 24/7 front-end support and also, more incipiently, automating back-end processes (Figure 1).

Figure 1. Types of AI applications in social security institutions



A growing practical application of AI consists of developing "chatbots", which are intelligent assistants to support self-e-services. The so-called chatbots are robot software capable of dialogue with customers in order. Chatbots enable one to respond to users' autonomously inquires on specific topics simulating human behaviour. They analyse and understand a user's questions in free natural language as well as managing the conversation flow. The implementation involves training an AI system using knowledge based on the responses and a very large dataset of potential questions and responses.

There is a significant interest in chatbots and they are increasingly being used by social security institutions. This trend is apparent in the good practices and experiences reported by ISSA members from Latin America[20] as well as from other regions.

Practical experiences include a chatbot called Julieta implemented by the Superintendency of Occupational Risks of Argentina to respond to questions about work

19 International Security Systems Association, *Artificial Intelligence in Social Security: Background and Experiences*, Geneva 2020.

20 *Idem*, *The application of chatbots in social security: Experiences from Latin America*, Geneva 2021.

injury benefits while the Social Security Bank of Uruguay (Banco de Previsión Social) implemented one to respond to the domestic workers scheme.[21]

In turn, the intelligent chatbot implemented by the Norwegian Labour and Welfare Administration (Nye arbeids- og velferdsetaten) has enabled the response to an increased demand for information in the context of the COVID-19 crisis. Concretely, during the period March to May 2020, the chatbot responded to more than 8,000 daily inquiries, which compares to a pre-COVID number of 2,000. The key success factors were the chatbot training based on a daily updated knowledge-base, the focus on a specific type of information, and a seamless connection from the chatbot to a human expert. The chatbot is being extended to new topics, and notably to support employers and the self-employed.[22]

The General Organization for Social Insurance (GOSI) of Saudi Arabia launched an experimental use of intelligent chatbots for service delivery. The objective was to develop an intelligent agent to respond to customers' inquiries and to simplify certain services and transactions. The agent communicates with customers through different chat and social networking applications.[23]

Some institutions are also using AI to improve back-end processes, notably to process large volumes of data comprising traditional databases as well as unstructured text and images of digitalised paper-based documents.

Employment and Social Development Canada (ESDC) applied AI to identify beneficiaries of the Guaranteed Income Supplement (GIS). Box 1 synthesises such experience.

Box 1. Employment and Social Development Canada experience applying AI

Employment and Social Development Canada applied AI to identify beneficiaries of the Guaranteed Income Supplement, which is a cash benefit targeting low-income old-age persons. In two months, Machine Learning models identified over 2000 vulnerable Canadians to be entitled to the GIS by processing more than 10 million records of unstructured text data.

In order to maximise the coverage of vulnerable beneficiaries, the business experts of the GIS programme decided that the model should have a high degree of inclusion and intentionally accepted false positives that would have to be reviewed manually.

The experience showed the importance of using representative data and capturing nuances as well as determining the adequate metrics and thresholds for the business needs by building the training dataset together with business experts.

As lessons learned, the ESDC highlighted that the quality of the underlying data is crucial and that AI projects require multidisciplinary teams with data scientists and business experts. The main identified risks comprised the selection of proper tools and the data literacy gaps among the staff in the organisation.

Source: International Security Systems Association, *Artificial Intelligence in Social Security: Background and Experiences*, Geneva 2020; *idem*, *Using artificial intelligence (AI) to identify vulnerable Canadians. Good practice of Employment and Social Development Canada*, ISSA Good practices database, https://ww1.issa.int/gp/198044 (online access: 22.9.2021)

21 *Ibid.* and *idem*, *The use of analytical…*, *op. cit.*

22 *Idem*, *Artificial Intelligence…*, *op. cit.*

23 *Ibid.*

Finland's Social Insurance Institution (Kela) is starting to apply AI in two ways: (i) improving customer services by combining e-services with intelligent chatbots, and (ii) using AI-based image recognition to automate administrative processes by recognising documents.

Similarly, the National Social Security Institute of Brazil (Instituto Nacional do Seguro Social, INSS) implemented an intelligent chatbot – called Helô – for providing automated responses 24/7 to customers' inquiries in the context of the myINSS personalised e-services. The first version deployed in May 2020 has already processed about a million inquiries. The INSS also uses AI to speed up beneficiary death detection to prevent undue payments.[24]

In turn, the Austrian Social Insurance (Dachverband der österreichischen Sozialversicherungsträger, SV) is applying AI for multiple purposes. Box 2 synthetises the Austrian experience applying AI.

Box 2. Austrian Social Insurance experience applying AI

The Austrian Social Insurance is applying AI for multiple purposes.

- Firstly, to deploy an intelligent chatbot – OSC Caro – which provides digital assistance to customers in various areas such as childcare allowances, sick pay and reimbursements.
- In addition, a voice recognition system supports call centre services by automatically forwarding customer inquiries to the corresponding offices.
- The system's language model, which is based on AI, was trained to recognise specific terms.
- Furthermore, AI is also used to implement the automatic dispatching of emails to the corresponding departments with up to 93 percent of accuracy.
- Finally, an ongoing project is implementing an AI-based semi-automatic reimbursement process of medical services fees. In this case, AI is applied to automate several tasks such as the recognition of the submitted documents, encoding diagnosis using the standard ICD-10, and extracting required data for the reimbursement (*e.g.* invoice amount, IBAN). This semi-automatic treatment enables one to speed-up the reimbursement process as well as support the involved staff.

Source: International Security Systems Association, *Webinar on AI*, Geneva 2020

Applications of Machine Learning in social security administration are reported in.[25] They include predicting customers' debt risks by an Australian government agency and proactive eligibility assessment by a UK government for additional social security benefits among vulnerable population groups receiving households benefits.

At the governmental level, several countries are defining national strategies on Artificial Intelligence. In particular, the Estonian strategy aims at enabling a proactive government based on a life-event service design and delivering personalised services

24 *Idem*, *The application of…*, *op. cit.; idem, The use of analytical…*, *op. cit.*

25 R. Van Leent, *Rise of…*, *op. cit.*

with zero bureaucracy through an intensive application of AI. The Estonian vision of AI-based digital public services is being put into practice through #KrattAI, which is an interoperable network of AI applications enabling citizens to use public services through voice-based interaction with virtual assistants. The more than 70 ongoing projects under this strategy, with 38 already operational, cover a wide range of areas including environmental applications, emergency support, cybersecurity and social services. In particular, an intelligent chatbot for customer services and processing long-term unemployment risk cases is applied in the context of unemployment insurance.[26]

The lessons learnt concerning AI application comprise ensuring the quality and privacy of the involved data, provide metadata, and manage the scalability of AI-based applications by using cloud infrastructure and developing adequate procurement models. Furthermore, the limits of automation for public services have to be correctly assessed.

Among the critical factors, data availability and quality are highlighted as a must in order to train the AI systems appropriately. Such "data needs" require establishing an organisational strategy to use internal data as well as potentially data from other organisations, and also involves assessing the compliance with data protection regulations. AI adoption requires specific institutional capacities. Institutions need to have a detailed understanding of the goal of the project, select data that is representative of the real world, choose simple solutions, pay special attention to the explainability of the algorithms used,[27] choose models that not only have the best results but also pass fairness standards that need to be carefully designed, and finally ensure transparency to ensure accountability.

In addition, institutions applying AI emphasised the importance of having projects developed by multidisciplinary teams involving business staff and data scientists. In this line, staff literacy on AI and data management also becomes a key factor. Business owners and project managers have to understand the implications of AI application in order to define what processes could be automated and which decisions must be in human hands.

Governance considerations

Although there are a growing number of success stories, the adoption of technologies in social security institutions is always complex and challenging. In particular, it requires strategic visions on developing a digital journey in the medium and long-term aligned with the institutional goals. This approach, called Digital Governance, involves the institution's decision-makers, in particular the CEOs, as they are increasingly leveraging ICT to carry out strategic institutional transformations and develop innovation capabilities.

26 International Security Systems Association, *Artificial Intelligence…, op. cit.*

27 F. Xu, H. Uszkoreit *et al.*, *op. cit.*

The ISSA Guidelines address these issues and provide orientations to carry out a sound Digital Governance in social security organisations.

At the institutional level, the ISSA Guidelines on Good Governance[28] calls for the board and the management to develop a shared vision of the institution's digital future and define broad, universal digital standards for service. It suggests the establishment of a Digital Governance framework that ensures that even as digital solutions are offered and prioritised, due care should be taken that a digital divide is not created. It also calls for established policies on the protection of personal data and the ethical use of Big Data and Artificial Intelligence, in particular, the prevention of such risks as misuse and the unintended consequences of data mining and algorithmic biases.

Concretely, Guideline 10, *Digital Governance,* recommends that

> The board and the management develop a shared vision of the institution's digital future and defines broad, universal digital standards for service. This includes a digital governance framework which prioritises user needs while balancing the business requirements of the institution, the sharing of information and the protection of personal data. The framework prioritises digital solutions and ensures that a digital divide is not created.

Furthermore, the ISSA guidelines state that ICT Governance constitutes a central responsibility for the board and management to apply technologies successfully. ICT governance can be defined as a

> framework for the leadership, organisational structures and business processes, standards and compliance to these standards, which ensure that the organisation's IT supports and enables the achievement of its strategies and objectives.

Chapter B.9 of the ISSA Guidelines on Good Governance[29] guides the board on developing an ICT Governance:

- Guideline 63. *ICT governance framework*. There is a single, integrated framework for ICT governance that establishes ownership, duties and responsibilities at the highest levels of the board and management.
- Guideline 64. *Strategic goals of ICT application*. The strategic goals of ICT application are aligned with and enable the institution's overall strategic plan. The goals reflect the strategic direction to be taken in the use of ICT, the Internet and the World Wide Web, as determined by the board and management.
- Guideline 65. *Innovations based on ICT and emerging technologies*. The ICT governance framework enables the institution to innovate the use of ICT, the Internet and the World Wide Web. There are established management processes to monitor emerging technologies and assess their potentials to improve the institution's business processes and services.

28 International Security Systems Association, *ISSA Guidelines on Good…, op. cit.*

29 *Ibid.*

As mentioned before, a sound Data Governance is crucial to implementing a data-driven administration, mainly to ensure data quality. The ISSA Guidelines on ICT include a section on Data and Information Management, which addresses data governance and data quality, mechanisms to enable information retrieval and analysis, and the implementation of master data systems in social security.[30]

At the government level, political leadership and support is essential at the national, federal and local levels. Creating connectedness across the different levels of government is fundamental to jointly developing digitisation strategies and creating that common ownership and shared commitment in order to achieve sustainable results. Socio-cultural and political factors will influence the structure of these governance frameworks. There are relevant examples in Australia, Canada and Estonia.

Box 3. Government of Canada Digital Standards – Improving government services in the digital age

The goal of these standards is to provide public services to Canadians that are simple to use and trustworthy. The Government of Canada's Digital Standards constitute the foundation of the government's shift to becoming more agile, open, and user-focused. They will guide teams in designing digital services in a way that best serves Canadians.

These digital standards were co-created with the public and key stakeholder groups. They are living standards and they will continue to evolve over time as we better understand the complexities involved in putting them into practice.

1. Design with users. Research with users to understand their needs and the problems we want to solve. Conduct ongoing testing with users to guide design and development.
2. Iterate and improve frequently. Develop services using agile, iterative and user-centred methods. Continuously improve in response to user needs. Try new things, start small and scale up.
3. Work in the open by default. Share evidence, research and decision making openly. Make all non-sensitive data, information, and new code developed in delivery of services open to the outside world for sharing and reuse under an open license.
4. Use open standards and solutions. Leverage open standards and embrace leading practices, including the use of open source software where appropriate. Design for services and platforms that are seamless for Canadians to use no matter what device or channel they are using.
5. Address security and privacy risks. Take a balanced approach to managing risk by implementing appropriate policy and security measures. Make security measures frictionless so that they do not place a burden on users.
6. Build in accessibility from the start. Services should meet or exceed accessibility standards. Users with distinct needs should be engaged from the outset to ensure what is delivered will work for everyone.

30 *Idem*, *ISSA Guidelines on Information…*, *op. cit.*

7. Empower staff to deliver better services. Make sure that staff have access to the tools, training and technologies they need. Empower the team to make decisions throughout the design, build and operation of the service.
8. Be good data stewards. Collect data from users only once and reuse wherever possible. Ensure that data is collected and held in a secure way so that it can easily be reused by others to provide services.
9. Design ethical services. Make sure that everyone receives fair treatment. Comply with ethical guidelines in the design and use of systems which automate decision making (such as the use of artificial intelligence).
10. Collaborate widely. Create multidisciplinary teams with the range of skills needed to deliver a common goal. Share and collaborate in the open. Identify and create partnerships which help deliver value to users.

Source: https://www.canada.ca/en/government/system/digital-government/government-canada-digital-standards.html (online access: 22.9.2021)

Conclusions and perspectives

There is a growing application of emerging data-driven technologies in social security organisations. Despite the involved complexities, such as emerging data-driven technologies, they are enabling institutions to implement value-added functionalities and social security services, taking advantage of the growing social security data.

The ISSA has developed guidance material to support institutions in applying such emerging technologies, notably guidelines on Analytics and Digital Governance complemented by several technical reports.

While many institutions worldwide are already applying analytics, Artificial Intelligence is gradually becoming a key technology for social security organisations. It enables them to increase administrative efficiency by automating processes and assisting staff in tasks requiring human decisions. However, although positive developments can be observed, several challenges also arise. These relate especially to the limitations and risks of AI, and the trade-off between process automation *versus* human control. Furthermore, the methodological differences between AI and traditional software development pose challenges to institutions carrying out the projects.

These outputs all serve to underline the key role of emerging technologies in social security and the importance of developing the institutional capacity to adopt them. While the intensive application of cutting-edge and emerging ICT may constitute a success factor, these also involve risks and challenges.

Therefore, institutions should have well-defined strategies and structured plans aligned with institutional objectives to adopt emerging data-driven technologies and implement a sound Digital Governance. Guided by a deep-seated culture of innovation,

the progressive adoption and innovative use of new technologies and the continuous value-added role of well-trained staff to enhance service delivery offer a smart approach to address emerging challenges.

Future research directions comprise defining practical approaches to automate social security processes by applying data-driven technologies. Notably, AI explainability and Big Data quality issues should be further analysed to enable a reliable application of emerging technologies matching good governance principles.

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SOURCES

- Berryhill J., Bourgery T., Hanson A., *Blockchains Unchained: Blockchain Technology and its Use in the Public Sector*, OECD Working Papers on Public Governance, No. 28, Paris 2018.
- Brandt T., Wagner S., Neumann D., *Prescriptive analytics in public-sector decision--making: A framework and insights from charging infrastructure planning*, "European Journal of Operational Research" 2021, Vol. 291(1).
- Frazzetto D., Nielsen T.D., Pedersen T.B., Šikšnys L., *Prescriptive analytics: a survey of emerging trends and technologies*, "The VLDB Journal" 2019, Vol. 28(4).
- Gartner, *Build the AI Business Case. A CIO's Guide to Building the Strategy and Business Case to Implement AI in the Enterprise*, 2018.
- International Security Systems Association, *Applying emerging technologies in social security*, Geneva 2019.
- International Security Systems Association, *Artificial Intelligence in Social Security: Background and Experiences*, Geneva 2020.
- International Security Systems Association, *Compendium of Innovative Approaches*, Geneva 2019.
- International Security Systems Association, *ISSA Guidelines on Good Governance*, Geneva 2019.
- International Security Systems Association, *ISSA Guidelines on Information and Communication Technologies*, Geneva 2019.
- International Security Systems Association, *Managing social security data*, Geneva 2016.
- International Security Systems Association, *Ten Global Challenges for Social Security*, Geneva 2019.
- International Security Systems Association, *Ten Global Challenges for Social Security – Africa*, Geneva 2017.
- International Security Systems Association, *Ten Global Challenges for Social Security – Americas*, Geneva 2017.
- International Security Systems Association, *Ten Global Challenges for Social Security – Asia and Pacific*, Geneva 2018.

- International Security Systems Association, *Ten Global Challenges for Social Security – Europe*, Geneva 2019.
- International Security Systems Association, *The application of chatbots in social security: Experiences from Latin America*, Geneva 2021.
- International Security Systems Association, *The use of analytical technology in social security systems during the pandemic – Experiences from Latin America*, Geneva 2021.
- International Security Systems Association, *Using artificial intelligence (AI) to identify vulnerable Canadians*, Good practice of Employment and Social Development Canada, ISSA Good practices database, 2020, https://ww1.issa.int/gp/198044 (online access: 22.9.2021).
- International Security Systems Association, *Webinar on AI*, Geneva 2020.
- Lake B., Ullman T., Tenenbaum J., Gershman S., *Building machines that learn and think like people*, "Behavioral and Brain Sciences" 2017, Vol. 40, E253.
- Organisation for Economic Co-operation and Development, *The Path to Becoming a Data-Driven Public Sector*, OECD Digital Government Studies, Paris 2019, https://doi.org/10.1787/059814a7-en.
- Van Leent R., *Emerging technologies enabling data-driven policy and practice*, SAP Institute for Digital Government, 2018.
- Van Leent R., *Overcoming Big Data challenges with Real-Time Computing – In Emerging technologies enabling Data-Driven policy and practice series*, SAP Institute for Digital Government, 2018.
- Van Leent R., *Rise of the Machines*, SAP Institute for Digital Government, 2019.
- Vassakis K., Petrakis E., Kopanakis I., *Big data analytics: applications, prospects and challenges* [in:] *Mobile big data*, 2018.
- Xu F., Uszkoreit H., Du Y., Fan W., Zhao D., Zhu J., *Explainable AI: A brief survey on history, research areas, approaches and challenges*, CCF international conference on natural language processing and Chinese computing, 2019.
- Yaga D., Mell P., Roby N., Scarfone K., *Blockchain Technology Overview*, USA 2018.

Zastosowanie w zabezpieczeniu społecznym nowych technologii opartych na wykorzystaniu danych. Doświadczenia poszczególnych krajów oraz wytyczne Międzynarodowego Stowarzyszenia Zabezpieczenia Społecznego (ISSA)

Zastosowanie technologii informacyjno-komunikacyjnych (*information and communication technologies*, ICT) umożliwia wprowadzanie coraz bardziej wszechstronnych systemów zabezpieczenia społecznego na całym świecie, jak również transformację usług z tego obszaru.

W szczególności tzw. innowacje oparte na wykorzystaniu danych umożliwiają instytucjom zabezpieczenia społecznego ulepszanie swoich produktów, procesów oraz metod organizacji. Podążając tą drogą, instytucje te stopniowo wprowadzają nowoczesne technologie, takie jak analityka, *big data* oraz sztuczna inteligencja. Podczas gdy połączenie analityki oraz *big data* pozwala na przeprowadzanie skomplikowanych analiz coraz obszerniejszych zbiorów danych, wykorzystanie sztucznej inteligencji umożliwia automatyzację procesów oraz wspomaga pracowników podczas zadań wymagających podjęcia decyzji przez człowieka.

Stosowaniu takich nowych, opartych na wykorzystywaniu danych technologii towarzyszą jednakże liczne wyzwania, głównie w postaci trudności wynikających z połączenia takich nie w pełni przetestowanych technologii z wymaganym poziomem stabilności procesów operacyjnych oraz różnic w zastosowaniu procesów rozwojowych.

Tekst ten omawia wyżej wymienione zagadnienia oraz przedstawia przegląd nowych technologii opartych na danych, a także ich obecne zastosowanie w instytucjach zabezpieczenia społecznego. Przedstawia on także opracowane przez Międzynarodowe Stowarzyszenie Zabezpieczenia Społecznego (International Security Systems Association, ISSA) wytyczne wspierające wykorzystywanie takich technologii w zabezpieczeniu społecznym.

Słowa kluczowe: analityka, sztuczna inteligencja, *big data*, zarządzanie cyfrowe, zabezpieczenie społeczne

Gertruda Uścińska

New technologies in the Social Insurance Institution

The Polish Social Insurance Institution (Zakład Ubezpieczeń Społecznych, ZUS) is one of the largest public institutions in Poland. For nearly nine decades it has been carrying out tasks in the area of social insurance, taking care both of the social security of citizens and the part of public finances it manages. ZUS has solutions which use modern techniques and technologies (so-called e-projects), which are the basic tools for achieving the organisation's objectives. The text outlines the objectives for ZUS development and related IT instruments in the area of IT over the last five years. Special attention has been paid to the solutions employed by ZUS during the COVID-19 pandemic (from spring 2020), which positively verified their legitimacy and application. The main e-projects have been described. Their role has been indicated and their efficiency assessed.

Key words: customer service, e-government, e-services, Electronic Services Platform ZUS (PUE ZUS), new technologies, Social Insurance Institution (ZUS)

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Introduction

The Social Insurance Institution (Zakład Ubezpieczeń Społecznych, ZUS), whose legal status and tasks are laid down by the Act on the Social Insurance System,[1] has been operating in the area of social insurance for nearly nine decades, taking care both of public social security policy implementation and the management of the relevant public finances. ZUS is one of the largest public institutions in Poland. It serves 26 million customers and cooperates with several hundred institutions in Poland and abroad.

ZUS's tasks, objectives and organisational structure define the needs and possibilities of changes in the institution's activity and determine the solutions – including new technologies – to be implemented. The following reflect the orientation and scope of implemented projects:

- quality of customer service,
- efficient task performance and realisation,
- results monitoring and appraisal,
- data security.

The Social Insurance Institution currently implements solutions that use modern techniques and technologies (e-projects), as the fundamental instruments for achieving the above objectives. A distinct evolution of these tools has been visible since 2016, but – paradoxically – it was the appearance of the pandemic and the associated restrictions on social and economic life that have caused a dynamic development in the use of new technologies at ZUS.

The article indicates the objectives of ZUS development and related IT instruments over the last five years. Special attention has been paid to the solutions used by ZUS during the COVID-19 pandemic (from spring 2020), which positively verified their legitimacy and usefulness. The main e-projects have been described – with an indication of their role and an assessment of their effectiveness. The potential has also been highlighted, this being the result of a forward looking assessment of changes in the socio-economic environment, strategic planning and efficient management of the institution in conditions of crisis.

ZUS – the first Polish e-office

The implementation of new technologies instruments to perform the statutory tasks of the Social Insurance Institution took place in the early 2000s, immediately after the announcement of the government's project to construct a system of e-government.[2] ZUS was one of the first public administration institutions to make information and downloadable forms available to customers on its websites and to enable online customer

1 Journal of Laws 2021, item 423, as amended, ch. 7.

2 D. Grodzka, *E-administracja w Polsce*, Infos – Biuro Analiz Sejmowych, No. 17, 2017.

consultations with ZUS staff using a chatbot. These were pioneering and experimental solutions in the public sector, but they were also implemented in such a way to allow for improvements according to the changing socio-environmental needs.

In subsequent years, new technology solutions introduced in ZUS reflected the implementation of ZUS's strategic development plans, among which the priority given to digitalisation and robotisation.[3] A vital solution for development in this direction was the launch in 2012 of the ZUS Electronic Services Platform (Platforma Usług Elektronicznych, PUE ZUS): the first electronic instrument for providing e-services in the public sector, one highly valued for its compliance with society's needs.[4] Thanks to PUE, ZUS has become a leader in e-government in Poland and the first Polish e-office.

Subsequently (mainly after 2016), ZUS has successively expanded functionality within the IT area. It has also developed and improved the Electronic Services Platform, recognised by Internet users as the most popular e-government website in Poland.[5]

Other e-projects implemented by ZUS, most important for the functioning of the institution, for the quality of its services and efficiency in managing public finances, include: e-Contribution (Polish "e-Składka"), e-ZLA (electronic medical certificates of incapacity for work), e-files (Polish "e-akta"), e-visits (Polish "e-wizyty") and Electronic Exchange of Social Security Information (EESSI).

ZUS's development as an e-office has been prioritised in the institution's subsequent long-term strategic plans, oriented at the implementation of e-services tailored to the needs of all groups of customers. Such an evolution and consistent strategy implementation have proved successful both in ZUS's everyday operations as well as in crisis conditions.

The article characterises in general terms ZUS's main projects utilising modern technologies, shows their potential – ones positively verified in the conditions of restrictions caused by the pandemic, and presents the institution's strategic objectives relating to the use of the latest technologies, and resulting from ZUS's current development plans.

ZUS key e-projects

The use of modern techniques and technologies as well as IT tools in ZUS activities is a priority for the development of this institution. The implemented e-solutions – in particular through the use of the possibilities offered by the Electronic Services

3 See ZUS strategies for the subsequent years, including the current one for 2021–2025: Zakład Ubezpieczeń Społecznych, *Strategia ZUS na lata 2021–2025* [ZUS Strategy for 2021–2025], https://bip.zus.pl/documents/493361/494179/Strategia_ZUS_2021–2025.pdf/50488985-c1d1–4cab-317b-420e460a075c?version=1.1 (online access: 11.6.2021).

4 This was confirmed by the results of an opinion poll titled "E-government in the eyes of Internet users" conducted for the Ministry of Digitisation by the PBS research company, https://www.zus.pl/documents/10182/24154/raport+PUE/73b5bce2-db20–445d-b80a-edf58cee2f18 (online access: 12.6.2021). For the implementation of PUE, ZUS was awarded the title of "IT Leader", which is granted by experts in the IT industry. When justifying this award, they emphasised that it was a distinction granted not only for the use of modern technologies, but also for a new way of thinking about management.

5 See Social Insurance Institution, *op. cit.*

Platform – are being prepared as prospective constructions, open to modification and change. The three largest of these projects are described in general terms below: PUE ZUS, e-Contribution and e-ZLA.

ZUS Electronic Services Platform – streamlining customer contact

ZUS Electronic Services Platform is a tool facilitating access to services provided by the institution, which currently allows ZUS customers to handle most matters online. To do so, the customer must set up an individual account and confirm his/her identity. PUE ZUS enables account holders to browse data collected at ZUS, submit insurance documents, file applications, ask questions and receive answers, as well as make appointments at ZUS branches. Insured persons may check the data saved on their profile and the status of their insurance account on PUE. They also have access to information about their medical certificates of incapacity for work. Contribution payers may use PUE to register an employee for insurance and to fill in and submit to ZUS settlement documents using data from ZUS database. They may also file specified applications and receive them on PUE, as well as collect the medical certificates of employees' incapacity for work.

Thanks to PUE, ZUS beneficiaries have access to, *inter alia*, benefit-related information necessary for tax settlements. The platform also allows one to make an appointment at a ZUS branch and to request a change in one's data. It also makes available the so-called professional profiles for doctors and bailiffs, providing such professionals with access to data necessary to perform their vocational duties. Sending letters and documents *via* PUE ZUS requires the user to have a trusted Electronic Platform of Public Administration Services (Elektroniczna Platforma Usług Administracji Publicznej, ePUAP) profile or an electronic signature confirmed with a qualified certificate.

ZUS's operational potential as a result of PUE has proven crucial for institution's capacity to act in crisis management conditions during the pandemic.

E-Contribution

Following the implementation of PUE, the Social Insurance Institution continued to introduce modern e-service solutions, using both the capabilities of the Platform and other modern technology-based solutions.

E-Contribution is particularly important among such projects. It was launched in 2018, laying the foundations for a completely new, modern and comprehensive mechanism for insurance contributions collection and settlement. This tool introduced a single individual bank account for the payment of contributions for all types of social insurance. This allowed one to organise the number and balance of insurance accounts. Having accurate and up-to-date records of accounts has made it possible, *inter alia*, to take action to eliminate the debts of contribution payers and to make – using the technological

possibilities of e-Contribution – a reliable balance of the Social Insurance Fund's (Fundusz Ubezpieczeń Społecznych) revenue and expenditure.

The possibility to keep up to date the number of contribution payers' accounts and the number of insured persons has proved to be very useful also outside the area of insurance. This is because it allows, *inter alia*, for a better identification of transformation processes within the economy, including labour market changes, making it possible to identify these changes *e.g.* in the number and dynamics of economic operators (companies) and in the number of employees.

Electronic medical certificates of incapacity for work

Electronic medical certificates of temporary incapacity for work (e-ZLA) are another key solution using IT mechanisms. The project has been piloted, on a voluntary basis, and subsequently reviewed since 2016. It has been in operation on a mandatory basis since 1 December 2018. This solution has allowed for the elimination of paper versions of certificates of temporary incapacity for work issued by doctors and their electronic transmission to employers and ZUS. This has contributed to a significant improvement and acceleration in the transfer of data on sickness absenteeism. Electronic resources of information in this area, at the disposal of ZUS, allow, for example, to monitor the dynamics of changes in this regard, taking into account many variables (including causes of incapacity for work and of morbidity in specific professional or socio-economic groups). The implementation of e-ZLA was the first element of the e-patient project, introduced in conjunction with the Ministry of Health, under which e-prescriptions and an online patient account were subsequently launched, among other innovations.

The above-mentioned three major e-projects at ZUS, based on new technologies, are not the only modern solutions using IT. However, these projects have proved particularly useful in the conditions of the crisis caused by COVID-19, allowing the Social Insurance Institution not only to operate in a stable manner and fulfil its tasks despite the pandemic, but also to support other, including non-insurance, areas of public administration in the implementation of anti-crisis programmes.

Electronic Exchange of Social Security Information

As a European Union (EU) member state, Poland is subject to provisions on the coordination of social security systems. Due to the free movement of persons within the EU, the implementation of these provisions requires the exchange of numerous documents between the social security institutions of the Member States. In order to streamline and accelerate the flow of data in this area, the European Commission has imposed on all Member States of EU and of the European Free Trade Association (EFTA) an obligation to implement an electronic exchange of information in social security, carried out in the application of European Union law in the area covered by the coordination of social

security systems. Thanks to this system, EU social security institutions will be able to exchange standard electronic documents on the basis of jointly agreed procedures.

The Polish Social Insurance Institution was the first among all obligated institutions in the European Union to implement the EESSI system, and is actively using it, both by sharing information with, and obtaining it from, other countries and institutions. The electronic exchange of data covers information, documents and declarations (scans) needed to determine eligibility under EU Regulation 883/2004 on the coordination of social security systems. This concerns matters relating to the applicable legislation, the award and payment of benefits (including pensions, sickness and maternity allowances, accident benefits and death grants), as well as the cross-border recovery of unpaid contributions and overpaid benefits.

Since the implementation of EESSI in the area of pensions in June 2020, ZUS has participated in more than 90 thousand electronic international proceedings, carried out electronically through the EESSI system.

On an EU scale, the rate of EESSI use is very high in Poland. Only Germany (220 thousand proceedings) and Austria (over 95 thousand proceedings) carry out more international proceedings in the area of granting benefits. On the other hand, in the area of applicable legislation, Poland participated in more than 270 thousand electronic international proceedings, conducted on electronic forms.

With the implementation of EESSI in other EU/EFTA Member States, the use of this system in the Social Insurance Institution is naturally increasing. For comparison: in the area of applicable legislation, 17 thousand electronic proceedings were initiated in July 2020; currently (*i.e.* 2021), this being already now 25 thousand new proceedings monthly.

New technologies in ZUS under pandemic conditions

The year 2020 and the COVID-19 pandemic put all sectors of the economy to a difficult test. This was also experienced by the public sector, including ZUS. Under the conditions of lockdown, projects earlier implemented proved extremely useful, and in some areas even necessary for task performance. ZUS had at its disposal modern technological solutions which provided opportunities to operate under the constraints caused by the pandemic. Their flexible design, with a high potential for development and adaptation to socio-environmental infrastructure, the availability of extensive databases and human resources allowed the Social Insurance Institution to become one of the three main public entities implementing government aid programmes, without jeopardising the fulfilment of its own statutory obligations.

As a result of the coronavirus pandemic, ZUS undertook tasks beyond the scope of its statutory obligations. Pursuant to the amended Act on special solutions related to preventing, counteracting and combating COVID-19, other infectious diseases and

crisis situations caused by them,[6] ZUS has additionally started handling applications for government aid filed by economic operators affected by the pandemic and aid for the population as a whole.

In order to perform these tasks, ZUS has adapted its ICT (information and communications technology) systems to provide maximum support to customers in their efforts to obtain the support to which they are entitled. Thanks to PUE, all applications for aid granted under government aid programmes (the so-called Anti-Crisis Shields, pol. Tarcze Antykryzysowe) may be submitted to ZUS in an electronic form, without the need to visit ZUS. PUE, adapted for the occasion, supports applicants by verifying the data entered online. If the required information is available in ZUS databases, the electronic system automatically fills in the form. The rules for the verification of completed applications eliminate errors, thus allowing for a more efficient handling of applications at later stages.

Since the regulations of the Anti-Crisis Shield have come into force, the Social Insurance Institution has accepted nearly 4.5 million applications *via* PUE. Automation in this respect reduces the time of their handling to the necessary minimum, and allows for feedback to be provided to the customer within a few days (often up to 48 hours). This mechanism is an important step in the process of the digitalisation of public administration services. Thanks to PUE, practically all applications for support from the programmes of subsequent Anti-Crisis Shields are handled electronically. At the same time, people who do not use computers, may submit selected applications in paper form, as previously.

Statistics from application processing during the pandemic show that the number of errors on paper applications is 2–3 times higher than on electronic applications. Therefore, submission of documents *via* PUE ZUS is the preferred solution. Through the Platform, employers and employees can also obtain information on referral to quarantine or home isolation. This new functionality is particularly important from the perspective of employers, who can obtain data on all employees in quarantine or home isolation from one source, without having to collect information from the persons concerned. The implementation of this functionality required integration with the IT systems of the Ministry of Health, and is another step towards an increased interoperability between state IT systems.

Under the constraints caused by the COVID-19 pandemic, information from the e-Contribution project has also proved extremely useful, as it allows one to determine the current number of contribution payers (companies, sole traders) and the number of employees, as well as changes in this regard. Among other things, these data were of paramount importance in estimating the scale of aid for entrepreneurs and its effects and the placement of government support.

In the period of the pandemic, the possibility for an electronic flow of information relating to medical certificates of temporary incapacity for work also cannot be overestimated. Data from the database of these certificates proved helpful, *inter alia*,

6 The Act of 31 March 2020 amending the Act on special solutions related to prevention, counteraction and combating COVID-19, other infectious diseases and crisis situations caused by them and some other acts, Journal of Laws No. 568, as amended.

in diagnosing the number of cases of coronavirus and identifying their outbreaks. The constantly growing role of the electronic channel of communication with ZUS customers forced changes aimed at minimising the risk of the unavailability of services for accepting electronic medical certificates of an incapacity for work. A redundant, additional channel, the so-called PUE-HA, was created in parallel to PUE. This system minimised periods of service interruption for accepting e-ZLAs from doctors. From the beginning of PUE-HA operation until 30 June 2021, more than 57 thousand e-ZLAs were received.[7] This is the first stage of revitalising the main e-services provided by ZUS.

E-services in ZUS

The year 2020 and the pandemic alert, with all its restrictions, brought – paradoxically – developments in the use of new technologies. ZUS implemented further e-services (*e.g.* e-visits, e-appointments) and developed the potential of already functioning solutions. They allowed ZUS to operate despite sanitary restrictions and to perform tasks imposed on this institution in relation to the mitigating the effects of COVID-19 (adjustment of PUE, *inter alia*, to pay additional care benefits, exchange information on quarantine with the country's sanitary services, handle the solidarity allowance and the Polish Tourist Voucher [Polski Bon Turystyczny]), and with remote cooperation with other public institutions (labour exchanges, tax offices, sanitary inspection, *etc.*).

The number of PUE users also increased significantly during the pandemic: the number of new profiles on PUE in 2020 increased by *ca*. 2.6 million, and in the first quarter of 2021 by another 700 thousand. Currently, there are 8.5 million profiles on PUE.

The period of the COVID-19 pandemic is subject to many analyses. On the basis of their results, various solutions used at that time are evaluated and with action plans for the future being developed. Referring to the pandemic impact assessment as regards the use of new technologies, ZUS has identified three main lines of action:

1) implementations to improve contact with customers,
2) providing ZUS with the ability to perform its tasks in the new, post-COVID reality,
3) introduction of further changes to ZUS IT systems to make the solutions used within the institution more flexible.

Implementations to improve contact with customers

The use of new technologies in ZUS in order to improve customer service, raise its standards, promote modern service instruments and build a system of compatible solutions in this area mainly concerns:

1) development and dissemination of PUE ZUS,

7 Data from ZUS Customers Service Department.

2) implementation of e-visits, e-appointments,
3) introduction of a mechanism of servicing the Polish Tourist Voucher (a non-insurance solution commissioned to ZUS), and
4) development of information protection services.

Development of PUE ZUS and its use in pandemic conditions

In order to meet the challenges posed by the pandemic and the tasks commissioned to ZUS, the institution has adapted its ICT systems to provide maximum support to customers in handling applications for aid from government programmes (their acceptance, verification, processing, decision taking and the disbursement of funds) and at the same time to totally fulfil all of its earlier tasks. Applications for support from nine consecutive Anti-Crisis Shields can be submitted electronically *via* the Internet, without the need to visit ZUS.

As has already been mentioned, practically all applications relating to the implementation of tasks under the so-called Anti-Crisis Shields are handled in an electronic form, although for digitally excluded persons the possibility to submit applications in a paper form has been retained for certain applications.

E-visits

In order to meet customers' requirements and constantly develop electronic channels of communication with them, last year the Social Insurance Institution introduced a new functionality: e-visits.

An e-visit is a video interview with a ZUS expert; providing an opportunity to settle one's matter at ZUS without the need to leave home. This solution has proved extremely useful, *inter alia*, in conditions of limited interpersonal contacts. All one needs is a computer, laptop, tablet or phone with a camera and microphone and an Internet connection. During the e-visit, experts answer questions on pensions, allowances, insurance and contributions. In cases relating to allowances and pensions, customers may also make an appointment for a consultation in Polish Sign Language (Polski Język Migowy, PJM). A video interview with a ZUS employee is also available for blind and visually impaired persons. Such an approach minimises the problem of the digital exclusion of citizens and allows as many customers as possible to settle their matters at ZUS on their own.

During a video interview, one can, *inter alia*: obtain general information on the applicable legislation, receive information on the principles of filling in, completing and submitting applications/documents, use the services of a retirement counsellor who can calculate the expected amount of any future old-age pension using a special pension calculator, use the services of a relief and remission counsellor, submit certain applications for certificates and receive support in setting up a PUE profile.

An e-visit allows one to quickly and comfortably settle the matter at ZUS, saves time spent on travelling to a ZUS branch and waiting in a queue, and allows one to maintain

safety measures in pandemic conditions. In the first half of 2021, ZUS employees handled over 69 thousand e-visits. The most popular were e-visits in the area of pensions (almost 19 thousand) and incomes (for contribution payers and persons insured – over 17 thousand). These data confirm the high popularity of this instrument among customers and indicate the legitimacy of this project and its usefulness.

E-appointments

The e-appointments project enables ZUS customers to make a remote (*via* the Internet) booking of an appointment with a ZUS facility for a specific day and time and to select the specific subject matter that is to be dealt with. This solution is fully integrated with the ticketing system used in the institution. This means that upon arriving at the service room in a ZUS branch or inspectorate, the customer takes a number and is directed to the appropriate desk.

This improvement allows one to plan customer visits and increases security both for them and for the staff, by maintaining the sanitary regime in the wake of the pandemic. Making appointments for a specific day and time minimises the time needed to deal with a case and allows for the appropriate scheduling of the workload for employees at ZUS facilities. People who do not have a profile on PUE can also make an appointment for a visit.

Remote visit appointments are integrated with the domain systems of the Complex Information System (Kompleksowy System Informatyczny, KSI) and are in line with the global trend of service organisation.

During the first six months of 2021, more than 26 thousand appointments were made for all customers with profiles on PUE and more than one thousand appointments for customers with so-called untrusted profiles. These figures confirm the interest of customers in the new form of service organisation, although this is only the first period of operation of the e-appointments system with it not yet being widespread in use.

Polish Tourist Voucher

The handling of the Polish Tourist Voucher by ZUS is an example of the flexible adaptation of modern ZUS IT systems to new tasks commissioned to this institution, ones which go beyond its statutory duties. The Polish Tourist Voucher was introduced as a solution under the government's policy of supporting the tourism industry, which was significantly affected by the lockdown caused by the pandemic. In handling this solution, ZUS is cooperating with the Polish Tourism Organisation and the Ministry of Development, Labour and Technology.

The Polish Tourist Voucher is a form of payment for tourist services which is available as a one-off voucher to every child under 18. Almost 6.5 million children in Poland can use the voucher. Its surface value is PLN 500 for each child, and in the case of a disabled child, an additional benefit of PLN 500 is available (the total value being PLN 1000). To receive this additional benefit, it is necessary to provide data on the child's disability certificate.

The Voucher can be used from July 2020 until the end of September 2022. The registration of tourism operators and public benefit organisations wishing to accept voucher payments started on 25 July 2020. In implementing this project, ZUS used a new technology that provided 24/7 access to this service without maintenance shutdowns. Upon receiving the voucher a number is generated in the system, the beneficiary of the programme (a family with a child under 18) may use the voucher to make payments at previously registered tourist organisations. ZUS keeps two registers: of the programme beneficiaries (*i.e.* persons authorised to receive the voucher and their children) and of the tourism operators to whom payments can be made using this method.

The payment operation itself takes place by communicating the voucher number to the tourism operator in order to verify the balance. Two codes are used to confirm the purchase at the time of service payment. The voucher can be used repeatedly until the prior established fund limits are exhausted, but no later than 30 September 2022.

Payments with the voucher may be accepted by legally established tourism operators or public benefit organisations providing hotel services or organising tourist events within the territory of Poland. Currently, more than 27 thousand eligible entities have joined the programme.

To secure the necessary availability and efficiency of Polish Tourist Voucher services and payment security, new elements of the solution were developed in the microservices architecture (open source) and launched in the container environment of ZUS's private cloud, which ensured their dynamic scalability (the ability to operate with changing requirements for resources). Additionally, the existing elements of architecture (including PUE ZUS) were adjusted architecturally to the expected increase in the workload.

Development of information protection services

In view of the ever-growing importance of information processed, changing environments and, in particular, the constantly emerging new threats related to information security, the Social Insurance Institution continuously improves the protection measures used in this area. Last year, particular attention was paid to ensuring the security of the software used, because in connection with the coronavirus pandemic ZUS had to create many new means of functionality and collect new data. To ensure the adequate level of security for information sent and processed in this part of the system, and in particular to ensure the integrity and inviolability of transactions made, *inter alia*, through the Polish Tourist Voucher, rigorous safeguards were introduced for the acceptance of the developed software – security tests were conducted by two independent teams not related to the teams designing and developing the software. The software was released for production implementation only after the tests had been successfully completed by both teams.

In 2022, it is planned to define and describe the internal critical infrastructure which, due to the sensitivity of the information processed, will be covered by detailed and

relevant protection plans strengthening its security level. These actions will be preceded by an audit of the current state. On the basis of information collected during the audit, maps of the connections and correlations between individual resources, the criticality and sensitivity of information processed on individual resources – plans for the protection of critical infrastructure will be drawn up, to be implemented, maintained and improved at subsequent stages.

It should be noted that this process will not focus solely on the technological aspects. It is assumed that the protection plans will also cover the organisational and formal area, so that the required protection measures are channelled in a comprehensive manner.

Continuous improvement of the level of information security in ZUS is a customer guarantee that the data entrusted by them are properly protected; it also minimises the risk of sensitive data leakage.

Performance of statutory tasks in a new reality

Remote working

In order to ensure the highest possible sanitary standard in the conditions of the pandemic, ZUS had to apply to a certain extent a new work model, *i.e.* remote working. This was a new organisational solution for the institution. Remote working had to take place outside the ZUS facility (usually at the employee's home), in particular in the event of infections among facility employees and the resulting quarantine. To ensure the efficient functioning of such a method of work, ZUS had to provide employees with: remote access to domain IT systems, security and an appropriate level of efficiency in the performance of tasks by IT system users, access to source data by digitising documents and securing an appropriate level of services provided to customers (Service Level Agreement, SLA). The scale of this project depended on the number of ZUS employees (over 42 thousand people).

In addition, the number of tasks performed during the pandemic period increased dramatically. In addition to the significantly increased volume of standard cases handled, there were also new applications under the tasks commissioned on the basis of the pandemic legislation. Such tasks included the handling of the additional care allowance or the solidarity allowance.

In a short time (about 2–3 months), ZUS reorganised itself and was able to carry out all the attributed tasks. The implementation of tools for remote access to IT systems, equipping employees with mobile equipment, launching tools guaranteeing the security of communication, introducing remote meeting methods and launching the digitisation of resources had the expected effect, permanently changing the forms of work in ZUS.

The use of remote working allowed ZUS to increase the flexibility of its working methods and to provide services even when local ZUS facilities were closed. The introduced solutions also resulted in labour productivity growth.

Under the remote working conditions, ZUS accepted and processed about 10 million additional cases, of which more than 80 percent were handled automatically; with more than 90 percent of cases relating to tasks commissioned to ZUS under government aid programmes being handled within 24 hours of the receipt of the application.

In connection with the digitalisation and computerisation of the work process, over 300 thousand folders with customer documents were digitised.

Automation

The automation of business processes in ZUS started in the benefits area, covering pensions and the sub-areas of allowances. Automation of processes in the allowances area includes:

- establishment of allowance cases on the basis of applications submitted through the PUE channel *via* the EPWD system (electronic data exchange platform),
- processing cases in the BC application (application for handling short-term benefits) ultimately for all types of allowances.

The automation process includes handling allowance applications submitted through the PUE or EPWD channels from the moment of their registration to their transfer to the payment list. For applications which meet the criteria for automatic handling, the automation process is started. It includes: establishment of a case, full examination of entitlements, determination of the basis for benefit assessment, determination of data for payment, classification of the case in terms of automatic approval, as well as making a decision and sending it for approval.

If decisions are negative or the documentation incomplete which prevents automatic processing, the cases concerned are referred to employees for handling. Initially, cases were processed by an IT tool and left to employees for review and approval. However, from mid-June 2020, selected ZUS branches started to refer cases for automatic payment, and from July 2020 this was already being done by most branches.

In order to automate the allowances-granting process even more efficiently, it was decided to expand functionality in the application for supporting the handling of social insurance allowances and to develop new technologies. The acceleration of this process was due to a significant increase in the number of applications for allowances (in particular sickness and care allowances – by about 500 thousand cases per month), which resulted in a very high workload for employees from departments dealing with these cases.

At the end of February 2021, a double automation was implemented in the allowances area. It consisted in the optimisation of functions of interactive applications supporting employees in the execution of processes. This allowed for full uniform handling of allowance documents submitted *via* PUE.

As part of the pilot, a new case processing tool was also introduced in selected ZUS branches connected with the creation of a common inflow channel for documents from PUE and the downloading of basic data, as well as ensuring their security.

On 20 April 2021, the PUE inflow channel was also launched, which allowed for the automatic payment of allowances. This was an extremely important event, because

for the first time the entire process – from the application registration on PUE, through case establishment, processing and concluding with the allowance payment itself – was performed without human intervention. Additional improvements are also being introduced on an ongoing basis, which will allow ZUS to increase the volume of automatically processed cases in the allowances area and their security.

Currently, two types of allowances are processed automatically: sickness and care allowances.[8] The implementation of the automatic establishment and processing of maternity and rehabilitation allowances is scheduled for the end of August 2021.

Automation of processes in the area of pensions was already used in 2016 in connection with changes in the retirement age, when a robot was used in a pilot project, which initially processed several hundred thousand cases. Currently, the scope of automation in this area is being gradually extended and concerns:

- processing of applications for benefits, consisting in the activation of an automatic system which took over operations that had been earlier performed by an employee (from the institution of the proceedings to the establishment of entitlements, calculation of benefit amount on the basis of data on contributions [after indexation] and initial capital from the insured person's account and calculation of the payment) – over 94 thousand proceedings;
- handling applications for establishing initial capital, consisting in an automatic system for a selected case or group of cases, which establishes or renews cases for establishing initial capital. After establishing the initial capital, the application continues the automatic process of handling benefit application – 44 thousand proceedings;
- handling the registration and settlement of pensions of deceased beneficiaries on the basis of the PESEL register (Universal Electronic System for Registration of the Population) consisting in the activation of an automatic system, which stops the active payment of benefits to deceased persons and handles the settlement of post-death entitlements (in some cases it is necessary for users to complete the proceedings) – over 112 thousand proceedings.

The functionality of automated processes is supported by the Process Console (a possibility to review the process status) and a list of user tasks (tasks related to the need to react in automated proceedings).

The automation of the pension and disability benefits area speeds up the stage of registering data and performing basic calculations, supports ZUS employees in determining the rights of the insured person and the balance of his/her account with regard to data necessary for calculating the benefit, speeds up the suspension of payment after the beneficiary's death (reduction in the number of overpayments and unduly paid benefits) and facilitates the performance of tasks related to the granting of benefits.

8 In the period from March to June 2021, there were 1.6 million allowance cases, including a total of 273 thousand cases of the sickness and care type, handled by the automation algorithm (17.3% for the first half of the year).

Implementation of business continuity plans

Ensuring ZUS's business continuity is one of the key statutory obligations of the institution. The main objective in building business continuity plans is to ensure that operations are maintained at an acceptable level during crisis situations and to take a proactive approach to reducing the negative impact on ZUS in such situations.

The crisis caused by the coronavirus pandemic has contributed to an increase in awareness of the importance of the institution's business continuity plans. It is planned to update these plans for critical ZUS business processes in the nearest future. As a first step, an audit of the current state of affairs will be carried out, while tasks related to conducting business impact assessments (BIA), building survival strategies and business continuity plans with disaster recovery plans are envisaged for subsequent ones.

Flexibility in operations and the implementation of new changes in ZUS IT systems – experience from the pandemic period

Faster implementation of business changes

In March 2020, when there was a freeze in the economy due to the pandemic alert, new obligations were imposed on ZUS related to the implementation of the Anti-Crisis Shields. Subsequent laws imposed further tasks on ZUS, almost overnight upon their enactment.[9] Since it was not possible to assign additional employees to handle the new duties and it was difficult to estimate the volume and dynamics of applications inflow, there was a necessity to automate all the new processes as much as possible.

The extremely short deadlines for launching the successive phases did not allow the software to be prepared in the traditional way, *i.e.* in a one target increment. Instead, it was necessary to implement the requirements sequentially and launch the subsequent increments also sequentially. In the first instance, implemented and launched were processes relating to the receipt of applications. At the time when applications were already being received by ZUS and placed in case files for electronic handling, intensive work was carried out to design and implement the processes of applications processing. When these, in turn, had been launched, all collected applications were sent for processing.

Importantly, errors and omissions identified in the processed applications were analysed on an ongoing basis, so that the rules for verifying applications could be adjusted and the software for registering them improved. The system analysed the incoming data,

9 Out of the five laws introducing successive aid benefits, two had a one-day *vacatio legis*, and the remaining three were effective from the date of promulgation.

thanks to which subsequent contribution payers received information about irregularities already at the stage of filling in the application.

These specific conditions resulted in an above-average increase in the number of software releases and the possibility of a re-verification of already processed (and rejected) applications on the basis of updated rules, without the need to inform the contribution payers.

As a result of the adopted solutions, simpler applications were fully processed by the 20th day after the law had come into force, and more complex ones by the 31st day. The maximum automation of processing allowed one to perform the new tasks without having to increase recruitment. From March to mid-September 2020 alone, almost 3 million applications were accepted under the government aid programmes, 85 percent of which were processed fully automatically, without any human intervention whatsoever. From March to mid-September 2020, the processing of applications involved 334 software releases, an average of 2 releases per day.

Use of new technologies

The new obligations imposed on ZUS became one of the factors initiating the introduction of technologies to the institution, which allowed it to provide the innovative digital services to facilitate customer service, speed up the processes carried out by ZUS and reduce overall costs.

One of the important ZUS objectives is to eliminate paper documents. Switching from paper to digital solutions means not only a significant reduction in costs, but above all a reduction in errors, a speeding up of processes and the possibility to guide customers (*e.g. via* interactive forms) in such a way that they can settle their matters in a straightforward way. The use of electronic signatures allows ZUS to issue decisions also in an electronic way and to deliver them immediately to the addressee.

An important issue in the computerisation process of public institutions is the use of data already stored in electronic form, thanks to which the customer is not burdened with the need to provide the same information once again. Data integration allows one to streamline service processes, create new value in the form of products or services, and accelerate administrative decision-making processes.[10]

New technologies were used in a more complex way in the Polish Tourist Voucher project. A unique digital service was created – an equivalent of a payment card with an assigned due amount, thanks to which payments could be made for selected tourist services. Thanks to the use of a confirmation mechanism in the form of e-mails and text messages, despite the huge scale of the operation (over 1.1 million text messages were sent), the system is secure, but also convenient to use. This method of payment can be effectively used in further digital services for citizens. In addition, it enables

10 An example of such integration can be the servicing of the Polish Development Fund (Polski Fundusz Rozwoju, PFR) shield. Thanks to practically unattended exchange of data stored in various public institutions, the PFR made decisions on funding in time counted in individual days from the date of submitting the application by an economic operator.

ZUS to reduce the costs of current operations, accelerate the implementation of business processes and provide customers not only with new, but also modern digital services, previously unavailable.

Accelerating the decision-making process in the office

The difficult period of the pandemic required non-standard measures. The result is the streamlining of ZUS operations, whose effect is measured by the SLA level of services provided by the institution. It is now important to maintain this level and even increase it. ZUS swift actions have contributed to saving jobs and strengthening the sense of social security in society, so an intensive effort has been made to accelerate the decision-making process, despite the significant increase in the inflow of cases, and thus provide designated social groups with specified aid measures.

This has been served by the automation of ZUS business processes and data digitisation. Supervision over the work of system users has been increased. Priority was given to optimisation in the processes of creation and the implementation of new functionalities and the related increased flexibility in customer contacts. As a result, decisions in individual cases (80–90 percent of cases) were made within 24–48 hours. As in other areas, a great deal of this experience will also be utilised in current ZUS undertakings.

Performance of new tasks indicated by government administration

During the pandemic, ZUS was obliged to perform many activities beyond its strictly chartered role. One of these was the full handling of the solidarity allowance for people made redundant as a result of the lockdown. ZUS fully serviced this application in its IT systems – from the moment of its acceptance in PUE (this being the only application accepted purely in electronic form) through processing in domain systems to the moment of payment to beneficiaries' accounts. In the period of solidarity allowance legislation validity, applications were quickly considered and benefits were paid out to 235 thousand beneficiaries to the amount of over PLN 313 million.

The experience resulting from the implementation of these projects allowed ZUS to be entrusted with another large-scale project related to the handling of a non-insurance benefit: the 300+ benefit (the so-called "Good Start", pol. "Dobry Start") for children in education. The programme provides servicing for around 4 million beneficiaries. Its implementation being from 1 July to 30 November 2021. So far, this support has been provided by local governments. From 2021 onwards, applications for the benefit have been received (in electronic form) and processed by ZUS, with the funds granted on their basis transferred to beneficiaries' accounts. This organisational change has accelerated application processing, which translates into faster payment to beneficiaries and a minimisation of programme operation costs.

This is another project outside the social insurance area (beside the Polish Tourist Voucher and the solidarity allowance), which is serviced by ZUS IT systems and its team of experienced employees. These projects are implemented in a centralised,

fully electronic manner. In selecting ZUS as the project contractor, it was not without significance that ZUS – as an organisational unit – is responsible for handling many other benefits paid in Poland. Its experience and technological resources allow for better management of public money.

Further campaigns using the solution currently under construction will allow further synergy effects to be achieved and ultimately reduce the costs of tasks performance. For example, analyses carried out at ZUS (audit) show that the automatic handling of the solidarity allowance results in savings in employment (about 500 jobs).

Conclusion – plans for the future: ZUS as an e-office in the strategic documents of the Social Insurance Institution

ZUS Strategy for 2021–2025[11] sets out four main directions of activity, based on the use of new technologies:

1) development of e-office,
2) digitalisation and automation of processes in ZUS, which will minimise the tasks and responsibilities of the insured, beneficiaries and businesses by transferring many of these burdens to ZUS,
3) increasing the electronic circulation of documents in contacts with ZUS customers, administrative bodies and within ZUS,
4) development of data exchange and integration within e-government so that facilities and improvements for citizens and businesses could be implemented.

The main role in the implementation of this transformation plan will be played by 14 strategic programmes. The most important of which are the automation of settlements of contribution payers and the consolidation and automation of allowances payments.

ZUS is also preparing solutions to facilitate business activities, *i.e.* by taking over from contribution payers the responsibility for tasks related to calculating contributions and determining amounts to be paid, as well as tasks relating to the payment of sickness insurance allowances. ZUS will thus take over allowances payment, which will reduce the workload on the entrepreneurs, as well as simplify and shorten the time of receiving the allowance, without the need for any additional contact.

The programme of banking ZUS benefits is another important project. It will support the state's efforts to increase cashless transactions in the economy, will increase the security of benefits and reduce the costs of ZUS operations.

The IT area will play a major role in the implementation of the automation programmes. Therefore, the programmes include those related to the modernisation,

11 See Zakład Ubezpieczeń Społecznych, *op. cit.*

unification and interoperability of IT systems and ZUS records. They are complemented by the Cyber Security Management Platform (Platforma Zarządzania Cyberbezpieczeństwem), thanks to which the security of ZUS customers' data will be further strengthened.

ZUS is also planning a major reconstruction of its Electronic Services Platform. This will provide all customers with access to ZUS advanced e-services. This programme will be supported by the digitisation of documentation, and here also in contacts with external entities.

The above plans are connected with the development of modern and open communication within the institution. ZUS will effectively disseminate information about its services and products as well as educational activities about the social security system, using, among others.

The new strategy will introduce many improvements for citizens and businesses and will allow for the further development of e-government. The transformation programmes set out therein will ensure the quality and timeliness of ZUS services, which will allow for a higher quality of customer service.

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SOURCES

- Grodzka D., *E-administracja w Polsce*, Infos – Biuro Analiz Sejmowych nr 17, 2017.
- Zakład Ubezpieczeń Społecznych, *Strategia ZUS na lata 2021–2025* [ZUS Strategy for 2021–2025], https://bip.zus.pl/documents/493361/494179/Strategia_ZUS_2021–2025.pdf/50488985-c1d1–4cab-317b-420e460a075c?version=1.1 (online access: 11.6.2021).

Nowe technologie w Zakładzie Ubezpieczeń Społecznych

Zakład Ubezpieczeń Społecznych (ZUS) jest jedną z największych instytucji publicznych w Polsce. Od blisko dziewięciu dekad realizuje zadania z obszaru ubezpieczeń społecznych, dbając zarówno o bezpieczeństwo socjalne obywateli, jak i o część finansów publicznych, którymi zarządza. W ZUS funkcjonują rozwiązania wykorzystujące nowoczesne techniki i technologie (tzw. e-projekty), które stanowią podstawowe narzędzia realizacji celów organizacji. W tekście wskazano cele rozwoju ZUS i powiązane z nimi instrumenty z obszaru IT w ostatnim pięcioleciu. Zwrócono szczególną uwagę na rozwiązania wykorzystywane przez ZUS w okresie pandemii COVID-19 (od wiosny 2020 r.), który zweryfikował pozytywnie ich zasadność i użyteczność. Scharakteryzowano główne e-projekty. Wskazano ich rolę i oceniono efektywność.

Słowa kluczowe: obsługa klientów, e-administracja, e-usługi, Platforma Usług Elektronicznych ZUS (PUE ZUS), nowe technologie, Zakład Ubezpieczeń Społecznych (ZUS)

Niko Väänänen

The digital transition of social security in Finland. Frontrunner experiencing headwinds?

Digitalization transforms our societies in a profound way. Public administrations and social security institutions are at different stages in this process. Digitalization poses technological, legal, and organizational challenges. Finland has typically been a frontrunner in the adaptation of ICT (information and communication technologies). This case study critically assesses the current state-of-the-art in the field of digitalization in Finnish social security. The text singles out the projects that are on-going and those that are planned for the immediate future. The article shows that Finnish social security institutions have integrated digital processes into their operations, but legal and ethical challenges exist, especially in the use of artificial intelligence and automatic decision-making in social security.

Key words: digital platform, digitalization, Finland, public administration, social security

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Introduction

Digital platforms have become a common feature of our everyday life. Most of us communicate with our family and friends *via* messaging applications and order food by online platforms. It is normal to use bank services or buy clothes online. The global pandemic has further advanced this trend by forcing people to stay at home. People have had to adapt to new technologies that replace the need for physical presence. Digitalization changes the way we interact with each other.

Digitalization, understood in this text as the transformation of information into digital form and the use of digital technologies, changes modern societies in a profound way. Digitalization moves fast in some areas, and slower in others. Typically, the public sector, due to the strict regulations that govern its activities, is a latecomer to technological progress. At times government and public administration is seen as inimical to growth. The Finnish case shows that this need not to be the case, quite the contrary, public administration can be among the early adapters. It is widely accepted that digitalization of public services benefits individuals and businesses.[1] Therefore, digitalization will continue – more tasks will be processed in a digital way in future. It is important to adapt existing processes to these changes. Yet, digitalization is not a straightforward process: it advances faster in some areas and slower in other areas. Digitalization poses technical, organizational, and legal challenges.

This article looks at digitalization in one specific area and in one country: in the field of social security in Finland. Firstly, this text briefly describes the Finnish government policy towards digitalization and describes the national digital architecture. Secondly, the text points out the most important steps taken within the Finnish social security system in the field of digitalization. Thirdly, the article addresses some aspects as to why Finland is an interesting case study: Finland has been considered as a frontrunner in digitalization, and the social security is organised in a decentralized manner by public bodies and private-public partnerships.[2] The text can help to understand the enablers of digitalization and to disseminate some best practices as well as point out potential challenges in the field of social security.

Why is Finland an interesting case study?

Manuel Castells and Pekka Himanen[3] argue that one of the key features of Finnish society is a combination of an information society and a democratic welfare state that support and reinforce one another. Individuals have access to a large set of services and

1 B.W. Wirtz, P. Daiser, *A meta-analysis of empirical e-government research and its future research implications*, "International Review of Administrative Sciences" 2018, No. 84(1).

2 For pensions see J.E. Johanson, V.P. Sorsa, *Pension governance in Finland, a case study on public and private logics of governance in pension provision*, Finnish Centre for Pensions, Reports, No. 2, 2010.

3 M. Castells, P. Himanen, *The Information Society and the Welfare State: The Finnish Model*, Oxford 2002.

benefits provided by public institutions and Finnish society, including public administration, eagerly adopts digital technologies. The change has been radical as only a few generations ago Finland was a poor rural country. Finland typically polls high in relation to trust in government or other State institutions. Finland is known for its good ICT (information and communications technology) infrastructure. Finnish e-government has ranked in top positions in international comparisons.[4]

Finnish social security is known for its innovative approach and experiment culture. The basic income experiment, that ran through the years 2017–2018, raised global media attention.[5] Another example stems from the early years of the Finnish welfare state. A maternity package, also known as the baby box, was introduced in the 1930s and has since then become a global success story.[6] Governments have backed the experiment culture in public administration.[7]

The method employed in this article is that of a case study.[8] The data has been retrieved from the available subject literature: previous research, newspaper articles, and the websites of social security institutions. In addition, one interview was conducted.[9] The aim of this article is to describe the state-of-the-art in the digitalization of Finnish social security.

Social security in the Finnish welfare state

The Finnish welfare state is typically classified as Scandinavian or Nordic.[10] Mikko Kautto, Matti Heikkilä *et al.*[11] summarize the key features of the Scandinavian model as emphasis on full employment, a tripartite negotiation mechanism, a wide range of free or heavily subsidized social benefits and services available to all and a high share of GDP social expenditure.

The organization of social security and health care in Finland is decentralized. Municipalities are responsible for basic healthcare services and jointly responsible (through

4 J. Korhonen, *e-Government in Finland – success stories and lessons from Finland* [in:] *E-democracy, e-governance and public sector reform revisited – Experiences of The Main Themes of the PADOS project in Finland and Estonia*, ed. A. Temmes, 2016, https://um.fi/documents/35732/48132/e_democracy__e_governance_and_public_sector_reform_revisited___experiences_of (online access: 12.5.2021).

5 For more see O. Kangas, S. Jauhiainen *et al.*, *The basic income experiment 2017–2018 in Finland: Preliminary results*, Reports and Memorandums of the Ministry of Social Affairs and Health, No. 9, 2019.

6 See A. Koivu, Y. Phan *et al.*, *The baby box. Enhancing the wellbeing of babies and mothers around the world*, Helsinki 2020.

7 A. Hautamäki, K. Oksanen, *Digital Platforms for Restructuring Public Sector* [in:] *Collaborative Value Co-creation in the Platform Economy*, ed. A. Smedlund, A. Lindblom, L. Mitronen, 2018.

8 S. Crowe, K. Cresswell *et al.*, *The case study approach*, "BMC Medical Research Methodology" 2011, Vol. 100, 11.

9 The interviewee was an expert working in the field of digitalization and innovation at Kela. The interview took around 60 minutes and all the main topics of this article were discussed.

10 See G. Esping-Andersen, *The three worlds of welfare capitalism*, New Jersey 1990.

11 *Nordic Social Policy: Changing Welfare States*, eds. M. Kautto, M. Heikkilä *et al.,* London 1999.

hospital districts) for specialized healthcare services. Other social security benefits and services are administered by different providers.

The main institution is the Social Insurance Institution of Finland, Kela, that offers a large variety of benefits and services for Finnish residents. Kela insures against most social risks: old age, incapacity for work, illness, unemployment, childbirth, death of the family breadwinner, rehabilitation, or studies.

Besides Kela, there are many institutions in Finland that administer and pay out social security benefits.[12] A second tier exists for pension and unemployment benefits that are employment linked and earnings-related benefits paid by specialized funds. Thus, there is a need for cooperation and the exchange of data between different autonomous institutions.[13]

Juhani Korhonen[14] points out that the overall picture of public e-services remains somewhat fragmented due to the large number of institutions involved. The application of digital platforms does not cancel out this need but creates new kind of challenges.

Kela – the Social Insurance Institution of Finland

Kela offers services and benefits ranging from kindergarten to deathbed. It is an autonomous institution that operates directly under the Parliament of Finland (Eduskunta). Kela is an institution that is present through 145 customer service locations across the whole country.

Innovation has become an important part of Kela's work. According to its strategy, Kela aims to be a frontrunner in digitalization. Kela has an in-house innovation unit that was created at the beginning of 2019. Its size is relatively small, only 13 people work at the unit. The total size of Kela staff is 8,095 persons, the majority of whom (5,290) work in benefit services. The aim of the unit is to study new emerging technologies and find ways to adapt them for Kela's processes, if they can be enhanced and made beneficial to the customer. Foresight work is conducted by scenario exercises that help to predict hypothetical situations and development paths. Innovation is considered as a strategic domain in the processes of Kela. Drivers for innovation and learning come from everyday situations and activities. One goal is to find ways to reduce the need for customers to take contact with the customer service. Kela has, as social security institutions typically have, large amounts of data on its customers. Finland has some 5.5 million inhabitants with Kela's e-services receiving some 64.4 million log-ins in 2020.[15]

In Finland, the relevant Ministry drafts the legislation, but social security institutions support that work with their expertise. Kela predicts potential pathways by the method of scenario exercises. Information from these exercises flows into the innovation processes. Foresight is a tool through which they can predict the need for potential changes in

12 Understood here as all benefits that are under the EC regulation on social security 883/2004.

13 For the rest of the article, all references made to social security institutions refer to any or all of these institutions. If a specific institution is discussed that institution is addressed directly by name.

14 J. Korhonen, *op. cit.*, p. 2.

15 Kela, *Kelan vuosi 2020* [Kela's annual report 2020], https://www.kela.fi/documents/10180/17802081/Kelan+vuosi+2020.pdf/0e40794f-3a1c-4d13–9d40-a8661c434f00 (online access: 16.5.2021).

legislation or new system requirements. Legislation has had a supportive role in Finnish development, while the legislation around e-government services is young.[16]

Enablers of digitalization

The position of frontrunner can be traced back to at least four different reasons. [17] Firstly, the information and communications technology sector has been an important part of the Finnish economy for decades. The most famous Finnish company, Nokia, was for a few years the global leader in mobile phone technology. Although Nokia later lost its position in mobile phones to competitors, still today, according to Eurostat, the ICT sector accounts for 4.85% of the Finnish GDP. Finland has had a supply of skilled personnel in the ICT branch. This trend might be reversed, though, as some studies suggest that Finland suffers from insufficient human capital in this field.[18] Still today, Finnish mobile game companies are known all over the world.[19] Finns are apt users of digital technology compared to the European Union (EU) average.[20] The prevalence of telework is the fourth most common in the European Union. Before the pandemic, in 2019, one third of the workforce teleworked at least occasionally.[21]

Secondly, Finland is a sparsely populated country. Finland has the least inhabitants per square kilometre of any country in the European Union. Digital services can offer new ways to facilitate access to public services in rural areas. Equally, Finland has one of the oldest populations of the European Union. Ageing of the population drives up the costs of major welfare state items such as pensions and long-term care as the old age dependency ratio weakens. In 2019 Finland's social spending totalled 24 percent as a proportion of GDP. This proportion was the biggest in Europe.[22] Digital platforms offer possibilities to provide services to rural areas where on-site services would be very costly, if not outright impossible, to offer. The average age is often higher in rural areas than in urban areas. The growth of ICT services, such as telemedicine, is partly driven by demand from rural areas with ageing populations.

16 J. Korhonen, *op. cit.,* p. 2.

17 O.C. Osifo, *Examining digital government and public service provision: the case of Finland*, International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO), 2018.

18 University of Vaasa, *Vaasan Yliopistolle 455,000 Euroa ICT-Muutokouluksen Järjestämiseen* [450,000 euros to the University of Vaasa for ICT-retraining], 2018, http://www.uva.fi/fi/news/ict_muuntokoulutus/ (online access: 10.5.2021).

19 A recent success being *Angry Birds*, a game developed by Rovio, a Finnish mobile game company.

20 European Commission, *Digital government factsheet Finland 2019*, https://joinup.ec.europa.eu/sites/default/files/inline-files/Digital_Government_Factsheets_Finland_2019.pdf (online access: 25.5.2021).

21 S. Milasi, I. González-Vázquez, E. Fernandez-Macias, *Telework in the EU before and after the COVID-19: where we were, where we head to*, JRC Science for Policy Brief 2020.

22 Eurostat, *Government expenditure on social protection 2021,* https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Government_expenditure_on_social_protection (online access: 25.5.2021).

Thirdly, a large trust in public administration enables the development of digital infrastructure and the collection of individual data. People trust that the information will be protected and that the data will not be misused.

Fourthly, the large welfare state with its universal character has meant that social security has always been at the centre of societal development. Finland spends a lot on welfare, and social security institutions operate on large budgets. Institutions are large service providers for a large customer base. Unsurprisingly, social security institutions were among the first entities in Finland that started to use computers. Kela, had one of the first eight computers, an IBM 604, in 1960.[23] The Finnish Centre for Pensions (Eläketurvakeskus, ETK) that as a central organization is responsible for the central registers within the decentralized earnings-related pension scheme, obtained its first computer, a model IBM 1410, in 1961.[24] The institutions administering social benefits have large registers which has given room for innovation led development and the adoption of new technologies.

Thus, it is no surprise that Finland has been and aims to stay one of the top countries in information management of social and health care services and benefits in the public sector. Sakari Taipale[25] argues that

> Finland was one of the early-adopters of e-government. Its general atmosphere has been open to change, modernisation and technological innovations, as its citizens have been, on average, well-educated and technologically savvy (cit. OECD [Organisation for Economic Co-operation and Development], 2010).

Digitalization as a priority

Finland is a society based on trust and it is marked by large trust towards public administrations and its institutions. In a recent study by the OECD[26] some 81 percent of Finns declared that they trust the government. Only Norway and Switzerland polled higher numbers. It is commonly accepted that trust is a key component if public sector institutions want to develop their digital services. If people do not trust the institutions, it is improbable that they will start using their services or would be willing to give consent to data storage. Finland, together with the other Nordic countries, is known for its large centralized registers. On the other hand, as a counterbalance, in Finland a legally guaranteed public access to government documents exists.[27]

23 P. Paju, *"Ilmarisen Suomi" ja sen tekijät* [Building "Ilmarinen's Finland": The Committee for Mathematical Machines and computer construction as a national project in the 1950s], Ph.D. Thesis, University of Turku 2008.

24 M. Wessmann, *Tietotekniikan pioneerit* [Pioneers of information technology] [in:] *Virastosta tietotaloksi* [Bureaucracy to knowledge centre], ed. J. Vauhkonen, Helsinki 2011.

25 S. Taipale, *The use of e-government services and the Internet: The role of socio-demographic, economic and geographical predictors*, "Telecommunications Policy" 2012, No. 37(4–5).

26 Organisation for Economic Co-operation and Development, *How's Life? 2020: Measuring Well-being,* 2020, https://doi.org/10.1787/9870c393-en.

27 P. Ahonen, T. Erkkilä, *Transparency in algorithmic decision-making: Ideational tensions and conceptual shifts in Finland*, "Information Polity" 2020, No. 25(4).

Finland has officially promoted the aim to increase the use of digital platforms in government services (e-government) for the last two decades. This strategy has received high-level backing and it has been among the priorities of successive governments. Many programmes have existed in this front: the first large national development programme on digitalization, the Action Programme on e-Services and e-Democracy, ran between 2009–2015.[28] Lately, many government-led initiatives have paid special attention to issues on algorithmic transparency such as establishing a systematic *ex ante* and *ex post* impact assessment of government artificial intelligence (AI).[29]

The promotion of the use of digital platforms in government services serves two main goals. Firstly, digitalization is meant to increase efficiency, to reduce costs, and secondly, to provide more targeted information so that individuals can make better choices and get better service. The wellbeing of individuals is a key driver in the increased emphasis on digital services.[30] Digitalization allows for a better customer reach through social media platforms. Most Finnish social security institutions are active on social media: for example, both Kela and ETK have accounts and they are active on Facebook, YouTube, Twitter, and Instagram.

Typically, the main motivation behind public sector reforms, if not to extend existing services and benefits or to innovate new ones, is to enhance efficiency, cut costs, deliver better service, increase transparency or strengthen citizen choice.[31] These aims are valid also for the process of digitalization.

The universal character of Finnish social insurance plays an important role: social security is visible in everyday life. Virtually all individuals are entitled to services or benefits from Kela at some point in their lives. Everyone has a vested interest in the development of social security. Institutions that administer social security are large service providers and they are known to Finnish citizens. There are clear-cut lines between the responsibilities of different actors and people know that the boundaries will be respected. Yet, challenges exist, especially in the field of rehabilitation where multiple institutions provide help to individuals in the return-to-work process. Partly overlapping responsibilities create administrative challenges and confusion in the eyes of individuals.[32]

The important role that social security plays in Finnish society is an important pull factor when social security institutions attract talents in Finland. Many individuals do want to work in social security because of the role it plays in society. Through innovation they can shape the lives of many people for the better. Therefore, social security institutions attract even the most tech savvy individuals because of the possibilities that working for these institutions offer.[33]

28 J. Korhonen, *op. cit.,* p. 2.

29 P. Ahonen, T. Erkkilä, *op. cit.,* p. 5.

30 J. Korhonen, *op. cit.,* p. 2.

31 A. Hautamäki, K. Oksanen, *op. cit.,* p. 2.

32 J. Liukko, N. Kuuva, *Cooperation of return-to-work professionals: the challenges of multi-actor work disability management*, "Disability and Rehabilitation" 2017, No. 39(15).

33 It was stated in the interview that many individuals apply for developer jobs in Kela even when they could get better salaries elsewhere because they feel they can contribute more to the common good by working for Kela.

Central features of digitalization are analogous with the platform technology such as the algorithmic revolution, big data, and cloud computing.[34] The algorithmic revolution has brought data to the core of development. Social security institutions administer large registers, with data management being an essential feature of their daily operations. Public authorities need to ensure a secure and accessible infrastructure of digital services, a common pathway, to citizens. Public institutions can include and integrate their services to this common pathway.

National architecture builds the base

Digitalization has meant that the amount of data has increased exponentially. New data are generated and stored continuously. The existence of a national architecture for digital services is at the core of the development. Without such an architecture it would be hard for individuals, providers, and authorities to share information and data quickly in a secure manner. Therefore, Finland has developed a national architecture that consists of a few main gateways to which all citizens have access. These gateways form the basis of the national architecture for digital services. Finland adheres to the MyData principle that promotes individuals' ownership of the data and practicalities for the usage of the data.[35] Typically, platforms are accessed either with a certificate card, mobile certificate, or bank credentials.

The main digital gateway for social security in Finland consists of three different platforms. Central in these gateways is Suomi.fi[36] that is a comprehensive service platform, a sort of one-stop shop, for almost all the digital services of Finnish public services and government. It is the common platform for digital public services. The platform allows individuals to grant to and request mandates from different authorities. Equally, citizens can verify the data that have been registered in different public registers. Suomi.fi acts as a central hub through which citizens have access to the platforms of public institutions, including those of social security. Suomi.fi will be connected to the EU-wide portal in line with the EU's Single Digital Gateway (SDG) regulation.[37]

Another important platform is the Incomes Register (tulorekisteri.fi) that has been fully operational since the beginning of 2021. This platform covers all data on earnings, pensions and social benefits that have been paid to individuals. To ensure that the

34 A. Hautamäki, K. Oksanen, *op. cit.,* p. 2.

35 A. Knuutila, V. Kokkonen *et al.*, *MyData muutosvoimana: Julkishallinnon henkilötiedon ihmiskeskeisen hyödyntämisen mallit ja vaikutukset* [Models and impact of MyData: Human-centric management and processing of public sector personal data], Publications of the Government's analysis, assessment and research activities, No. 67, 2017, https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/80615/61_MyData%20muutosvoimana.pdf?sequence=1 (online access: 15.5.2021).

36 Suomi is Finland in Finnish, so the site translates as Finland.fi in English.

37 J. Rinne, *EU's Single Digital Gateway and its implementation in Finnish eGovernment: A case study*, Master's thesis, Aalto University, 2019.

data is up to date there is an obligation on the payer to report all the payments to the register within five days. The payer has an obligation to ensure the validity of the data. The platform allows individuals and companies to access this information to verify the correctness of the data. If the data are not correct, an individual reports it to the payer who then corrects the data. The validity of the data is crucial, as Kela and other social security institutions use the data from the Incomes Register for decision making.

Thirdly, in social and health care Kanta (kanta.fi) is a service platform that stores medical records and prescriptions online. All prescriptions are issued and dispensed *via* the Kanta services. Certificates and reports issued by healthcare professionals needed for decisions on social security benefits can be forwarded to Kela for processing through this service. It is equally a data repository for patient data. In this way old patient data are archived through a centralized manner. In addition, it is a pharmaceutical database that contains the necessary information about medicines, their price and reimbursement status in terms of issuing and dispensing, and about interchangeable medicines.

There are some on-going projects related to the national architecture that are as yet not operational. Firstly, the national artificial intelligence programme AuroraAI has as its objective to offer citizens personalised services at the right time. This requires that public sector organisations must be interconnected through the AuroraAI network. As an example, a person changing jobs should be informed by different parties in this transitional process through the help of AuroraAI. This network should be operational at the end of 2022.[38]

Secondly, there is an on-going project by the public-private Findy cooperative that aims to develop a shared and secure network through which different institutions, and private entities, could ensure the authenticity of information required in e-services. This would reduce the need for centralized registers as institutions could verify the authenticity of data from other providers with the consent of the customer or organisation. The approach resembles that of a blockchain in which no central database is required.[39]

Projects related to services in social and healthcare

Being a major customer service provider, Kela answers some two million customer calls annually.[40] Kela is engaged in a project to advance conversational AI and to develop an intelligent chatbot technology platform. Kela aims to implement chatbots

38 Implementation of the national AuroraAI programme, https://www.europeanpensions.net/ep/Finnish-AI-successfully-identifies-future-retirees-facing-disability-pension.php (online access: 20.9.2021).

39 Findy – verifiable data network, https://findy.fi/en/ (online access: 20.9.2021).

40 Kela, *op. cit.*, p. 4.

that understand spoken Finnish and that can respond to customers in Finnish. These bots could be used in a phone customer service to reduce customer waiting time. The telephone waiting time for Kela customer services was six minutes in 2019. The chatbot, once implemented, would enhance operational efficiency, and leave more time for human-to-human interactions.

Kela has been active in developing its online process related to applications. This approach is based on need. Although it is possible to apply for benefits online, and 72 percent of application to Kela were filed online in 2020 which is an increase from 2016 when 64 percent applied online.[41] Despite this development, many customers still use paper applications and attachments. These are often sent to Kela by mail. Attachments include copies of documents needed for decisions (such as rental contracts). These copies include photos taken by mobile phones that are then printed on paper. The quality of the image varies significantly. To reduce the time needed for the personnel to go through different attachments, Kela has implemented an intelligent scanning process of the paper documents/attachments sent to it.

As part of this public-private partnership process, Kela has integrated a scanning program that identifies and interprets paper applications and attachments. After identifying the necessary information of the applications and attachments, the program then stores them in the right manner to the document management software. The program recognizes who has applied, what kind of benefit was applied for and what kind of attachments are included. Machine learning is used to enhance the quality of the software in recognizing different types of attachments. Previously the benefit handlers had to manually rotate, zoom, and read the attachments on their computers to be able to classify them in the right way. Digitalization has saved large amounts of time in customer service.

Kela has implemented an automatic decision-making (Robotic Process Automation – RPA) process for some benefits. The RPA process did not include any profiling of applicants. Yet, Kela received a notification from the Ombudsman that this process was not in line with the current legislation, but it was not against the law. The Ombudsman criticized that: "individual's right is that decisions are not based solely on automatic decision-making".[42] The main problem with automatic decision-making was that the method was not covered by valid legislation. This is against the Finnish Constitution that states that all exercising of public power should be based on an Act and that the laws should be strictly observed.[43] Currently, new legislation is being prepared which would allow for the use of automatic decision-making and clarify the outstanding issues related to transparency. Public administration institutions expressed their views that such a legislation is urgently needed as they planned to expand automatic processes. For Kela,

41 *Ibid.*

42 *Oikeusasiamies kieltäisi automaattiset viranomaispäätökset* [The ombudsman would ban automatic-decision making],"YLE news" 17 December 2019, https://yle.fi/uutiset/3–11122069 (online access: 21.9.2021).

43 P. Ahonen, T. Erkkilä, *op. cit.*, p. 5.

the aim was that the RPA would take over some routine tasks that would then liberate time for the personnel to concentrate on more complicated cases. Yearly, Kela makes some 19 million decisions and of those around half a million are given automatically without any involvement of persons, only by the use of IT.[44]

Another way to use AI is by algorithms that can serve as a support for decision making. In 2018, the Finnish Centre for Pensions tested a machine learning algorithm that used a self-learning statistical technique to predict whether an individual would retire on a disability pension within two years. The algorithm was created based on the data of 500,000 individuals. At the end of the process, the algorithm predicted correctly 78 percent of cases when an individual would retire on a disability pension. The data consisted of socioeconomic, earnings, and benefit information.[45] The extensive and centralized registers offer a good platform for the use of machine learning to identify risks. Since this experiment, the pension fund Varma has developed a forecast model that will help employers to identify potential cases of disability risk. This machine learning uses data on socio-demographic information as well as information on rehabilitation and benefits.

Questions of ethics and equality

New technologies create new possibilities and challenges. Big questions are related to ethics. Especially so in the use of algorithmic data. Other central ethical concerns around digitalization are issues related to privacy, autonomy, security, human dignity, justice, discrimination, and the balance of power.[46] These concerns need to be addressed in a way that represent the values that liberal democracies cherish, namely individual freedom, the rule of law and democracy.

Focus has been on privacy issues related to personal data and digital security. The main issue at this moment is the utilisation of information, especially the ownership of data. Individuals have access to their data and services should be integrated so that they can be utilized in the best possible manner. The correct usage of data makes it possible to take decisions at the right time.

Questions of big data, algorithmic profiling, the impact on equal treatment are growing issues for justice and balance of powers.[47] Hackers and criminals, if not foreign

44 P. Örnberg, *Mitä tarkoittaa, jos Kela myöntää automaattisesti jonkin etuuden?* [What does it mean if Kela automatically grants a benefit?], Kela blog 2020, https://elamassa.fi/pasi-ornberg/mita-tarkoittaa-jos-kela-myontaa-automaattisesti-jonkin-etuuden/ (online access: 10.5.2021).

45 T. Andrew, *Finnish AI testing successfully identifies future retirees facing disability pension*, "European Pensions" 17 April 2018, https://www.europeanpensions.net/ep/Finnish-AI-successfully-identifies-future-retirees-facing-disability-pension.php (online access: 10.5.2021).

46 L. Royakkers, J. Timmer *et al.*, *Societal and ethical issues of digitalization*, "Ethics and Information Technology" 2018, No. 20.

47 *Ibid.*

powers, might want to attack and paralyze platforms and services in exchange for a ransom. Institutions also hold large amounts of sensitive data that can be sold on Internet black markets if retrieved by hackers or other criminals.[48]

People are willing to share private information on social networks such as Facebook or Twitter that are owned by private companies. Often there is considerable unclarity concerning the ownership of the data. Although data regulation requires people to give consent on the details of the data. Ângela Pereira, Alice Benessia, Paula Curvelo[49] argue that people are suffering from consent fatigue or do not understand what they consent to. Another worrying public example is that of the Chinese government that scores its citizens behaviour and awards those that achieve high scores.

An important matter for concern is the question of inequality. Social security institutions have as customers individuals from all walks of life, including marginalized groups, such as the long-term unemployed who might not have the best skills when it comes to information technology. Not all of us are equally digitally skilled. Typically, pensioners are less skilled with new technological tools and prefer more classical methods. According to a study by S. Taipale[50] rural people use e-services less than people in cities. Although there is an actual lack of physical service points in rural areas when compared to cities. This uneven usage is accentuated by the fact that people living in cities are more educated on average. Education and training are needed to increase the use of e-services

AI makes mistakes, just like humans: in the latter case the responsibility is clear but in the former it is more difficult. Currently, after the notification of the Ombudsman, Kela states in every decision the individual who is responsible for the decision. The use of AI does not change the legal responsibility for the decision. Yet, this case has highlighted the need for having relevant legislation in place. This is never self-evident. Therefore, as it was stated in the interview, Kela tries to hypothesize possible scenarios and provides help for the relevant Ministry in drafting the laws.

Public institutions collect large amounts of data on individuals and on their interactions with these institutions. The data are collected throughout individuals' life courses. To address this asymmetry of information that exists between individuals and public institutions, transparency on the utilization of data is needed. It is crucial that public institutions communicate openly about their processes and respond to criticism in an open manner. All social security institutions of Finland are active on social media and they test new ways to communicate with the public which increases such transparency.

48 In 2020, a large data breach of a private psychotherapy center, Vastaamo, was reported to have occurred between 2018 to 2019. Vastaamo had been a service provider for Kela's rehabilitation services. The hackers leaked some information on discussion fora and tried to sell the data on the Internet. The hackers were never caught. The leak was possible because Vastaamo had not sufficiently protected its database.

49 A. Pereira, A. Benessia, P. Curvelo, *Agency in the Internet of Things*, JRC Scientific and Policy Reports, 2013.

50 S. Taipale, *op. cit.*, p. 5.

Conclusions

Finland has long traditions in the utilization of information technology in public administration. Social security institutions were among the first to adopt computer-based technology in Finland. This trend has not subsequently been overturned; on the contrary, it has remained strong. There have not been major scandals, such as data breaches or leaks, in public institutions related to information technology. Neither has there been a retreat from this rather positive view on technology and its possibilities in creating value for customer service and operations within these institutions. Trust in the institutions and in the protection of the data has remained. The State has supported the digital development by creating common pathways that form the core of the national digital architecture. Lack of legal provisions has slowed down the adoption of AI in decision-making.

Therefore, the digitalization of Finnish social security is rather advanced. The administration of social security is fragmented but institutions cooperate enabling the adoption of new technologies. Currently, a reform commission (2020–2027) is preparing a comprehensive social security reform. One of the aims of the reform is to enhance cooperation and the mutual exchange of data to ensure better customer service. The main challenges are related to the legal framework that is not fully in line with the methods that the institutions wish to apply, as the example on automatic decision-making shows.

Social security institutions in Finland are big service providers and holders of registers. Both features contribute to the fact that digital services are well developed in the field of social security. The Finnish case is an example that decentralized systems do not cause a problem if the authentication of data is overcome. Everything does not need to be in one register, but registers need to be accessible. Currently, there are big on-going projects related to the automatization of processes. The next phase in digitalization might be the increased use of it in customer service.

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SOURCES

- Ahonen P., Erkkilä T., *Transparency in algorithmic decision-making: Ideational tensions and conceptual shifts in Finland*, "Information Polity" 2020, No. 25(4).
- Andrew T., *Finnish AI testing successfully identifies future retirees facing disability pension*, "European Pensions" 17 April 2018, https://www.europeanpensions.net/ep/Finnish-AI-successfully-identifies-future-retirees-facing-disability-pension.php (online access: 10.5.2021).
- Castells M., Himanen P., *The Information Society and the Welfare State: The Finnish Model*, Oxford 2002.

- Crowe S., Cresswell K., Robertson A., Huby G., Avery A., Sheikh A., *The case study approach,* "BMC Medical Research Methodology" 2011, Vol. 100, 11.
- Esping-Andersen G., *The three worlds of welfare capitalism*, New Jersey 1990.
- European Commission, *Digital government factsheet Finland 2019*, https://joinup.ec.europa.eu/sites/default/files/inline-files/Digital_Government_Factsheets_Finland_2019.pdf (online access: 25.5.2021).
- Eurostat, *Government expenditure on social protection 2021*, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Government_expenditure_on_social_protection (online access: 25.5.2021).
- Hautamäki A., Oksanen K., *Digital Platforms for Restructuring Public Sector* [in:] *Collaborative Value Co-creation in the Platform Economy*, ed. A. Smedlund, A. Lindblom, L. Mitronen, 2018.
- Johanson J.E., Sorsa V.P., *Pension governance in Finland, a case study on public and private logics of governance in pension provision*, Finnish Centre for Pensions Reports, No. 2, 2010.
- Kangas O., Jauhiainen S., Simanainen M., Ylikännö M., *The basic income experiment 2017–2018 in Finland: Preliminary results*, Reports and Memorandums of the Ministry of Social Affairs and Health, No 9, 2019.
- *Nordic Social Policy: Changing Welfare States,* eds. M. Kautto, M. Heikkilä, B. Hvinden, S. Marklund, N. Ploug, London 1999.
- Kela, *Kelan vuosi 2020* [Kela's annual report 2020], https://www.kela.fi/documents/10180/17802081/Kelan+vuosi+2020.pdf/0e40794f-3a1c-4d13–9d40-a8661c434f00 (online access: 16.5.2021).
- Knuutila A., Kokkonen V., Sunquist H., Kuittinen O., Thure S., *MyData muutosvoimana: Julkishallinnon henkilötiedon ihmiskeskeisen hyödyntämisen mallit ja vaikutukset* [The models and impact of MyData: Human-centric management and the processing of public sector personal data], publications of the Government´s analysis, assessment and research activities, No. 67, 2017, https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/80615/61_MyData%20muutosvoimana.pdf?sequence=1 (online access: 15.5.2021).
- Koivu A., Phan Y., Näsi E., Abuhamed J., Perry B.L., Atkins S., Perkiö M., Koivusalo M., *The baby box. Enhancing the wellbeing of babies and mothers around the world,* Helsinki 2020.
- Korhonen J., *e-Government in Finland – success stories and lessons from Finland* [in:] *E-Democracy, E-Governance and Public Sector Reform Revisited – Experiences of The Main Themes of the PADOS project in Finland and Estonia*, ed. A. Temmes, 2016, https://um.fi/documents/35732/48132/e_democracy__e_governance_and_public_sector_reform_revisited___experiences_of (online access: 12.5.2021).
- Liukko J., Kuuva N., *Cooperation of return-to-work professionals: the challenges of multi--actor work disability management*, "Disability and Rehabilitation" 2017, No. 39(15).
- Milasi S., González-Vázquez I., Fernandez-Macias E., *Telework in the EU before and after the COVID-19: where we were, where we head to,* JRC Science for Policy Brief

2020, https://ec.europa.eu/jrc/sites/default/files/jrc120945_policy_brief_-_covid_and_telework_final.pdf (online access: 21.9.2021).
- Organisation for Economic Co-operation and Development, *How's Life? 2020: Measuring Well-being*, 2020.
- Örnberg P., *Mitä tarkoittaa, jos Kela myöntää automaattisesti jonkin etuuden?* [What does it mean if Kela automatically grants a benefit?], Kela blog 2020, https://elamassa.fi/pasi-ornberg/mita-tarkoittaa-jos-kela-myontaa-automaattisesti-jonkin-etuuden/ (online access: 10.5.2021).
- Osifo O.C., *Examining digital government and public service provision: the case of Finland*, International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO), 2018.
- Paju P., *"Ilmarisen Suomi" ja sen tekijät* [Building "Ilmarinen's Finland": The Committee for Mathematical Machines and computer construction as a national project in the 1950s], Ph.D. Thesis, University of Turku, 2008.
- Pereira A., Benessia A., Curvelo P., *Agency in the Internet of Things*, JRC Scientific and Policy Reports, 2013.
- Rinne J., *EU's Single Digital Gateway and its implementation in Finnish eGovernment: A case study*, Master's thesis, Aalto University, 2019.
- Royakkers L., Timmer J., Kool L., Van Est R., *Societal and ethical issues of digitization*, "Ethics and Information Technology" 2018, No. 20.
- Taipale S., *The use of e-government services and the Internet: The role of socio-demographic, economic and geographical predictors*, "Telecommunications Policy" 2012, No. 37(4–5).
- University of Vaasa, *Vaasan Yliopistolle 455,000 Euroa ICT-Muutokouluksen Järjestämiseen* [450,000 euros to the University of Vaasa for ICT-retraining], 19 January 2018, https://www.uwasa.fi/fi/news/ict_muuntokoulutus (online access: 10.5.2021).
- Wessmann M., *Tietotekniikan pioneerit* [Pioneers of information technology] [in:] *Virastosta tietotaloksi* [From bureaucracy to knowledge centre], ed. J. Vauhkonen, Helsinki 2011.
- Wirtz B.W., Daiser P., *A meta-analysis of empirical e-government research and its future research implications*, "International Review of Administrative Sciences" 2018, No. 84(1).

LINKS:

- Kanta.fi (Healthcare database).
- Suomi.fi (Information and services for life events).
- Tulorekisteri.fi (Incomes register).
- Findy.fi/en (Findy).

Transformacja cyfrowa zabezpieczenia społecznego w Finlandii – lider doświadczający przeciwności?

Cyfryzacja dogłębnie przeistacza nasze społeczeństwa. Administracja publiczna oraz instytucjne zabezpieczenia społecznego znajdują się na różnych etapach tego procesu. Proces cyfryzacji stawia wyzwania natury technologicznej, prawnej oraz organizacyjnej. Finlandia była zazwyczaj liderem w wykorzystywaniu technik informacyjnych (*information and communication technologies*, ICT). Artykuł korzysta ze studium przypadku, aby krytycznie przyjrzeć się obecnym postępom poczynionym przez Finlandię w procesie cyfryzacji sektora zabezpieczenia społecznego. W tekście wyszczególniono zarówno projekty bieżące, jak również te, których realizacja jest zaplanowana na najbliższą przyszłość. Artykuł pokazuje, że fińskie instytucje zabezpieczenia społecznego zintegrowały cyfrowe procesy ze swomi działaniami, choć nadal napotykają problemy natury etycznej i prawnej, szczególnie w sytuacjach wykorzystujących sztuczną inteligencję oraz zautomatyzowane podejmowanie decyzji w zakresie zabezpieczenia społecznego.

Słowa kluczowe: platforma cyfrowa, cyfryzacja, Finlandia, administracja publiczna, ubezpieczenia społeczne

Valeria Bonavolontà, Massimiliano D'Angelo

Digital transition and public administration in Italy: the experience of the Italian National Social Security Institution – INPS

The innovation and modernization processes of national public administrations feature prominently in the process of digital transition that the whole Europe is going through. In Italy, the National Institute of Social Security (Istituto Nazionale della Previdenza Sociale, INPS) has historically always been at the forefront in terms of digital skills and the use of Information Technology for the provision of social security services, constituting a model of excellence in the landscape of public administrations both in Italy and Europe.

INPS is currently facing a strategic challenge: that of constituting the driving force for the digital transition of the Italian public sector. To meet this challenge, the Italian Social Security Institute has equipped itself with an ICT (information and communications technology) Plan that represents a marked discontinuity with respect to past plans and which deserves, as a result of its innovative character, to be analyzed in detail.

In particular, the ICT Strategic Plan of INPS for the three-year period of 2020–2022 aims to introduce a paradigm shift towards the digitization of the public services that the Social Security Institute offers to the whole country, planning a radical technological, organizational and cultural innovation, an enabling prerequisite for creating a new model service for citizens, businesses and other public administrations.

Key words: digital skills, digital transition, public administration, public services, social security

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Introduction

This article aims to illustrate the experience and vision of the Italian National Social Security Institute (Istituto Nazionale della Previdenza Sociale, INPS), and here within the framework of the digital transition of the Italian public administrations, in order to offer a quality benchmark for similar institutions in other European Union (EU) countries.

Information technology in the INPS has historically been one of the key factors in the management efficiency of the Institute itself, and has allowed over time it to provide a large number of services, most of which are exclusively online, to a considerable number of users, achieving important recoveries of productivity, even in the face of a progressive decrease in the number of employees and the constant reduction in the budget for computerization costs.

However, it is now necessary to add to these consolidated management skills ensured by the ICT (information and communications technology) in INPS, a new capacity for innovation, one even radical, which would support the new service-logics that the Institute is starting to implement, aimed at decisively reviewing the relationship with the Italian public.

In fact, it is no longer sufficient to intervene in order to improve existing solutions, to recover further margins of internal efficiency: the Institute's service offer must be aligned with the reference standards of the customer experience, set out in a context of numerous users, which is multiple and often highly specific, but which can no longer be managed with territorial and sectoral logics, since now it is increasingly characterized by mobility and dynamism.

Users no longer perceive as a value only the efficiency or the timeliness of the provision of services, aspects which must in any case be ensured, but seek an integral experience with the Social Security Institute, a qualified entity taking charge of their needs across a range of services, which ensures long-term assistance, helping them to make choices and evaluate the consequences as well as to exploit the opportunities in line with their own work/ entrepreneurial profile, or in relation to their socio-economic or health-related frailties.

By realizing this paradigm shift, the Social Security Institute will therefore be able to propose itself as a technological and management "hub" at the service of the public, other public administration bodies and the country at large, favoring and creating new opportunities for interactions within multi-stakeholder digital ecosystems, in line with the Three-Year Plan of the Public Administration (see *infra* paragraph 3).

INPS ICT Plan, which targets 2022 as an end date, aims to enable the "digital" transformation of the social protection administration, taking advantage of all the opportunities offered by new technologies, cloud, data architectures, analytics and big data, artificial intelligence, agile development, cybersecurity *etc*. Furthermore, it also proposes to enable a cultural renewal in the organization of the INPS, which must be

accompanied by training interventions that in turn enable staff to make the best use of technologies to create additional value for users. Renewal must put people at the center, otherwise this will simply be impossible.

The above mentioned Plan is the reasoned product of the generative debate within the "General States of INPS computer science" event, which took place at the beginning of 2020, during which the IT staff of INPS had the opportunity to both discuss and reflect on innovation scenarios with competent people outside of the organization. Hence the "roadmap" for innovation, which outlined a path of discontinuity for the INPS IT Department. A path that, within the framework of the reference model identified by the three-year plan for IT in public administration, "metabolizes" the reflections and indications of the INPS IT Health Status, incorporates the contributions of the managers of the IT Areas, enriching itself finally by the experience acquired during the management of the COVID-19 emergency and of the confrontation with the newly installed Board of the INPS.

In the view of INPS, three lines of action coexist, on which hinge the IT projects to be launched in 2020–2022: radical innovation, to introduce completely new solutions for the Institute; evolution, to improve the existing one and make it more compliant with the new service-model; continuity in performance, to ensure an adequate transition to innovation. In this context, the exogenous factors are essential elements of analysis, as they represent guidelines of a regulatory and strategic nature, adopted by Italy in reference to ICT, which the Institute must adhere to promptly and efficiently also in relation to the leadership role within the national technological landscape that it has traditionally pursued. The main external factors of reference are the Digital Administration Code (*Codice dell'Amministrazione Digitale*, CAD) and the Three-Year-Plan for IT in the Public Administration (see subsequent paragraphs).

The Italian Code of Digital Administration

The Code of Digital Administration is a regulatory act of the Italian Republic (Legislative Decree 82/2005), which takes the form of a single text that brings together and organizes the rules concerning the computerization of public administration in its relations with citizens and businesses. With the latest regulatory intervention, the CAD replaced the previous technical rules with guidelines in order to direct public administration bodies to undertake a process of rapid and reactive adoption of the digital. Specifically, the CAD has led to simplified and rationalized guidelines when compared to previous ones, with a focus on the new concept of public administration characterized by the following non-exhaustive aspects:

- Payments using IT methods: public administration bodies will have to integrate their collection systems with the Italian general platform for payments to the public administration, called pagoPA, use services provided by other beneficiaries already

active on the pagoPA platform, or entrust their income to a special collector who is already a member of pagoPA;

- Digital Identity: the so-called SPID (*Sistema Pubblico di identità Digitale*) system allows Italian citizens to access the online services of public administration and private entities with a single Digital Identity. In addition, other identity digitization solutions have been introduced, such as the electronic identity card and the National Services Card (CNS), the latter being available as an electronic authentication tool for making payments between private parties and public administration; INPS has already defined a roadmap for the progressive abandonment of the INPS Personal Identification Number – which has so far been valid for the access to INPS' social security services – to the advantage of the SPID;
- Digital Signature: the Italian FEQ (*Firma elettronica qualificata*), a qualified electronic (or digital) signature, is the result of an IT procedure, called validation, which guarantees the authenticity, integrity and non-repudiation of IT documents. It represents a revolution in the dematerialization field for administration, since the digital signature integrates and replaces the affixing of seals, punches, stamps, marks and trademarks of any kind and for any purpose required by the legislation hitherto. Furthermore, it enables a remote signature, limiting the use of paper, making administrative processes more efficient and streamlined;
- Public connectivity and cooperation system (*Sistema Pubblico di Connettività*, SPC): this is the set of technological infrastructures and technical rules that ensures interoperability between the information systems of public adminsitration, allows for the coordination of data/documents between central, regional and local administration, as well as between these and EU systems, and is open to membership by public service operators and private entities. The public administration bodies that, on the basis of current legislation, have the obligation or the right to implement a public system of connectivity and cooperation (SPC) can use the Framework Contract, within the limits of the capacity of the total maximum amount, by entering into one or more Executive Contracts;
- Validity, management and storage of electronic documents: the electronic document satisfies the requirement of the written form and is effective when there is a digital signature, other types of qualified electronic signature, or an advanced electronic signature. The public administration body in charge of the procedure collects deeds, documents and data in an electronic file and through the IT document management system of public administration ensures the indexing and search for documents and IT files. Documents transmitted by anyone to a public administration by any telematic or computerized means, suitable for ascertaining their origin, satisfy the requirement of the written form and their transmission must not be followed by that of the original document;
- Reuse and Open Source: the term "reuse" of a software means the set of activities that allow its use in a context other than that for which it was originally developed. According to the Code of Digital Administration, the software in reuse is exclusively

released with an open license by a public administration body. These bodies acquire computer programs or parts of them in compliance with the principles of economy and efficiency, investment protection, reuse and technological neutrality, following a comparative technical and economic evaluation. Bodies owning software solutions are obliged to make the related source code available (on the AgID Platform), complete with documentation, and to be released in the public repertory under an open license, for free use by other public administration bodies;

- Database of national interest: the CAD defines a database of national interest as the set of information collected and managed digitally by the public administration, homogeneous by type and content, the knowledge of which is relevant for the performance of the institutional functions of other public administration bodies. Without prejudice to the competences of each such body, the databases of national interest constitute, for each type of data, a unitary information system, which takes into account the different institutional and territorial levels, and which guarantees the alignment of information and access to it by the interested public administration bodies. These information systems must possess the set minimum qualities of security, accessibility and interoperability, and are created and updated according to specific technical rules as well as the current rules of the Italian National Statistical System.

The Three-Year IT Plan for the Italian public administration

The Three-Year Plan for IT in the Public Administration is the strategic and economic policy document that was created to operationally guide the digital transformation of the country and become a reference for central and local administration in the development of their information systems. The Plan defines such a reference model for the development of Italian public IT by establishing the fundamental architectural principles, the rules of usability and interoperability, and specifying the logic of classification of ICT expenses.

The strategy of digital transformation of the public administration, addressed by the Three-Year ICT Plan for 2019–2021 AgID, and its updated version for the three-year period of 2020–2022, published in August 2020, which set out the relevant actions, responsibilities and timelines, lays down the foundations for the definition of internal policies of the evolution of the public administration through the implementation of "cardinal principles" (drivers) on which the public administration bodies build the new strategic model of evolution, which are referred to below, though not exhaustively:

- digital & mobile by default, or digital and mobile by definition: public administration bodies must provide digital services as a default option, providing as well agile methods of continuous improvement, starting from the user experience and based on the continuous measurement of performance and use;

- once only: the user data is unique and shared throughout the national ecosystem of the public administration, so that citizens and businesses provide the information only once;
- inclusiveness and accessibility of services: public administration bodies must design digital public services that are by definition accessible, inclusive and meeting the varied needs of people, for example to protect the elderly, the disabled, and linguistic minorities present in the national territory;
- interoperable by design: public services must be designed to operate in an integrated and uninterrupted way throughout the national and European single market, as well as according to standard and API-first ontologies;
- openness and transparency of applications and data in terms of preference for the use of software with open code (Open Source) as well as enhancement of the information assets and availability of the same to citizens/businesses, in an open and interoperable form (Open Data);
- digital identity only: public administration must conduct preparatory actions for the adoption of generalized digital identity systems;
- cross-border by design: public administration must make relevant digital public services available cross-border;
- cloud first: public administration, when defining a new project and/or developing new services, must first evaluate the adoption of the cloud paradigm before any other technology, taking into account the need to prevent the risk lock-in;
- security & privacy by design: from the design stage on, the profiles relating to the protection of personal data, the protection of privacy and IT security must be integrated.

INPS ICT Plan for 2020–2022

The INPS ICT Strategic Plan for 2020–2022, in line with the Three-Year Plan for Public Administration IT issued by the Italian Agency for Digitalisation (Agenzia per l'Italia Digitale, AgID), with the Italian Ministry of Digitalization's Innovation Plan and with the main innovative trends of the market, is characterized as a tool to promote change because:

- it defines the ICT vision of the management, which takes the form of a single logical-architectural model to be achieved in the next few years and towards which to direct evolutionary efforts;
- it is an essential element enabling the creation of a new "model" of "proactive" service centered on the user, based on the constant interaction between systems, services, users, INPS personnel and technological partners, and aimed at generating value within and outside of the Institute, in organizational, cultural and social terms;
- it identifies challenging and innovative ICT objectives, which at the same time are clear and measurable, for the evolution of the Institute's information systems

towards an architectural target model that reflects and enables the digital and strategic vision of INPS;
- it defines ICT Programs and the "strategic actions" instrumental to the achievement of one or more ICT objectives, and qualifies them according to a logic of transition from the concept of silos, with IT confined to supporting individual institution, towards a cross-organizational vision, which enables coordination and connection between the structures;
- it introduces an innovative model of planning and management of ICT resources (Comitato Elettrotecnico Italiano, CEI) in synergy with the organizational guidelines and tools of the bimodal approach;
- it represents a live tool to be reviewed, updated and monitored periodically in the implementation phases, according to a dynamic governance model.

The pillars of INPS ICT Plan

INPS, like any social security institution, needs to continually renew itself to respond to the requests for the service of users, as well as the ever-increasing number of tasks assigned to it by the law. Citizen needs are rapidly changing, due to increasingly dynamic work and career experiences; ones that require periodic interventions on the part of the social security system, and here often linked to temporary contingencies. In this context, the INPS is called upon to reconfigure the services and activities according to the needs and expectations of the different user segments, according to the dual key of personalizing the service and proactivity. The need to adapt operational processes to a user-centric function requires the adoption of a new service model and a new system of integrated services.

The Italian Social Security Institute therefore intends to enable its organization to actively respond to this new model, overcoming the logic of territorial competence or performance verticality and proposing itself as a "reference point for Italians" in line with the best international experiences and with the evolutionary trends in the country.

The drivers of INPS digital change give rise to three main macro-areas of intervention (the so-called CEI Framework):

1. Innovation for leadership: ICT programs instrumental for the achievement of new "horizons" and innovative business models by leveraging disruptive technologies;
2. Evolution for growth: ICT programs instrumental for ensuring the growth of the current business model in terms of methodologies, culture, organization, tools and technologies;
3. Continuity of business: ICT programs instrumental in guaranteing the operational continuity of the systems supporting the "business", in terms of ordinary regulatory adjustments, operational efficiency, performance improvement, cost reduction and risk containment.

Innovation for leadership

The ICT programs classified as Innovation for leadership represent the set of lines of action necessary to communicate the change of paradigm and the innovation of the ICT vision outside the Institute.

The paradigm shift takes the form of the re-engineering of the service model, in terms of proactivity in the provision of services, personalization (customer journey), user involvement (co-design), omnichannel (*e.g.* mobile), virtual assistants based on artificial intelligence [chatbot, voicebot, IVR (interactive voice response) algorithms of Machine Learning and Natural Language Processing], as well as in obtaining the role of a cultural and technological leader in the digital transformation landscape of the national IT ecosystem. And here based on the right awarded to re-enter the National Strategic Pole to offer infrastructure services to other public administration bodies, on user loyalty and on the "trust" of institutions (customer journey, cloud infrastructure, cyber security).

Specifically, four ICT Programs have been identified as part of the Innovation for Leadership Program:

- implementation of the customer journey through data-driven and artificial intelligence logics to enable the transformation of the INPS' service model;
- development of services in blockchain technology to support the effectiveness of institutional policies, the certification of performance data and interoperability with other public administration bodies;
- development of a cyber security strategy aimed at the integrity of data and infrastructure, the construction of a dedicated workforce and the adoption of new tools and skills;
- evolution and enhancement of the infrastructure to support country-wide interoperability.

Evolution for Growth

The ICT programs classified in Evolution for Growth represent the set of lines of action necessary to implement the paradigm change of the ICT vision within the Institute, according to both cultural and technological development guidelines. The definition of application, architectural, security, quality and data governance standards, the introduction of the Publish/Subscribe logic as best practice for the dynamic exchange of data between applications of different nature, the implementation of the DevOps (development and operations) approach for the integration of delivery processes, the structured refactoring of systems towards an "API-driven" (application programming interface) architecture aimed at combining similar functions and process automation, the implementation of the bimodal approach with a focus on the integration of work and "human capital", cannot be separated from a radical change in the operational approach with a view to cross-organizational "agile" collaboration.

Specifically, the four ICT Programs that form part of the Evolution for Growth Program are:

- definition of the guidelines for the evolution of the IT department, in terms of common and shared standards, models, procedures and policies;

- architectural and infrastructural refactoring of applications, functional aggregation of systems to support the simplification of institutional processes and self-functioning;
- centralization, rationalization and integration of the INPS information assets;
- digital and workflow governance and document management.

Continuity of business

The socio-economic instability gradually established in the national context in the light of recent emergency events constitutes an "extraordinary" factor that constitutes a critical issue in itself in the management of the Institute's IT services.

Regardless of the situation in recent months, the Institute's evolution and innovation roadmap inevitably involves the assumption of operational risks linked to change: having a "mature" information system can become a temptation to limit the services to a few adaptive interventions in place, while the same technological evolution requires a continuous evolution of the platforms, which in this context must adapt to new standards and new market scenarios, making occasionally more mature and consolidated environments continuously obsolete and therefore digitally unsupported.

The nationwide lockdown made necessary by the COVID-19 pandemic has forcibly brought citizens closer to digital opportunities, increasing their readiness and expectations in terms of user experience, in a rapidly and exponentially evolving technological landscape (Digital Tsunami). For the INPS this period, with all the critical issues related to operations and services provided, paradoxically represented an opportunity to accelerate the innovation process, which had already been marked downstream of the INPS ICT General Estates of February 2020.

The aforementioned "new risk factors" to be managed in order to ensure business continuity and "customer satisfaction" help highlight the opportunities and benefits of a "disruptive" ICT strategy enabling a paradigm shift, in line with the objectives of leadership in the ICT landscape, that the Institute has historically pursued, and with the national and European context oriented to the "New Normal" and to the digital transformation of the public administration.

The ICT programs classified under the Continuity of Business aim to ensure the maintenance of the application park and the infrastructural and architectural components necessary to guarantee the operation regarding the provision of services of institutional competence, in compliance with the defined service levels and for the benefit safeguarding the level of quality perceived by users.

Specifically, the ICT Programs thus classified aim to include the interventions necessary for the adaptation of the application systems to regulatory changes (ICT "C1" Program) and the preventive, ordinary and extraordinary maintenance actions to support the operation of the infrastructure, assets and IT security systems.

INPS has also launched a series of infrastructure evolution projects with a view to a cloud transformation strategy.

The roadmap

Organization

In order to ensure the success of the ICT Strategic Plan, the INPS IT department must possess all the characteristics necessary for its correct implementation.

In particular, in the face of a significant change proposal in terms of technology and process or performance, a Change Advisory Board is active, which will have the aim of assessing the transversal impacts of the introduction of innovation, involving the relevant application areas and ensuring a homogeneity of approach and solution.

The Competence Centers – made up of personnel overseeing the innovation initiatives that take care of the design, implementation, testing and commissioning of the software, experts both in the business area affected by innovation (vertical area), and in the transversal areas – will collaborate in synergy with all the other components of the interfunctional group and will have a double responsibility: for the objective, jointly with the product management, and for the technological solution to be implemented, in an end-to-end logic.

Within the cross-functional groups, the coherence of the technological solutions with the ICT standards of the Institute can be guaranteed by the presence in the groups themselves of the representatives of the transversal areas of the IT department of INPS, which will have to carry out a function of alignment and control of compatibility between the different branches of procedural development, and will support the application areas involved.

INPS administrative departments (such as Pension, Social contributions, *etc.*) will have to ensure full accountability for the final result of the changes made, through mechanisms of involvement in the transition processes (*e.g.* testing of new functionalities/applications).

Again, in reference to the digital innovation path to be implemented, the INPS IT department will operate in conjunction with a new INPS department for technological innovation and digital transformation. In particular, this new department is meant to monitor the evolution of emerging technologies and the new opportunities offered by the market, in order to evaluate and support the adoption of those enabling the achievement of the strategic objectives of the Institute, promoting technological innovation as a key driver for change. Furthermore, it will be involved in promoting the adoption of agile project management methodologies, with the main purpose being to find new flexible and structured approaches to the complexity of the social protection field.

Human resources

Digital transormation requires a deep change in the organisation's culture and the development of digital skills, according to the following main actions:

- mapping of the target skills;
- skills assessment to identify the skill gaps;

- consolidation and strengthening of skills to be carried out through targeted training interventions;
- acquisition of skills from outside the public administration, for the implementation of all those projects for which technological and specialist profiles are required that cannot be found in the organization's staff;
- in general, promoting initiatives aimed at increasing the digital culture and mindset in the organisation.

Next Generation EU

The path towards the digitization of public administration in Europe in the coming years will receive a further stimulus through Next Generation EU (NGEU) funding. At the heart of NGEU is the Recovery and Resilience Facility (RRF), which will provide € 672.5 billion in loans and grants to support reforms and investments made by the Member States under their national recovery and resilience plans, to subsequently make European economies and societies more sustainable, resilient and better prepared for the challenges and opportunities of the green and digital transition. In this regard, the commitment made by the institutions is to earmark a share of no less than 20% of the total appropriations of the RRF to interventions in the digital field.

With regard to the Italian Recovery and Resilience Plan, "Digitization and innovation" represents one of the pillars that guides the country's relaunch action. Furthermore, at the implementation level, the intervention in the field of "digitization, innovation, competitiveness and culture" represents the first of the six missions into which the plan is structured. Within this mission, one of the three components specifically concerns "digitization, innovation and security in public administration", which aims to give a decisive boost to the relaunch of the competitiveness and productivity of the entire country.

Therefore, this Mission 1 aims to significantly reduce the current structural gaps in terms of competitiveness, productivity and the digitization rate. It is divided into three components that have an organic impact on the following issues: Public administration, Production systems, Tourism and culture. The first component of Mission 1 sets itself the goal of transforming the Italian public administration within a digital perspective, with repercussions on technological and infrastructural equipment, on human capital and on the methods of providing services to citizens.

The goal of this strategy is to reduce the distance between citizens and public administration, offering basic services that are increasingly efficient and easily accessible. To do this, first of all, action will be taken on the infrastructural component, which will allow citizens to have equal access to digital services and create a reliable and secure technological/architectural ecosystem, through the migration of administrations to the cloud, the increase of interoperability levels between public administrations and the simplification/de-bureaucratization of the key procedures for each public administration body. At the same time, the extension of the offer of public services will be taken care of

as well as their use in terms of simplicity of interaction with the public administration and increase in quality standards based on the "once only" principle (according to which public administration should avoid requiring from citizens and businesses repetitious input of data already held).

In the latest edition of the Digital Economy and Society Index (DESI) of 2020, Italy ranked twenty-fifth out of twenty eight in Europe in the rate of digitization, *i.e.* well below the European average. The poor permeability of Italian society to technological innovation is both the cause and effect of the limited diffusion of digital skills and the scarce diffusion of advanced technologies, such as cloud.

In response to this evidence, action will therefore be taken for the enrichment of citizens' digital skills and the strengthening of human capital within the public administration (including through measures conducive to the full implementation of key reforms for central administrations).

The strong push towards the digitization of the services offered by the public administration aims to significantly reduce bureaucracy and the distance between public bodies, the population and businesses.

This premise has accentuated within the INPS the need for a transformation of the Institute not limited to a mere technological and application upgrade, due to contingency, but one which provides for a radical organizational, cultural and structural change, with positive direct and indirect impacts for the benefit of citizens, businesses and other public administration bodies. Implementing a paradigm change based on the digitization of welfare services means creating the conditions so that the technologies and services made available to users can generate value both within the INPS, in organizational terms, and above all outside, in terms of social impact.

In this context, the ICT Strategic Plan of the INPS sets out general concepts such as simplification, transparency, innovation, customer journey, interoperability, reengineering process, efficiency and cost-effectiveness of services, for the definition of a new model of proactive and user-centric service able to intercept the latent needs of the end users of the services provided by the Institute (citizens, companies, other public administration bodies, *etc.*).

Monitoring and periodic updating of the ICT Strategic Plan

ICT Strategic Plans need a periodic updating. Specifically, the updating process of the INPS ICT Plan is divided into the following phases:

1. Single Project Monitoring: during the Management phase, the coherence of the project initiatives to be launched with the programs and strategies of the Plan and the congruity of the associated Key Performance Indicators (KPIs) are assessed by the IT department. During the execution of the Plan, the reference projects are analyzed in terms of achieving the intermediate objectives and any critical issues that have arisen; a specific area of the IT department collects the progress reports periodically updated by the individual Project Managers;

2. Program "War Room": the outputs and outcomes of each qualifying project are aggregated, providing a view by program, and the merit assessment of the expected objectives and any benefits for operations/continuity takes place;
3. Plan Monitoring: finally the aggregate analysis is conducted at the level of the entire Plan.

During the three phases, interaction with the Change Advisory Board, with the Competence Centers and with the new department for innovation and digital transformation can be envisaged in the event that the program/project requires a significant change of the technical insights or a comparison with respect to innovation guidelines.

This process confers an agile approach to the concept of the ICT Strategic Plan of the Institute, and constitutes a structured and live tool, periodically updated with respect to the results obtained after the first publication, giving the possibility to monitor the implementation phases of the Plan, survey the critical issues and ensure timeliness and ample room for maneuver for any re-planning and re-calibration of the objectives and projects envisaged as part of the transformation waves.

The INPS IT department adopts a model for the definition of monitoring indicators, classified into "result", "impact" and "performance", in accordance with the guidelines of the Italian AgID:

- result indicators measure the immediate effect of project progress with respect to the objectives of the specific "qualifying project";
- impact indicators measure the long-term benefits expected in the face of project progress;
- performance indicators measure the achievement of objectives in the context of application and infrastructural performance.

The indicators are monitored periodically (*i.e.* every six months) in order to assess the result, impact and performance of the ICT Programs, and remedies are promptly adopted if necessary.

Conclusions

In the framework of the NextGeneration EU, the Italian Recovery and Resilience Plan represents for the entire public administration, and especially the National Social Security Institute, an extraordinary opportunity to carry out a series of interventions to complete the current digital transformation process.

The ICT 2020–2022 Plan of the INPS has been designed to enable the new service model for Italian social security that places the user at the center of the services provided. Furthermore, it is the result of the aim to reposition the INPS in a leadership role at the technological level within the context of national and European public administration. Compared to the past, the 2020–2022 ICT Plan is characterized in terms of discontinuity both in terms of its contents and implementation methods.

As regards the contents, the current plan identifies a precise target in an architectural model, and with respect to the latter defines challenging and innovative ICT Objectives and Programs according to a distinctive classification method, that divides them into the three lines of action, focused on Innovation, Evolution and Continuity respectively (CEI framework, which makes it possible to identify the programs instrumental to guarantee the operational continuity of the business or its evolution, but also those functional to the achievement of highly innovative operating models owing to the use of emerging technologies).

With regard to the implementation methods, the plan adopts the bimodal approach for the management of projects in order to balance the maintenance of the systems with the search for new opportunities and the incremental improvement of processes with the design of new services favored by enabling technologies – and thanks to the provision of specific processes and indicators for monitoring ICT interventions that give the plan a pragmatic and concreteness character, guaranteeing an overall governance of the implementation phase over the plan implementation period, in order to evaluate the progressive achievement of the ICT strategic objectives. These characteristics require appropriate investments and a series of actions to be pursued, which enable the complete and correct implementation of the plan itself in reference to human resources, economic resources and the organization of the entity.

In particular, with regard to human resources, the acquisition of new personnel, the reskilling of employees in the basic/specialized technological skills indispensable to implement the digital transformation, the alignment of the objective assignment model and the incentive of personnel are necessary. Moreover, in reference to economic resources, it is necessary to reshape the expenditure, balance more adequately the resources allocated to the innovation programs and to the "traditional" initiatives, as well as to reshape the evaluation system with responsibility at program and project level with respect to the indicators defined. Finally, as regards the organization, it is necessary to activate an organizational development path that aims at the full accountability of INPS departments for the final result of the new digital services and the adherence of the latter to citizen needs.

The goal in the medium term is not only to improve the existing services, but above all to define a new path of innovation capable of guaranteeing citizens' rights and legitimate expectations.

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Proces cyfryzacji a administracja publiczna we Włoszech: doświadczenia Krajowego Zakładu Zabezpieczenia Socjalnego (INPS)

Wdrażanie innowacji oraz modernizacja narodowej administracji publicznej pełnią kluczową rolę w procesie cyfryzacji, przez który obecnie przechodzi cała Europa. We Włoszech Krajowy Zakład Zabezpieczenia Społecznego (Istituto Nazionale della Previdenza Sociale, INPS) zawsze był liderem pod względem kompetencji cyfrowych oraz wykorzystania technologii informatycznych do świadczenia usług zabezpieczenia społecznego, stworzył tym samym wzorcowy model dla środowisk administracji publicznej zarówno we Włoszech, jak i w całej Europie.

INPS zmaga się obecnie ze strategicznym wyzwaniem, aby zagwarantować siłę napędową dla cyfrowej transformacji włoskiego sektora publicznego. By sprostać temu zadaniu, włoski Instytut Zabezpieczenia Społecznego przyjął Strategiczny Plan ICT (pol. technologie informacyjno-komunikacyjne, ang. *information and communications technology*), który wyraźnie odcina się od planów z przeszłości i ze względu na swój innowacyjny charakter zasługuje na szczegółową analizę.

Plan ICT opracowany jest przez INPS na trzy lata: 2020–2022, w szczególności ma na celu wprowadzenie zmiany paradygmatu w kierunku cyfryzacji usług publicznych, oferowanych całemu krajowi przez Instytut Zabezpieczenia Społecznego. Plan uwzględnia radykalne nowoczesne rozwiązania technologiczne, organizacyjne i kulturowe, umożliwiające stworzenie nowego modelu usług dla obywateli, przedsiębiorstw i innych organów administracji publicznej.

Słowa kluczowe: umiejętności techniczne, transformacja cyfrowa, administracja publiczna, organy służb publicznych, zabezpieczenie społeczne

Hlib Filipchuk

Digital transformation in Ukraine

Introduction

The aim of this study is to present how the process of digitization and the implementation of new technologies in the public sector of Ukraine has proceeded in recent years. In 2015, the implementation of reforms began, which brought about positive results.

This is evidenced by the progressive computerization of the public sector, which can be seen in the following examples:

- the e-pension project, which allows for electronic application submission for the granting and calculating of old-age pensions; and
- recognition of electronic passports in the appropriate smartphone application as fully fledged documents for identity confirmation.

Over the past six years, the state's computerization strategy has been adapted to the economic and political changes in the country. Though in addition to the successfully implemented reforms, there have been attempts to implement projects that raise great doubts among the public, or ones that have not fully met the hopes of political decision-makers. For two years now, Ukraine has been implementing its e-state strategy, informally known as the "a State in a smartphone". It requires an enormous amount of work within public administration and the imposition of numerous changes to the legislation and the existing algorithms for the applications operating across state institutions.

The pillars of successful digitization are not only the support of citizens, but also ensuring the security of the information technologies themselves. Controversies related to the protection of citizens' personal data appeared with the introduction of the first state-owned applications for the use of public services.

Digital Ukraine – the concept of introducing new technologies in the state

Creation and the first years of a digital transformation strategy in Ukraine

The beginning of the digital transformation can be considered the year 2007, when the Ukrainian parliament adopted a law on the basic principles for the development of an information society in Ukraine, and here for the years 2007–2015.[1] This act stipulated the conditions of:

- creation and development of an information society,

1 Zakon Ukrainy (Verkhovna Rada of Ukraine), Zakon Ukrainy Pro Osnovni zasady rozvytku informatsiinoho suspilstva v Ukraini na 2007–2015 roky [Law of Ukraine on the Basic Principles for the Development of an Information-Oriented Society in Ukraine for 2007–2015], https://zakon.rada.gov.ua/laws/show/537-16#Text (online access: 16.11.2021).

- gradual transformation of the industrial economy into a knowledge-based economy,
- development of a public information infrastructure, *i.e.* public services electronically accessible, and
- principles of universal access to the telecommunications services and information resources, increasing the variety and number of the available electronic services.

The act provides for the introduction of information and telecommunications technologies within the activities of governmental and local government administration bodies as one of the priority directions of public policy, including the computerization of the public service sector. The document quickly lost its validity, although it still constitutes the initial concept for the indication of the government's tasks to develop an information society in Ukraine. Its weakness are, among others, no regulations on many issues related to the implementation of technology in public administration. The act was imperfectly prepared in terms of compliance with the existing legislation, and there was also a lack of executive provisions. This act was all but not implemented. As a result of the critical assessment, as early as 2013, the National Commission for the State Regulation of Communications and Informatization presented a draft[2] of a significant amendment to the act, which took into account the changes concerning the implementation of electronic services on the Ukrainian market, the rapid development of the mobile telephony market and broadband Internet access. Some changes have been introduced, including the approval by the Cabinet of Ministers of Ukraine on May 15, 2013 of the Information Society Development Strategy in Ukraine.[3] This strategy defined the basic principles and goals of the development of an information society in Ukraine, including:

- improvement of the regulatory framework to ensure the development of the information sphere and acceleration of its adjustment to European legal norms and standards;
- ensuring proper coordination of the actions of all stakeholders in the implementation of e-democracy instruments;
- improving the institutional mechanism of shaping, coordinating and controlling the implementation of the development tasks for an information society;
- strengthening the image of Ukraine as a participating country in the Internet space and increasing the presence of Ukrainian information resources therein;
- increasing the importance of the Ukrainian segment of the Internet at the state level as one of the most important tools for the development of an information society and state competitiveness;

2 Natsionalna komisiia, shcho zdiisniuie derzhavne rehuliuvannia u sferi zv`iazku ta informatyzatsii (National Commission for the State Regulation of Communications and Informatization), *NKRZI proponuie zminy do Zakonu Ukrainy* "*Pro Osnovni zasady rozvytku informatsiinoho suspilstva v Ukraini na 2007–2015 roky*" [NCRCI proposes amendments to the law "on the Basic Principles for the Development of an Information-Oriented Society in Ukraine for 2007–2015"], https://nkrzi.gov.ua/index.php?r=site/index&pg=99&id=230&language=uk (online access: 16.11.2021).

3 Kabinet Ministriv Ukrainy (Cabinet of Ministers of Ukraine), Rozporiadzhennia vid 15 travnia 2013 r. No 386-r Pro skhvalennia Stratehii rozvytku informatsiinoho suspilstva v Ukraini [Resolution of the Cabinet of Ministers of Ukraine on the approval of Information Society Development Strategy in Ukraine], https://www.kmu.gov.ua/npas/246420577 (online access: 16.11.2021).

- development at the national and local level of a mechanism for the effective participation of society and its control over the implementation of the priority of Information Society Development.

The effects of the application of the Information Society Development Strategy in Ukraine were already visible at the turn of 2014 and 2015. The greatest progress in the digitization of the state in this period was primarily:

- the introduction of a system of electronic petitions from 2015;
- implementation of the electronic public procurement system, which was to ensure its transparency and minimize the risk of corruption;[4]
- ensuring the possibility of the automatic processing of public data, access to them, as well as making this data transparent,
- introduction of the e-Government system in 2016.[5]

Although these reforms took place in a particularly difficult political and economic period for the state, most of the changes planned for 2015–2016 were implemented. The success of the reforms was determined by the high priority given to these changes and the broad cooperation of the Ukrainian administration with the European Union in the area of digitization (the possibility of integrating systems, databases, *etc*.). Already in 2017, the eGovernment Development Concept[6] was approved – this was aimed at supporting the coordination and cooperation of state and local authorities in order to achieve the necessary level of electronic management effectiveness based on the wide use of modern information and communication technologies throughout the country.

Then, in 2018, *The Concept of a digital economy and society development in Ukraine for the years 2018–2020*[7] was approved. This document defines digitization as saturation of the physical world with electronic-digital devices, means, systems and as a configuration of communication between them, which in turn was to guarantee the greatest possible interaction of the virtual and physical world, *i.e.* creating a cyber-physical space. The concept also formulates the basic principles of digitization in Ukraine. According to which digitization should:

1. provide every citizen with equal access to services, information and knowledge provided on the basis of information, communication and digital technologies;

4 Natsionalna rada reform pry prezydentovi Ukrainy (State Council for Reforms under the President of Ukraine), *Monitorynh Prohresu Reform – zvit za 2015 rik* [Reform progress monitoring – report 2015], https://platforma-msb.org/wp-content/uploads/2016/02/broshura_a4_ukr.pdf (online access: 16.11.2021).

5 Natsionalna rada reform pry prezydentovi Ukrainy (State Council for Reforms under the President of Ukraine), *Monitorynh Prohresu Reform 2016* [Reform progress monitoring 2016], https://www.president.gov.ua/storage/j-files-storage/00/54/98/fbae933a5c44c426c978fcb5d73ff8f0_1512988449.pdf (online access: 16.11.2021).

6 Kabinet Ministriv Ukrainy (Cabinet of Ministers of Ukraine), Rozporiadzhennia vid 20 veresnia 2017 r. No 649-r Pro skhvalennia Kontseptsii rozvytku elektronnoho uriaduvannia v Ukraini [Resolution of the Cabinet of Ministers of Ukraine on approval of eGovernment Development Concept in Ukraine], https://zakon.rada.gov.ua/laws/show/649-2017-%D1%80#Text (online access: 23.11.2021).

7 Kabinet Ministriv Ukrainy (Cabinet of Ministers of Ukraine), Rozporiadzhennia vid 17 sichnia 2018 r. No 67-r Pro skhvalennia Kontseptsii rozvytku tsyfrovoi ekonomiky ta suspilstva Ukrainy na 2018–2020 roky ta zatverdzhennia planu zakhodiv shchodo yii realizatsii [Resolution of the Cabinet of Ministers of Ukraine about the Concept of digital economy and society development and action plan for its implementation for the years 2018–2020], https://zakon.rada.gov.ua/laws/show/67-2018-%D1%80#Text (online access: 23.11.2021).

2. act to the benefit of citizens in various areas of everyday life;
3. be dependent on economic growth that occurs through increased productivity and competitiveness;
4. favor the development of the information society and media;
5. be based on international and regional cooperation in order to integrate Ukraine with the European Union (also by presenting Ukrainian IT solutions on the European and global market);
6. being standardized, this is one of the main success factors;
7. increase the level of society's trust in digital technologies as well as information security and personal data protection, which are conditions for digital development and appropriate risk management;
8. function as an integral part of comprehensive public administration.

However, Ukrainian information legislation required further corrections. First of all, it lacked systematization and codification – *e.g.* the development and adoption of the Ukrainian information code, which would clearly define entities of information law, taking into account their rights and legitimate interests, would ensure a uniform approach of the government to the reform and the principles of regulating relations in information space, and would establish a number of coherent concepts within this scope. The need to adopt such a code was included in the Law on the Basic Principles for the Development of an Information-Oriented Society in Ukraine for 2007–2015[8] of 2007 and became more relevant after 2014 due to the need to regulate the mechanisms for ensuring Ukraine's information sovereignty and ensuring the security of citizens' information considering them as components of the so-called national security of Ukraine. Such a code was not approved, which was caused by the lack of political will on the part of the government that held power until 2019, as well as subsequent significant political changes in Ukraine, which in turn resulted in a change in the approach of the new ruling team to the concept of digitization of the state.

The concept of digitization of public services in Ukraine from 2019

Immediately after the presidential elections in 2019 and after the early elections to the parliament of this year, on July 29, 2019, the Verkhovna Rada of Ukraine (Zakon Ukrainy) approved the new list, numerical composition and competence of the committees of the Verkhovna Rada of Ukraine for the new term of office.[9] Among others, The Committee on Digital Transformation, whose scope of activities included:

8 Zakon Ukrainy (Verkhovna Rada of Ukraine), Pro Osnovni zasady rozvytku informatsiinoho suspilstva v Ukraini na 2007–2015 roky [Law of Ukraine on the Basic Principles for the Development of an Information-Oriented Society in Ukraine for 2007–2015], https://zakon.rada.gov.ua/laws/show/537-16#Text (online access: 23.11.2021).

9 Postanova Verkhovnoi Rady Ukrainy, Pro perelik, kilkisnyi sklad i predmety vidannia komitetiv Verkhovnoi Rady Ukrainy deviatoho sklykannia [Resolution of the Verkhovna Rada of Ukraine on the list, number and subjects of the competence of committees of the Verkhovna Rada of Ukraine of the ninth convocation], https://zakon.rada.gov.ua/laws/show/19-20#Text (online access: 23.11.2021).

1. issues of the legal foundations of digitization and digital society in Ukraine;
2. work on state computerization programs;
3. participation in the EU digital single market program (including: Digital Single Market, EU4Digital) and other digital collaboration programs;
4. work on e-Government and public electronic services, intelligent infrastructure (cities, communities), cybersecurity and cyber defense.

In addition, in order to optimize the system of central executive bodies, the Cabinet of Ministers of Ukraine, by its regulation of September 2, 2019, transformed the State Agency for E-Government of Ukraine into the Ministry of Digital Transformation.[10] On September 18, 2019, the regulation of the organization and operation of the Ministry of Digital Transformation of Ukraine,[11] which has become the central body in the field of electronic public services, was approved by the Cabinet of Ministers of Ukraine. This body is responsible for creating and implementing public policies in the field of digitization, digital development, digital economy, digital innovation, electronic governance and e-democracy (*i.e.* enabling citizens and companies to participate in state governance using online tools, improving communication between the government and community, increasing the transparency of government activities through the use of modern information access technologies), the development of an information society and the IT industry.

On September 27, 2019, a conference of the Ministry of Digital Transformation took place, during which the public was acquainted with the slogan and assumptions of the "Digital State".[12] The concept of the digital state envisages that the state should become a service of public services for citizens:[13] on the one hand, help provide services to citizens, and institutions support them in the implementation of their tasks (it was assumed that services provided online or electronically would eliminate possible corruption attempts).

This idea forms the basis of the current concept of the development of the digital state in Ukraine and the creation of the Diia brand (Ukrainian: *Дія - Держава і Я*, English: Action – the State and Me). The concept was presented by the minister of digital transformation, Mykhailo Fedorov. For the first time in Ukraine, a comprehensive strategy for the digitization of public services had been prepared, and the persons responsible for its implementation clearly identified. Its implementation was a response to what was missing in the previous attempt to reform digitization.

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10 Kabinet Ministriv Ukrainy (Cabinet of Ministers of Ukraine), Postanova vid 2 veresnia 2019 r. No 829 Deiaki pytannia optymizatsii systemy tsentralnykh orhaniv vykonavchoi vlady [Resolution on some issues of optimizing the system of central executive authorities], https://www.kmu.gov.ua/npas/deyaki-pitannya-optimizaciyi-sistem-829 (online access: 23.11.2021).

11 Kabinet Ministriv Ukrainy (Cabinet of Ministers of Ukraine), Postanova vid 18 veresnia 2019 r. No 856 Pytannia Ministerstva tsyfrovoi transformatsii [Resolution of the Cabinet of Ministers of Ukraine about the competence of the Ministry of Digital Transformation], https://zakon.rada.gov.ua/laws/show/856-2019-%D0%BF#Text (online access: 23.11.2021).

12 *IT-ministr prezentuvav proekt "Derzhavy v smartfoni"* [IT minister presented the project "A State in a Smartphone"], epravda.com 27 September 2019, https://www.epravda.com.ua/news/2019/09/27/652053/ (online access: 23.11.2021).

13 *Servis bez chynovnykiv. Yak bude vyhliadaty i pratsiuvaty "derzhava v smartfoni" Zelenskoho* [Service without officials. How Zelensky's "State in a smartphone" will look and work], https://www.epravda.com.ua/publications/2019/09/30/652085/ (online access: 23.11.2021).

Diia was established to solve the four most important problems[14] of the digitalisation of public services so far:

1. The main association of a citizen with regard to any interaction with official matters is stress. Most Ukrainians see the state as a system that cannot ensure high-quality service provision. For this reason, the government decided to remove the officials from this process as much as possible, making it possible to settle official matters *via* the Internet.
2. The next problem was that people were often not sure how to use the service. A small number of previously functioning electronic public services were dispersed across the websites of various government agencies. These services were rendered on documents with different designs and structures, and the pages had different interface types. Therefore, it was decided to develop such a portal that all services could be located in one place, on one website and in one smartphone application.
3. To use most government services over the Internet, a citizen must authorize access using an electronic digital signature. However, the procedure for obtaining such a signature is very bureaucratic, there are few points that issue it, and the way of using an electronic signature is inconvenient. To overcome this, a suggestion was made to switch to Smart-ID technology (a free individual identification tool).
4. The complex organizational structure of the state apparatus in Ukraine prevents effective and centralized implementation of digital reforms. Various governmental structures did not have a common goal and a shared vision of the country's digital transformation strategy. Thanks to the establishment of the parliamentary Committee for Digital Transformation at the Verkhovna Rada of Ukraine and the Ministry of Digital Transformation, it is possible to appoint a representative of these bodies to each ministry in the country.

After introducing new solutions in the field of digitization, *i.e.* after launching the diia.gov.ua Internet portal of public services, the Ministry of Digital Transformation planned to launch the Diia mobile application. With it, a citizen can access any public service through his/her smartphone. The ministry assumes the achievement of three goals by 2024:

- 100% of all public services will be available online;
- 20% of currently available services will be fully automated, without the intervention of an official;
- creating one online form, the completion of which will allow access to each of the existing official services.

The designation of a short time for the introduction of such important reforms proves that digitization of the state is one of Ukraine's priorities, and this results, for example, from President Volodymyr Zelenskyy's willingness to keep his political promise. 1.5 years after the presentation of the Digital Ukraine strategy, a comprehensive catalog of e-Government and electronic state services tools was presented. Among them, the most

14 *Ibid.*

important are the Internet portal that integrates the possibility of obtaining all public services online in one place and the Diia application for a smartphone.

In addition to successful projects, there are still problems with ensuring information security, and the state's actions in the field of computerization of public administration also do not enjoy full support from the public, something that will be discussed later on in the article.

Digitization tools in Ukraine

Tools implemented

After the presentation of the Diia brand and the "Digital State" project in December 2019, the beta testing of the Diia mobile application began. At this stage, only users with a driving license and a car registration certificate were allowed to test the correct operation and display of the electronic versions of these documents and the functioning of the application in terms of its stability. The identification and authentication of users in the test version took place *via* the banking applications of the two biggest banks. The possibility of using the authorization through the so-called BankID has been implemented in a public application. During the six weeks of beta testing of the application, the Ministry of Digital Transformation received applications from 58 thousand drivers, of which 32.5 thousand of them took part in the public beta test.[15] During the test period, the IT team at the abovementioned ministry managed to overcome many technical obstacles and significantly expand the application possibilities. In Ukraine, out of 9.5 million driving license holders, only 2.5 million had a digitized version of the face photo that was used on this document in the register of the Ministry of Internal Affairs. At the beginning of 2020, *i.e.* after the beta tests, this was still a small percentage, but it increased thanks to the synchronization of application data with a demographic register containing photos of citizens who received biometric passports. Thus, the number of potential users of the application increased to 6 million.

After the end of beta testing, from February 6, 2020, Ukrainian drivers were able to use the digital versions of the driving license and the registration certificate *via* the Diia application. The official presentation of the generally available version of the mobile application was held with the participation of the President of Ukraine, the Prime Minister and the Minister of Internal Affairs. During this event, it was announced that in the near future the aforementioned documents in their digital version (in the Diia application) would have the same legal force as those in the paper version. However, the initiative

15 *Diia — u dii! Prezentovano mobilnyi zastosunok Diia ta Natsionalnu onlain-platformu tsyfrovoi osvity* [Diia in action! The mobile application Diia and the national online platform for digital education were presented], https://thedigital.gov.ua/news/diya-u-dii-prezentovano-mobilniy-zastosunok-diya-ta-natsionalnu-onlayn-platformu-tsifrovoi-osviti (online access: 23.11.2021).

required legal changes by parliament. Politicians also declared that presenting a driving license or passport in the application would be the same as showing a paper version of the document confirming identity when traveling on domestic rail and air lines. If the user has been authorized in the application, further viewing of documents is available both online and offline. Moreover, a mechanism for verifying the data of the owner of the documents was launched. In this way, drivers can correct their data in the app and obtain electronic versions of documents with up-to-date information. During the presentation of the first version of the application, the Prime Minister announced which of them would be available electronically, *i.e.* ID passport, biometric (foreign) passport, car insurance policies and student ID. Electronic versions of ID passports and biometric (foreign) passports were introduced for all application users on April 22, 2020.

At the same time, with the introduction of the Diia application, the government has planned to make the Diia online portal available in any personal computer web browser. Such a website was presented on April 2, 2020. Initially, it offered access to 27 services,[16] including: opening own company in 10 minutes, arranging formalities for childbirth or obtaining the necessary certificates, *e.g.* a certificate of having no criminal record. Citizens can use five state registers, these are:

1. a uniform state register of legal persons, natural persons, entrepreneurs and non-governmental organizations;
2. state register of property rights to real estate;
3. Unified State Register of Registered Vehicles and Their Owners at the Ministry of Internal Affairs;
4. state land cadastre;
5. the state register of liabilities on movable property.

Interestingly, no budgetary funds were spent on creating the portal. All costs for the development, design and security of the digital portal are covered by the international donors and partners. As the government administration of Ukraine maintains, the operation and maintenance of the application and portal are financed with the support of the USAID project (US Agency for International Development), UK AID (Funding mechanism of the UK Government's Foreign, Commonwealth & Development Office – Support Program for the Office of Foreign Affairs, Community and UK Government Development), Transparency and Accountability in Public Administration and Services (TAPAS),[17] the EGAP program financed by the Swiss Agency for Development and Cooperation and implemented by the Foundation for Eastern Europe and Innovabridge, the USAID project "Supporting organizations-leaders in counteracting corruption in Ukraine »interaction«" and the EGOV4UKRAINE project.

On October 5, 2020, the application was updated (it became Diia 2.0) and new electronic services were introduced in the application and on the web portal. During

16 *Mintsyfry zapustylo portal derzhavnykh posluh Diia* [Ministry of Digital Transformation launched public services portal Diia], https://thedigital.gov.ua/news/mintsifri-zapustilo-portal-derzhavnikh-poslug-diya (online access: 16.11.2021).

17 TAPAS: About Project, https://tapas.org.ua/en/about-project/ (online access: 16.11.2021).

its public presentation, the President of Ukraine said that from the next year Ukraine would start entering the so-called paperless era, which means government authorities will no longer require paper certificates or other documents from citizens wishing to access public services. At the end of 2020, the application was used by as many as 6 million Ukrainians, of which over 2.6 million from the updated version 2.0.[18] The application allows to view digital versions of nine documents and access three official services. At that time, 50 public services were already available on the Diia website. On March 30, 2021, the Verkhovna Rada of Ukraine adopted a law according to which, from August 23, 2021, electronic passports from the Diia application can be used instead of paper documents. Thus, the earlier promise to grant digital documents full legal force was fulfilled. According to the Minister of Digital Transformation Mykhailo Fedorov, Ukraine has become the first country in the world where electronic passports have the same legal force as their paper counterparts.

On May 17, 2021, the "Diia Summit 2.0" congress was held, attended by the President of Ukraine, the Prime Minister and the Minister of Digital Transformation. During this event, another major update of the Diia application was presented, *i.e.* over 10 new e-services, including:

- online change of check-in place;
- automatic registration of sole proprietorship (without the participation of the registering office, the application is immediately entered in to the business register, if it has been correctly completed);
- the ability to pay taxes and settle tax returns in the application;
- Diia.Signature service – *i.e.* providing a secure electronic signature;
- the possibility of applying for a driving license replacement.

Already three days after the introduction of the new services, the Ministry announced information to the public about the statistics of the use of some of them, *e.g.* that in this short time the electronic signature (Diia.Signature) was obtained by 32,000 people *via* the mobile application.[19] On May 20, 2021, the results of a survey conducted on May 16–18, 2021 were published. It shows that the presidential program "A State in a smartphone", which has been developed for two years, enjoys one of the highest levels of trust among all other Presidential reforms. It is trusted by as many as 64% of Ukrainian citizens.[20]

Despite the huge popularity of the Diia application and website, there were also some doubts about the functioning (*e.g.* technical errors, displaying incorrect data) and the security of these tools. In May 2020, one of the anonymous bots that had access to the personal

18 *Mykhailo Fedorov prezentuvav 100 peremoh Mintsyfry za 2020 rik* [Mykhailo Fedorov presented 100 victories of the Ministry of Digital Transformation in 2020], https://thedigital.gov.ua/news/mikhaylo-fedorov-prezentuvav-100-peremog-mintsifri-za-2020-rik-ta-anonsuvav-masshtabni-natsionalni-proekti (online access: 23.11.2021).

19 *32 tysiachi ukraintsiv vzhe otrymaly Diia.Pidpys* [32 thousand Ukrainians have already received Diia.Signature], https://www.kmu.gov.ua/news/32-tisyachi-ukrayinciv-vzhe-otrimali-diyapidpis (online access: 23.11.2021).

20 *Dva roky prezydenta Zelenskoho: otsinky hromadian* [Two years of President Zelenskyy: citizen ratings], http://ratinggroup.ua/files/ratinggroup/reg_files/rg_ukraine_2y_president_052021_press.pdf (online access: 23.11.2021).

data of 26 million Ukrainians sold them *via* the Telegram messenger. Virtually every person could purchase the personal data of Ukrainian citizens and obtain such information (*e.g.* as on the driving license) that was in the Diia application. Therefore, those whose data were disclosed suspect that it was the launch of the Diia portal and the Diia application that caused leaks in public databases. However, the Minister of Digital Transformation, M. Fedorov, stated that Diia cannot be responsible for the leakage of any personal data:

> It is impossible, even theoretically! First and foremost, Diia has no database and does not collect any information. Secondly, the amount of information available to the public is dozens or even hundreds of times greater than that used by Diia [the bot obtained data from other registers, *e.g.* the Ministry of the Internal Affairs – ed. author]. Thirdly, a preliminary analysis of the information provided by the bot shows that the old [existing – author's note] databases used had been available on the darknet for over a year,

the minister said.[21] And cybersecurity experts believe Diia may be only partially related to the data leak.

Up to the time of writing this article, no reasons for this had been found, including as a result of the inability to indicate the persons or entities responsible. In Ukraine, citizens' data is scattered over 300 different registers. The Ministry of Digital Transformation has set itself the goal of organizing these databases and creating their electronic version. However, it should be emphasized that organizing such a large amount of data in a short period of time in accordance with data security rules seems impossible.

Planned tools

In early 2021, President V. Zelenskyi publicly praised the Cabinet of Ministers of Ukraine for creating a clear and effective digital transformation strategy for the next three years. On February 17, 2021, the Cabinet of Ministers of Ukraine approved the list of 94 digital transformation projects[22] proposed by the Minister of Digital Transformation, which would be implemented within three years. These projects, covering the areas of education, health, justice, economy and trade, energy and infrastructure, were presented during the "Digital State" congress organized with other ministries on the digital transformation of Ukraine. The government's actions are conducive to the implementation of a strategy that includes clear and understandable plans for the digitization of official services – the transition to modern, transparent rules for the automatic settlement of official matters. The digital transformation projects for the next three years include:

21 *Dannye 26 mln voditel'skih udostoverenij ukraincev vylozhili v internet. Mincifry otricaet prichastnost' "Dii" k utechke* [The data of 26 million driving licenses of Ukrainians have been posted on the Internet. The Ministry of Digital Transformation denies the involvement of "Diia" in the leak], ITC.ua 12 May 2020, https://itc.ua/news/dannye-26-mln-voditelskih-udostoverenij-ukrainczev-vylozhili-v-internet-minczifry-otriczaet-prichastnost-di%D1%97-k-utechke/ (online access: 23.11.2021).

22 *Volodymyr Zelenskyi pidtrymuie stratehiiu tsyfrovoi transformatsii Ukrainy na nastupni roky* [Volodymyr Zelenskyy supports Ukraine's digital transformation strategy for the upcoming years], https://www.president.gov.ua/news/volodimir-zelenskij-pidtrimuye-strategiyu-cifrovoyi-transfor-66605 (online access: 23.11.2021).

e-notary, e-property, e-town planning, e-school, e-social care, e-migration, e-hospital, e-permit. Ukrainians will be able to personally control the transparency of the system and observe the implementation of projects in real time. To make this possible, the Ministry of Digital Transformation launched a public catalog with a description of each project, clearly defined dates and thepersons responsible for the processes. All this information is now available on the website that tracks the progress of each project.

From the catalog of services that will be introduced to the application and/or the Diia portal by the end of 2021, the following should be mentioned:

- Diia ID – a modern digital signature that will authenticate online documents and official applications,
- the possibility to change the place of check-in online;
- online construction services – offering the possibility of completing the formalities related to the commencement of construction works and the commencement of construction of CC2 and C3 class buildings (*i.e.* at least five-storey apartment blocks and estates of multi-storey blocks and complexes with shopping centers);
- introduction of electronic sick leave – replacement of a paper sick leave with an electronic sickness card;
- online tax services (*e.g.* payment of necessary stamp payments, filing tax returns) – transferring the provision of these services to Diia would allow for their optimization. Currently, the Ukrainian taxpayer portal is not integrated with the Diia portal, but is located on a separate website of the State Tax Service of Ukraine.

An important goal for the Ministry of Digital Transformation is also to increase the number of users of state e-services tools. At the end of February 2021, the number of unique users of the Diia 2.0 application exceeded 3.7 million, with a daily increase of at least 15 thousand. According to the first deputy minister of digital transformation, Oleksii Viskub, the goal for this year is to reach the number of 10 million application users, *i.e.* to retain existing ones and acquire about 6 million new users.

Tools in the social security system

Regardless of the successive implementation of the "a state in a smartphone" concept, some sectors of public administration have been using digital solutions for years, including in the social security system. In 2012, the Pension Fund of Ukraine (Pensiinyi Fond Ukrainy), the institution responsible for social insurance, launched an electronic services portal. Through this website, the insured and contribution payers could access basic information in the field of social insurance and some documents (*e.g.* certificates) in an electronic version. The portal is constantly being modernized, and a logged in user can now perform a number of activities, including:

- submitting an application for a pension;
- using a pension calculator;
- obtaining certificates and information, the reliability of which can be verified by scanning the attached QR code (*e.g.* a certificate of the amount of the old-age pen-

sion, information on remuneration paid, a certificate of contributions paid to the employee, information on insurance periods);
- activating the service of free SMS notification (*e.g.* on the determination of the entitlement/calculation of old-age pension, payment of contributions by the employer).

In addition to the electronic services portal, there is a mobile application for smartphones and tablets titled The Pension Fund, which provides access to all official services of the Pension Fund of Ukraine, including the authorization of applications submitted to the Fund within the digital signatures.

On September 22, 2021, the Cabinet of Ministers decided that applications for pensions, subsidies for rent and other types of social assistance will be available on the Diia portal.[23] As part of the pilot project, Ukrainians will also be able to submit an application for social assistance for children under guardianship, for children of single mothers, for seriously ill children, assistance related to the adoption of a child and assistance for children with disabilities *via* this website. The implemented solutions will partially overlap with the functions available on the electronic services portal of the Pension Fund of Ukraine. Despite this duplication, the decision to proceed with these activities is in line with the assumptions of the project to create a uniform social information system created by the Ministry of Social Policy and the Ministry of Digital Transformation, and the digital transformation strategy of Ukraine's social policy. The benefit requested through Diia will be automatically determined.[24] The pilot project will be available by the end of 2021 to citizens of at least two oblasts (administrative districts).

In addition, as part of the concept of digital transformation of Ukraine's social policy, from October 1, 2021, all health care facilities issue electronic sick leave documents. The digitization of sick leave documents assumes a reduction in the administrative workload of doctors. On the other hand, patients have easier access to due benefits. In order to successfully launch electronic sick leave documents, the ministries of health and digital transformation conducted several training courses and webinars for doctors on the correct creation of these documents. The electronic release consists of two parts:
- a medical opinion issued by a doctor and then certified with an electronic signature; and
- an electronic disability card, which is created in the Pension Fund register as a result of a medical opinion.

The employer can check the electronic sick leave documents of employees on the profile of the contribution payer after logging in to the Electronic Services Portal of the

23 *Pensii, zhytlovi subsydii ta sotsdopomoha malozabezpechenym simiam: yaki novi posluhy ziavliatsia v Dii* [Pensions, housing subsidies and social assistance to low-income families: what new services will be available in Diia], https://thedigital.gov.ua/news/pensii-zhitlovi-subsidii-ta-sotsdopomoga-malozabezpechenim-simyam-yaki-novi-poslugi-zyavlyatsya-v-dii (online access: 17.11.2021).

24 Proiekty tsyfrovoi transformatsii [Digital transformation projects], https://plan2.diia.gov.ua/projects (online access: 17.11.2021).

Pension Fund. At the same time, until February 1, 2022, in some exceptional cases, specified by law,[25] paper sick leave documents may be issued, after this date all health care institutions should issue sick leave certificates only in an electronic form.

Conclusions

Observation of the Ukrainian digitization process in the country in the last two years shows that the Ukrainian authorities have carried out the digitization reform in too short a period, which had a negative impact on the technical efficiency of the solutions prepared and the security of the data handled.

On the other hand, the process of creating the so-called digital state turned out to be effective: new digital tools were made available (such as the Diia.Company project or local support centers for entrepreneurs – Diia.Business) and existing official services for citizens were computerized. The introduction of appropriate legal and system solutions supported the entire process – thanks to the adoption of the Act, digital documents gained a legal force equivalent to paper documents. The Cabinet of Ministers of Ukraine has established the position of the Chief Digital Transformation Officer (CDTO), *i.e.* the director of digital transformation. Each ministry has the CDTO as a deputy minister who is responsible for the specific directions and areas of digital reforms, and this position is also gradually being introduced at the level of regional state administrations.

Ukraine may achieve the status of an effective digital state in the next few years if it takes further steps towards digitization and the creation of an e-state, as well as introducing legal and systemic solutions allowing for the correct use of information systems, as equally of wider computerization of the activities of public entities, *i.e.* computerization of cooperation between these entities.[26]

25 Nakaz Ministerstva Okhorony Zdorovia Ukrainy "Pro zatverdzhennia Zmin do deiakykh normatyvno-pravovykh aktiv Ministerstva okhorony zdorovia Ukrainy" [Order of the Ministry of Health of Ukraine on the approval of amendments to certain regulatory legal acts of the Ministry of Health of Ukraine], https://zakon.rada.gov.ua/laws/show/z1277-21#Text (online access: 17.11.2021).

26 *Mykhailo Fedorov na Henasamblei OON: Nasha meta – stvoryty tsyfrovu derzhavu, de kozhen hromadianyn otrymaie rivni mozhlyvosti* [Mikhail Fedorov at the UN General Assembly: Our goal is to create a digital state where every citizen will have equal opportunities], https://thedigital.gov.ua/news/mikhaylo-fedorov-na-genasamblei-oon-nasha-meta-stvoriti-tsifrovu-derzhavu-de-kozhen-gromadyanin-otrimae-rivni-mozhlivosti (online access: 23.11.2021).

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SOURCES

- *32 tysiachi ukraintsiv vzhe otrymaly Diia.Pidpys* [32 thousand Ukrainians have already received Diia.Signature], https://www.kmu.gov.ua/news/32-tisyachi-ukrayinciv-vzhe-otrimali-diyapidpis (online access: 23.11.2021).
- *Dannye 26 mln voditel'skih udostoverenij ukraincev vylozhili v internet. Mincifry otricaet prichastnost' "Dii"* k *utechke* [The data of 26 million driving licenses of Ukrainians have been posted on the Internet. The Ministry of Digital Transformation denies the involvement of "Diia" in the leak], ITC.ua 12.5.2020, https://itc.ua/news/dannye-26-mln-voditelskih-udostoverenij-ukrainczev-vylozhili-v-internet-minczifry-otriczaet-prichastnost-di%D1%97-k-utechke/ (online access: 23.11.2021).
- *Diia – u dii! Prezentovano mobilnyi zastosunok Diia ta Natsionalnu onlain-platformu tsyfrovoi osvity* [Diia in action! The mobile application Diia and the national online platform for digital education were presented], https://thedigital.gov.ua/news/diya-u-dii-prezentovano-mobilniy-zastosunok-diya-ta-natsionalnu-onlayn-platformu-tsifrovoi-osviti (online access: 23.11.2021).
- *Dva roky prezydenta Zelenskoho: otsinky hromadian* [Two years of President Zelenskyy: citizen ratings], http://ratinggroup.ua/files/ratinggroup/reg_files/rg_ukraine_2y_president_052021_press.pdf (online access: 23.11.2021).
- *IT-ministr prezentuvav proekt "Derzhavy v smartfoni"* [IT minister presented the project "A State in a smartphone"], epravda.com 27.9.2019, https://www.epravda.com.ua/news/2019/09/27/652053/ (online access: 23.11.2021).
- *Mintsyfry zapustylo portal derzhavnykh posluh Diia* [Ministry of Digital Transformation launched public services portal Diia], https://thedigital.gov.ua/news/mintsifri-zapustilo-portal-derzhavnikh-poslug-diya (online access: 16.11.2021).
- *Mykhailo Fedorov na Henasamblei OON: Nasha meta – stvoryty tsyfrovu derzhavu, de kozhen hromadianyn otrymaie rivni mozhlyvosti* [Mikhail Fedorov at the UN General Assembly: Our goal is to create a digital state where every citizen will have equal opportunities], https://thedigital.gov.ua/news/mikhaylo-fedorov-na-genasamblei-oon-nasha-meta-stvoriti-tsifrovu-derzhavu-de-kozhen-gromadyanin-otrimae-rivni-mozhlivosti (online access: 23.11.2021).
- *Mykhailo Fedorov prezentuvav 100 peremoh Mintsyfry za 2020 rik* [Mykhailo Fedorov presented 100 victories of the Ministry of Digital Transformation in 2020], https://thedigital.gov.ua/news/mikhaylo-fedorov-prezentuvav-100-peremog-mintsifri-za-2020-rik-ta-anonsuvav-masshtabni-natsionalni-proekti (online access: 23.11.2021).
- Natsionalna rada reform pry prezydentovi Ukrainy, *Monitorynh Prohresu Reform – zvit za 2015 rik* [Reform progress monitoring – report 2015], https://platforma-msb.org/wp-content/uploads/2016/02/broshura_a4_ukr.pdf (online access: 16.11.2021).
- Natsionalna rada reform pry prezydentovi Ukrainy, *Monitorynh Prohresu Reform 2016* [Reform progress monitoring 2016], https://www.president.gov.ua/storage/j-files-storage/00/54/98/fbae933a5c44c426c978fcb5d73ff8f0_1512988449.pdf (online access: 16.11.2021).

- Natsionalna komisiia, shcho zdiisniuie derzhavne rehuliuvannia u sferi zv`iazku ta informatyzatsii, *NKRZI proponuie zminy do Zakonu Ukrainy "Pro Osnovni zasady rozvytku informatsiinoho suspilstva v Ukraini na 2007–2015 roky"* [NCRCI proposes amendments to the law "on the Basic Principles for the Development of an Information-Oriented Society in Ukraine for 2007–2015"], https://nkrzi.gov.ua/index.php?r=site/index&pg=99&id=230&language=uk (online access: 16.11.2021).
- *Pensii, zhytlovi subsydii ta sotsdopomoha malozabezpechenym simiam: yaki novi posluhy ziavliatsia v Dii* [Pensions, housing subsidies and social assistance to low-income families: what new services will be available in Diia], https://thedigital.gov.ua/news/pensii-zhitlovi-subsidii-ta-sotsdopomoga-malozabezpechenim-simyam-yaki-novi-poslugi-zyavlyatsya-v-dii (online access: 17.11.2021).
- *Servis bez chynovnykiv. Yak bude vyhliadaty i pratsiuvaty "derzhava v smartfoni" Zelenskoho* [Service without officials. How Zelensky's "State in a smartphone" will look and work], https://www.epravda.com.ua/publications/2019/09/30/652085/ (online access: 23.11.2021).
- TAPAS: About Project, https://tapas.org.ua/en/about-project/ (online access: 16.11.2021).
- *Volodymyr Zelenskyi pidtrymuie stratehiiu tsyfrovoi transformatsii Ukrainy na nastupni roky* [Volodymyr Zelenskyy supports Ukraine's digital transformation strategy for the upcoming years], https://www.president.gov.ua/news/volodimir-zelenskij-pidtrimuye-strategiyu-cifrovoyi-transfor-66605 (online access: 23.11.2021).

Jakub Górka

Problem solving approach to an electronic payment service in e-government on the example of ZUS (Payment-as-a-Service)

By adopting a problem solving approach, the paper aims to present the electronic payment service in e-government on the example of the Social Insurance Institution project (Zakład Ubezpieczeń Społecznych, ZUS), the proper preparation, implementation and maintenance of which are the condition for meeting the requirements of the institution and its customers. The e-payment project connects with the Social Insurance Institution's Strategy for 2021–2025. The article compares the attributes of the e-payment service prepared at ZUS with the attributes of similar e-payment services provided in the Polish public administration and in selected European countries. Moreover, the paper analyses the model of the service (from the perspective of ZUS and the customer), the process of preparing for its launch, ZUS e-payment risk profile and selected problems accompanying the potential service roll-out. All these aspects are examined using the following research methods: desk research, a survey, a case study, participant observation, lateral thinking heuristics. The paper has a practical character and presents the process of preparation for the roll-out of the e-payment service in public administration in the Payment-as-a-Service formula.

Key words: e-government, e-payment, fintech, payment-as-a-service, Social Insurance Institution (ZUS)

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Introduction

Poland belongs to those countries with a high level of digital government services development. In 2020, Poland scored 0.85 on the United Nations (UN) E-Government Development Index (EDGI) scale (2 years earlier it had been 0.79). This means that Poland is classified within the group of countries with the highest EDGI index in the world, currently ranking 24th among 193 countries (having moved up 9 positions from 2018). On the other hand, there are still many countries, especially European ones, rated as more advanced than Poland in terms of the development of digital government services. The highest EDGI index levels, oscillating around 0.95, are noted in Scandinavian countries.[1] Europe is the leader among continents in terms of advancement in the development of digital public services. Every two years the UN conducts e-government surveys in countries, checking for, among other things, the scope of public services provided online. They include, *inter alia*: sending tax forms, filing applications, as well as electronic payments for administrative fees, fines, taxes and social insurance. This last sphere concerning the services of electronic payments in public administration is analysed in this paper.

The Polish Social Insurance Institution (Zakład Ubezpieczeń Społecznych, ZUS) has been chosen as the object for the case study. By adopting a problem solving approach, the paper aims to present the electronic payment service in the Polish e-government on the example of the ZUS project. The aim is achieved through the multifaceted characterisation of the e-payment service planned at ZUS, presentation of the process of ZUS preparations for launching the service and highlighting the functional and technical problems related to its implementation. Besides, in order to outline a broader national and international context, the e-payment service planned at ZUS is compared with other services of this kind provided by public administration in Poland and in Europe. Several research methods have been used in the paper: desk research (of scientific and industry literature, web portals), survey (conducted among European experts[2]), participant observation[3] and lateral thinking heuristics, combining both research methods and theoretical concepts as well as practical solutions used in the paper and in the ZUS e-payment project.

The paper fills a research gap in the cognitive field, *i.e.* it presents the issue of designing the e-payment service from the perspective of a public sector organisational unit responsible for the performance of social insurance tasks in Poland. ZUS is an important public finance sector entity, which, while implementing the e-payment service in the Payment-as-a-Service model (*cf.* further explanation of the term), should take into

1 United Nations, *United Nations E-Government Survey 2020,* New York 2020, https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2020 (11.8.2021).

2 Mainly from PSMEG (*Payment Systems Market Expert Group of the European Commission*): https://ec.europa.eu/transparency/expert-groups-register/screen/expert-groups/consult?do=groupDetail.groupDetail&groupID=2287 (11.8.2021).

3 The author of the paper was the head of two inter-departmental working teams at ZUS from 2019 to 2021, involved in the ZUS preparation for the introduction of an e-payment service for insurance contribution payers.

account the needs of its customers and the characteristics of similar services provided in other Polish and foreign offices. Therefore, the analysis covers both the characteristics of the modelled service and the profile of ZUS as a public acceptor of payments (payee) for insurance contributions, as well as shows how the e-payment service is provided in other public sector institutions, including foreign ones. This enables comparisons and conclusions concerning the quality of the e-payment service planned at ZUS, as well as the model whereby the online public services can be provided.

The ZUS e-payment project should be perceived as a continuation of the e-Contribution project.[4] It fits into the Strategy of the Social Insurance Institution for 2021–2025,[5] which is defined by four directions of ZUS organisational and digital transformation:

- modern e-government;
- automation and improvement of processes and modern IT architecture;
- digitalisation of processes, communication and documentation digitisation;
- exchange and integration of data within e-government.

The structure of the paper has been subordinated to its aim according to the following logic of the argument: an introduction is the first section, the second section presents the background of the analysis and the conceptual apparatus used in the paper. The third section contains an analysis of e-payment services in European countries and in Poland based on the results of the author's own survey and desk research. In the fourth section, the ZUS e-payment service has been presented through the authorisation and clearing process. The fifth section describes the risk profile of this service and is divided into two subsections (*ZUS as an acceptor of payments for insurance contributions, ZUS as a mass creditor*). The sixth section characterises the process of the preparation for launching the service. The seventh section contains an analysis of selected dilemmas in the implementation of the ZUS e-payment service as Payment-as-a-Service, and the eighth section summarises the analysis, comparing the Polish and European context in relation to the ZUS strategy and tasks set.

Background of the analysis and conceptual apparatus

The real and financial spheres of the economy are becoming digitalised. This is a universal trend, gaining momentum in the times of the fourth industrial revolution, whose symbols include artificial intelligence, APIs (application programming interfaces)

4 J. Górka, P. Jaroszek, *E-Składka ZUS innowacją FinTech w polskiej administracji publicznej* [ZUS E-contribution as a FinTech Innovation in the Polish Public Administration], conference paper from the 10th Congress of Polish Economists, Warsaw 28–29 November 2019, accepted for publication [in:] *Gospodarka a megatrendy współczesnego świata*, eds. E. Kwiatkowski, B. Majecka, E. Mińska-Struzik, Warszawa 2021/2022 (scheduled publication date).

5 Zakład Ubezpieczeń Społecznych, *Strategia ZUS na lata 2021–2025* [ZUS Strategy for 2021–2025], https://www.zus.pl/o-zus/o-nas/strategia-zus/strategia-zus-na-lata-2021–2025 (30.8.2021), and in this issue G. Uścińska, *Nowe technologie w Zakładzie Ubezpieczeń Społecznych*, "Ubezpieczenia Społeczne. Teoria i praktyka" 2021, 4 (151).

robotisation, the Internet of Things and services.[6] In administration, public services are being moved to the virtual world. Public administration customers – citizens, businesses and other organisations – expect these services to be convenient, secure and time-saving.

The e-state can benefit from financial innovations emerging in the fintech (financial technology) ecosystem. The importance of fintech is evidenced by the fact that some authors – experts in this field – already refer to it as the new DNA of financial services.[7] The payment innovation using new technologies – so-called paytech – is one of the most important areas of fintech, characterised by the high number of entities involved, the variety of products and the high value of investments.[8] In practice, the development of electronic payment services is often classified in the paytech segment, in particular if it takes place with the involvement of non-banking companies, in technology hubs, in cooperation between young companies and banks or technology giants (so-called bigtechs – *e.g.* Google, Apple).

A feature of fintechs' approach in their agile mode of operation is the use of external resources. In the pay-per-use subscription model, the user buys the necessary disk space or computing power (Infrastructure-as-a-Service, IaaS), software (Software-as-a-Service, SaaS) or even the entire operating system or platform for running business applications (Platform-as-a-Service, PaaS). Instead of creating an infrastructure or a service in-house, one can use it from a cloud according to needs. CAPEX (capital expenditure) turns into OPEX (operational expenditure), and the company gains access to a scalable and flexible solution that is operated by a specialised provider. Naturally, the choice of partner is important and there is a risk of failure, such as the Curve and Revolut fintechs, painfully experienced in 2020, using Wirecard's payment card transaction processing systems. However, the Wirecard case is an exception, and most cloud services meet customer expectations, as proved by the rapidly growing market for these services.[9]

The philosophy of the cloud computing model is being transferred to the financial services industry.[10] Comprehensive FinTech-as-a-Service (Faas) or Banking-as-a-Service (Baas) services are being introduced, where both well-established banks and young fintech companies can use ready-made components and processes, or

6 *Industry 4.0 and Regional Transformations*, ed. L. De Propris, D. Bailey, London 2020, and K. Śledziewska, R. Włoch, *Gospodarka cyfrowa. Jak nowe technologie zmieniają świat*, Warszawa 2020, and D. Dikhanbayeva, A. Tokbergenova *et al.*, *Critical Factors of Industry 4.0 Implementation in an Emerging Country: Empirical Study*, "Future Internet" 2021, 13 (137), https://doi.org/10.3390/fi13060137.

7 P. Gupta, M. Tham, *Fintech: The New DNA of Financial Services*, Boston/Berlin 2018.

8 J. Harasim, K. Mitręga-Niestrój, *FinTech – dylematy definicyjne i determinanty rozwoju*, "Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu" 2018, No. 531, doi:10.15611/pn.2018.531.15, and M. Polasik, A. Huterska *et al.*, *The impact of Payment Services Directive 2 on the PayTech sector development in Europe*, "Journal of Economic Behavior & Organization", 2020, 178(c), DOI: 10.1016/j.jebo.2020.07.010 and J. Błach, M. Klimontowicz, *The Determinants of PayTech's Success in the Mobile Payment Market – The Case of BLIK*, "Journal of Risk and Financial Management" 2021, 14(9), https://doi.org/10.3390/jrfm14090422.

9 Gartner research, https://www.gartner.com/en/newsroom/press-releases/2021–04–21-gartner-forecasts-worldwide-public-cloud-end-user-spending-to-grow-23-percent-in-2021 (2.9.2021).

10 Z. Jagiełło, P. Kubisiak, *Od skarbonki do chmury, czyli historia transformacji PKO Banku Polskiego*, Warszawa 2020.

even the entire operational banking system, through Application Programming Interfaces (APIs). Such services are offered both by neobanks themselves (*e.g.* Aion, Fidor Bank, Solarisbank) and technology companies (*e.g.* Asseco, Comarch, Incat). For the recipient of the service, the value of a white-label banking or bank-out-of-the-box solution also consists in the possibility of using the entity's banking licence (licence-lending model). Several BaaS models are distinguished in the subject literature.[11] In addition, the literature contains empirical studies on factors affecting the adoption of Software-as-a-Service (SaaS) and similar solutions[12] by companies, although it should be noted that services developing the SaaS concept, *i.e.* BaaS or FaaS, have a shorter track record and are only recently becoming widespread. Empirical research is of a quantitative nature and is conducted on survey samples of service users. Such research usually uses the Technology Acceptance Model (TAM) or its variants.

Following the example of FaaS and BaaS, payment services can also be provided as PaaS (Payment-as-a-Service).[13] The service recipient may integrate with the PaaS platform, which will handle payment processing in its entirety, or may use selected services offered by the platform, *e.g.* the issuing or acquiring of payment instruments, recording and posting transactions, data analytics, risk and security management, compliance with legislation and industry standards. Integration runs through APIs and the service model is modular and scalable through the use of cloud technology. In the European Union, the development of Payment-as-a-Service can be expected to go in parallel with the development of open banking, whose regulatory foundations were laid down by the second Payment Services Directive (PSD2). The third-party access to information and payment initiation services enabled by PSD2[14] favour the demand for specialised Payment-as-a-Service.

The e-payment (electronic payment) service within public administration in its classic form should be defined similarly to the e-payment service in an online shop, where the customer selects goods to a basket and then pays for the basket using a "pay" button (link) which redirects the customer to an online payment service of an external payment service provider (online payment platform or electronic payment operator).[15] On the public administration's website, the payer of a public levy, having completed a given operation (*e.g.* submission of a tax form, a social security contribution form or simply the verification and acceptance of the amount due to a given public authority), may use the "pay" button and make payment using a selected payment method from a catalogue

11 M. Grabowski, *Legal Aspects of "White-Label" Banking in the European, Polish and German Law*, "Journal of Risk and Financial Management" 2021, 14(6), https://doi.org/10.3390/jrfm14060280.

12 For example: A. Benlian, T. Hess, P. Buxmann, *Drivers of SaaS-Adoption – An Empirical Study of Different Application Types*, "Business & Information Systems Engineering" 2009, 1 (5), DOI 10.1007/s12599–009–0068-x.

13 Radar Payments, *Payment as a service. The next wave of payment services*, report, 2021, https://www.radarpayments.com/guide-payment-as-a-service (6.9.2021).

14 J. Górka, *IBANs or IPANs? Creating a Level Playing Field between Bank and Non-Bank Payment Service Providers* [in:] *Transforming Payment Systems in Europe*, ed. J. Górka, London 2016, DOI: 10.1057/9781137541215.

15 Securionpay, https://securionpay.com/blog/how-to-define-e-payments/ (6.9.2021).

made available by the operator (integrator) of electronic payments in agreement with the public administration.

The UN report[16] quoted above indicates the dynamic development of e-government in many countries around the world. Some of them, like European or Asian countries – *e.g.* Singapore or South Korea, have a very well thought-out electronic system of public services and implement a coherent strategy of building e-government and the digital economy. E-payment can be one of the offered public services linked to a given basic service (*e.g.* tax assessment and collection). Interestingly, not only developed countries, but also developing ones, such as Vietnam and Kenya boast of offering such a service. However, the question remains whether the e-payment service is actually provided in the country in question in the manner described above, or whether a slightly different system is meant by it. An analysis of e-payment in European countries will be presented below.

E-payment service in Europe and in Poland (survey and secondary sources)

In order to obtain information on the electronic payment of public levies (taxes, social insurance contributions, administrative fees), an online survey was conducted among experts of the EU countries (and the UK), and an analysis of public administration websites in individual countries was carried out. Two complementary research methods were deliberately used. The survey prepared on the basis of the author's questionnaire[17] was of a qualitative nature and constituted the initial stage of the research. It was sent out once in July 2021 to European experts involved in payments[18] or cooperating with ZUS. The received responses related to 11 European countries.[19]

Both the questionnaire and the desk research of web portals were profiled in order to gain information on e-government online payments of public levies *via* desktop, laptop or mobile devices, *i.e.* directly from the e-government website or from the mobile application of the public sector body in question (e-payment service). Payments effected at physical public offices were beyond the scope of the survey.[20]

The aim of the study was to verify whether in EU countries in the public sector:

- e-payment services are provided,

16 United Nations, *op. cit.*

17 The survey questionnaire entitled *What possibilities exist for the online payment of taxes and other levies in your country?* was made available through Google Forms on the author's profile on the University of Warsaw domain at the following link: https://docs.google.com/forms/d/e/1FAIpQLSebGo7fh2ZERSyUSutOZ6RB1ydYhhpdhxkXwAd3eXjJwYroZg/viewform.

18 PSMEG (*vide* footnote 2 in this paper).

19 Belgium, Estonia, Finland, France, Germany, Ireland, Italy, Netherlands, Portugal, Spain, the United Kingdom.

20 The quality of the information obtained proved to vary across EU countries. Continuation of the study is advisable.

- EU countries have a one-contact point (one-stop shop) for e-payments,
- mobile applications with built-in e-payment functionality exist,
- a transaction fee for the e-payment service is paid by the remitter/taxpayer or the payee (public administration unit),
- there is an immediate payment option (with immediate settlement of the funds in the public administration's account and simultaneous release of the payer's liability).

Analysis of the results of survey and public service websites leads to the conclusion that European countries differ in their approach to public services online provision. A simple comparison of the parameters of an e-payment service according to the above-mentioned assumptions turns out to be debatable, as this service, if any, is provided as one of many in a specific public service model.

European countries can be divided into those that have a more or less centralised public service model. Typically, a country is somewhere on the scale of services centralisation, closer to or further from the one-stop shop model for citizens and businesses. However, even when the "one-stop shop" term is used in a particular country, the actual scope of services provided within it may be limited (*cf.* for VAT the Czech or Slovak MOSS, Mini One Stop Shop). Usually, central administrative services are bundled together (centralised), including, among public levies, mainly taxes – *e.g.* income tax, VAT. Local taxes, social insurance or various administrative fees are often not provided within the one-stop shop or only some of them are provided there. The web service mainly provides tax information, the possibility to update it, send registration or other-type applications, while the e-payment service is integrated much less frequently. In fact, its integration is relatively rare in such a form that through the "pay" button (link) the public service customer is redirected to pay a specific levy (fee, fine) in the payment website of an external entity (electronic payment operator). More often, the facilitation offered to the payer (public sector customer) is only the provision of payment identifiers and the amount to be paid in the e-government website or mobile application, which customers should provide to their bank by themselves. This is how *e.g.* the Taxisnet system (income tax, VAT) works in Greece, the system for paying insurance contributions and taxes in Portugal, the Dutch e-government system for tax payments.

In 2021, Latvia introduced a single tax account for a relatively wide range of taxes and administrative fees (15 categories). On the other hand, Lithuania's Sodra (the functional equivalent of the Polish Social Insurance Institution), for the purposes of insurance contributions payment, uses a system of its bank accounts in various commercial banks, which require the payer to fill in special transfer formats (*cf.* the Polish system before the introduction of e-Contribution).

In Europe, the decentralised model is more common when it comes to citizen and entrepreneur contact with public administration, as well as e-payments. It seems that the idea of a one-stop shop for public administration services (including e-payments) has been implemented to the greatest extent in the UK (HMRC web service). At the other extreme is Germany, where public services are highly dispersed. E-payment services, if

any, are provided independently by cities, municipalities and local authorities (*e.g.* the kfz-online Berlin car registration system). Usually, the following payment methods are available in German offices as part of the e-payment service: PayPal, payment card (Mastercard, Visa), giropay (based on credit transfer or direct debit). The transaction fee is paid by the payee (public administration unit).

Public services are highly decentralised in Spain, where each of the 19 regions has its own public service, and also in Portugal. In Spain, the central Agencia Tributaria provides access to tax information (mainly VAT and income tax). Also in Estonia, a European leader in e-government, public services are dispersed. E-payment is possible *via* a link from a bank account or with a payment card in the e-MTA tax system (but not all Estonian banks are integrated into the service). In Finland, on the one hand, public services are decentralised (tax service omavero.fi, pension insurance companies varma.fi, elo.fi, veritas.fi, ilmarinen.fi) and on the other hand there is the suomi.fi platform, which collects a lot of information for citizen and company in one place. Interestingly, within the suomi.fi platform, the Finnish State Treasury provides each public administration unit with the possibility of using a central contract for e-payments. Once the public administration unit integrates this service, it pays a monthly fee of several hundred euros and a fee per transaction for each payment method provided (online payment by credit transfer, payment card, MobilePay). Similarly, in the UK, HMRC provides public sector units with an option of using a model contract for the e-payment service (GOV.UK Pay). Once the service is integrated, such an administrative unit can offer customers an e-payment service with a payment card or even a digital wallet (*e.g.* Apple Pay, Google Pay). Payments are handled by an external payment service provider selected in a tender (currently Stripe and Worldpay) in a model in which transaction fees are borne by the public party, but fees on transactions with certain payment instruments (*e.g.* business card) are passed on to the customer.

In Scandinavian countries (Denmark, Norway, Sweden) there is a fairly far-reaching centralisation towards a one-stop shop for citizens and businesses. But e-payment is not always possible. Both Norway and Sweden have a web service and a mobile application serving as, *inter alia*, a tax account (Altinn and Skatteverket respectively), but without e-payment. In Denmark, on the other hand, e-payment is made available to companies within the e-Tax system (TastSelv Erhverv). Danish companies can pay *via* online banking (credit transfer), Visa and Dankort payment cards and can make mobile payments *via* MobilePay.

In Belgium, an e-payment service is provided within the tax portal MyMinfin.be, but only payment *via* a link to online banking (credit transfer) is a fully integrated payment instrument. In another Benelux country, the Netherlands, VAT can be paid online using the Dutch interbank system iDEAL, based on credit transfer. Also in Austria, within one of the business websites FinanzOnline, there is an integrated e-payment service whereby a company can pay its income tax *via* the eps electronic transfer system (however, not every Austrian bank is integrated into the service).

France is an example of a country where public services are dispersed, but there is some centralisation for payments (mainly) for income tax and social insurance contributions on the website and in the mobile application impots.gouv.fr. It streamlines the preparation of a payment order with the payer's details, which is sent to the bank and paid by direct debit. This payment method is also available in other countries, such as Portugal and the United Kingdom, allowing for the convenient, recurring debiting of the payer's account and payment of the levy to the tax authority.

In the UK, however, a much wider range of taxes and other public levies is available *via* HMRC than in France, and these can be paid using a wider range of payment methods, more or less integrated into the e-payment service – *e.g.* Faster Payments (immediate payments allowing the due amount to be settled on the same day or, at the latest, the following day), BACS and CHAPS payment systems, direct debit (clearing and recording of the money within 3–5 days of payment), payment cards. It turns out that immediate payment in the form of the immediate settlement of funds in the account of a public administration unit with simultaneous release from the payer's obligation is rather uncommon in Europe, but some services, such as the payment of corporate income tax using Faster Payments in the UK, are similar to it.

While in the UK the transaction fee is mostly paid by the payee (the public administration entity), in Italy the typical model is one in which the payer (public administration customer) bears the cost of the payment transaction by a particular method, *i.e.* is charged with a transaction fee which varies depending on the payment service provider. Italy has taken a comprehensive approach to the electronic payment system organisation for the public sector. It has set up a national electronic payment system for public administration, the pagoPA platform, allowing the payment of all public levies, fees and making other payments to the central and local public administration. On the pagoPA platform, payers can choose the payment method according to their habits and preferences (bank transfer, MyBank e-transfer, payment card, *etc.*). Payment by any payment instrument to the public administration is an irrevocable process. Payers themselves choose the payment service provider (bank, other provider). The pagoPA platform has been operating since 2012, but under Italian law, as of 28 February 2021, all payment providers handling payments to the Italian public administration must use it, enabling e-payments for levies and public services to Italian citizens. Banks and other payment service providers from outside Italy may also join the system. The rules of PSD2 (second Payment Services Directive) apply. In addition, all Italian public administration entities and public companies have had to join the pagoPA system. Thus, the system is complete, because it covers Italian creditors (public administration entities), payment service providers and citizens. Thanks to the high bargaining power of the pagoPA platform, which represents the whole Italian public administration, charges for the e-payment service for citizens are favourably lower. Furthermore, Italy has made available to its citizens

the IO mobile application linked to pagoPA, which is a one-stop shop aggregating various public services. In the IO mobile app, a payment to the public administration can be initiated from a QR code, which contains all the necessary data to identify and pay a specific public levy or administrative fee.

In addition to collecting information on e-payment services in European (mainly the EU) countries, e-payment services provided in the Polish public administration have been also examined. Their characteristics are given in Table 1.

Table 1. Characteristics of e-payment services in Polish public administration units

Public administration unit	Ministry of Finance	Ministry of Digitalisation	Ministry of Justice	Agricultural Social Insurance Fund (KRUS)
Electronic payment operator (integrator)	KIR	KIR	Dotpay	KIR
Who pays the transaction fee?	customer*	customer*	customer*	customer*
Service	payment in „Twój e-PIT"	payment on ePUAP	payment of court or other fee	payment of contributions in eKRUS
Transaction fee to be paid by the customer	0.59 PLN	0.59 PLN	0.0001%, but not less than 0.19 PLN	0.59 PLN

*Customer using public services: citizen or entrepreneur (depending on the service)
Source: own study

An integrated e-payment service is available in several ministries and in KRUS. The service is payable for customers (payers) who decide to use it directly from the web portal, *e.g.* when settling the difference in income tax due to the tax office in the "Twój e-PIT" service or when paying farmers' national insurance contribution in the eKRUS system. The fee transaction collection model of the e-payment service based on the direct charging of the payer with the transaction fee is common in Polish public administration. The public levy may not be depleted by any fees (*e.g.* payment transaction fee).

The payments for public levies are operated mainly by the National Clearing House (Krajowa Izba Rozliczeniowa, KIR), although the Ministry of Justice is served by Dotpay (merging in 2021 with Przelewy24). In September 2021, the introduction of an e-payment service for fines for incorrectly leaving a car in a paid parking zone was also announced by the Warsaw Municipal Road Authority (Zarząd Dróg Miejskich, ZDM). In the ZDM solution, Blue Media is the payment operator.

KIR can be used to pay *via* the Paybynet online payment system, which resembles a typical pay-by-link (fast e-transfer in Poland) at other payment operators, except that KIR has an account at the National Bank of Poland (Narodowy Bank Polski, NBP) and is the operator of the ELIXIR payment system, so funds under the Paybynet system are sent directly from the payer-customer's bank account to the public administration unit's bank account. The range of available payment instruments at the Dotpay operator is wider,

beside the typical pay-by-link it includes, *inter alia*, payment cards and BLIK. Pay-by-link and BLIK were in 2021 the most frequently used payment methods in Polish e-commerce.[21]

ZUS e-payment service through the authorisation and settlement process

The e-payment service planned at ZUS is similar to:

- the e-payment service for goods in online shops,
- the e-payment service for other public levies (*e.g.* the e-PIT service, e-payment of court fees, e-payment for KRUS contributions),
- e-payment service for so-called mass creditors (*e.g.* telecoms, utilities).

The Social Insurance Institution belongs to the category of payment acceptors or in other words payees or merchants, accepting payments for, *inter alia*, insurance contributions. The contribution collection system was modernised on 1 January 2018. Since then, each social security contribution payer pays the contributions by regular credit transfer to their own individual account number (contribution account number, the so-called NRS [*numer rachunku składkowego*]). Prior to the e-Contribution reform, the payer was obliged to make three or four transfers to ZUS to aggregated central accounts (so-called fifties) that were the same for all payers. Each payment required the contribution payer to complete a complicated payment document containing several identifiers. After the introduction of e-Contribution, the contribution payment system has been simplified and payments for contributions have become much more convenient. Erroneous payments, being a problem for both the payers and ZUS, have been practically eliminated.[22]

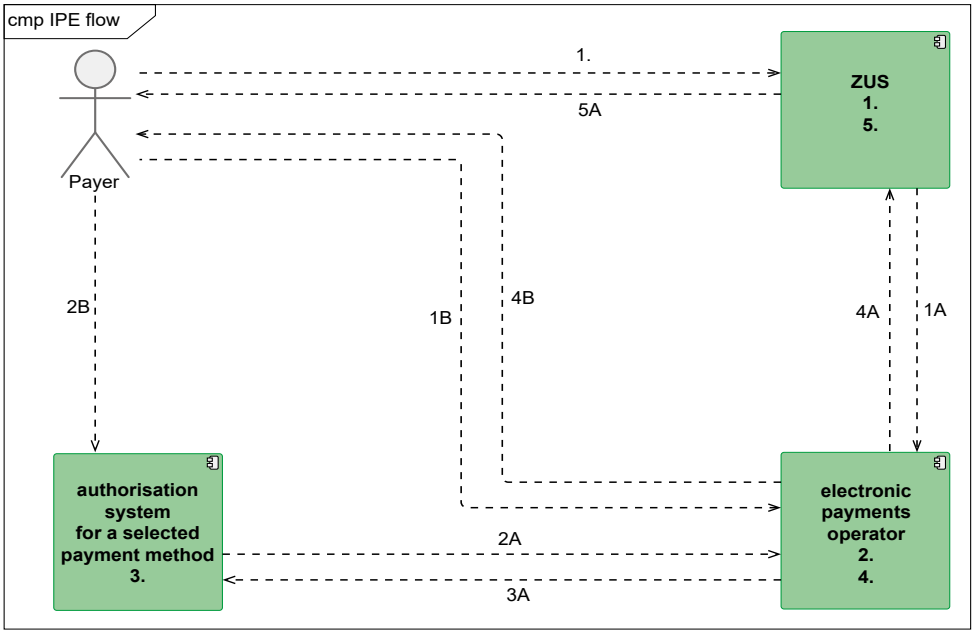
The planned ZUS e-payment service is another improvement aimed at increasing the convenience of contribution payers by combining related processes, including primarily the process of verifying the payer's balance and submitting social security contribution forms with electronic payment. The customer (contribution payer), after selecting the "pay" button in the ZUS application (*e.g.* ePłatnik), will be redirected to the operator's e-payment system. The customer will be able to choose the payment method on the website and make a payment to the customer's NRS by means of this method. The payment process is presented in the figure below. It describes the stages (steps) of the payment process from the point of view of the payer, the ZUS system and the system of the e-payment operator (detailing the stages of data exchange).[23]

21 I. Krzemińska-Albrycht, *Badanie Blue Media: Blik ulubioną formą płatności za zakupy w internecie. Wyprzedził przelewy pay by link*, https://www.cashless.pl/10367-blik-ulubiona-forma-platnosci (28.7.2021).

22 More on e-Contribution and its effects in J. Górka, P. Jaroszek, *op. cit.*

23 The payment process diagram, as well as the description of the service and the draft concession agreement were published by ZUS as a part of the market research (Request For Information, RFI) on the selection of an electronic payment operator, which ZUS conducted in the period March–April 2021 (*cf.* further section *Process of preparation for launching the e-payment service*).

Figure 1. Process of e-payments initiated from ZUS application



Source: ZUS study

Stages of the payment process:

1.

The payer initiates the payment process in the user interface of the ZUS system (pay button or link to the "pay" function). A payment form is displayed with the details of the payment, including the proposed payment amount. The payer can change the payment amount in the displayed payment form and then approves the payment *via* the "pay" button. The ZUS system registers the payment transaction. The ZUS system redirects the user to the electronic payment provider's website using the link.

1 A

Data exchange between ZUS and the electronic payment operator.

1 B

Data exchange between the payer (payer's web browser or mobile application) and the electronic payment operator.

2.

The electronic payment operator's system registers the payment transaction and checks the correctness of the call by the ZUS system. The electronic payment operator's system displays on the so-called paywall the payment methods in accordance with ZUS requirements (contract). The payer selects the payment method. The electronic payment operator's system transfers the transaction data to the authorisation system for the selected payment method and at the same time redirects the payer to the appropriate authorisation system.

2 A

Data exchange without participation of ZUS systems.

2 B

Data exchange without participation of ZUS systems.

3.

The payer authorises a payment transaction in the authorisation system for a selected payment method. The authorisation system sends the result of the authorisation to the electronic payment operator and redirects the payer to the electronic payment operator's system, this happens automatically without the payer's participation. The electronic payment operator's system displays the status of the transaction.

3 A

Data exchange without participation of ZUS systems.

4.

The electronic payment operator's system records the status of the payment transaction and sends it to ZUS. The electronic payment operator's system redirects the payer to the ZUS system, redirection occurs automatically after a specified short time. The browser view displayed in the electronic payment operator's system is closed. The electronic payment operator informs the payer about the payment transaction and the authorisation status (e-mail).

4 A

Data exchange between the electronic payment operator and ZUS.

4 B

Data exchange without the participation of ZUS systems.

5.

The ZUS system displays the status of the payment transaction to the payer, information about the transaction is shown to the payer in the ZUS system.

5 A

Data exchange without the participation of electronic payment operator's systems.

Figure 1 shows the sequence of steps in the payment process, which includes only authorisation of the transaction with the selected payment method – *e.g.* pay-by-link, BLIK, payment card, other payment instrument. The catalogue of available methods enabling payment for insurance contributions should be defined depending on their convenience, risk, labour-intensiveness of handling, matching the requirements of ZUS and its customers (*cf.* below the section *Selected dilemmas in the implementation of ZUS e-payment service as Payment-as-a-Service*). Figure 1 shows the steps in authorising transactions from the customer (payer) side and registration in the ZUS system of information from the e-payment operator about the authorisation process and its result.

Authorisation does not end the whole payment process. It is followed by clearing and settlement of funds, which – like the authorisation itself – is specific to the given payment instrument. Most payment instruments are characterised by delayed settlement, *i.e.* usually the electronic payment operator receives the funds from the payment system with a delay, in a given ELIXIR clearing session. The ZUS intention is that funds should be transferred to

the ZUS account without undue delay, *i.e.* in the next ELIXIR clearing session (or in another payment system within the meaning of the Settlement Finality Act that the Act on the social insurance system refers to[24]). On the one hand, the electronic payment operator is not required to credit ZUS and its customers, but on the other hand, it should not make money on float.

After funds transfer to the ZUS account held by the NBP regional branch in Warsaw, ZUS must retrieve from the NBP bank statement analytical information on those contributions paid to an individual NRS. Individual payments are identified and then linked *via* NRS to the payer's account in the System for Accounting and Financial Records (System Ewidencji Kont i Funduszy, SEKiF). SEKiF then settles the payments on the payer's account and replicates them from the Complex Information System (Kompleksowy System Informatyczny, KSI) to ZUS applications (*e.g.* ZUS Electronic Services Platform [Platforma Usług Elektronicznych, PUE ZUS]), in which the payer is informed about the recording of the paid contribution. The recording of contributions in payers' (and then insured persons') accounts is not immediate. However, taking into account the evolution of the economic environment towards an acceleration of processes in response to user needs, the development of the information and record system of ZUS in this direction would be, indeed, desirable. Then, the immediacy of authorisation and clearing of the payment transaction itself (using the payment instrument that offers it) combined with the immediacy of the recording in SEKiF and the provision of this information to payers in their ZUS application would give the best results.

Figure 1 shows the payment transaction process, which is only initiated in a single ZUS applications (*e.g.* ePłatnik or any other application, in the future also *e.g.* mobile). Later, the payment transaction is redirected to the payment system of an external operator, which bears the legal and economic risk of transaction processing (its authorisation and clearing). However, it is conceivable that the convenience of the payment process for the customer may be further increased, without prejudice to the principle of the external operator's responsibility for transaction processing. The process would be streamlined, for example, by reducing the number of payment steps, *e.g.* when a given payment method is selected by the customer who agrees to use it in subsequent recurring payments or, the operator's payment page is displayed directly in the ZUS application. Undoubtedly, user experience of the payer should be optimised.

Risk profile of ZUS e-payment service

The following is a brief risk analysis of the ZUS e-payment service in relation to similarities of ZUS e-payment service with other e-payment services mentioned at the beginning of the previous section of this paper.

24 Act of 24 August 2001 on settlement finality in payment and securities settlement systems and rules of supervision over those systems (Journal of Laws 2001 No. 123, item 1351, as amended) and Act of 13 October 1998 on the social insurance system (Journal of Laws 1998 No. 137, item 887, as amended).

ZUS is considering a model of an e-payment service based on an external operator (integrator) of electronic payments, which will be selected in a tender in a concession mode and will provide its service for a specified period. The payment operator, through its system, will enable payers to make payments of insurance contributions electronically on the Internet directly to individual contribution accounts (NRS) using payment methods indicated by ZUS. The concessionaire (payment operator) will be entitled to collect fees for the executed payment transactions from contribution payers. Any legal and business risk related to the collection of a transaction fee from the payer for the use of each of the provided payment methods, as well as the risk of proper authorisation and the clearing of payment transactions will be borne by the payment operator. The operator will provide services to the contribution payers using its e-payment system in its own name and on its own responsibility. This is the nature of the concession service, as well as of the e-payment integration and acquiring services provided by payment operators to payment acceptors (public and private – public administration units and online shops, respectively).

ZUS as a payment acceptor (payee) for insurance contributions

ZUS's risk profile is similar to that of other public sector merchants/ payees/ payment acceptors (*e.g.* Ministry of Finance, Ministry of Justice, KRUS) and private sector merchants/ payees/ payment acceptors – online shops. However, unlike the latter, ZUS does not sell goods or services, but collects a public levy (the payment for contributions), thus avoiding many risks arising from the obligations of sellers of goods *per se*.

Moreover, ZUS – unlike deposit and credit banks – does not keep its customers' funds, does not accumulate deposits and does not perform banking operations. ZUS is the acceptor, *i.e.* the recipient of payments, for insurance contributions.

Funds paid to individual account numbers (NRS), which are in fact virtual International Bank Account Numbers (IBANs), are credited to a ZUS account held in the secure infrastructure of the National Bank of Poland. The bank account with the NBP is at the sole disposal of ZUS. It is not available to any other entity, including the contribution payer. Payers cannot withdraw the funds paid to the NRS for contributions. They may only pay them in, and in fact they pay the funds into a ZUS bank account and not their own.

While successfully introducing one of the biggest reforms of public finances in recent years – e-Contribution – ZUS has linked NRS with SEKiF. The NRS and SEKiF do not keep cash, but only information on the contributions paid in. Consequently, there are no financial risks that occur in banks (related to the transfer of funds from one bank account to another, *i.e.* with the debiting and crediting of bank accounts). It should be emphasised that, from the payer's point of view, it is important that the insurance contribution is paid effectively and promptly recorded in the payer's account with ZUS (in SEKiF), as this releases the payer from public-law liability.

ZUS as a (mass) creditor

The planned service is intended to be similar in nature to the mass-collect service for customer payments to individualised virtual IBAN accounts provided to customers by mass (*i.e.* large, with multiple debtors) creditors (*e.g.* telecoms, public utility companies).

ZUS assumes that the electronic payments operator selected in the tender will serve ZUS and its customers in a similar way as it serves online shops and at the same time will meet the requirement of accepting payments to individual NRS (mass collect) regardless of the payment method selected by the payer and allowed by ZUS. The customer (contribution payer), after selecting the "pay" button in the ZUS application, will be redirected to the operator's e-payment system. From that moment on, the operator will be responsible for any errors related to payment authorisation and its clearing and settlement. By making a payment in the operator's system, the customer accepts the operator's terms and conditions of service and enters into a direct contract with the operator.

There is no possibility of funds withdrawal by ZUS customers. They may only pay their contribution to the NRS.

Process of ZUS preparation for launching the e-payment service

The service of e-payment for public levies is available in the public administration services of various countries, including Poland (*cf.* above section *E-payment service in Europe and in Poland…*). The research conducted by ZUS in 2018–2019 shows that there is interest in such a service also among ZUS customers in the context of the possibility to pay insurance contributions on the PUE ZUS portal, and possibly also in other ZUS applications (*e.g.* a mobile application that may be created and made available in the future). In 2018, with the support of an external research institute, ZUS conducted a survey of payers in the form of Focus Group Interviews (FGIs) aimed at finding out what should be improved or added as a PUE ZUS function. Respondents indicated, *inter alia*, the possibility to pay contributions directly on the PUE ZUS portal, *e.g. via* the "pay now" function, and the availability of a mobile version of the portal. On the other hand, in a Computer Assisted Telephone Interview (CATI) conducted by ZUS *via* the Call Centre (Centrum Obsługi Telefonicznej, COT) in June 2019 on a group of 265 contribution payers, almost 80 percent responded that they would use electronic payments in the ePłatnik application or the Płatnik programme. More than half of respondents to this survey would be willing to make ZUS contribution payments on mobile devices in an application (if one were created). The greatest interest in e-payments using a mobile app was noted among

small payers ("self-pay" and "up to 10 insured"). In recent years, interest in mobile apps and online services has grown even more. A good reference point is the increase in the use of: public administration services (*e.g.* e-PIT), public administration mobile applications such as mObywatel, as well as e-banking and mobile applications of banks and online shops.

Based on market observations and the results of customer research, ZUS has analysed the possibility of introducing the e-payment service in its applications and the building of a mobile application for contribution payers which would include the e-payment function. In the course of the analysis, it was determined that the e-payment service should be launched in cooperation with an external entity (e-payment operator), which, as an institution specialising in this area, would assume the business and operational risk related to service provision, and at the same time would operate in the fee collection model already commonly used for this type of services in Polish public administration (Ministries of: Digitalisation, Finance, Justice and KRUS), *i.e.* it would earn on fees charged directly to customers. Such characteristics of the service and a broader legal and economic analysis carried out in this respect led to the conclusion that the appropriate legal framework in which the e-payment service should be launched would be a concession contract between ZUS and an external entity selected in a tender (an e-payment operator).

Given the fact that ZUS has never conducted a tender procedure in the concession mode, the working team has developed complex principles for selecting an operator of electronic payments in such a mode. Internal and external concession documents have been prepared, *i.e.* documents to be published in the concession contract award procedure: a draft description of the concession contract award procedure (being an equivalent of the Specification of the Terms of the Contract in the Public Procurement Law), which includes, *inter alia*: the description of the subject of the concession contract, qualification criteria of economic operators (that must be met by the concessionaire), prerequisites for any exclusion of economic operators, the description of the criteria for tenders evaluation, a tender form, templates of lists and statements, concession contract with annexes.

When preparing for the selection of a payment operator and for the defining of the conditions for the e-payment service provision under the concession, ZUS held consultations with:

- the National Bank of Poland,
- the Financial Supervision Authority (Komisja Nadzoru Finansowego, KNF),
- payment systems (schemes) Visa, Mastercard, Diners Club, BLIK.

In addition, between March and April 2021, ZUS gathered information by means of Request For Information (RFI) on the selection of an electronic payment operator providing payment methods to insurance contribution payers, which allowed for the collection of market comments on the draft concession contract and to determine the extent to which electronic payment operators meet the assumed qualification criteria (licensing, experience and quality – market coverage) and preliminary tender

evaluation criteria (service fee and the degree of market coverage). Several electronic payment operators with a high market share in Poland responded to the RFI, providing a guarantee of a high quality of service and the security of payment transaction processing. Comments from electronic payment operators, payment systems: Visa, Mastercard, Diners Club, BLIK, supervisors: NBP, KNF allowed ZUS to broaden its competences and better prepare for the proceedings for the selection of an electronic payment operator. The submitted comments allowed for an analysis of the correctness of contract description and the correction of selected provisions of the draft description of the concession contract award procedure. ZUS assumptions were also verified as regards the functional and technical requirements for the e-payment service, which are part of the draft concession contract for electronic payment integration services made available on PUE ZUS and in the applications of the Contracting Entity. The specification of the functional and technical requirements for the e-payment service is a derivative of the statutory requirements governing ZUS operations, care for the convenience of ZUS customers, the characteristics of the ZUS IT system and the model of cooperation with contractors at ZUS as well as the best market practices in terms of the available payment methods used by e-payment operators serving online shops and other online merchants.

However, the ZUS approach differs from that of online shops in that ZUS, due to the high number of potential payment transactions and the systemic importance of the public service, *i.e.* collecting contributions from all payers in Poland, expects any bilateral technical IT integration from the e-payment operator. On the one hand, ZUS assumes communication with the provided interface of the e-payment system of the electronic payment operator carrying out the authorisation and clearing of payment transactions, and on the other hand, for the purposes of monitoring the quality of the e-payment service, ZUS requires additional integration of the operator with ZUS in order to be able to handle service notifications of errors, defects or other incidents concerning the interface or provided services (the integration of ZUS defects' call centre with the service centre of the operator-concessionaire).

Under the functional (business) and technical requirements, ZUS defines the requirements for the operator regarding the authorisation and clearing of payment transactions for individual NRS, the handling of complaints from payers, transaction reporting, interface and communication between ZUS and the operator (in the test and production environment).

ZUS should proceed with the selection of an electronic payment operator in the form of a tender procedure in the concession mode when it is fully prepared to launch the service and then to maintain it. Preparation for launching the service means not only the inclusion of the above-described aspects related to the terms of service, its shape and the formula for integration and cooperation with the payment operator, but also the IT readiness of ZUS, consisting in securing the resources for the purpose of changes to the IT infrastructure of ZUS and connecting with the operator through program interfaces. Besides, there is a need for organisational preparation for the subsequent handling

of the contract and the ongoing cooperation with the payment operator (locating the new process within the tasks of individual ZUS departments).

Selected dilemmas in the implementation of the ZUS e-payment service as Payment-as-a-Service

The ZUS e-payment service corresponds in its nature to the Payment-as-a-Service model, because ZUS would rely on an external partner – an e-payment operator, which, as a concessionaire, would provide the e-payment service at its own risk (legal, operational and business). Both the scalability of the solution and the contractual liability towards the contribution payers for the payment service provided in respect of payment transactions would rest with the payment operator. ZUS integration with the operator would take place *via* API (*vide* the previous section of this paper). Through a properly formed legal relationship (concession contract) and business relationship (ongoing cooperation) with the e-payment operator, ZUS would take care of the quality of the service, protecting the public interest and the interest of the e-government customer (the contribution payer).

The concession contract assumes that the party contracting the service (in this case ZUS) does not bear the costs of this service. This condition is fulfilled by using a fee collection model of e-payment service, common in Polish e-government, based on the direct charging of the payer with the transaction fee. In the interest of the customer, and of the public administration, this fee should be as low as possible, because this would increase the probability of executing a higher number of payment transactions by payers, who as a population are characterised by a specific but also varied price elasticity. While it is theoretically conceivable that fees in a concession model would be covered by another (third) source, in such a situation it should be ensured that all payment methods offered are free of transaction fees in order to avoid discrimination against any of them, in particular the cheaper (more cost-effective) ones.

In the context of the catalogue of payment methods made available by the payment operator with the consent of the contracting public administration unit, it needs to be mentioned that it should allow payment with such electronic payment instruments that are popular among customers. The popularity of a payment method derives from its convenience, security and accessibility. On the other hand, when deciding on a specific catalogue of payment methods, one should take into account the obligations, risks (operational, financial, image-related) and the labour intensity of processing transactions with the use of a given method for a public administration unit, *e.g.* the need to adjust to specific industry standards, *e.g.* PCI DSS, 3D Secure in the case of payment cards or the right to chargeback characteristic of this instrument (*vide* the issue of irrevocability

of a public levy payment). In addition, image-related issues (*e.g.* connected with the making available of a credit method of payment for insurance contributions, such as Buy Now Pay Later, characterised by a deferred settlement mode) may be important. It is also worth thinking ahead about payment methods that will become increasingly popular along with the evolution of the financial ecosystem and the development of open banking – this includes the Payment Initation Service (PIS), which was introduced by the second Payment Services Directive (PSD2) and which ZUS has thoroughly analysed for its potential.

The issues of technical integration with the payment operator remain non-trivial: they are related to the requirements for the authorisation and clearing of payment transactions, their reporting and handling according to the needs of the public administration unit and customers. Therefore, the technical and functional requirements should be defined *ex ante*, so that they can be made available with the draft concession contract in the tender procedure. The e-payment service should be designed in a convenient and safe way for the customer.

Conclusion

The analysis of the planned e-payment service at ZUS and its comparison with similar services provided in Polish e-government leads to the conclusion that there are many similarities between them in terms of the service provision model. ZUS has carefully prepared for the introduction of an e-payment service, on the one hand, by its benchmarking against solutions already operating on the market and, on the other hand, by using the best market standards. In the preparation process, ZUS has cooperated with supervisors (NBP, KNF), payment systems (BLIK, Visa, Mastercard, Diners Club) and the e-payment operators themselves (*via* Request for Information, RFI). The e-payment service provided by an external electronic payment operator in the concession model can be made available in any ZUS application (*e.g.* ePłatnik, or a mobile application that can be created in the future) or even in a foreign environment (*e.g.* a mobile application made available by another unit of the Polish public administration) within the scope of ZUS activities (*e.g.* collecting insurance contributions).

The launch of proceedings to conclude a concession contract for the electronic payment service should be correlated with the introduction of relevant changes to ZUS IT systems. The pandemic period has forced the Polish government to implement anti-crisis measures. At that time, ZUS actively pursued many government tasks commissioned under the Anti-Crisis Shields (Tarcze Antykryzysowe), which took priority over ZUS own projects. ZUS needs to prioritise projects to meet its strategic objectives for 2021–2025.

A comparison of ZUS e-payment service in the Payment-as-a-Service model with those services provided in other European countries allows for the conclusion that

the quality of the designed ZUS service is at a high level indeed. The attributes of the e-payment service vary between European countries. Many countries have a highly fragmented public service system. Some countries are transforming their public administration towards a one-stop shop for the citizen and the entrepreneur in order to simplify their communication with e-government and the handling of official matters. In fact, it is not always literally one website or mobile application, there may be several of them (*vide* also the Polish case: obywatel.gov.pl and biznes.gov.pl websites). Moreover, the international review shows that it is justified to create e-government dedicated applications and websites with a narrower scope of use, if there is a demand for them amongst customers and when they perform their function well. Looking at the solutions in other countries (*e.g.* Scandinavia, Italy, the UK), it can be concluded that it is worth developing Polish e-government in an evolutionary way.

The paper presents the e-payment service in e-government on the example of the ZUS project. The analysis brings the following cognitive value: on the one hand it shows the e-payment service in an international context,[25] and on the other hand it provides information on the planned ZUS e-payment service in the Payment-as-a-Service model,[26] *i.e.* on:

- its characteristics (from the perspective of the process of the authorisation and clearing of payment transactions, the risk of ZUS e-payments, the role of ZUS as a payment acceptor and mass creditor of contribution payers, the demand for the service from ZUS customers);
- the process of preparing for its launch in a tender for a concession service;
- dilemmas related to defining its parameters and as to its implementation (the legal and business aspects of cooperation and technical integration with the electronic payment operator, the fee collection model, the catalogue of payment methods).

The analysis has practical implications for the implementation and maintenance of the e-payment service for ZUS and, more broadly, for the entirety of Polish e-government. In the future, research can be further extended in several fields. Firstly, a broader comparative study of e-payment services provided in the e-government of EU Member States could be carried out. Secondly, empirical research could focus on a group of public levy payers or public administration units in terms of their needs, usability and the use of public services, including intentional use (using the TAM model). Thirdly, the e-payment service itself can be analysed using a broader set of tools (*e.g.* business process management or information systems/ IT). Fourthly, the conceptual and practical research on the strategy for the development of the public service model in Poland and the effective operationalisation of activities that implement it represents a substantial value in itself.

25 Research methods used: survey and desk research.

26 Methods used: case study and participant observation.

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SOURCES

- Benlian A., Hess T., Buxmann P., *Drivers of SaaS-Adoption – An Empirical Study of Different Application Types*, "Business & Information Systems Engineering" 2009, 1 (5), DOI: 10.1007/s12599–009–0068-x.
- Błach J., Klimontowicz M., *The Determinants of PayTech's Success in the Mobile Payment Market – The Case of BLIK*, "Journal of Risk and Financial Management" 2021, 14 (9), https://doi.org/10.3390/jrfm14090422.
- Dikhanbayeva D., Tokbergenova A., Lukhmanov Y., Shehab E., Pastuszak Z., Turkyilmaz A., *Critical Factors of Industry 4.0 Implementation in an Emerging Country: Empirical Study*, "Future Internet" 2021, 13 (137), https://doi.org/10.3390/fi13060137.
- Gartner research, https://www.gartner.com/en/newsroom/press-releases/2021–04–21-gartner-forecasts-worldwide-public-cloud-end-user-spending-to-grow-23-percent-in-2021 (2.9.2021).
- Górka J., Jaroszek P., *E-Składka ZUS innowacją FinTech w polskiej administracji publicznej* (*ZUS E-contribution as a FinTech Innovation in the Polish Public Administration*), conference paper from the 10th Congress of Polish Economists, Warsaw 28–29 November 2019, accepted for publication [in:] *Gospodarka a megatrendy współczesnego świata*, eds. E. Kwiatkowski, B. Majecka, E. Mińska-Struzik, Warsaw 2021/2022 (scheduled publication date).
- Górka J., *IBANs or IPANs? Creating a Level Playing Field between Bank and Non-Bank Payment Service Providers* [in:] *Transforming Payment Systems in Europe*, ed. J. Górka, London 2016, DOI: 10.1057/9781137541215.
- Gupta P., Tham M., *Fintech: The New DNA of Financial Services*, Boston/Berlin 2018.
- Grabowski M., *Legal Aspects of "White-Label" Banking in the European, Polish and German Law*, "Journal of Risk and Financial Management" 2021, 14(9), 14(6), https://doi.org/10.3390/jrfm14060280.

- Harasim J., Mitręga-Niestrój K., *FinTech–dylematy definicyjne i determinanty rozwoju*, "Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu" 2018, 531, doi:10.15611/pn.2018.531.1.
- *Industry 4.0 and Regional Transformations*, eds. L. De Propris, D. Bailey, London 2020.
- Jagiełło Z., Kubisiak P., *Od skarbonki do chmury, czyli historia transformacji PKO Banku Polskiego*, Warszawa 2020.
- Krzemińska-Albrycht I., *Badanie Blue Media: Blik ulubioną formą płatności za zakupy w internecie. Wyprzedził przelewy pay by link*, cashless.pl 28 July 2021, https://www.cashless.pl/10367-blik-ulubiona-forma-platnosci (28.7.2021).
- United Nations, *United Nations E-Government Survey 2020,* New York 2020, https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2020 (11.8.2021).
- Polasik M., Huterska A., Iftikhar R., Mikula S., *The impact of Payment Services Directive 2 on the PayTech sector development in Europe*, "Journal of Economic Behavior & Organization" 2020, 178(c), DOI: 10.1016/j.jebo.2020.07.010.
- Radar Payments, *Payment as a service. The next wave of payment services*, report, 2021, https://www.radarpayments.com/guide-payment-as-a-service (6.9.2021).
- Securionpay, https://securionpay.com/blog/how-to-define-e-payments/ (6.9.2021).
- Śledziewska K., Włoch R., *Gospodarka cyfrowa. Jak nowe technologie zmieniają świat*, Warszawa 2020.
- Uścińska G., *Nowe technologie w Zakładzie Ubezpieczeń Społecznych*, "Ubezpieczenia Społeczne. Teoria i praktyka" 2021, 4 (151).
- Zakład Ubezpieczeń Społecznych, *Strategia ZUS na lata 2021–2025* [ZUS Strategy for 2021–2025], https://www.zus.pl/o-zus/o-nas/strategia-zus/strategia-zus-na-lata-2021–2025 (30.8.2021).

Ujęcie problemowe usługi elektronicznych płatności w e-administracji na przykładzie ZUS (*Payment-as-a-service*)

Celem artykułu jest prezentacja w ujęciu problemowym usługi elektronicznych płatności w e-administracji na przykładzie projektu Zakładu Ubezpieczeń Społecznych, którego odpowiednie przygotowanie, wdrożenie i utrzymanie są warunkiem spełnienia wymagań instytucji oraz jej klientów. Realizacja projektu e-płatności komponuje się ze Strategią Zakładu Ubezpieczeń Społecznych na lata 2021–2025. W artykule porównano atrybuty przygotowywanej w ZUS usługi e-płatności z atrybutami podobnych usług e-płatności świadczonych w polskiej administracji publicznej i w wybranych krajach europejskich. Ponadto analizowany jest model usługi (od strony ZUS i klienta), proces przygotowania do jej uruchomienia, profil ryzyka e-płatności ZUS i wybrane kwestie problemowe wdrożenia. Owe aspekty badane są z zastosowaniem następujących metod badawczych: analizy danych zastanych, ankiety, *case study*, obserwacji uczestniczącej, heurystyki myślenia lateralnego. Artykuł ma charakter praktyczny i przedstawia proces przygotowania do wdrożenia usługi e-płatności w administracji publicznej w formule *Payment-as-a-Service*.

Słowa kluczowe: e-płatność, e-administracja, fintech, payment-as-a-service, ZUS

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