



Enhancing Legally-Based E-Government Services in Education Through Artificial Intelligence

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Abstract: Through the utilization of artificial intelligence (AI), governments can automate the analysis of publicly available government datasets. This process aids in the recognition of patterns and the development of a more profound comprehension of various socio-economic factors and empowers governments to base their policy decisions on data, effectively tackling societal issues, and optimizing the allocation of resources. In this paper we present AI's application in the realm of e-government, with particular emphasis on its potential influence on the advancement of this field through e-government services and their significance for a range of stakeholders. Moreover, we have conducted comprehensive review of existing literature on the subject and the identification of avenues for enhancement along with consideration of legislation as a potent instrument to guide the progression of AI within the sphere of e-government, thereby amplifying its transformative effect. We emphasize the importance of education in area of AI in order to ensure it's high quality implementation in this and other areas.

Keywords: artificial intelligence, e-government, open data, transparency, improvement.

Introduction

Open Government Data (OGD) plays a vital role in the concept of open government. Its popularity has increased significantly in recent years and continues to grow, aligning with the ongoing trend of establishing or enhancing the understanding of the current status, drawbacks, and advantages of OGD initiatives (including specific components like the OGD portal or OGD platform) and their position relative to others (Spalević, Veljković and Milić, 2023). The value generated through OGD extends across various government functions, including decision support, transportation, public health, and law enforcement. This value contributes to building citizens' trust in the government, fostering greater transparency, and yielding positive societal and governmental implications. Further harnessing of the potential of OGD can be leveraged by artificial intelligence (AI) techniques and algorithms, with purpose of extracting valuable insights and patterns from vast amounts of open data, leading to enhanced decision-making processes and improved service delivery (Zuiderwijk, Chen and Salem, 2021). Through AI, governments can automate the analysis of open government datasets, identify trends, and gain a deeper understanding of various socio-economic factors. This enables them to make data-driven policy decisions, address societal challenges more effectively, and allocate resources efficiently. Another advantage of using AI is handling the huge amount of information on the approach of automatic processing and other services (Sträßer and Stolicna, 2023).

AI also plays a significant role in ensuring the accessibility and usability of open government data. Moreover, AI-powered algorithms can assist in data quality assurance, anomaly detection, and data privacy protection. By leveraging AI techniques, governments can identify potential biases, improve data accuracy, and ensure the responsible and ethical use of open government data. The synergy between AI and OGD holds immense potential for promoting transparency, citizen engagement, and evidence-based governance. It empowers both governments and individuals to harness the transformative power of data, fostering innovation, and driving social progress. Full exploitation of AI in this and other areas can be achieved by striving towards education in AI, enabling consequently proper and adequate application of

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AI in order to fulfill the set goals (Buiten, 2019).

To achieve effective implementation and successful integration of AI in the public sector, comprehensive AI governance is essential (Etscheid, 2019). It entails developing robust plans for implementation, engagement, and communication, while also addressing the technical aspects of AI along-side governance, policy, and regulatory issues. For governments it is crucial to recognize that AI and OGD should not only be approached from a technical perspective but also from a governance standpoint (Kankanhalli, Charalabidis and Mellouli, 2019). By comprehensively addressing AI governance, policy, and regulatory challenges, governments can formulate effective strategies for utilizing AI in the public sector while safeguarding the interests of their citizens.

Research objective

In this paper, we examine the utilization of artificial intelligence within the realm of e-government, paying particular attention to its potential impact on advancing this domain. To accomplish this objective, we initially center our discussion on e-government services and their significance for a range of stakeholders. Subsequently, we delve into the deployment of AI in the e-government domain by conducting a comprehensive review of existing literature and pinpointing opportunities for enhancement. An essential aspect that requires due consideration is the legal framework. Consequently, the paper explores the strategic deployment of legislation as a powerful instrument to guide the evolution of AI in the e-government sector, thereby augmenting its transformative influence. Therefore, we here establish two research questions which will be further researched throughout the paper:

RQ1: Is there any opportunities for enhancement of deployment of AI in the e-government domain?

RQ2: How legal frameworks are aligned with current development of e-government?

E-government services

With digital services, government worldwide can deliver information and services to their citizens anytime, anywhere, and citizens can access to that information and services through any platform or device. Here we can come to question what is the importance of e- services in open government? Open government does not only mean the availability of government information on the internet, but also the interaction between the government and citizens. That interaction is reflected into the concepts of openness, transparency and participation.

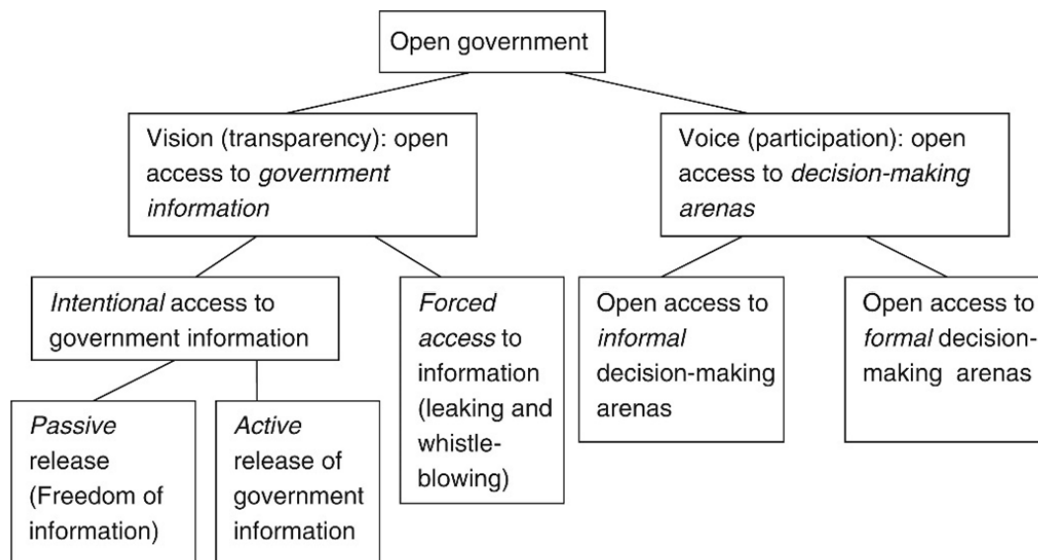


Figure 1. Vision of open government (Meijer, Curtin and Hillebrandt, 2012).

In open government, special emphasis is placed on the importance of the availability of open data (OGD). Moreover, transparency of government reduces the information gaps between government and the citizens (Kim and Lee, 2012). Transparency can be described as the active disclosure of information by an organization with the intent of allowing external actors to monitor and assess the internal workings or performance of that organization (Krah and Mertens, 2020). However, if information is not comprehensible

to the users, then published information about an organization does not contribute to the transparency.

Citizens are at the heart of open government, and their participation represents a fundamental principle of the latter (Wirtz, Weyerer and Rosch, 2019). Citizen participation has always been considered one of the key pillars of open government (Kempeneer and Wolswinker, 2023) and one of the main objectives of open government. However, the possibility for citizens to express their opinions, as well as to participate in the processes of government decision-making using digital services, implies the need for the availability and accessibility of modern technologies to the whole society. This is especially pronounced in developing countries, where the “digital divide” must first be bridged (Milić, 2019). Bridging the digital divide has implications in terms of fostering economic equality, educational potential, and earning potential (Fong, 2009).

Over the past few years, e-government services implementation is rapidly growing worldwide. For one to understand the idea of e-government services, must first understand electronic services in general. “Electronic service, refers to services offered over the information and communication technologies” (AlBalushi, 2021). These services are becoming increasingly important with continuously developed application in various domains (business, government, education and health) as these services provide benefits to all parties concerned from service providers, service users and the society. While developing countries are implementing the concept of e-government for the first time, developed countries are trying to improve quality of already existing services, and the question that arises is how to do it? The answer to this question is: quality of services can be improved only through understanding of the situation in some country (Mukamurenzi, Gronlund and Islam, 2019).

“E-government services affect many stakeholders including citizens and enterprises, government staffs, information technology developers and policy makers” (Fan and Jang, 2015). Each stakeholder has different interests and goals and depending of how government services fulfill those interests and goals, stakeholders evaluate the quality of e-government services in that way. “As service providers want to boost the efficiency and quality to reach more users to utilize these services, a prime challenge in developing these services with high quality to meet users’ expectation becomes a must” (AlBalushi, 2021). The service provider offers various services to the end-users and they use it. However, the question is what affects the maintenance of trust between service providers (in this case government) and end-users? Quality which is reflected in personalization, usability, performance, web design, security, user involvement, satisfaction and loyalty is the answer. Quality requires constant work on it, because only in that case quality of e-government services is at high level. Nevertheless, raising awareness about of e-government services and their usage benefits, as well as important of usage of OGD portal contributes to the further exploitation and utilization of e-government services.

Public sector organizations have started making governmental data available on web portals, as web services, so that the public have access to such official datasets in one place (Weerakkody et al., 2017). “A real benefit of OGD is not simply that single databases can be used more widely; it is that these data can also be leveraged, shared and combined with other data” (Huston, Edge and Bernier, 2019). In the human and environmental health realms, for example, the ability to access and combine diverse data can advance early signal detection, improve analysis and evaluation, inform program and policy development, increase capacity for public participation, enable transparency and improve accountability. In order to further advance the goals of open government it is important to make reflection on the possibilities of OGD usage and not simply view publishing OGD as an end point (Ruijter et al., 2020). It is expected that OGD will be exploited to create various applications by end users and that these applications will be for the benefit to the whole society.

In many domains, OGD can be of benefit, and examples of how OGD can be used already exist in many applications. Keeping that in mind, utilization of OGD has emerged as a transformative force in the field of education (Chokki et al., 2022), fostering transparency, innovation, and informed decision-making. In the context of education, OGD encompasses a wide range of information, from school performance and enrollment statistics to curriculum materials and educational resources (Huss and Keudel, 2020). One of the primary advantages of OGD in education is its potential to empower parents, educators, policymakers, and researchers with insights to drive meaningful change. By providing access to data on school performance, teacher qualifications, and student outcomes, stakeholders can make informed decisions to improve educational quality. Parents can better evaluate school options for their children, and policymakers can identify areas in need of targeted interventions to enhance educational outcomes.

The collaborative potential of OGD is particularly evident in fostering partnerships between governmental bodies, educational institutions, and civil society organizations. These partnerships can leverage data to design evidence-based policies, monitor educational progress, and promote greater accountability. For example, transparency in budget allocation and resource distribution can lead to more

equitable funding across schools, narrowing educational disparities (Yates et al, 2021).

Artificial intelligence in e-government

On the global stage initial addressing of the matter of artificial intelligence was done by the Organization for Economic Cooperation and Development (OECD). In May 2019, the OECD adopted the “Recommendation of the Council on Artificial Intelligence, marking it as the first clear and legislatively regulated standard within the realm of artificial intelligence” (Yeung, 2020). This recommendation was endorsed by the Council upon the motion of the Committee for Digital Economy Policy. The document emphasized the need for advancing and refining artificial intelligence systems among member states of the OECD. It stressed the significance of considering human rights and fundamental freedoms to prevent the misuse of AI (Anderjung and Hazell, 2023) as a tool by authorities or interest groups. A key directive of this document pertained to the principles that should be incorporated into national laws to guide the creation of responsible and confidential AI systems. These principles encompassed notions of inclusive growth, sustainable development, reaping the benefits of artificial intelligence through application in various areas such as e-government, e-health and etc., upholding human values and principles, ensuring transparency and comprehensibility, maintaining quality and safety in AI systems, and establishing accountability for those who develop and implement such systems (Nguyen et al., 2022).

In the rapidly evolving landscape of e-government, AI has emerged as a transformative force, reshaping the way public services are delivered and accessed (Al-Mushayt, 2019). E-government, which refers to the use of digital technologies to enhance government operations and interactions with citizens, has found a powerful ally in AI. One of the most notable applications of AI in e-government is in citizen service delivery. Virtual assistants powered by AI (Chohan and Akhter, 2021) can provide real-time support and information to citizens, offering personalized responses and guiding them through various government processes. This not only reduces the burden on government call centers but also provides citizens with faster and more convenient access to the information they need. AI-driven chatbots (Cantador et al., 2021) can handle routine inquiries, freeing up human resources to focus on more complex tasks and policy matters.

Moreover, AI's data analysis capabilities are revolutionizing decision-making within government agencies (Valle-Cruz, Gil-García and Fernandez-Cortez, 2020). By sifting through vast amounts of data from disparate sources, AI systems can identify patterns, trends, and insights that human analysts might overlook. This data-driven approach enhances policy formulation, resource allocation, and public service planning. For instance, AI can predict and prevent bottlenecks in public services, optimize traffic management, and even assist in disaster response by analyzing real-time data from various sensors and sources. However, the adoption of AI in e-government comes with challenges. Privacy and data security are paramount concerns, as the processing of sensitive citizen data requires robust safeguards to prevent misuse or breaches. Additionally, there is a need for upskilling government employees to understand, manage, and collaborate effectively with AI systems. “Ensuring transparency and accountability in AI decision-making processes is also crucial for building public trust in government AI applications” (Kim, Park and Suh, 2020).

Nonetheless, the implementation of AI in e-government is not without challenges. Ensuring the ethical use of AI (Al-Besher and Kumar, 2022), maintaining data privacy and security, and addressing potential biases in AI algorithms are critical concerns. Governments must establish robust frameworks to govern AI deployment (Al-Mushayt, 2019), encompassing transparency, accountability, and mechanisms for addressing unintended consequences. From previously stated, it can be noted that there is numerous opportunities for improvement of deployment of AI in the e-government domain. Not to forget ethical considerations and privacy issues, which will further elaborated in next paragraphs.

One of the central ethical concerns in the deployment of AI in e-government is transparency (AlShamsi et al., 2020). Governments have a responsibility to be transparent about the ways in which AI is being utilized to make decisions that affect citizens' lives. Citizens have the right to understand how AI algorithms operate, how decisions are reached, and what data is being used to inform those decisions. Transparent AI systems promote trust among citizens, as they can better comprehend the processes that impact them and hold the government accountable for fair and unbiased outcomes. Equity and fairness are also critical ethical dimensions of AI in e-government. Governments must be vigilant in ensuring that AI systems do not perpetuate existing biases or discriminate against certain groups of citizens. If AI algorithms are trained on biased or incomplete data, they may inadvertently amplify societal disparities. Regular audits and assessments of AI systems for fairness and bias are essential to rectify and prevent

such issues.

Data privacy is another paramount ethical concern. E-government systems often involve the collection and processing of citizens' personal data (Shah, Wassan and Usmani, 2022). Governments must uphold stringent data protection measures to prevent unauthorized access, use, or sharing of this sensitive information. Citizens should have control over their data and be informed about how it is being utilized within AI systems. Accountability is a fundamental principle that should be upheld in AI-driven e-government (Vrabie, 2023). While AI systems can automate decision-making processes, governments must retain oversight and responsibility for the outcomes. Clear lines of accountability should be established to determine who is ultimately responsible for AI-related decisions and actions.

Legislation of AI and e-government

Legislation is increasingly aligning with the ongoing development of e-government to address the complexities arising from the digital transformation of public services. These frameworks are essential for establishing clear guidelines related to data protection, cybersecurity, and privacy, ensuring that citizens' rights and government transparency are maintained in the digital era. They also play a pivotal role in fostering public trust in e-government initiatives, as they provide a regulatory foundation for the secure and responsible use of technology in the delivery of government services.

At the United Nations (UN) level, specifically within the United Nations Institute for Research on Crime and Justice (UNICRI), the Center for Artificial Intelligence and Robotics was established in 2015 in the Netherlands, based in the Hague. The center's focus lies in preventing crime and fostering justice and security through the use of AI and robotics. A notable publication from this center is "Artificial Intelligence and Robotics for Law Enforcement" (UNICRI, 2020), which explores the potential applications of these technologies in the realm of law enforcement (Raaijmakers, 2019). While artificial intelligence holds considerable potential for enhancing law enforcement processes, it also introduces various risks to citizens' rights and freedoms. It has the capacity to propagate misinformation and inaccurate information, manipulate photos and video content, potentially undermining the legitimacy of evidence and legal proceedings conducted by public authorities. To mitigate these risks, states are urged to allocate additional resources for understanding artificial intelligence through expertise-building processes (Liu, Lin and Chen, 2019). Additionally, fostering international collaboration is vital during the development of expert systems to counteract these challenges.

Proposal of the European Commission for the European Union's regulatory framework on artificial intelligence represents the first significant step in the regulation of this technology in the EU. This proposal, known as the EU regulatory framework on artificial intelligence (AI) aims to establish clear rules and standards for the use of AI in different sectors to ensure ethical, transparent and responsible application of this technology (Veale and Zuiderveen Borgesius, 2021). The main importance of this proposal is given on Table 1.

Table 1
EU regulatory framework on AI

No.	Action	Description
1	Categorization of AI systems	Framework provides the division of artificial intelligence systems in three categories – high, limited and minimal risk.
2	Requirements for transparency	The proposal establishes that users and citizens must be notified if they interact with an AI system to maintain transparency and trust.
3	Prohibited AI system	The proposal prohibits the use of certain artificial systems intelligence that represent an "unacceptable risk" for the fundamental rights and values of the EU.
4	Training and documentation	The proposal requires that high-risk artificial intelligence systems go through training, testing and documentation procedures in order to confirm safety and reliability.
5	Sanctions for non-compliance	The proposal includes sanction mechanisms for organizations that violate the provisions of the regulation on artificial intelligence.
6	Cooperation with Member States	The proposal emphasizes cooperation between Member States and EU to ensure consistent enforcement of regulations.

This proposal showed the desire of the European Union towards responsible and ethical use of artificial intelligence, with a special focus on the protection of basic rights of citizens. However, during the next two years, many abuses of use appeared in practice systems and AI tools (Buiten, 2019), which led to the need to define a restrictive legal solution regarding the use of artificial intelligence.

The European Parliament adopted the Draft Law on Limiting Artificial Intelligence on 16.6.2023. This Law establishes norms that should ensure that artificial intelligence tools are developed and/or used in the EU in full compliance with EU rights and values. First of all, it is the same relating to the supervision of people and objects, security, privacy, transparency, non-discrimination and socially responsible behavior (Buiten, 2019). These standards aim to promote the definition and adoption of artificial intelligence (AI). Which is reliable and people-oriented, protecting health, safety, fundamental rights and democracy from possible harmful effects and application of artificial intelligence.

Conclusions

In this paper, our aim was to examine AI's utilization within the e-government domain, particularly in its alignment with open data, services, and various aspects such as transparency, collaboration, participation, innovation, and legislation. AI's aptitude for data analysis is leading a transformation in decision-making processes within government agencies by uncovering patterns and insights from a wide array of data sources, ultimately enhancing the formulation of policies, allocation of resources, and the planning of public services. Through literature analysis on up to date research of e-government services and answering to established research question, we try to provide recommendations for readers which go towards harnessing of the AI for the prediction and prevention of service bottlenecks, aiding in pattern recognition, and facilitating a deeper understanding of various socio-economic factors, thereby strengthening accountability and automating decision-making processes.

Our review findings confirm that AI is being employed to support various functions within governance, with a primary emphasis on improving the delivery of public services. However, there is a noticeable scarcity of AI's application in policy modeling to assist in the development of effective intervention strategies. Additionally, the implementation of legal regulations is imperative when employing AI in government operations, with the objective of ensuring transparency and providing citizens with more convenient and expedited access to essential information. Furthermore, there is a lack of a standardized approach to AI's application, especially in the context of education, where specialized training for AI practitioners in government and other sectors is absent.

Conflict of interests

The authors declare no conflict of interest.

Author Contributions

Conceptualization, P.M.; methodology, Z.S.; investigation, Z.S. and S.V; formal analysis, P.M and S.V; writing—original draft preparation, P.M. and S.V.; writing—review and editing, P.M. and S.V. All authors have read and agreed to the published version of the manuscript.

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