

# Application of Artificial Intelligence in Administrative Decision-making

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## ABSTRACT

In the present research, I want to examine what trends and current events are taking place in the application of artificial intelligence in the administrative decision-making. At the same time, I want to shed light on the limitations and the required level of competence. Besides, I would like to point out the limitations of the application of artificial intelligence. I examined the good practices of many OECD countries on the subject. The results show that the prepared human factor is indispensable, and at the same time, it is always necessary to ensure the transparency, legality and fairness of the applications.

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## 1 INTRODUCTION – CONCEPTUAL FRAMEWORK

Many domestic and international authors have written on the consequences of the use of artificial intelligence in public administration. [1] On the one hand, they saw opportunities in technology: to improve the quality of public services, to increase efficiency, effectiveness and confidence, to make more substantiated and simulated decisions. It also covers a wide range of applications within the public sector: it can support decision-making in the fields of health, transport, agriculture, law and national defense. However, there are several risks in its application: the potential for abuse, lack of fairness and lack of transparency. It is necessary to further review the concepts closely related to the topic and their significance such as digitization, big data and artificial intelligence.

Digitalization is the basis of the fourth industrial revolution, it is one of many megatrends affecting public administration. There is a widespread conceptual separation in the Anglo-Saxon literature of two definitions that are digitization - an operation (conversion of analogue data) - and digitalization (the increasing use of digital or computer technology, which affects all subsystems of society). Digitalization has opened many opportunities both in (administrative) decision-making and in the organization as well as in the

implementation of decisions. To highlight just two, these are the impact of Big Data and Artificial Intelligence, which are closely related megatrends. In my previous research, I have highlighted that digitalization holds many new opportunities and solutions to certain problems in society and business. Technology that transforms both production and corporate governance as well as customer service (personalized but cheaper services) is key for businesses. Those who are more cautious on the subject point out that the digital switchover threatens jobs, replaces the human workforce and embodies a new dimension of serious security threats. [7]

Big Data is one of the megatrends presented by BUDAI – GERENCSE – VESZPRÉMI that they define as „a phenomenon when the data to be handled by an organization (in quantity, time, required resource collection, etc.) exceeds the organization’s traditional database storage or processing capacity. In the public administration, which traditionally often handles more data than it can handle, this phenomenon is exaggerated.” [3]

Artificial Intelligence has now infiltrated everyday life. Artificial intelligence facilitates / replaces the work done by man. The literature generally agrees that artificial intelligence is the adaptation of human intelligence capable of solving problems / tasks independently, interacting and self-learning. According to the EU concept, artificial intelligence refers to systems that exhibit intelligent behavior by analyzing their environment and taking steps to achieve specific goals with a degree of autonomy. [13]. According to BUDAI – GERENCSE – VESZPRÉMI, „infocommunication tools are able to operate technologies that transform processes, the amount of workforce and the type of workforce required by using artificial intelligence.” [3] According to Zödi, artificial intelligence “means procedures, methods, software and concrete solutions on which so-called agents can be built who can think / act in a human way / rationally / autonomously. Agents are software already capable of “acting,” “thinking,” (that is, imitating human thinking) that are not yet necessarily present in physical reality. Robots are distinguished from agents by the fact that they also have a physical extent, as stated in the relevant EU report. [26] According to Yoshiaki Shirai - Jun-ichi Tsujii, the goal of artificial intelligence research is to make computers capable of performing tasks that yet only can be solved with human intelligence. The spread of artificial intelligence and its formation before our eyes challenges researchers, government and society itself. This is one of the reasons why there are organizations working on these effects: the AI Now Institute at New York University which seeks to help understand the social implications of artificial intelligence through its research. [9]

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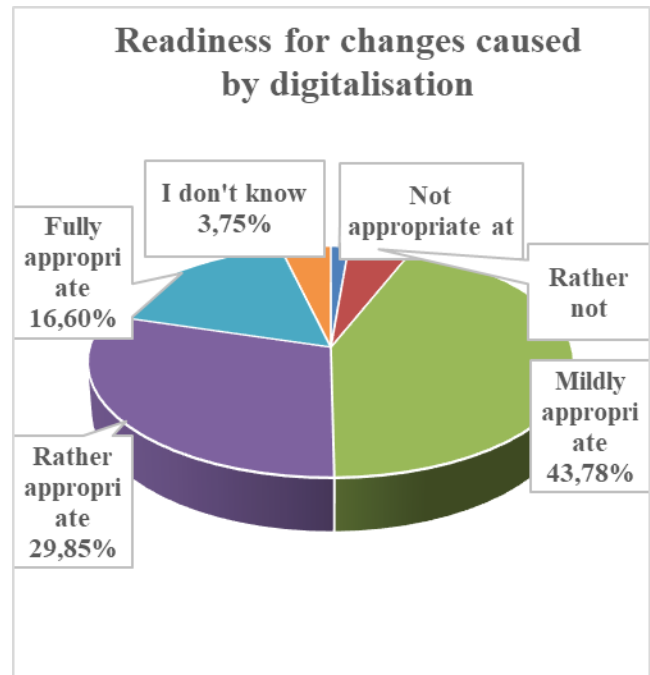
## 2 PREREQUISITE OF PRACTICAL APPLICATIONS

The European Union set out the competencies that people need to have, including digital competences in 2006. [27] When these previously defined competencies were revised in 2018 no significant changes were adopted, but the need to redefine the competencies was emphasized. [14]. In addition, the European Commission has seen digitalization as an opportunity and a challenge for public administrations. It believed that citizens could be involved in decision-making in new ways (strengthening eDemocracy), although, governments also must integrate the opportunities offered by digitalization, not to provide them in addition to their existing services. There is a need to move from a user-centered approach to a user-driven approach, so citizens must be involved in the creation of common solutions. The topics of Big Data, digital networks, interoperability and cyber defense also appear in the thinking.

The existence of digital knowledge and digital competencies is of paramount importance for both citizens and officials working in public administration. There are numerous suggestions that the public administration and its processes need to be rethought. [2] [4] However, this requires qualified, digitally competent officials who know and understand the processes taking place in the world, thus taking a serious role in the developments – even as proponents. A high level of digital competence of officials is therefore essential to operate a digital solutions-based administration. Their knowledge, experience, ability to innovate and willingness to provide an appropriate supportive environment significantly contribute to the rethinking and reorganization of the operational processes of public administration. The development of the appropriate application of digital solutions with the involvement of scientific actors is a common task. Digitalization can lead to more efficient, cost-effective public operations which is also a factor in competitiveness. Based on empirical research conducted online in the spring of 2019 involving nearly 800 people, it can be concluded that the proficiency of officials in the areas of information and data management and communication and cooperation is typically intermediate or high. In the areas of security as well as problem solving, the proficiency of officials is typically intermediate or basic. In the digital content competency area, the proficiency of officials is typically basic or lower. Their readiness was characterized as follows. [8]

## 3 ROLE OF DATA AND CHALLENGES

The systematization, record-keeping, analysis of open access data sets (Big Data) as one of the main megatrends in public administration supported by artificial intelligence is a serious opportunity for governments. Numerous OECD studies emphasize the importance of data-driven government. Data is one of the most valuable resources in today's society, economy and governments. As Fejes – Futó argues, good data is the basis for good quality decisions. [10] In addition, data-centricity speeds up processes, makes administration and the performance of public tasks more efficient (for example, in already overburdened healthcare), and helps governments to meet their increased responsibilities in addressing public policy challenges in order to achieve citizen satisfaction. [22] The complex development of public registers can contribute to more substantiated decisions i.e., on policy issues but can also allow governments



**Figure 1: Distribution of respondents according to their own readiness for changes caused by digitalization (n=747) Source: own edit [8]**

to intervene in a more targeted way in dealing with a (crisis) situations (such as a natural disasters or epidemic). However, complexity is a special area in public administration because data exist in a fragmented way. The fragmented presence of data in many places hinders the integration of individual data files, the creation of "Big Data". Coordination between the different databases where this data is stored by each body is difficult and certainly not costless. It should be emphasized that the cooperation has not only material but also legal implications which leads us to the field of data protection and data security. It is particularly important that this data is secure and protected from both external (cyberspace) and internal (government) threats. "Abundance of data" should be prevented from revealing information or "naming" anonymous databases that seriously infringe on people's privacy, providing a breeding ground for various negative events (blackmail, victimization of crime). It is the government's job to build trust and protect data in cyberspace while ensuring that it does not abuse its primacy. [18] [22]

## 4 ARTIFICIAL INTELLIGENCE IN PUBLIC ADMINISTRATION

There is a unified position in the literature that the widespread use of artificial intelligence is radically transforming the labor market. Based on the exploration of the literature, there is a consensus that automation – which also uses / applies artificial intelligence – has benefits for governments, increases efficiency, and contributes to long-term strategic planning. An earlier McKinsey study found an eight-point list of interventions that could be identified as a pledge to raise the level of further digitization in Hungary. One of them

focuses on e-government solutions, developing, implementing and supporting them. It notes that the digitization of public services has many benefits for citizens, businesses and government alike. Digital government services can significantly reduce the administrative burden on citizens and businesses. They also increase the transparency of decisions and thus reduce the risk of corruption. [21]

According to a report published by McKinsey a few years ago, artificial intelligence could increase global GDP growth by 16 percent by 2030. Digital services have long been widely available in the private sector. Users / customers want the same user experience and service quality from the public sector as the private sector provides them. As there are already many examples, public administrations need to be open to new technologies and their adaptation, adjusting their processes to the possibilities, and rethinking them. Artificial intelligence does not necessarily mean that those working in the public sector lose their jobs, as technology replaces the human factor in routine tasks, allowing employees to do more complex, creative, high-quality work. Applying artificial intelligence in the public sector increases efficiency, puts decision-making on a new footing by processing and analyzing large amounts of data (Big Data), improves execution (e.g., health, traffic management, public safety), improves front office (chat bots) and back-office routine tasks can be automated, it can provide new services to citizens. Ultimately, a smarter public sector can emerge. [9]

Another McKinsey report of 2018 highlights, "modern, automated machines can perform analysis of large data sets, digitize paperwork, and perform thought-provoking and non-routine tasks at a significant and ever-lower cost." [11]

Based on the typology of Fejes and Futó, expert systems are suitable for giving a detailed justification for a decision made at the end of a substantive administration in accordance with legal requirements. The other large group of artificial intelligence tools that are based on machine learning act as black boxes, mapping input data to output data, so the reason for the solution is unknown. Therefore, these tools are not suitable for direct substantive administration but may support administration by using expert systems. [10]

In 2020, after a long preparatory work, Hungary's Artificial Intelligence Strategy was completed. The document sets targets for 2030 and outlines an action plan for 2025. The Strategy mentions in several places that it intends to support more accurate, reliable decision-making even in critical decision-making situations, especially in health, agriculture, national defense and disaster management as well as in the public sector. In the case of disaster management, the army and the law enforcement agencies, the goal is to develop the simulations needed to model complex decision-making situations, to introduce tools that enable rapid action and – especially in the case of national defense – to automate decision-making and support systems. Regarding the automation of administrative processes with the help of AI, the main goal is to create a "data-driven service state" in which the development of automatic decision-making functions should be emphasized. [5]

## 5 LIMITATION OF THE APPLICATION OF ARTIFICIAL INTELLIGENCE

The literature raises a number of issues related to artificial intelligence, including decision-making. According to Zódi, automatic

decision-making eliminates the human factor which is either a software configuration error or a lack of discretion (which artificial intelligence can exercise less or not at all like a human being), or the automatic / mechanical – lacking human factors – learning can be detrimental to individuals. Zódi proposes that systems based on automatic decision-making should be refined in such a way that decisions are legal and transparent so that citizens are not (financially) disadvantaged. [26] If this were to happen, it is a question of who is liable (for damages). [24]

McKinsey's 2020 study shows that customers can measure performance through better decision-making based on accurate data. What can help you make better decisions? Examples are fairness, stability and the ability to change. Predictability or stability is needed in the public sector, but decision-making models also need to be updated as significant changes occur in the underlying data set. These can be internal changes such as the implementation of new policies or external ones such as new legislation, a changed environment, epidemics, and so on. In their experience, artificial intelligence and machine learning are most valuable when used to support, and not replace human decision-making. [20]

Regarding the rights of freedom, Zódi also points out that the regulation of artificial intelligence and robots is still a very evolving area of law. Nevertheless, artificial intelligence is used in areas such as criminal justice, law enforcement, housing and education in a way that influences decisions and affects the lives of individuals. [26]

A more complex issue is the area of fairness. In particular, this takes into account the risks inherent in the process of self-learning of artificial intelligence: relying on artificial intelligence alone can lead to biased, inaccurate and unfair results.

One of the risks inherent in artificial intelligence is that it is capable of prejudice. [26] Examine the setbacks of self-directed learning in practical application. Desouza and Jacob argue that Big Data is a necessary but not a sufficient condition for it (so it is not enough to rely on correlations "only" in the public sector) - it is necessary to carefully plan how and in what form they will be relied upon in a given policy area. The problem of "programmed discrimination" and the lack of discretionary power may also arise. [18] A "programming error," for example, is when certain skin colors and genders are "underrepresented" in the learning process. In this case, the subsequent error is already "coded", for example, in face recognition. What is more worrying is that there is no need to program this because they can "learn from each other" [17]. In fact, researchers have recognized this, and they do against it. Google has set up a body called the Advanced Technology External Advisory Council which involves renowned researchers to monitor the ethical use of artificial intelligence. [25]

## 6 PRACTICAL APPLICATION IN DECISION-MAKING

The application of artificial intelligence has a role not only in decision-making but also in decision-preparation. In Hungary, not only was the benefits of digitization applied after the Covid 19 virus (the fact that development was explosive at the time), but it was preceded by several years of construction and development.

The selection was based on the fact that the practices of OECD countries would be presented both on the European and American continents. Thus, the Hungarian, Belgian and Dutch examples, the Canadian solution (which is the world's first), and an American example (which tries to show the limitations) were chosen. Since the individual cases do not have a long history, precise conclusions cannot be drawn, but in general it can be said that the developments point in the direction of strengthening democracy, and they are working on transparent, legal and fair solutions. In this way, citizens are also more satisfied, and processes can be carried out more efficiently. It is very important that possible distorting factors are minimized (see the American example), and that the principle of data protection also prevails.

In the following, I would like to present domestic and international decision support and decision-making development directions that are specific ideas / already implemented systems.

Flexible Tax Control Decision Support and Data Mining System – Hungary

Simpler artificial intelligence applications are already operating in the Hungarian public administration. Targeted tax audits can be conducted by analyzing data from online cash registers. The Flexible Tax Control Decision Support and Data Mining System of the National Tax and Customs Administration helps in risk analysis and selection of tax control subjects if it looks for criteria related to high tax arrears based on previously examined cases and concludes on the future. The system also uses machine learning for evaluation. [23]

The Automated Administrative Decision-Making Model (AADM) - Hungary

One of the outstanding elements of the developments under the auspices of the Ministry of the Interior is the Automated Administrative Decision-Making Model. The essence of the development of this expert system is that the administrative steps between the opening and closing of the case are carried out in part or in whole without human intervention (on the one hand no or only necessary administrative discretion) if the data required for decision-making are available electronically and the missing data can be retrieved automatically from the available background records. This would include a complex AI-based system capable of automatically managing all cases. Examples are speeding cases for which there is objective liability. These can be done without human intervention: the camera takes a photo of the car crossing the speed limit, the system searches for the operator based on the license plate, calculates and determines the penalty, sends the fine and uploads the recording to the website. [23] Among the advantages of the development, the Ministry mentions predictable, transparent public administration free from corruption risks, as well as the reduction of bureaucracy. However, it should be emphasized that human resources will always be needed, they will only need a transforming (digital) competency package. [12] It is important though that in the case of the AADM service, it is not necessary to approve the decision of the machine as an administrator during the decision-making, but there is a possibility of human intervention. They would like to make the system suitable for speeding up processes and reducing administrative burdens as it also indirectly supports the performance of manual processes, meaning that the data already queried

and collected by AADM is transferred to other systems like records management system and other specialized systems. [15]

National Ambulance Service – Hungary

Support of healthcare and the research of the spread of viruses – based on network research – have also been carried out using artificial intelligence. A good example of its use in healthcare is that the Hungarian National Ambulance Service with the help of a market partner uses artificial intelligence to provide a forecast of how the demand for ambulances will develop in certain periods based on available past data and external data. The goal is to get the resources i.e., the rescue units to the site as quickly as possible and to prepare the rescue management for when, where and what kind of event is expected. Based on these, resources can be optimized [19]

White Paper on Responsible Artificial Intelligence - Canada

Canada used artificial intelligence to process visa applications from India and Canada. This was expected to increase efficiency. It was a challenge to develop a process that contributes to fair and impartial decision-making. The aim was to have a clear ethical direction in the public sector in cases related to automated decision-making. The system is currently operated in risk areas such as determining benefits (algorithms determine whether applicants meet the requirements). Considering the above, the Government of Canada published a White Paper on Responsible Artificial Intelligence (which is therefore not legally binding) on 1 April 2019. It seeks to ensure the transparency, accountability, legitimacy and fairness of automated decision-making, and imposes certain requirements on the use of decision-making algorithms and systems by government. The White Paper is the first of its kind in the world and came into force at the federal level in April 2020. The backbone of the White Paper is algorithmic impact assessment which is the responsibility of the heads of the agencies before an automated decision-making system is set up or substantially changed. The impact assessment includes questions such as whether customers belong to a vulnerable group, how complex the algorithm is (interpreted and explained), who collected the data used to train the system, whether the system replaces a human decision, and if necessary whether the system can justify its decisions, whether the decisions can be overridden by man, and whether the effects of the decision can be reversed. Managers are required to publish the results of their assessments online as open government data. This provides a comprehensive, publicly available overview of existing automated decision programs. [16]

The transparency is also significant for Amsterdam and Helsinki. An algorithm register has been introduced where citizens can track what artificial intelligence algorithms the municipality is using to improve the functioning of the city. The aim of the register is to ensure the same level of transparency and security for AI-driven public services. Examples include AI-driven parking system, AI-based chat robots, intelligent library management service etc. [6]

CitizenLab – Belgium

The aim of the Belgian technology company is to help the public sector analyze the opinions of citizens, make better decisions and cooperate more effectively internally. CitizenLab has developed a public participation platform that uses machine learning algorithms to help officials easily process thousands of citizen contributions and use these insights effectively in decision-making. The platform

allows you to classify ideas, highlight emerging topics, summarize trends, and group similar topics by demographic or location. The platform uses Natural Language Processing (NLP) and Machine Learning methods to automatically classify and analyze thousands of comments from citizens. [16]

The city of Temse also used geographical representation in its consultations. This helped the administration to identify areas affected by key issues and make decisions on the allocation of resources. By automating the time-consuming data analysis task, the platform has freed up time for the administration to have meaningful contact with citizens. From the citizens' point of view, this open and transparent process helps to build trust and increase support for political decisions. This has also had a positive effect on citizens' willingness to participate. [16]

The technology also allows governments to analyze the "mood" of the population, their subjective well-being – among other things by analyzing social media activity (typically Twitter accounts) . An example of this is the UN Global Pulse program , a social media analysis and analytics platform developed at Harvard University that also analyzes and predicts from existing data. [18]

Boston – USA (limitations of algorithmic analysis)

Desouza and Jacob also highlight the important role of technology: for example, in detecting the spread of viruses, thus providing an opportunity for effective control; or it is also suitable for making law enforcement and crime prevention more effective than ever before if appropriate (ly complex) databases are connected which are analyzed with a suitable method and algorithm. Linked to the examples above, the public in Boston was able to announce the pot-holes that helped policymakers plan investments to improve urban roads. Analyses revealed that the announcements came from richer neighborhoods because they had more access to smartphones there. According to the authors, this is a good view that public institutions cannot make full use of technology to address urban challenges; they need to think in multiple dimensions. The question arises in an exemplary manner: who are the users of the application? Is the survey representative? How can people be used as "sensors" without compromising privacy? These and similar questions need to be answered before making substantiated decisions. [18]

## 7 CONCLUSIONS

As has been shown, there are a wide range of possibilities before the application of artificial intelligence. From Hungary's point of view, monitoring and adapting international examples is a viable option. At the same time, Hungary also has good examples, it has been on the path of development for some time, behind which there is a serious government intention and will. However, this requires the collaboration of science and industry, and the involvement of experts and researchers in the development of the processes. A scientific basis for this could be the Institute of the Information Society within the Eötvös József Research Center at the University of Public Service – Ludovika. It should be seen that proper elaboration and regulation is required before starting the application. The human factor cannot be avoided, it is necessary to bring technology closer to humans. It is necessary to ensure that the operation of the technology is fair, transparent and ethical, and that the use of technology does not become elitist.

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