



EuroEconomica

A Comparative Study About the Use of Artificial Intelligence (AI) in Public Administration of Nordic states with other European Economic Sectors

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Abstract: Artificial Intelligence (AI) is revolutionizing public administration in Nordic countries like Denmark, Finland, Iceland, Norway, and Sweden. This integration of AI technologies is transforming governance practices, improving efficiency, service quality, and citizen engagement. The European Union tracks and quantifies the digitization of public and fiscal administration using the Digital Economy and Society Index (DESI)² index, indicating the level of digitization at the European level. The study explores the use of AI in Nordic states, focusing on strategies and integration of AI technologies in service delivery processes. It examines the region's strong digital infrastructure, emphasis on responsible data use, and high public trust in government. The research reviews policies, strategies, and case studies to understand the drivers, challenges, and outcomes of AI deployment in various administrative domains. It also compares the use of AI in Nordic Public Administration with other European Economic Sectors, identifying lessons learned and best practices for future implementation. The study aims to identify strengths and potential challenges for Nordic states in enhancing efficiency, transparency, and citizen engagement. The findings contribute to both scholarly discourse and practical policymaking by offering insights into the opportunities and challenges associated with AI adoption in Nordic public administration and further underscores the importance of fostering interdisciplinary collaboration, knowledge exchange, and international partnerships to maximize the benefits of AI while addressing concerns about fairness, equity, and societal impact. Ultimately, this research contributes to a deeper understanding of the evolving role of AI in shaping the future of governance and public service delivery in the Nordic region.

Keywords: Artificial Intelligence; Digital Economy and Society Index (DESI); Digitized Public Services; EU Economic Trends; Public Administration

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² European Commission (2023). The Digital Economy and Society Index (DESI) 2023 dashboard for the Digital Decade: A dashboard of indicators summarizing Europe's performance across the four dimensions of the Digital Decade policy program: digital skills, digital infrastructure, digitalization of business and digitalization of public services. Retrieved from <https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts>.



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1. Background

Several compelling justifications underpin the selection of the research topic titled “*A Comparative Study about the Use of Artificial Intelligence (AI) In Public Administration of Nordic states with other European Economic Sectors*”. Firstly, the increasing adoption of AI technologies within Public Administration represents a significant paradigm shift in governance practices, with potential implications for administrative efficiency, service delivery, and citizen engagement. By focusing on Nordic states and other European Economic Sectors, this comparative study offers a unique opportunity to explore variations in AI utilization across diverse regional contexts, characterized by differing socio-economic landscapes, governance structures, and technological ecosystems. Additionally, comparative analysis enables the identification of common trends, best practices, and region-specific challenges, providing valuable insights for policymakers, practitioners, and stakeholders seeking to harness AI’s transformative potential within the public sector. Furthermore, studying the use of AI in public administration contributes to the broader discourse on digital transformation, governance innovation, and the future of public service delivery, facilitating cross-regional learning and collaboration to address shared challenges and maximize opportunities for societal benefit. Overall, this research topic holds immense relevance and potential for advancing scholarly understanding and informing strategic decision-making in the field of AI governance and public administration.

2. Introduction

Artificial intelligence (AI) is technology that enables computers and digital devices to learn, read, write, create and analyze¹, Public administration is a field that demystifies the mechanics of government and makes it accessible. At its core, public administration is the art and science of managing public programs and policies, ensuring their effective execution for the benefit of society² and, an economic sector is a part of the economy where a particular business activity is undertaken. AI is a traditional technological innovation process that uses science and technology to create machines, software, and algorithms that interact with economic activities, particularly production. However, it is also a radical, disruptive process as these intelligent agents can recognize and respond to their environment (Acemoglu & Restrepo, 2019). AI is revolutionizing government operations by automating tasks, analyzing data for informed decision-making, and improving efficiency, service delivery, and public administration. In the past few years, the incorporation of Artificial Intelligence (AI) technologies has become a crucial tactic for updating public administration and improving governmental processes on a global scale. Whether it’s simplifying administrative duties or refining service provision and decision-making, AI presents numerous avenues for boosting efficiency, effectiveness, and citizen contentment within the public sector, becoming a general purpose technology (GPT), i.e. a technology through which complementary innovations can be developed, thus becoming a source of efficiency and economic growth (Torrent-Sellens, 2020). The Council of State regulates public institutions and identifies rules of administrative law. However, the system faces challenges in addressing disputes and precautionary protection, with rites of silence and compliance often failing to provide immediate satisfaction (Franchini, 2023). This

¹ International Business Machines Corporation (IBM). What is artificial intelligence (AI)? Retrieved from <https://www.ibm.com/topics/artificial-intelligence> on March 20, 2024.

² University of Pittsburgh. Graduate School of Public & International Affairs. What is Public Administration? Retrieved from <https://www.gspia.pitt.edu/insider-insights/what-public-administration> on March 20, 2024.

comparative study delves into the utilization of AI in public administration, focusing on a comparison between Nordic states—comprising Denmark, Finland, Norway, Sweden, and Iceland—and other European Economic Sectors. The Nordic states and other European Economic Sectors represent diverse yet interconnected regions characterized by varying socio-economic landscapes, governance structures, and technological ecosystems. Understanding how these regions harness AI to address administrative challenges and deliver public services is crucial for identifying common trends, best practices, and areas for collaboration. This research aims to analyze the policies, strategies, and implementation frameworks guiding the adoption and deployment of Artificial Intelligence (AI) in Public Administration across Nordic states and other European Economic Sectors. It will examine AI strategies, investment priorities, regulatory frameworks, and ethical considerations to understand the similarities, differences, and drivers shaping AI utilization in these regions. The comparative analysis will also examine case studies and empirical evidence to assess the impact of AI on administrative efficiency, service quality, and citizen engagement while the Digital Economy and Society Index (DESI) tool developed by the European Commission to measures progress in digitalization, including connectivity, digital skills, internet services, business integration, and digital public services serves as a benchmark for evaluating the digital readiness and capabilities of Nordic states and other European Economic Sectors in leveraging AI in public administration. The research aims to inform strategic decision-making, foster cross-regional learning, and facilitate the economic development of robust AI governance frameworks. The study will analyze current applications of AI in Public Administration across Nordic states and selected EU member states, examine national strategies and best practices for AI development and implementation, identify unique strengths and potential challenges faced by Nordic states, and contribute valuable insights to the scholarly understanding of AI governance and provide practical insights for policymakers, practitioners, and stakeholders seeking to harness AI’s transformative potential in public service delivery and governance.

3. Research Questions

The research topic is chosen due to its unique regional contexts, policy implications, and diverse technological landscapes. Nordic states, have distinct socio-economic, cultural, and governance characteristics. Comparing their AI adoption and implementation strategies with other European Economic Sectors allows for an exploration of how regional contexts influence AI adoption and implementation strategies. The adoption of AI in Public Administration carries significant policy implications, impacting service delivery, economic growth, governance structures, and citizen engagement. This research investigates the following question:

Main Question:

Q: How do the utilization, strategies, challenges, impacts, and ethical considerations of Artificial Intelligence (AI) in Public Administration differ between Nordic states and other European Economic Sectors, and what factors contribute to these variations?

The chosen research question have been carefully crafted to address key dimensions of the comparative study on the utilization of Artificial Intelligence (AI) in public administration across Nordic states and other European Economic Sectors. The research question serves as the central inquiry, seeking to understand the differences in AI adoption and implementation between these regions and identify

contributing factors to these variations. This overarching question provides a comprehensive framework for comparing and analyzing the AI landscape in public administration and a comprehensive and multifaceted approach to examining the comparative use of AI in public administration across Nordic states and other European Economic Sectors, offering insights into strategies, challenges, impacts, and ethical considerations shaping AI governance and implementation in diverse administrative contexts.

4. Literature Review

The literature review delves into the existing body of knowledge surrounding AI adoption and utilization in both the Public Administration of Nordic states and other economic sectors across Europe with aims to explore and analyze the current state of AI implementation, examining its efficacy, challenges, and implications within these distinct contexts. The study *Daniel* (Mügge, 2024) explore the concept of AI sovereignty and states that EU AI strategy aims to compete with major AI powers like the USA and China, aiming for AI sovereignty. However, AI sovereignty is underspecified and open to interpretation. The article proposes three dimensions of AI sovereignty, considering trade-offs and political character. The strategy primarily focuses on EU stakeholders, considering values and relationships between citizens, public authorities, companies, and the world. The study *Nuta Alina Cristina* (Nuta, et. al, 2024) highlights the importance of mitigating air pollution for maintaining urban wellbeing and suggests policy implications for decision makers aiming to promote economic, social, and environmental welfare in urban areas. The study *Rzycki, B.* (Rzycki, Duenas-Cid & Przegalińska, 2024, pp. 119–137) provides an overview of artificial intelligence-driven solutions developed and implemented by Poland’s central public administration (PA). It discusses AI governance, AI innovation, actors within the ecosystem, and the field of AI innovation for PA. The chapter also examines stakeholder dynamics in AI-driven innovation building for PA. The study *Csernaton, R.* (Csernaton, 2024) explore that in 2023, AI hype fueled geopolitical discussions, but challenges and limitations emerged. The EU must navigate AI systems, balancing transparency, responsibility, and ethical frameworks. A geopolitical race to innovate and regulate AI presents risks. Harmonized foreign policy, strategic alliances, and effective AI Act implementation are crucial. The research article *Correia, P.M.A.R.* (Correia, Pedro & Mendes, 2024) highlights the advantages of AI systems in public administration, such as simplified processes, faster transformation, and improved quality of life. However, legal justification for AI-facilitated actions must consider unique decision characteristics and AI system features. The study *Alshaib, B.M.* (Alshaib, et. al, 2023) examines the link between fiscal sustainability indicators and economic growth in Egypt from 1980-2018. It finds a dynamic relationship, with government expenditure and external debt significantly impacting long-term economic expansion. However, government revenue doesn’t significantly influence growth. The study emphasizes prudent fiscal management, balancing public service investments with fiscal deficit management. Future research should explore AI systems for smart governance and challenges they may pose. The study *Quintas, D.T.R.* (Quintas, de Oliveira Mendes & Correia, 2023) highlights the fact that modernization and quality in public administration have always been a feature of all governance models. The Study *Cetina Presuel* (Cetina Presuel & Martinez Sierra, 2023) concluded that Public administration is shifting towards Automated Government, despite potential bias issues. However, cautious adoption is advised, especially in areas affecting citizen rights, to avoid techno-solutionist and techno-optimist temptations. The study *Geanta, M.* (Geanta, Cucos, Boata, Nuta & Nuta, 2023) highlights the need for innovative surveillance systems to tackle infection

outbreaks and future outbreaks. Combining lessons from the pandemic, war, and continuous outbreak surveillance, new public health and digital intelligence tools must be designed and implemented. The study *Oliveira* (Oliveira, Serra, Sousa & Beatriz, 2023) Smart Governance is directly related to public participation, more specifically, to participatory governments and also to the functioning of the administration in terms of the service provided to citizens, because it is essential that there is adequate management in order to avoid the risks arising from the lack of resources and capacities on the part of local governments. The study *van Noordt, C.* (van Noordt, Misuraca & Mergel, 2024) shows that EU's public administrations are increasingly implementing AI technologies, primarily for efficiency-related objectives, despite potential contributions to professionalism, efficiency, service, and engagement public values, posing potential public value destruction risks. The study *Lamovšek, Nejc (2023)* (Lamovšek, 2023) Digital smart tools can help analyze texts and understand deeper meanings, influencing society and science. They can highlight key keywords and general connotations, influencing AI technology use in public administration. However, limitations include limited scientific articles, possible hallucination, and author representation. Simultaneous use of ChatGPT-4 and Voyant Tools is recommended for broader policy shaping. The study *Alhosani, K.* (Alhosani & Alhashmi, 2024) explores that AI and machine learning are gaining attention for their potential benefits, including increased productivity and automation. However, concerns about job displacement and long-term effects on governments remain unexplored. AI is used in various sectors. This paper *Broomfield, Heather* (Broomfield & Reutter, 2022) examines the participation of citizens in datafication in public administration, focusing on Norway. It reveals that citizens and civil society are rarely involved, with a top-down, technocratic approach that obscures the context, values, and agendas of datafication. The study *Florin, B.* (Florin, 2023) reveal that Digitalization of public administration is crucial for society's communication and convenience. International organizations like the EU and OECD support this goal. The EU has set strategic targets for 2030, including full digitalization of key services and access to medical records. However, societal involvement is needed for full benefits. The study *Nuta, F.* (Nuta, 2023) examines global crises like COVID-19, geopolitical tensions, and climate change, highlighting their interconnectedness and implications for human civilization. The study *Sanchez-Graells, Albert* (Sanchez-Graells, 2024) explores that the UK's "pro-innovation" approach to AI procurement and use is unjustified and will lead to individual harms and broader negative social effects. An alternative regulatory strategy, in contrast to the UK's pro-innovation approach, is unlikely to be implemented under the current government. The study *Eva M^a. Menéndez Sebastián¹* highlights that the Spanish civil service must undergo significant changes due to the changing circumstances of the future. An integrated approach, rather than an apocalyptic one, is advocated for to address the challenges ahead. The Spanish civil service is expected to adapt effectively, efficiently, innovatively, and responsibly, ensuring its primary function remains unchanged. The study *Carullo, G.* (Carullo, 2023) delivers that Deep Learning (LLM) in public administration can enhance transparency, accountability, and decision-making by generating similar text outputs to human decision-makers. However, it must adhere to individuals' rights and procedural guarantees, ensuring access to data for accurate analysis and review. Balancing AI's

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transformative power with democratic principles is crucial. The studies *Nuță, F.M.* (Nuță, Marcuța, Nuță & Marcuța, 2024) examine global economic pressures arising from the COVID-19 pandemic, geopolitical conflicts, banking system turmoil, energy crises, digitization, and environmental concerns. The study by *Waage, M., et. al.* (Waage, Weinbach & Larsen, 2024) shows a slightly greater understanding and ambition for AI investment in SFJ enterprises, with concrete plans to tackle future technological challenges. However, data utilization is not necessarily a priority. The study by *Ponce* (Ponce, 2005) states that good administration primarily covers regulations and norms aimed at securing the correctness of administrative decisions. The study *Nuta, F.* (Nuta, 2023) examines global crises like COVID-19, geopolitical tensions, and climate change, highlighting their interconnectedness and implications for human civilization. The study *Madan, R.* (Madan & Ashok, 2024) highlights Deep Learning (LLM) in public administration can enhance transparency, accountability, and decision-making by generating similar text outputs to human decision-makers. However, it must adhere to individuals' rights and procedural guarantees, ensuring access to data for accurate analysis and review. Balancing AI's transformative power with democratic principles is crucial. The research *Butt, Junaid* (Butt, 2023) explores the use of Artificial Intelligence in administrative decision-making is a complex issue requiring ethical and legal considerations. While it offers benefits like improved efficiency and cost savings, it also poses risks. Comparative studies can inform policymaking, ensuring transparency, accountability, and respect for privacy and human rights. The study by *Marienfeldt, Justine* (Marienfeldt, 2024) examines the impact of digital transformation on street-level work and decision-making in service-oriented and regulation-oriented public administrations. The article by *Henrik Palmer Olsen, et. al.* (Olsen, Hildebrandt, Wiesener & Larsen, 2024) highlights the need for transparency in AI in public decision-making. The study by *Cazzaniga, M. et. al.* (Cazzaniga, et. al, 2024) states that the AI adoption could significantly impact labor markets, with advanced economies better positioned to leverage it. The study *Ignat, G.* (Ignat, Sargu & Prigoreanu, 2022) highlights that Organizations must understand the industry's trends to capitalize on this growth and adapt to the growing adoption of cloud services. The study *Butt, Junaid* (Butt, 2024) explores the EU Artificial Intelligence Act, 2024 ("AI Act, 2024"), the world's first horizontal and standalone legislation exclusively dedicated to AI governance. It analyzes the Act's key components, including definitions, principles, obligations, and enforcement mechanisms. Specifically, the study delves into how the Act addresses "inelegant biases" within AI systems and its requirements for explain-ability in AI decisions. Additionally, the research scrutinizes the effectiveness of the mechanisms established for enforcement and oversight. It aims to identify strengths, weaknesses, opportunities, and threats inherent in the AI Act, 2024, considering its adaptability to evolving technological landscapes and alignment with fundamental human rights principles. The study contributes valuable insights to ongoing discussions about responsible and ethical AI governance. In conclusion, this literature review has provided valuable insights into the use of artificial intelligence (AI) in Public Administration, particularly focusing on a comparative analysis between Nordic states and other European economic sectors. Through the examination of existing research and scholarly articles, it is evident that AI applications in Public Administration are diverse and evolving rapidly, presenting both opportunities and challenges. The review highlights the importance of understanding the contextual factors influencing the adoption and implementation of AI in public administration across different regions. While Nordic states exhibit certain commonalities in their approach to AI governance and regulation, variations exist in terms of policy frameworks, technological infrastructure, and organizational readiness. Additionally, comparative studies with other European economic sectors shed light on the broader implications of AI

integration, such as its impact on governance structures, service delivery models, and citizen engagement.

5. GAPS in Available Literature

From the above literature, several gaps emerge that warrant further exploration in the context of the research topic on the comparative study of AI utilization in public administration across Nordic states and other European Economic Sectors. Firstly, while Mügge (2024) and Csernaton (2024) delve into the concept of AI sovereignty and the geopolitical implications of AI adoption, there remains a gap in understanding how AI sovereignty manifests differently in Nordic states compared to other European Economic Sectors, necessitating a comparative analysis. Additionally, while studies by Florin (2023) and Butt (2023) touch upon the importance of societal involvement and ethical considerations in AI deployment, there is limited exploration of how these factors vary across different regions and their impact on AI governance within public administration. Furthermore, Rzycki et. al. (2024) provide insights into AI-driven solutions in Poland's central public administration, yet there is a gap in comparative analysis with similar initiatives in Nordic states and other European Economic Sectors, offering valuable lessons and best practices. Lastly, the literature highlights the potential impacts of AI adoption on labor markets (Cazzaniga, et. al, 2024) and the need for transparency in AI decision-making (Olsen, et. al, 2024), suggesting avenues for further research to explore the socio-economic implications and governance mechanisms of AI utilization within public administration across diverse regional contexts. Addressing these gaps would contribute to a more comprehensive understanding of the comparative dynamics of AI in public administration, informing policymaking and fostering cross-regional learning and collaboration. Overall, this literature review lays the foundation for further research into the comparative use of AI in public administration, emphasizing the need for interdisciplinary perspectives and empirical investigations to address the complex dynamics at play. By synthesizing existing knowledge and identifying gaps in understanding, this study contributes to advancing our understanding of AI's role in shaping the future of governance and public service delivery in both Nordic and European contexts.

6. Research Methodology

The author uses a comparative research design to analyze the use of artificial intelligence (AI) in public administration across Nordic states and other European economic sectors. Primary data is collected through surveys, interviews, and case studies with key stakeholders in public administration agencies, AI technology providers, policymakers, and experts. Secondary data is gathered from academic literature, government reports, policy documents, and industry publications. Purposive sampling is employed to select representatives from Nordic countries and other European economic sectors. Data analysis involves quantitative and qualitative methods to identify patterns, trends, and relationships in AI adoption and usage across different regions and sectors. Thematic analysis is used to identify key themes, challenges, and success factors associated with AI implementation in public administration. Ethical considerations are ensured, with informed consent obtained from participants and anonymity and confidentiality maintained to protect privacy and minimize bias. Limitations are acknowledged, such as sample size constraints, generalizability of findings, and biases inherent in self-reported data.

Robustness checks and sensitivity analyses are conducted to address potential sources of bias and enhance the validity and reliability of research findings. The research methodology adopted by the author enables a comprehensive examination of the use of AI in public administration across Nordic states and other European economic sectors. By combining quantitative and qualitative approaches, the study provides valuable insights into the comparative dynamics of AI adoption, contributing to both theoretical understanding and practical implications for policymakers, practitioners, and researchers.

7. Case Studies

Governments worldwide are utilizing AI to enhance service delivery, as evidenced by numerous case studies. They are investing heavily in AI to create innovative and improved public services for residents. Some of the applications of AI in the public sector include; the Revenue Department of South New Wales has implemented artificial intelligence since 2018 to assist disadvantaged customers with penalties, reducing financial burdens and improving efficiency. With approximately 46,000 vulnerable consumers, the AI solution significantly benefits the community (Johnston, 2021). Artificial intelligence significantly enhances healthcare by enabling early disease detection, facilitating clinical decision-making, and real-time patient tracking. It also aids in warning professionals of potential threats and enhancing government healthcare delivery, as seen in COVID-19 virus identification (Makridakis, 2017). Capgemini and Google have developed AI technology to analyze aerial pictures and locate unidentified buildings, uncovering 20,000 ponds in France and generating €10 million in tax revenue. The French government plans to use this scheme to identify unregistered gazebos and patios. Similar AI methods are used by US federal departments and insurance companies (Medaglia & Gil-Garcia, 2023). Belgian authorities utilized Citizen Lab's AI crowdsourcing tool during 2019 climate change rallies to understand protesters' demands, prioritizing 15 climate action initiatives based on public sentiment analysis (Fabrègue, Portal & Cockshaw, 2023). The Digital Care Act in Germany aims to improve care and make it more personalized, benefiting chronic patients. To reach full potential, medical apps need to be interoperable with EHRs (Re Ferrè, 2024). The report of World Bank explores the adoption of AI in the public sector, focusing on governance and its potential benefits. It emphasizes the need for ethical principles, institutional arrangements, and broader policy responses. The report also provides practical examples and technical information for practitioners¹. The OECD states that Artificial intelligence is being utilized for proactive implementation of public policies and services, aiming to make services more accessible, increase user satisfaction, and reduce administrative burdens. Countries are relying on strategic and trustworthy AI use, aligning with OECD Principles and Council Recommendation (OECD, 2023). Plumerai showcases computer vision solutions on small, embedded devices to address use cases that include people detection and face identification. The platform is built on the high-performance Renesas RA8x1 MCU with Arm Cortex-M85 and Arm Helium vector extensions to accelerate people-detection neural networks using just 300 KB RAM (ARM, 2024). Thales has launched an AI-based tactical training and shooting analysis system at Eurosatory 2022, aiming to ensure safety and expedite training for law enforcement agencies and special operations forces. The system records training sessions and analyzes trainee behavior and performance (GlobalData, 2024). The European Court of Human Rights is exploring the use of Artificial Intelligence (AI) to enhance case-processing and justice

¹ World Bank (2020). *Artificial Intelligence in the Public Sector: Maximizing Opportunities, Managing Risks*. Equitable Growth, Finance and Institutions Insight. Retrieved from <http://hdl.handle.net/10986/35317>.

delivery. AI could address a backlog of cases, but risks to human rights must be managed. The court must ensure transparency and coherent decision-making processes to minimize these impacts (Allioui, 2023). The Netherlands' government resigned following a 2021 "childcare scandal" where an algorithm for detecting welfare fraud was biased towards foreigners. The Dutch Data Protection Authority fined the Minister of Finance €2.75 million and the Hague District Court ruled SyRI cannot be used again, violating the European Convention on Human Rights (Amaro, 2021). Budapest Bank has been fined €634,000 by the Hungarian Data Protection Authority for using AI-driven software to automatically assess customers' emotional states. The European Data Protection Board found the AI-based processing posed a high risk to individuals' fundamental rights (EDPB, 2022). The European Union's Data Protection Authority (CNIL) has imposed a €20 million penalty on Clearview AI, a software company that extracts over 20 billion publicly available facial images for biometric templates. The decision argues that the extensive processing constitutes intrusive processing and privacy invasion. The ruling also emphasizes the reasonable expectation of individuals regarding their photo privacy. The decision aligns with a recent report by Matthias Marx¹. Conversational AI is revolutionizing the public sector and healthcare organizations in the Nordic countries, aiming to enhance citizens' quality of life and streamline services. Traditionally analog, the public sector is embracing digital transformation, accelerated by the pandemic's impact. Chatbots and virtual agents are becoming integral channels for two-way communication between governments and citizens. In Norway, Sweden, Denmark, and Finland, local and national governments are at the forefront of digitizing customer service, utilizing platforms like Kommune-Kari, a multi-city chatbot answering diverse queries and automating tasks across municipalities. The success of such initiatives is evident, with Kommune-Kari handling millions of conversations annually and experiencing surges in traffic during the COVID-19 pandemic. Similarly, Finland's Virtual Agent Network streamlines services across immigration, taxation, and business registration, setting new standards for cross-departmental customer service. Notably, conversational AI aids the Finnish tax administration, Verohallinto, in automating interactions and improving customer experience during tax season. In Norway, the Norwegian Labour and Welfare Administration relies on Frida, a virtual agent, to manage a surge in inquiries, demonstrating the efficacy of AI in handling increased demand. Sweden's Västra Götaland region leveraged conversational AI to disseminate critical health information during the pandemic efficiently. These examples underscore the transformative potential of conversational AI in reshaping public services and fostering a more connected and efficient society in the Nordics².

¹ Facial Recognition: Italian SA Fines Clearview AI EUR 20 Million|European Data Protection Board. https://edpb.europa.eu/news/national-news/2022/facial-recognition-italian-sa-fines-clearview-ai-eur-20-million_en. The decision can be accessed at the Greek Data Protection Authority website: <https://www.gdpd.it/web/guest/home/docweb/-/docweb-display/docweb/9751362>. Hellenic DPA Fines Clearview AI 20 Million Euros | European Data Protection Board. https://edpb.europa.eu/news/national-news/2022/hellenic-dpa-fines-clearview-ai-20-million-euros_en The decision can be accessed at the Greek Data Protection Authority website: <https://www.dpa.gr/el/enimerwtiko/prakseisArxis/epiboli-prostimoystin-etaireia-clearview-ai-inc> (Accessed March 2024).

² The information provided in the summary paragraph is derived from the case study titled "Public sector and healthcare organizations in the Nordics are using conversational AI to improve quality of life for citizens" last updated on February 29, 2024, retrieved from <https://boost.ai/case-studies/public-sector-nordics-conversational-ai-case-study/>.

8. Expert Narratives

In her 2023 State of the Union address, European Commission President Ursula von der Leyen¹ emphasized the importance of mitigating the risk of extinction from AI, citing a statement from the Center for AI Safety. She also highlighted the power of AI, stating that it is accessible, powerful, and adaptable for civilian and military uses, alongside other societal-scale risks. In the words of political scientist Charmaine Chua (Charmaine, 2023) narratives of technological disruption have become powerful instruments to cement depictions of either attainable, desirable futures of economic growth and societal progress or dystopian renderings of catastrophic risks. Elisa Ferreira, the European Commissioner for Cohesion and Reforms, expressed concerns about the impact of budget cuts on public administrations' efficiency and preparedness in the EU, highlighting their crucial role in transitioning to a greener, more digital economy and the need for reinforcement amid financial constraints (Ferreira, 2024). In a message for the Roman Catholic Church's World Day of Peace, Pope Francis has called for a legally binding international treaty to regulate the development and use of artificial intelligence (AI) to prevent algorithms from superseding human values and the rise of a "technological dictatorship." He urged nations to recognize the global scale of AI and emphasize the role of international organizations in reaching multilateral agreements. The pope also addressed ethical concerns, urging scrutiny of AI developers and their intentions (Pullella, 2023).

9. Legal Framework (EU AI Act, 2024)

The arrival of the EU's AI Act, 2024 is set to impact the use of AI in Public Administration across Europe, potentially affecting both the Nordic states, currently leading in AI adoption, and other European sectors lagging behind. For the Nordic countries, the AI Act, 2024 might introduce some adjustments but is unlikely to be a major hurdle. Their existing regulatory frameworks likely already address many of the concerns the Act raises around data privacy, algorithmic fairness, and human oversight. In fact, the clear and predictable regulations outlined in the Act could solidify the Nordic advantage by providing a stable foundation for continued AI development and deployment in public administration. For other European sectors, the impact of the AI Act might be more significant. The Act could act as a catalyst for change, prompting these sectors to re-evaluate their AI adoption strategies. The need to comply with the Act's requirements around risk assessment, data governance, and human oversight might necessitate investments in technology, legal expertise, and workforce training. This could help bridge the gap between the Nordic states and other European sectors by setting a common standard for responsible AI development across the continent. However, navigating the complexities of the Act could also pose challenges for some sectors, particularly those with limited resources. The costs associated with compliance and potential delays caused by the Act's risk assessment processes could create hurdles, especially for smaller public administrations. The only available analytical study about the groundbreaking implications of the EU Artificial Intelligence Act, 2024, *Butt, Junaid* (Butt, 2024) highlights that the Act addresses the pressing need for regulatory frameworks to govern the development and deployment of AI technologies responsibly. Through a multidisciplinary analysis, this research scrutinizes the Act's key components, including definitions, principles, obligations, and enforcement

¹ 2023 State of the Union. Address by President Von der Leyen. European Commission, September 13, 2023, https://ec.europa.eu/commission/presscorner/detail/ov/speech_23_4426.

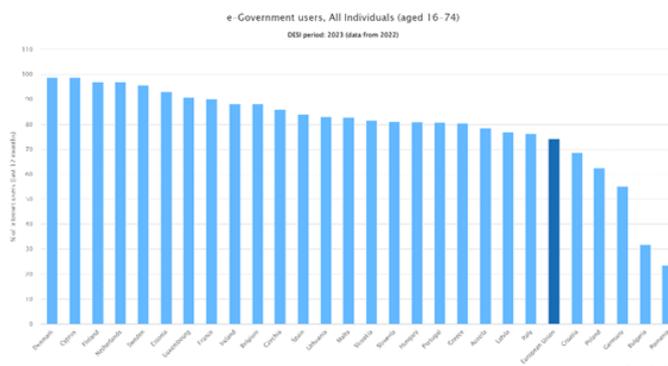
mechanisms, shedding light on its potential impact on stakeholders, innovation ecosystems, and societal dynamics globally. Key aspects of the Act, such as addressing inelegant biases, ensuring explain-ability in AI decisions, and establishing enforcement mechanisms, are examined closely. The conclusion underscores the significance of the Act in setting ethical standards, promoting transparency and accountability, and fostering responsible AI innovation while mitigating risks and disparities. Moreover, the Act’s emphasis on collaboration and adaptability serves as a precedent for other countries, signaling a new era of proactive and inclusive AI regulation worldwide. Overall, the AI Act is likely to have a positive long-term impact on the use of AI in Public Administration across Europe. By establishing clear guidelines and promoting responsible AI development, the Act can help ensure that AI is used effectively, ethically, and in a way that benefits all European citizens. However, the short-term impact may vary depending on the existing AI infrastructure and resources available in different European sectors.

10. Digital Economy and Society Index (DESI)

The Digital Economy and Society Index (DESI)¹ is a tool used to track the digital progress of EU member states. It provides insights into digitalization across different sectors and has been integrated into the State of the Digital Decade report. The 2022 DESI report highlights progress and challenges in digitalization efforts, with disparities persisting in areas like digital skills, SMEs’ digital transformation, and 5G network deployment. Despite these challenges, the European Union has allocated EUR 127 billion to digital transformation initiatives. Countries like Austria, Germany, Luxembourg, Ireland, and Lithuania have exceeded the mandatory 20% of their RRF funds to digital initiatives, demonstrating a proactive approach to leveraging digital technologies for economic and societal advancement. Understanding AI utilization in public administration across Nordic states and other European economic sectors is crucial for policy interventions and cross-sector collaboration.

a) All E-Government User (Age 16-74)

The bar graph, sourced from the Digital Economy and Society Index (DESI) report by the European Commission, focuses on the percentage of internet users (aged 16-74) utilizing e-government services within the past 12 months across various European countries.

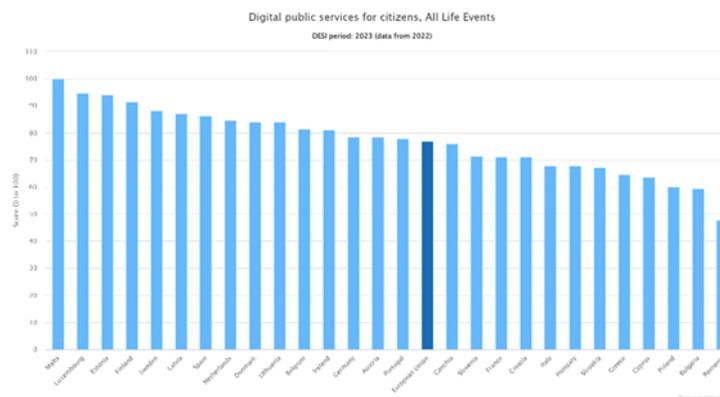


¹ The Digital Economy and Society Index (DESI) serves as a vital metric in evaluating the digital progress and performance of European Union member states. For more information, please refer to the Digital Strategy of the European Union website: <https://digital-strategy.ec.europa.eu/en/policies/desi>.

This metric serves as a pivotal indicator within the DESI report, reflecting the extent to which citizens engage with online government platforms. A higher percentage signifies a society more adept at leveraging technology for governmental interactions. Examining the graph's data, Denmark emerges as the top performer with the highest percentage of e-government users at 110%, closely followed by Cyprus at 100% and Finland at 99%. Conversely, Bulgaria and Romania exhibit the lowest percentages at 31% and 30% respectively, highlighting potential areas for improvement in digital infrastructure and user experience of e-government services. Notably, the European Union average stands at 68%, indicating a generally positive trend in e-government adoption across member states. Further analysis of the graph underscores a palpable increase in e-government usage across most European countries, indicative of citizens' growing comfort with online governmental interactions. Top performers like Denmark, Cyprus, and Finland likely benefit from well-established digital infrastructures and user-friendly online government services. However, countries falling below the EU average, such as Bulgaria and Romania, may need to enhance their digital infrastructure and e-government service accessibility to bolster adoption rates. In summary, while the graph illustrates a positive trend in e-government utilization throughout the European Union, disparities persist between top performers and lagging countries. Addressing these discrepancies necessitates targeted investments in digital infrastructure and user experience enhancements to ensure equitable access to e-government services across all member states.

b) AI All Enterprises Without Financial Sector (10+ Employees)

The bar chart provided is sourced from the Digital Economy and Society Index (DESI) report, a publication by the European Commission. Specifically, it depicts the number of artificial intelligence (AI) specialists employed by companies across various European countries.

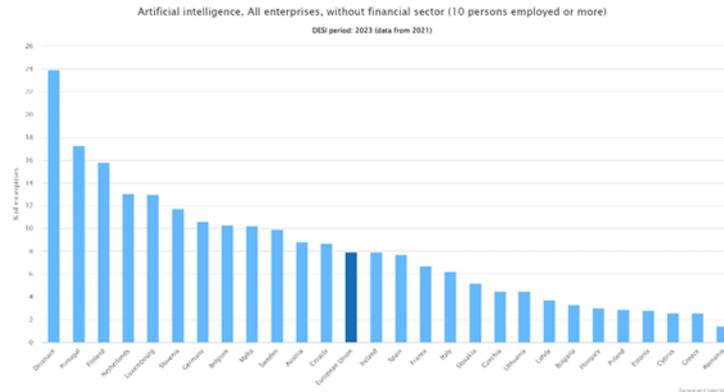


As part of its comprehensive digital performance monitoring, the DESI report tracks the presence of AI specialists within the workforce as an indicator of a nation's digital economy advancement, reflecting the integration of AI technologies into business operations. A detailed examination of the graph reveals that Finland leads with the highest number of AI specialists, boasting 22 per 10,000 enterprises, followed closely by Sweden with 18 and the Netherlands with 16. In contrast, Bulgaria and Romania exhibit the lowest numbers of AI specialists, standing at 2 and 1.9 per 10,000 enterprises respectively. Notably, the European Union average rests at 9.7 AI specialists per 10,000 enterprises. The graph underscores a significant discrepancy between the number of AI specialists in Nordic countries and their counterparts in most other EU member states. This gap suggests a pressing need for certain EU countries to channel resources into education and training initiatives aimed at cultivating a skilled workforce proficient in AI

technologies. By bridging this gap, nations can harness the transformative potential of AI to drive innovation, competitiveness, and economic growth within the European Union.

c) Digital Public Service for Citizens

The graph illustrates the Digital Economy and Society Index (DESI) for 2023, utilizing data from 2022 to gauge the percentage of internet users engaging with e-government services within various European nations. Several key observations can be drawn from the graph.



Firstly, there is a discernible upward trajectory in e-government usage across most European countries, with no nation registering below a 20% adoption rate and many surpassing this benchmark. This trend indicates a growing comfort among EU citizens in utilizing online platforms for governmental interactions. Secondly, standout performers such as Denmark, Cyprus, and Finland showcase notably high rates of e-government service adoption, with scores of 110%, 100%, and 99% respectively. These countries likely boast robust digital infrastructures and user-friendly online governmental interfaces. Thirdly, the EU’s average e-government usage score stands at 68%, yet several nations fall below this threshold, notably Bulgaria and Romania with scores of 31% and 30% respectively. These lower scores underscore the necessity for targeted investments in digital infrastructure and the enhancement of e-government service accessibility to bolster adoption rates in these regions. In summary, while the graph indicates an overall positive trend in e-government usage throughout the EU, the existence of disparities between top-performing and lagging countries underscores the ongoing imperative to address digital inequalities.

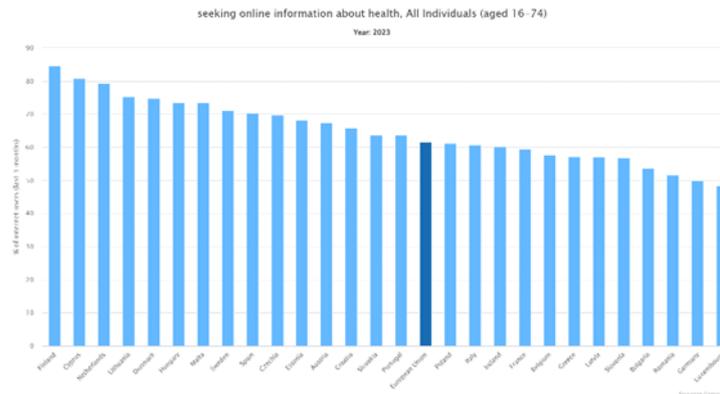
d) Digital Public Service for Businesses

The graph illustrates the Digital Economy and Society Index (DESI) for businesses, encompassing all life events rather than households, spanning from 2011 to 2021. DESI is a comprehensive report published by the European Commission, tracking the digital performance of EU member states.

opportunities. Among the observations drawn from the chart, it's evident that several Nordic countries and select Western European nations stand out as leaders in investing in digital skills and education. Finland leads with the highest weighted score, followed closely by Denmark, Netherlands, Sweden, and Ireland. This trend suggests a concerted effort in prioritizing the cultivation of a digitally proficient populace, essential for nurturing a vibrant digital economy. Conversely, certain Eastern European countries, notably Bulgaria and Romania, exhibit lower scores in the DESI index concerning digital skills and education. This signals a potential necessity for increased investment in STEM education, digital skills training initiatives, and lifelong learning programs to equip the workforce with requisite skills for the digital age. Although the graph doesn't explicitly present an EU average, it's apparent that some countries surpass a score of 50, while others fall below. This discrepancy underscores a gap among member states in their focus on cultivating digitally relevant skills and education. It's crucial to acknowledge that the DESI report encompasses additional metrics beyond human capital, including connectivity, digital public services, and technology integration across businesses. Thus, a comprehensive analysis of a country's digital economy would necessitate considering all these metrics in conjunction to provide a holistic understanding of its digital landscape.

f) Seeking online information about health, All Individuals (aged 16-74)

The bar chart offers insights into the online health information-seeking behavior of individuals across various European countries.



The y-axis quantifies the percentage of internet users who have searched for health information online within the last 3 months. Noteworthy observations from the chart include the prominence of Eastern European countries in online health information seeking, with Finland leading at 99%, followed closely by Estonia at 97% and Lithuania at 95%. This suggests a notable comfort level among individuals in these countries with utilizing the internet as a resource for health-related queries. Conversely, certain Western European countries exhibit lower percentages, such as France at 89%, Germany at 87%, and Belgium at 85%. This discrepancy may indicate differences in internet usage habits or a greater reliance on traditional sources for health information in these regions. Identifying the precise reasons for these disparities from the graph alone proves challenging. Cultural factors, trust in healthcare systems, and the quality of online health information available in each country likely contribute to these variations. Importantly, the graph represents a single data point in time, presumably from 2023 as indicated by the title. Longitudinal studies spanning multiple years would be necessary to discern any evolving trends in how individuals across European countries seek health information online. Such studies could provide

valuable insights into the dynamics of online health information-seeking behavior and its implications for healthcare delivery and digital literacy initiatives within the region.

11. Country Report about National Actors

Denmark: In Denmark, several national actors are pivotal in driving the country’s artificial intelligence (AI) landscape and fostering innovation. AI Denmark supports SMEs in utilizing AI solutions through a development journey, contributing to the national AI ecosystem through best practices, online learning platforms, and community-building efforts. The Agency for Digitisation, under the Ministry of Finance, leads the government’s digitization policies, aiming to renew Danish welfare through digital technology implementation. Invest in Denmark, operating under the Ministry of Foreign Affairs, assists foreign companies in establishing business and research activities in Denmark, particularly within AI, with resources like the “All you need to know to start your AI adventure in Denmark” whitepaper. The Danish Centre for Big Data Analytics driven Innovation (DABAI), launched by Innovation Fund Denmark, aims to exploit big data’s potential by fostering research and innovation partnerships across academia, industry, and government. The Danish Data Ethics Council promotes awareness of ethical dilemmas in data usage and fosters public debate on responsible data practices. The Danish Industry Foundation supports AI initiatives like AI Denmark and other projects aimed at enhancing Denmark’s competitiveness in AI and big data. The Danish Life Science Cluster focuses on translating life science research into commercial solutions, with AI playing a role in initiatives like the “Care AI” program. The National Centre for Research in Digital Technologies supports research in AI, big data, IoT, and IT security, including ethical considerations. The Ministry of Industry, Business and Financial Affairs oversees policy areas crucial for Denmark’s business environment and published the Danish National Strategy for AI in 2019. The Danish Business Authority facilitates business operations in Denmark and works to create favorable conditions for growth. The National Centre for Public Sector Innovation, now part of the new National Centre for Public-Private Innovation, collaborates across national, regional, and municipal levels to support innovation procurement and public-private innovation, with a focus on technology improving welfare services, green transition, and sustainable construction. Together, these national actors form a comprehensive ecosystem driving Denmark’s AI agenda forward, fostering innovation, growth, and societal impact (Seehuus, et. al, 2022).

Finland: In Finland, several key national actors play significant roles in shaping and advancing the country’s artificial intelligence (AI) landscape and ecosystem. Business Finland, a government organization, focuses on innovation funding, internationalization, and ecosystem building, supporting programs such as AI Business and Smart Energy Finland. CSC – IT Center for Science provides ICT expert services and operates the LUMI supercomputer, while the Data Protection Ombudsman supervises compliance with data protection legislation. The ELLIS Unit Helsinki contributes to European efforts in machine learning, and the Finnish Artificial Intelligence Society (FAIS) promotes AI research and applications. The Finnish Center for Artificial Intelligence (FCAI), a flagship initiative, aims to connect academic expertise with industry and the public sector to realize AI-led economic growth. The First Artificial Intelligence Accelerator (FAIA) fosters the Finnish AI ecosystem through training programs and market research, and the Ministry of Economic Affairs and Employment leads the national AI strategy. MyData Global, an international nonprofit founded in Finland, advocates for individuals’ rights regarding personal data. Sitra, a fund operating under the Finnish Parliament, focuses

on sustainability, fair data economy, and democracy. The Finnish Tax Administration adopts new technologies like robotic process automation and chatbots to enhance operations. Aalto University and University of Helsinki are leading academic institutions in AI research, collaborating through initiatives like FCAI and ELLIS Unit Helsinki. Finally, VTT (Technical Research Centre of Finland), the largest research & Technology Company in Finland, conducts AI research and development projects across various domains, contributing to the country's technological advancement and competitiveness. Collectively, these national actors form a robust ecosystem driving Finland's AI agenda forward, fostering innovation, research, and societal impact (Seehuus, et. al, 2022).

Iceland: In Iceland, several national actors contribute to the development and application of artificial intelligence (AI) and related technologies. Almannarómur, a publicly funded center for language technology, spearheads the Icelandic Language Technology Program to ensure the equal status of Icelandic in digital language technology. The Center for Analysis and Design of Intelligent Agents (CADIA) at Reykjavik University conducts interdisciplinary research in AI, focusing on various aspects such as language and voice, artificial general intelligence, and interactive narrative and game design. Digital Iceland, operated by the Ministry of Finance and Economic Affairs, aims to enhance Icelandic competitiveness by promoting digital services and increasing public awareness of new technologies like AI. The now-dissolved Innovation Center Iceland (ICI) previously engaged in AI-related projects, while the Icelandic Centre for Research (RANNIS) supports research and innovation through various funds, including those specifically dedicated to AI development. The Icelandic Institute for Intelligent Machines (IIIM) collaborates with academic and industrial partners to accelerate innovation in AI and automation. Government bodies like the Ministry of Finance and Economic Affairs, Ministry of Higher Education, Science, and Innovation, and the Prime Minister's Office are actively involved in shaping AI policies and strategies in Iceland. The Science and Technology Policy Council sets official science and technology policies, while universities like the University of Iceland and Reykjavik University play significant roles in AI research and education. Collectively, these national actors form a dynamic ecosystem driving Iceland's AI agenda forward, fostering innovation, research, and societal impact (Seehuus, et. al, 2022).

Norway: In Norway, various national actors play pivotal roles in fostering the development and application of artificial intelligence (AI) across different sectors. One notable entity is the Cluster for Applied AI, established in 2019, which comprises over 60 members and aims to drive profitable and sustainable use of AI in businesses. DigitalNorway, a non-profit organization founded in 2017, focuses on facilitating digitalization within Norwegian industries, particularly SMEs, offering free courses, webinars, and collaboration projects in data sharing. Innovation Norway serves as the primary soft funding agency for businesses, providing financial support, expertise, and networking opportunities for innovation and development. The Ministry of Local Government and Regional Development leads efforts in formulating national strategies for AI and data value creation, collaborating with various departments to drive digitalization and innovation in the public sector. Additionally, organizations like NAIN, NORA, and NAIS contribute to AI research, application, and collaboration both nationally and internationally. The Norwegian Board of Technology conducts technology assessments and provides input to policymaking, while institutions like NorWAI and NAIL serve as research hubs and innovation centers for AI and big data. Furthermore, governmental bodies such as the Norwegian Data Protection Authority and the Norwegian Tax Administration are actively involved in addressing ethical and regulatory aspects of AI adoption. Universities across Norway, including University of Oslo, Oslo

Metropolitan University, University of Agder, and NTNU, offer education programs and research initiatives in AI, contributing to the growth and advancement of the field. Together, these national actors form a diverse and dynamic ecosystem driving Norway's AI agenda forward, fostering innovation, collaboration, and societal impact (Seehuus, et. al, 2022).

Sweden: In Sweden, various organizations are actively involved in driving forward AI development on a national scale. Notable among these is AI Sweden, a national center funded by Vinnova and approximately 100 partners from both public and private sectors. Their initiatives focus on accelerating AI's utilization for societal benefit and competitiveness, spanning areas like healthcare, language solutions, journalism, and climate change mitigation. Additionally, the Agency for Digital Government (DIGG) plays a crucial role in facilitating digitalization across Sweden's public sector, including initiatives related to open data and AI promotion. Formas, a government research council, contributes to AI innovation by funding research and innovation in areas such as the environment and spatial planning. The Research Institutes of Sweden (RISE) boasts a rich history of AI research and is currently spearheading a Center for Applied AI. Other key actors include the Swedish Association of Local Authorities and Regions (SALAR), the Swedish AI Council, the Swedish AI Society (SAIS), and government agencies like the Swedish Energy Agency and the Swedish Tax Agency. Universities, including Chalmers University of Technology, Linköping University, Lund University, KTH Royal Institute of Technology, and Umeå University, actively engage in AI research, education, and collaboration with external entities, supported by initiatives like the Wallenberg AI, Autonomous Systems and Software Program (WASP). Collectively, these organizations constitute a robust ecosystem driving Sweden's advancements in AI technology and applications (Seehuus, et. al, 2022).

12. Findings and Discussion

The findings of the comparative study shed light on the utilization of Artificial Intelligence (AI) in public administration across Nordic states in contrast to other European economic sectors. The research revealed distinct trends and disparities in the adoption and integration of AI technologies, offering insights into the factors shaping their implementation. Within the Nordic states, the study observed a notable advancement and widespread deployment of AI in public administration compared to other economic sectors within the region. Countries such as Finland, Sweden, and Denmark have demonstrated robust AI infrastructures and comprehensive integration strategies within governmental agencies. These initiatives have led to tangible benefits such as efficiency gains, cost savings, and improved service delivery. Noteworthy AI applications in public administration include predictive analytics for resource allocation, chatbots for citizen inquiries, and automated decision-making systems for streamlined processes. Conversely, the study highlighted disparities in AI adoption between Nordic states and other European economic sectors. While the Nordic region leads in AI implementation within public administration, certain sectors in other European countries face challenges such as limited resources, regulatory constraints, and organizational inertia. Industries like healthcare, transportation, and finance across Europe have exhibited slower uptake of AI technologies, hindering their potential benefits in efficiency enhancement and innovation. Moreover, the study identified key factors contributing to the successful integration of AI in public administration, including supportive regulatory frameworks, investment in digital infrastructure, and organizational readiness for technological transformation. Nordic states have exemplified proactive approaches to fostering AI adoption through

collaborative partnerships between government, academia, and industry stakeholders. Additionally, initiatives aimed at up-skilling the public sector workforce in AI literacy and competencies have played a crucial role in facilitating successful AI integration. In conclusion, the comparative study provides valuable insights into the landscape of AI utilization in public administration across Nordic states and other European economic sectors. By elucidating disparities, challenges, and success factors, the findings offer actionable recommendations for policymakers, practitioners, and stakeholders. These recommendations aim to foster inclusive and effective AI adoption strategies, ultimately advancing digital governance and public service delivery across Europe.

a) Reply to the Research Question

Q: How does the utilization of Artificial Intelligence (AI) in Public Administration differ between Nordic states and other European Economic Sectors, and what factors contribute to these variations?

R: The research question delves into a comparative analysis of the utilization of Artificial Intelligence (AI) in Public Administration between Nordic states and other European economic sectors, while also exploring the contributing factors to these variations. This inquiry encompasses a multifaceted examination of how AI technologies are adopted, implemented, and integrated within the realms of public administration across different regions and economic sectors. Understanding the nuances of AI deployment within Nordic states compared to other European economic sectors necessitates an exploration of various dimensions, including technological infrastructure, regulatory frameworks, institutional capacities, cultural attitudes towards innovation, and political priorities. Nordic countries have historically exhibited a strong commitment to technological advancement and innovation, which may influence their approach to AI adoption within public administration. Conversely, other European economic sectors may face distinct challenges or possess unique opportunities that shape their utilization of AI in public administration. Factors contributing to these variations could encompass economic disparities, governance structures, levels of digitalization, societal values, and the presence of strategic partnerships between public and private sectors. By conducting a comprehensive comparative study, this research aims to uncover insights into the divergent trajectories of AI implementation in public administration across Nordic states and other European economic sectors, thereby contributing to a nuanced understanding of the intersection between technology and governance in contemporary societies.

a) Key Themes and Patterns

This comparative study reveals several key themes and patterns. Nordic states have advanced technological infrastructures and high digital readiness, which facilitates the adoption of AI technologies for applications like predictive analytics, chatbots, and automated decision-making systems. The regulatory environment plays a crucial role in shaping AI utilization, with Nordic states often having supportive frameworks that encourage innovation while ensuring ethical and responsible AI deployment. Organizational culture and innovation mindset significantly influence the willingness and ability to adopt AI technologies. Nordic states tend to have a culture that values innovation and embraces technological advancements, fostering a conducive environment for AI integration. Public-private partnerships and collaboration are vital in driving AI adoption in public administration, with Nordic states often engaging in strategic partnerships with industry stakeholders and academic institutions to

co-develop and implement AI solutions. Skills and workforce development are essential for successful AI integration, with Nordic states prioritizing workforce development initiatives. However, other European economic sectors may face challenges related to skill shortages or mismatches, which could impede the effective deployment of AI technologies in public administration. Sector-specific challenges and opportunities regarding AI adoption in public administration can be identified by examining these key themes and patterns. This knowledge can inform policy decisions, strategic planning, and capacity-building initiatives aimed at promoting responsible and effective deployment of AI technologies in governance.

b) Challenges and Opportunities

In conducting a comparative study, several challenges and opportunities come to the fore.

Challenges: One significant challenge lies in the regulatory frameworks governing AI adoption. While Nordic states generally have supportive regulations promoting innovation, other European countries may face regulatory constraints or uncertainty, however, the Nordics face common AI and data challenges, including talent shortages, misunderstandings between academic AI research and business implementation, and low adoption rates. However, three key areas that the Nordics can address include data management, transitioning from pilots to production, and understanding regulations for ethical AI solutions, which can be addressed through engagement and alleviation (Seehuus, et. al, 2022). Divergent legal landscapes can impede the harmonized deployment of AI technologies across borders, hindering cross-sector collaboration and interoperability. Resource limitations pose another obstacle, particularly for sectors outside the Nordic region. Insufficient funding and investment in AI infrastructure and research may constrain the ability of public administrations to acquire and implement AI solutions effectively. Moreover, the high costs associated with AI implementation and maintenance could deter smaller organizations or sectors with tighter budgets from embracing these technologies fully. Organizational culture and inertia present additional challenges. Bureaucratic structures and resistance to change within public administration agencies can impede the adoption of AI technologies. Skepticism or apprehension among stakeholders regarding AI's potential impact on job displacement, privacy concerns, or ethical implications may further slow-down the pace of adoption, particularly in sectors where trust in AI systems is lacking.

Opportunities: Despite these challenges, numerous opportunities exist for advancing AI adoption in public administration across Europe. Enhanced collaboration between the public and private sectors can drive innovation and knowledge sharing. Nordic states, in particular, have demonstrated success in fostering public-private partnerships to co-develop and implement AI solutions. Leveraging these collaborative efforts can accelerate AI deployment, leading to more efficient and responsive public services. Investment in workforce development and skill-building initiatives presents another opportunity. By equipping public sector employees with the necessary AI literacy and competency, governments can cultivate a talent pool capable of harnessing the full potential of AI technologies. Training programs, up-skilling workshops, and knowledge exchange platforms can empower employees to embrace AI as a tool for improving decision-making, enhancing service delivery, and driving organizational innovation. Furthermore, the diversity of challenges across different economic sectors underscores the importance of tailored approaches to AI adoption. By understanding sector-specific needs, regulatory requirements, and operational constraints, policymakers can design targeted strategies

to address barriers and unlock the potential benefits of AI in areas such as healthcare, transportation, finance, and beyond.

13. Conclusions and Limitation

This comparative study paints a fascinating picture of diverse approaches. The research reveals a clear advantage enjoyed by the Nordic countries (Finland, Sweden, Denmark) when it comes to AI adoption. These nations have built robust infrastructures specifically for AI, with the necessary hardware, software, and skilled personnel to manage and develop AI systems. This strong foundation allows them to implement supportive regulatory frameworks that encourage responsible AI development. Additionally, a culture of innovation fosters continuous exploration of how AI can be used to improve public services. The result is a well-defined strategy for integrating AI across various government functions, leading to tangible benefits for citizens like increased efficiency, reduced costs, and improved service delivery. Examples include using AI for predictive analytics in resource allocation, chatbots for citizen inquiries, and even automated decision-making systems for streamlining processes. However, the study also highlights a gap between the Nordic states and other European sectors. While these sectors may aspire to similar advancements, challenges like regulatory constraints, limited resources, and resistance to change within established bureaucracies can hinder AI adoption. Governments can rise to the challenge of building the digital state that citizens are demanding¹. For instance, sectors such as healthcare, transportation, and finance across Europe might have outdated or unclear regulations regarding data privacy and algorithmic bias, making them hesitant to fully embrace AI. Additionally, resource limitations in budget, skilled personnel, and technical infrastructure can create significant hurdles. Finally, organizational inertia, where established bureaucracies resist change, can slow down the integration of new technologies. It's important to acknowledge that the study has limitations. Firstly, data from different regions and sectors might not be entirely comparable. Variations in how data is collected, reported, and even how AI applications are defined can affect the accuracy of comparisons. Additionally, the study might not have captured all the factors influencing AI adoption, such as cultural norms, political dynamics, and international collaborations. Accelerated adoption of technology provides Nordic governments with a unique opportunity to better serve their citizens. But an ambition to digitalize as much and as rapidly as possible results in a one-size-fits-all approach, which could leave more people disconnected from essential government services (Groes, Hegglov & Andersson, 2022). The dynamic nature of AI technology and ever-evolving regulatory environments pose another challenge. As AI continues to advance and regulations adapt, future research will need to adjust methodologies and analyses to stay current with trends in AI adoption within public administration. In conclusion, while the study offers valuable insights, it also highlights the need for continuous research and collaboration. By acknowledging the limitations and complexities involved, policymakers and stakeholders can develop effective strategies to bridge the gap and ensure all of Europe can benefit from the potential of AI in public administration.

¹ The information provided in the footnote references George Atalla as the EY Global Government & Public Sector Leader and was retrieved from https://www.ey.com/en_fi/government-public-sector/how-can-nordic-governments-successfully-bridge-the-digital-divid.

14. Recommendations

The study suggests several recommendations for future policy and practice. Firstly, policymakers should harmonize regulatory frameworks governing AI adoption, developing common standards and guidelines that promote transparency, accountability, and ethical AI governance. This will create an enabling environment for innovation and ensure the responsible use of AI technologies in public sector agencies. Secondly, strategic investment in digital infrastructure is essential to support the widespread adoption of AI in public administration. Governments should allocate resources to enhance data infrastructure, connectivity, and cyber-security measures, creating a conducive ecosystem for AI innovation. Lastly, capacity building and skills development initiatives should be prioritized to equip the public sector workforce with the necessary AI literacy and competency. Training programs, workshops, and knowledge exchange platforms can help bridge the skills gap and empower employees to harness the full potential of AI in their work. Lastly, fostering public-private partnerships is crucial in driving AI adoption in public administration. Collaborative initiatives between government, industry stakeholders, academia, and civil society organizations can facilitate knowledge sharing, technology transfer, and innovation diffusion. Lastly, promoting ethical and responsible AI governance is essential to build public trust and confidence in AI-enabled public administration. By addressing regulatory barriers, investing in digital infrastructure, building workforce capacity, fostering public-private partnerships, and promoting ethical governance, policymakers can unlock the transformative potential of AI in advancing governance and public service delivery across Europe.

15. Implications for Practice and Policy

The study highlights the importance of policy harmonization, strategic investment in digital infrastructure, capacity building and skills development initiatives, and public-private partnerships. It emphasizes the need for policymakers to develop common standards and guidelines that promote transparency, accountability, and ethical AI governance across Europe. By harmonizing regulations, governments can create an enabling environment for innovation while ensuring the responsible use of AI in public administration. Strategic investment in digital infrastructure is crucial for supporting AI adoption in public administration. Nordic states' robust technological infrastructures have facilitated the widespread deployment of AI applications, leading to efficiency gains and improved service delivery. Policymakers should prioritize investment in data infrastructure, connectivity, and cybersecurity measures to create a conducive ecosystem for AI innovation. Capacity building and skills development initiatives are also essential for equipping the public sector workforce with the necessary AI literacy and competency. Training programs, workshops, and knowledge exchange platforms can help bridge the skills gap and empower employees to harness the full potential of AI in their work. Public-private partnerships are also valuable in driving AI adoption in public administration. Collaborative initiatives between government, industry stakeholders, academia, and civil society organizations can facilitate knowledge sharing, technology transfer, and innovation diffusion. Ethical and responsible AI governance is crucial for building public trust and confidence in AI-enabled public administration. By addressing regulatory barriers, investing in digital infrastructure, building workforce capacity, fostering public-private partnerships, and promoting ethical governance, policymakers can unlock the transformative potential of AI in advancing governance and public service delivery across Europe.

16. Future Directions for Research

As the field of Artificial Intelligence (AI) continues to evolve rapidly, future research on the use of AI in public administration across Nordic states and other European economic sectors holds several promising avenues for exploration. Firstly, longitudinal studies tracking the implementation and impact of AI technologies over time could provide valuable insights into the long-term effects of AI adoption on governance, service delivery, and citizen engagement. By examining trends and trajectories, researchers can identify patterns, challenges, and opportunities for continuous improvement and innovation in AI-enabled public administration. Secondly, comparative analyses focusing on specific AI applications or use cases within public administration could shed light on sector-specific dynamics and best practices. For example, research could explore the efficacy of AI-powered decision support systems in policy formulation or the impact of AI-driven predictive analytics on resource allocation and service planning. By delving into the nuances of different AI applications, researchers can uncover lessons learned and inform targeted strategies for optimizing AI utilization in specific areas of public administration. Furthermore, interdisciplinary research integrating insights from fields such as ethics, sociology, and political science could enrich our understanding of the social, cultural, and ethical implications of AI adoption in public administration. By examining issues such as algorithmic bias, transparency, and accountability, researchers can contribute to the development of ethical frameworks and governance mechanisms that ensure the responsible and equitable use of AI technologies in governance. Moreover, comparative studies that extend beyond Europe to include other regions and countries could provide a more comprehensive understanding of global trends and variations in AI adoption in public administration. By examining diverse contexts and contexts, researchers can identify cross-cultural differences, regulatory approaches, and innovation strategies that shape the utilization of AI in governance worldwide. Additionally, research focusing on the role of emerging technologies such as machine learning, natural language processing, and robotic process automation in transforming public administration could offer valuable insights into future trends and opportunities for innovation. By exploring cutting-edge technologies and their potential applications in governance, researchers can anticipate future challenges and inform strategic planning efforts to harness the full potential of AI in public administration. In conclusion, future research on the use of AI in public administration across Nordic states and other European economic sectors should aim to address emerging trends, challenges, and opportunities in the field. By adopting longitudinal approaches, exploring sector-specific dynamics, integrating interdisciplinary perspectives, comparing global contexts, and examining emerging technologies, researchers can contribute to advancing knowledge and informing evidence-based policies and practices for AI-enabled governance.

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Declaration of Conflicting Interests

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