The Application of Generative AI in Public Administration Units – Big Data Analysis

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Abstract

This paper explores the potential application of Generative Artificial Intelligence (GenAI) in enhancing citizen communication within public administration units. A big data analysis was conducted based on the content of 108 official municipal websites from Poland and Romania. The study focused on identifying references to GenAI through relevant features, aiming to assess the current level of adoption and future prospects. Three potential application areas of GenAI in public administration were identified: citizen communication, process optimization, and strategic planning. However, this study specifically addresses the first area—communication with residents. The analysis reveals a growing awareness among municipalities regarding the potential of AI technologies. Notably, current implementations of AI primarily involve the generation of visual content, indicating an early but promising stage of GenAI integration. These findings suggest a foundation upon which more advanced GenAI-based communication tools can be developed in the future, contributing to more efficient and interactive governance.

Keywords: Gen-AI, public administration, big data, e-government

1. Introduction

The application of Generative Artificial Intelligence (GenAI) by local public administration units can take various forms. It may serve to enhance communication with residents through the use of virtual assistants, the generation of citizen-friendly messages, or content for social media. GenAI can also support decision-making processes by analyzing documents, creating training materials, or interpreting court rulings. A particularly popular area of GenAI application—both within and beyond the public sector—is cybersecurity, through incident detection and classification based on security logs.

The objective of this paper is to analyze the potential of GenAI implementation by Polish and Romanian cities to improve communication with residents. To achieve this goal, big data and machine learning tools were employed. Two research hypotheses were formulated:

H1: Local public administration in Polish and Romanian use GenAI mechanisms, such as chatbot, to communicate with citizens.

H2: There are legal, ethical and social constraints that slow down the process of GenAI implementation by public administrations in the two countries analyzed.

Throughout the paper, the term "city" refers to local public administration and its activities. To test the proposed hypotheses, a big data analysis was conducted on official municipal websites to identify the frequency and distribution of keywords relevant to the research topic.

This paper comprises three parts. The first discusses the opportunities and threats related to GenAI adoption in public administration. The second outlines the

research methodology. The final part presents the research findings, followed by conclusions and a summary.

2. Opportunities and threats of GenAI implementation in the Public Sector – a literature review

The integration of GenAI into local public administration structures presents both significant advantages and notable risks. Key benefits for cities include:

- Innovative management approaches that increase competitive advantage over other cities [9],
- Strengthened communication with residents (via virtual assistants and chatbots, automated generation of official correspondence, translating official messages into more accessible content) [10],
- Public services better tailored to citizens' actual needs [1],
- Higher standards of data protection [2],
- Virtual monitoring and analysis of spatial data accessible to residents [12].

However, GenAI implementation also carries considerable risks. One major concern is the potential loss of data privacy [14], especially when non-anonymized requests are processed by GenAI tools. In some cases, AI use may erode public trust in administration [7]. From a sustainability perspective, GenAI has a significant environmental footprint, particularly due to greenhouse gas emissions from its development and usage [3].

According to an Implement Consulting Group report commissioned by Google, an estimated 69% of positions within the Romanian public administration exhibit potential for the integration of GenAI in routine operations. These roles are characterized by tasks for which GenAI can contribute to approximately 10–49% of current workload—such as content generation (including text, code, and images) and collaborative problem-solving in complex scenarios. Over time, the adoption of this technology may enhance operational efficiency, improve productivity, and allow personnel to allocate more time to higher-value activities [11].

In conclusion, public administration should take proactive steps to maximize GenAI's benefits while minimizing its costs. These steps may include public consultations, educating residents about GenAI, developing appropriate implementation strategies, and adopting clear and strict data protection policies for GenAI applications.

3. Research Methodology

As outlined in the introduction, the aim of this study is to analyze the extent to which artificial intelligence is being utilized by cities in Poland and Romania. The research encompassed 66 Polish cities with county rights, as well as 41 Romanian county capitals and the city of Bucharest, resulting in a total dataset of 108 cities. Cities with county rights were selected due to their greater budgetary capacities, which enable the implementation of innovative technological solutions. Moreover, these cities often serve as role models for smaller municipalities and exert broader influence over their surrounding regions.

The first stage of the research involved compiling a database of all cities, including their official website URLs. Subsequently, big data and machine learning techniques were applied to analyze the content published on the municipal websites. The Python programming language was used to conduct the analysis.

The next stage involved categorizing the collected content according to specific areas of GenAI application. These areas refer to particular functions or activities where the use of GenAI technologies is technically feasible. For the purposes of this study, the analysis focused on evaluating the degree of GenAI adoption in the domain of digital communication with residents.

Table 1. Identified areas of GenAI application in local public administration.

No.	Area	Specific Actions
1	Digital communication with residents	1. Virtual assistants and chatbots 2. Automated generation of official documents 3. Creation of clear explanations of administrative procedures 4. Detection of fake news
2	Optimization of internal processes	1. Analysis of applications and documents 2. Automated report and data analysis generation 3. Drafting administrative orders and verifying legal compliance 4. Jurisprudence analysis 5. Creation of training materials for public officials
3	Strategic planning	1. Socio-economic forecasting 2. Urban development simulations 3. Risk forecasting

Source: Own study.

Due to the fact that the presented study is a kind of pilot which is a prelude to future research, this paper focuses only on the first area indicated in Table 1. The analysis of the other two areas is the subject of future work.

Based on the above, a set of keywords (such as *chatbot*, *bot*, *artificial intelligence*, *ChatGPT*) was assigned to the first area of application presented in Table 1. The selection of the keywords indicated above, on the basis of which the analysis of websites was carried out, was carried out in several stages. In the first stage of keyword selection, a review was conducted of websites where chatbot or virtual assistant solutions exist. The review concerned the way such solutions are named. The result of this stage was the selection of the following words for analysis: chatbot and virtual assistant. The next stage was a review of content published on websites to see if the implementation of GenAI was mentioned in published articles. From the websites where such information appeared, the words that were used in the context of describing the phenomenon in question were collected. This is how the other two words included in the analysis were selected: chatgpt and artifficial intelligence. In the process of automatic big data analysis, the keywords were appropriately de-identified, translated into the relevant language, and lemmatization and stemming mechanisms were applied to obtain the most precise search results possible. Using machine learning techniques, these keywords were searched for within the official websites of the selected cities. These websites typically contain information about current events, applicable regulations, document templates, and procedures for handling administrative matters. The collected data was stored in a NoSQL database to facilitate further analysis.

4. Research Results

As mentioned above, keywords related to GenAI technologies were assigned to the category concerning digital communication with residents. During the research process, a total of 10,996 records were collected for cities in Poland and 10,412 records for cities in Romania. The structured and analyzed data are presented in Table 2.

Table 2. Analysis results.

Category	Keyword	Poland	Romania	Total
AI in communication with residents	chatbot	46	7	53
	chatgpt	2	2	4
	virtual assistant	2	–	2
	artificial intelligence	37	12	49

Source: Own study.

The aim of this study was to analyze the official websites of cities in Poland and Romania in terms of the application of artificial intelligence mechanisms. The research, which employed big data tools and machine learning techniques, revealed

that *53* out of the analyzed cities offer chatbots or virtual assistants to support communication with residents. Furthermore, *55* cities mention the use of artificial intelligence in various operational areas. The content analysis indicates that AI is most frequently used for generating visualizations and improving data security measures.

The significant discrepancy in the research results can stems from the nature of the analyzed websites. To mitigate this, manual check of the sample for selected cities was performed. In Poland, websites designed for communication with residents frequently publish content aimed at explaining specific phenomena. As a result, citizens are better informed about ongoing changes. Additionally, Polish cities conduct information campaigns, thereby establishing a competitive advantage. In contrast, the analysis of Romanian municipal websites revealed that they primarily feature official information, such as procedures for handling administrative matters, traffic disruptions due to infrastructure projects, or summaries of past cultural events. The study appears to be an important prelude to conducting further analysis on the implementation of GenAI tools by public administrations in Poland and Ruminia. The results suggest that public administrations are open to implementing modern technology in their core business, which is important from the point of view of digital transformation.

5. Summary and Conclusions

According to the introduction, two research hypotheses were formulated to support the study objective. The first concerned the implementation of chatbots by local public administrations in Poland and Romania. The findings indicate that many cities are already utilizing AI mechanisms, especially chatbots, suggesting the existence of basic technical conditions for further development. The second research hypothesis regarding the use of GenAI in the context of constraints was analyzed on the basis of literature analysis. In 2024, Regulation (EU) 2024/1689 of the European Parliament and of the Council laying down harmonized rules on artificial intelligence and amending Regulations (EC) No 300/2008, (EU) No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (Artificial Intelligence Act, AI Act) came into force. This document governs the use of artificial intelligence by various types of institutions and the prescribed penalties for non-compliance with the rules set forth in the AI Act [5]. The mentioned regulations can help increase citizens' trust in GenAI.

A study conducted in 2021 by Scantamburlo, Cortes et al. [6] which, among other things, included an analysis of the trust of citizens of selected EU countries in artificial intelligence The literature analysis shows that citizens in Poland have limited trust in the technology in question, but rank second in the use of AI. Romanian citizens, on the other hand, indicate a high degree of both trust and use of AI technology [13]. Based on the aforementioned studies, it can be concluded that the analyzed countries have potential with regard to the implementation of innovative solutions based on AI. In addition, a 2024 survey by the Polish Economic Institute shows that as many as 41 percent of polish citizens are willing to rely on information provided by AI. Among the most important areas that require special attention in order for the public to consider AI trustworthy, polish citizens cite proper human oversight of the development of AI systems (40 percent), ensuring data privacy (39 percent), and resilience to hacker attacks and a high level of cyber security (35 percent) [4]. In the Romanian context, according to the long-running ISEGOV impact studies (2010-2024), only 31.4 percent of Romanians would let an AI application cast a vote on their behalf and 36.4 percent regard AI forecasts as more reliable than traditional opinion polls, while a striking 67.1 percent are unsure whether their public administration even uses AI – revealing a

transparency gap [8]. The aforementioned studies/surveys also show that appropriate legal regulations implemented at the national level to protect jobs, among other things, affect the level of citizens' confidence in using the technology in question.To fully validate the second hypothesis, interviews with representatives of the cities for which the first hypothesis was confirmed should be conducted.

In light of the above, the next phase of the study will extend the analysis to the remaining two areas of GenAI application presented in Table 1. These areas pertain to the use of GenAI within the internal structures of public administration. The follow-up research will involve surveys and interviews with representatives of those cities that, based on the current study, were identified as actively implementing AI technologies. These efforts may contribute to forecasting the development of GenAI and support the design of long-term urban development strategies that incorporate the evolution of generative AI technologies.

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