

EMBRACING ARTIFICIAL INTELLIGENCE CHALLENGES FOR PUBLIC SECTOR ORGANIZATIONS IN PAKISTAN

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Abstract

Public sector organizations are adopting Artificial Intelligence to gain efficiency, improve service quality and enhance policy-making capabilities. However, the growth of technology adoption in Pakistan's public sector organisations is slow because of several challenges the country faces. This paper focuses on the challenges that Pakistan's public sector organisations face in implementing AI and aims to highlight the initiatives in light of "Vision 2025," and "Digital Pakistan Policy 2018." In a nutshell, technological challenges like cost, budgets, technology adoption, research and development, cost-benefit analysis, collaborations, bureaucratic structures, and ICT readiness are the issues that are faced by public sector organisations. Policy-making in digitalisation and overcoming the adoption challenge is a big challenge for public sector organizations. This paper has identified some of the challenges in public sector organisations where further research and policy-making can help overcome challenges for public offices in the future.

Keywords: *Artificial Intelligence, Adoption Challenges, Public Sector Organizations, Pakistan.*

Introduction

Artificial Intelligence (AI) in public sector organisations has caught much attention worldwide in the last two decades because of its potential uses and information dissemination capabilities.¹

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¹ Wesley G. Sousa et al., "How and Where is Artificial Intelligence in the Public Sector Going? A Literature Review and Research Agenda," *Government Information Quarterly* 36, no. 4 (2019): 101392, <https://doi.org/10.1016/j.giq.2019.07.004>.

Advancement in the field of Artificial Intelligence (AI) has sparked a debate in literature, and policy-makers over the probable benefits of digital technology adoption in the public sector.² As the public sector organisations in a country are primary enablers and users of Information Technology (IT), there is an increased chance that Artificial Intelligence (AI) adoption will benefit public-private coordination and transparency in its services. The use of AI in the public sector is often driven by the goal of improving public services, enhancing efficiency, and addressing societal challenges. Government organizations have access to large amounts of public data, such as government records, public surveys, and demographic information. They may use AI to analyze this data for policy-making, resource allocation, and public service delivery, which can benefit private organizations in terms of service delivery in light of policies made by public sector organisations. As public sector organisations work with an aim of provision of essential services to the people, collaborate, allocate resources and devise policies. In comparison there is profit making in private sector. Public service delivery challenges are unique as compared to private organisations and need special consideration to overcome barriers. Because of the immense uses of technological services like Artificial Intelligence, cloud storage, Cyber security, and machine learning, there is a potential for digital technology adoption in the public sector organizations that can help in the transformation and development of government services.³

The likely advantages of AI in the government sector include; improved productivity and performance, identification of issues, economic incentives, information gathering, service benefits, overall societal benefits, decision-making, public engagement and interaction with the system, and sustainable development.⁴ Keeping in view the potential benefits like transparency, value, and accountability, the responses from public institutions have been welcomed around the world regarding the implementation of AI-enabled initiatives in their workplaces.⁵

² Bernd W. Wirtz, Jan C. Weyerer, and Carolin Geyer, "Artificial Intelligence in Theand the Public Sector—Applications and Challenges," *International Journal of Public Administration* 42, no. 4 (2019): 101-3927 (2018): 596-615, <http://doi.org/10.1080/01900692.2018.1498103>.

³ OECD, *The OECD Digital Government Policy Framework: Six Dimensions of a Digital Government*, (Paris: OECD, 2020), <https://doi.org/10.1787/f64fed2a-en>.

⁴ Anneke Zuiderwijk, Yu-Che Chen, and Fadi Salem, "Implications of the Use of Artificial Intelligence in Public Governance: A Systematic Literature Review and A Research Agenda," *Government Information Quarterly* 38, no. 3 (2021), <http://doi.org/10.1016/j.giq.2021.101577>.

⁵ Carlos E. Jimenez-Gomez, Jesus Cano-Carrillo, and Francisco Falcone Lanas, "Artificial Intelligence in Government," *Computer* 53, no. 10 (2020): 23–27.

It is because of the various uses of AI in the public sector organizations, many countries have developed and adopted the policies on a larger scale. The European Union (EU) "Digital Europe Programme," is one initiative where the EU has planned a budget of €8.2 billion between 2021 and 2027.⁶ Other countries followed in their footsteps and allocated a considerable amount of funds for the development and up-gradation of their technological services. Globally, it is estimated that the spending on AI services will be around \$98 billion in 2023, and around 24 percent of the global GDP will be generated by AI services, which makes it a potential market for the industry.⁷

Despite its numerous benefits, developing countries and their respective public sector organizations are lagging in technology adoption. McKinsey and company reported that the barriers to technology adoption by the government include lack of technological talent, low funding for technological research and development and unclear regulation of technology adoption in these countries.⁸ Other factors also include cloud security issues, support of executive management, and cloud complexity that hinder in the way of technology adoption.⁹ World Economic Forum (WEF) identified five challenges that are hindering the way of Artificial Intelligence adoption in the public sector organizations including; the efficient use of AI generated data, lack of AI adoption skills, low AI landscape in public sector organizations, legacy culture and policies of procurement mechanism.¹⁰ As a developing country, Pakistan has many challenges that government organisations face while transforming to digital services like Artificial Intelligence. Although Pakistan has started adopting Artificial Intelligence and digital technologies in key departments, the overall adoption of technology process is however slow. This paper focuses on the adoption challenges that Pakistan is facing in

⁶ European Commission, *White Paper on Artificial Intelligence: A European Approach to Excellence and Trust*, (Brussels: European Commission, 2020), <https://commission.europa.eu/publications/>

⁷ World Economic Forum, *The Future of Jobs Report 2018*, (Geneva: World Economic Forum, 2018), <https://www3.weforum.org/docs/>

⁸ Niklas Berglind, Ankit Fadia, and Tom Isherwood, "The Potential Value of AI-- and How Governments could Look to Capture it," McKinsey & Company, 2022, <https://www.mckinsey.com/industries/>

⁹ Ali Al Hadwer et al., "A Systematic Review of Organizational Factors Impacting Cloud-based Technology Adoption Using Technology-Organization-Environment Framework," *Internet of Things* 15 (2021): 100407.

¹⁰ Julián T. Santeli and Sabine Gerdon, "5 Challenges for Government Adoption of AI," World Economic Forum, 2019, <https://www.weforum.org/agenda/2019/08/artificial-intelligence-government-public-sector/>. (Accessed April 5, 2023).

implementing digitalized services like Artificial Intelligence in public sector organisations and aims to highlight these challenges in light of "Vision 2025" and "Digital Pakistan Policy 2018."¹¹ The study is aimed at addressing the question, "What are the AI adoption challenges for public sector organisations in Pakistan?" The study is qualitative in nature and results are drawn based on literature collected from secondary sources using PRISMA techniques.¹² The study has adopted Institutional Theory to understand the phenomenon and provide policy implications for development and understanding of the AI adoption challenges.

The first section of the paper provides a background of AI technologies from a global perspective, and highlights some challenges. The second section discusses the "Artificial Intelligence," technologies in practise in the public sector organisations of Pakistan. The third section discusses the AI adaption challenges in light of secondary data collected from various sources. The last section focuses on the challenges in detail before concluding AI adaptation challenges in Pakistan.

Artificial Intelligence: Global Perspective

The use of Artificial Intelligence has gained popularity in the public sector organizations, economy, and society giving way to new opportunities, and broadening the scope of existing workplaces.¹³ Artificial Intelligence for public sector organizations is aimed at designing a system that accesses the environment and designs solutions accordingly to attain specific goals with autonomy."¹⁴ The tasks are assigned to the system according to the needs of the organization which it interprets to provide several possibilities to take action.¹⁵ Artificial Intelligence usage in government organizations comprises of, but is not limited to, planning,

¹¹ Sadia Jamil, "From Digital Divide to Digital Inclusion: Challenges for Wide-Ranging Digitalization in Pakistan," *Telecommunications Policy* 45, no. 8 (2021): 102206.

¹² Dinah V. Parums, "Editorial: Review Articles, Systematic Reviews, Meta-Analysis, and the Updated Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 Guidelines," *Medical Science Monitor* 27 (2021)

¹³ Matthew Boyd and Nick Wilson, "Rapid developments in Artificial Intelligence: how might the New Zealand government respond?" *Policy Quarterly* 13, no. 4 (2017)

¹⁴ European Commission, *Communication Artificial Intelligence for Europe: Shaping Europe's Digital Future* (Online: European Commission, April 25, 2018), <https://digital-strategy.ec.europa.eu/en/library/communication-artificial-intelligence-europe>.

¹⁵ Kristinn Thórisson et al., "Why Artificial Intelligence Needs a Task Theory and What It Might Look Like," (In International Conference on Artificial General Intelligence, vol. 9782, 2016), 118–28.

research and development, analytical skills, optimisation functions, optimization, cyber activities, the Internet of Things (IoT), robotics and, image recognizing, virtual assistance, and self-directed technologies.¹⁶ Public sector organizations have gained interest in Artificial Intelligence usage in administrative and support services to improve efficiency and organisational policy-making. As a result, the service quality of citizen to government administration, taxation, police, and health services has improved with Artificial Intelligence adoption.¹⁷

Despite numerous benefits of technology adoption, public sector organizations globally are facing Artificial Intelligence (AI) adoption challenges including weak regulations, low organizational readiness, compatibility issues and lack of resources.¹⁸ The biggest user of Artificial Intelligence, healthcare faced issues pertaining to learning curve, technology usability, health and safety, government regulations, user readiness because of high regulations. Specifically issues like patient readiness to get operated by machine instead of humans¹⁹ Other issues include data sharing problems, privacy and security concerns, low engagement of stakeholders, lack of harmony between anticipated and actual outcomes and organizational hierarchies.²⁰ The technical issues include data interpretation and trust on the results, bias of algorithms applied, and the misinterpretation of the outcomes of the data which posed challenges for the users of the data.²¹ Adversarial attacks have also emerged as a new threat to AI adoption where the enemy attacks through AI limit the potential use of AI in different fields including medical field, defense technologies and organizations using deep learning.²²

¹⁶ Petar Radanliev et al., "Artificial Intelligence in Cyber-Physical Systems," *AI & Society* 36, no. 3 (September 1, 2021): 783–96.

¹⁷ Sohail Raza Chohan and Zaeem Hassan Akhter, "Electronic Government Services Value Creation from Artificial Intelligence: AI-Based e-Government Services for Pakistan," *Electronic Government, an International Journal* 17, no. 3 (January 2021): 374–90.

¹⁸ Sulaiman Alsheibani, Yen Cheung, and Chris Messom, "Artificial Intelligence Adoption: AI-readiness at Firm-Level," In *PACIS 2018 Proceedings* 37, 2018, <https://aisel.aisnet.org/pacis2018/37>.

¹⁹ Rishi P. Singh et al., "Current Challenges and Barriers to Real-World Artificial Intelligence Adoption for the Healthcare System, Provider, and the Patient," *Translational Vision Science & Technology* 9, no. 2 (2020): 45.

²⁰ Averill Champion et al., "Overcoming the Challenges of Collaboratively Adopting Artificial Intelligence in the Public Sector," *Social Science Computer Review* 40, no. 2 (2020): 462-477.

²¹ Ricardo S. Peres et al., "Industrial Artificial Intelligence in Industry 4.0 - Systematic Review, Challenges and Outlook," *IEEE Access* 8 (2020): 220121-220139.

²² Shilin Qiu et al., "Review of Artificial Intelligence Adversarial Attack and Defense Technologies," *Applied Sciences* 9, no. 5 (2019),

Artificial Intelligence: Public Sector of Pakistan

The government of Pakistan has taken various steps to introduce digitalized technology in light of the global "Industrial Revolution 4.0." The planning commission of Pakistan issued "Vision 2025" for the country in 2013, where the emphasis was given to the development of digitalization in Pakistan named "The Knowledge Revolution."²³ The document contains a roadmap to public-private consortium in the Information Technology (IT) sector and enabled educational institutions to develop curriculums accordingly. Under Pillar III of the document, E-governance strategies have been planned by the government, which focuses on the up-gradation of the IT infrastructure and a close connection between the government and its citizens along with the establishment of "E-government," "E-health," "E-education," and "E-commerce."²⁴

Globally, Pakistan has an AI index of 40.22 compared to the US, which has an index of 85.72, India with 63.67, and China with 70.84 according to the "Government AI readiness index 2022."²⁵ It ranked 92nd in the world out of 181 and 13th in the region out of 16 countries. In research conducted on the responses, accessibility, mobile friendliness, and content accessibility on public organizations' websites in Pakistan, it was found that only 12 from the 50 web pages reported less than fifty percent of issues in accessibility and very poor conformance according to international standards in 2021.²⁶

Artificial Intelligence Institutional Adoption in Pakistan

In light of the digital revolution, different technological initiatives have been introduced into the system by public service organisations to enhance the digitalization capabilities. The year 2020 saw the establishment of the Special Technology Zones Authority (STZA) for the development of the IT sector of Pakistan, whose aim is to establish Special Technology Zones (STZs) in the country.²⁷ In light of Vision 2025, the

²³ Planning Commission Pakistan, *Pakistan Vision 2025*, (Islamabad: Ministry of Planning Development and Reforms, 2014), <https://www.pc.gov.pk/uploads/>

²⁴ Ibid.

²⁵ Oxford Insights, "Government AI Readiness Index 2022," Oxford Insights, 2023, <https://www.unido.org/sites/default/files/files/>

²⁶ Muhammad Bilal et al., "Evaluate Accessibility and Usability Issues of Particular China and Pakistan Government Websites," (In 2019 2nd International Conference on Artificial Intelligence and Big Data (ICAIBD), 2019), 316–22.

²⁷ Minister of E-Commerce, "List of Software Technology Parks," ETijarat Portal (blog), 2022, <https://etijarat.gov.pk/information/software-technology-parks/list-of-software-technology-parks/>.

government of Pakistan developed twenty-two software technology parks in the country in the year 2022 and a plan to increase them to 40 was underway by the year end.²⁸

Sino-Pak Center for Artificial Intelligence (SPCAI) was established in 2022 to provide solutions to the daily life challenges of the industry in the country.²⁹ The institute provides solutions in the field of intelligent biomedical applications, smart city urban planning, smart agriculture, applied neural interface, computer vision, robotics, deep learning, system designs, natural disaster management, and the Internet of Things (IoT) for different stakeholders.³⁰ Another institution established by the government is the National Center of Artificial Intelligence (NCAI) Secretariat, Pakistan which offers its services to local industry, the Higher Education Commission (HEC), along with other government departments in the field of AI, machine learning, deep learning, Image Recognition, and Automatic Speech Recognition (ASR) equipping them with the latest technology as a part of the Vision 2025.³¹ HEC has also approved thirty-eight universities in Pakistan to offer AI in their curriculum.³² HEC also established six national centers under the Public Sector Development Program (PSDP) 2018-19, that offer research in the field of AI under the names “National Centre for Cyber Security” (NCCS), “National Centre for Robotics and Automation” (NCRA), “National Centre for Artificial Intelligence” (NCAI), “National Centre for Cloud Computing and Big Data” (NCBC), “National Centre for GIS and Space applications” (NCGSA), and “National Centre for Livestock Breeding, Genetics and Genomics” (NCLBG&G).³³ The purpose of these facilities is to enhance capacity building of public and private institutions of the country through offering their consultancy in their respective fields.

Healthcare is another sector where Artificial Intelligence is adopted in some institutions of the country. Technological advancement in the field of Artificial Intelligence is crucial for the healthcare industry of Pakistan, which, if it does not develop, will not reap the benefits of

²⁸ The News, “IT Ministry to Set up 18 More Software Technology Parks,” *The News* (online), January 24, 2022, <https://www.thenews.com.pk/print/>.

²⁹ PAF IAST, “SPCAI: Sino-Pak Center for Artificial Intelligence,” PAF IAST (blog), 2021, <https://paf-iaست.edu.pk/spcai/>

³⁰ Ibid.

³¹ NCAI, “National Center of Artificial Intelligence- NCAI Sectt, Pakistan: Overview,” LinkedIn, 2021, <https://www.linkedin.com/company/ncai-pk/?originalSubdomain=pk>. (Accessed April 6, 2023)

³² Edu Rank, “Best Artificial Intelligence (AI) Universities in Pakistan,” August 11, 2021, <https://edurank.org/cs/ai/pk/>

³³ HEC, “Research for Innovation National Centers (NCs),” Higher Education Commission, 2019, <https://www.hec.gov.pk/english/research/>

technological breakthroughs.³⁴ The use of AI in medical services has been welcomed by practitioners because of its positive role despite a lack of practical knowledge of the technology which they are willing to adopt. The role of advanced AI in the medical profession, whether private or public, is a welcoming sign for countries like Pakistan that can benefit from the AI advancement and improve their services.

Another field where the public sector investment in AI in Pakistan is granted is the educational institutions especially higher education institutions and research facilities established under the umbrella of the Higher Education Commission (HEC), Pakistan. Educational institutions have started adopting AI to meet user needs but the constraints in implementing it fully of comprise budget, time, and technology-equipped staff.³⁵ Under the HEC funding policy related to Artificial Intelligence, different research facilities have been set up within different universities that are building advanced digital capabilities at institutional levels and offering expertise to the industry both in the government and private sectors.³⁶

The central bank and other economic organisations have been testing Artificial Intelligence in different economic and financial modelling tools, although the technology is not fully implemented. Artificial Intelligence has also been used in economic models forecasting in Pakistan to test conventional forecasting techniques with Artificial Neural Networks (ANN) models where the use of Artificial Intelligence predicted better results compared to traditional methods.³⁷ Other models that are used by AI networks include decision tree, Support Vector Machine, Bayesian Classifiers, K-means clustering, and Random Forest. These models have also been used on an experimental basis in different institutions of the country for research and scientific purposes. It has also generated reliable content for use by public and private institutions. For instance, the use of ANN modeling in rainfall predictions has also been tested in Pakistan and is found to be much more accurate than the mathematical conceptual methods already being used by the metrological

³⁴ Muhammad Imran Khan et al., "Status of Artificial Intelligence in Pakistan and Its Implications in Anesthesiology," *Anaesthesia, Pain & Intensive Care* 26, no. 1 (July 2, 2022): 110–14.

³⁵ Muhammad Y. Ali et al., "Artificial Intelligence Application in University Libraries Of Pakistan: SWOT Analysis and Implications," *Global Knowledge, Memory and Communication*, (2022)

³⁶ Ibid.

³⁷ Adnan Haider and Muhammad Nadeem Hanif, "Inflation Forecasting in Pakistan Using Artificial Neural Networks," *Pakistan Economic and Social Review* 47, no. 1 (2009): 123–38.

department.³⁸ The use of Artificial Intelligence is also found to be facilitating the human resource functions of government operated institutions in Pakistan.³⁹

In certain institutions, there is an urgent need for AI adaptation for improved services as Pakistan is behind the global standards in these places. The lack of using Artificial Intelligence in the legal system of Pakistan to help legal system reforms and speedy case processing is also found to be lagging behind the UK, Australia, and India due to which the process is time taking.⁴⁰ Other uses of AI are in the public sector organizations where the initiatives are still lagging include Smart electricity and water distribution networks, shelf management, crop-yield prediction, customer segmentation, stock market prediction, financial frauds prediction, crime prediction and cyber-attacks prediction. This is challenging because the majority of the AI projects are still in testing phases and their implementation on a large scale has not been attained by the public sector organizations so far. Digital technologies like Artificial Intelligence, cloud computing, cyber security and digital application platforms have also found its uses in the defense forces globally where warfare modelling has improved as a result of advanced decision-making capabilities of the machines including robots and machine learning models.

Theoretical Lens

The article has discussed the Artificial Intelligence (AI) challenges in light of the Institutional Theory. The institutional theory of organizations suggests that organisations get influenced by economic factors but also by social norms, values, and institutional pressures.⁴¹ One key concept in institutional theories is institutional isomorphism, which refers to the tendency of organizations to become similar to each other over time which is driven by the pressures organizations face to conform

³⁸ A. R. Ghumman et al., "Runoff Forecasting by Artificial Neural Network and Conventional Model," *Alexandria Engineering Journal* 50, no. 4 (December 1, 2011): 345–50.

³⁹ Syed Alamdar Ali Shah et al., "Information Technology Moderation in HR Functions of Public Sector Organisations in Pakistan," *International Journal of Technological Learning, Innovation, and Development* 13, no. 4 (January 2021): 370–87.

⁴⁰ Javairia Shafiq, Hafiz Muhammad Salman Shafiq, and Muhammad Shabbir Sarwar, "Use of ICTs and Artificial Intelligence to Overcome Judicial Trial Delays in Pakistani Courts," *Pakistan Languages and Humanities Review* 6, no. 2 (June 30, 2022): 1153–63.

⁴¹ Lynne G. Zucker, "Institutional Theories of Organization," *Annual Review of Sociology* 13 (1987): 443–464.

to the expectations and practices of their institutional environment.⁴² Institutional Isomorphism could be further distributed into three categories;(1) Coercive isomorphism where organizations adopt similar structures and practices due to external pressures from powerful actors. (2) Mimetic isomorphism where Organizations imitate successful models or practices of other organizations in their field, often driven by uncertainty or a lack of clear best practices and (3) Normative isomorphism where organizations conform to the norms and values of their institutional environment, such as professional standards or cultural expectations.⁴³ Institutional theories also emphasize the role of legitimacy, which refers to the perception that an organization's actions and practices are appropriate, desirable, and socially acceptable.⁴⁴ Organizations seek to maintain or enhance their legitimacy by aligning with the prevailing institutional norms and values.

Institutional theory, in the light of isomorphism can be applied to understand the challenges and opportunities of adopting artificial intelligence (AI) by government organisations in Pakistan. The theory, on AI adoption in Pakistan, can help examine the need of technology adoption, and what are the institutional pressures that drive or hinder the adoption of AI in government organisations. The study used the PRISMA technique to identify previous literature. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) is a widely used framework for conducting and reporting systematic reviews and meta-analyses.⁴⁵ While PRISMA is primarily designed for primary research, some of its strategies can also be applied to secondary research. The articles were extracted by the guidelines of PRISMA using the inclusion and exclusion criteria and based on research objectives. To answer the research question of the challenges of artificial intelligence adoption to public sector industries, we introduced the setting to secondary data extraction using academic peer review journals and generated the results using the following keywords; Artificial Intelligence, Adoption challenges, public sector organisations, Pakistan. The initial search matched 4460

⁴² Bob Hinings, Thomas Gegenhuber, and Royston Greenwood, "Digital Innovation And Transformation: An Institutional Perspective," *Information and Organization* 28, no. 1 (2018): 52-61.

⁴³ Donald C. Hambrick et al., "Isomorphism In Reverse: Institutional Theory As An Explanation For Recent Increases In Intra industry Heterogeneity And Managerial Discretion," *Research in Organizational Behavior* 26 (2004): 307-350.

⁴⁴ David Baxter et al., "Institutional Challenges in Agile Adoption: Evidence from a Public Sector IT Project," *Government Information Quarterly*, 2023.

⁴⁵ PRISMA, "Who Should Use PRISMA?" PRISMA, 2020, <https://prisma-statement.org/?AspxAutoDetectCookieSupport=1>.

review articles. Further application of inclusion-exclusion criteria matched nine searches since 2019.

Adaption Challenges

Table 1: AI Adaption Challenges for Public Sector Organizations. (n=9)

Authors	Adoption Challenges
(Zuiderwijk et al., 2021) ⁴⁶	The potential challenges for AI adaption in government include data challenges, social, societal, and economic issues, organizational adoption issues, management compatibility, skill set, understanding, ethical and acceptability challenges, political, legal, policy drafting and implementation challenges.
(Zeeshan Javed, 2021) ⁴⁷	Adaption of AI and digital technologies have made policy-making easy for various government institutions for data collection and service delivery but the biggest challenge for the government will be in cyber security that, if not resolved, could bring the entire AI system to a complete halt within hours.
(Yongrong Xin et al.) ⁴⁸	The challenges for AI adaption in the public sector organizations in Pakistan include lack of infrastructure development, standardization of inter-departmental databases, adoption issues, and cyber security risks.
(Alex Gilliard 2020) ⁴⁹	Eight challenges to Pakistan's AI transformation are; work ethics and culture, lack of knowledge, frequently changing leadership of the country, delays in funding, no software procurement rules, missing national data governance policy, context-driven digital payment gateways, and

⁴⁶ Chen Zuiderwijk, and Salem, "Implications of the Use of Artificial Intelligence in Public Governance: A Systematic Literature Review and a Research Agenda."

⁴⁷ Zeeshan Javed, "The Role of Artificial Intelligence in the Enhancement of Cyber Security of Pakistan," *Journal of Contemporary Studies* 10, no. 2 (2021): 1-14.

⁴⁸ Yongrong Xin et al., "Assessing Citizens' Attitudes and Intentions to Adopt E-Government Services: A Roadmap toward Sustainable Development," *Sustainability* 14, no. 22 (2022)

⁴⁹ Rasool and Malik, "The 8 Challenges in Pakistan's Digital Transformation Journey."

	lack of secure and reliable digital access in the country.
(Maciej Kuziemski & Gianluca Misuraca, 2020) ⁵⁰	Hefty costs, negative experiences with technological installment in the past, governance issues, resistance by the bureaucratic structures, and decision-making issues of man versus machine autonomy.
(Mahrose Nadeem et al., 2023) ⁵¹	The challenges in digitalized economy include a lack of IT infrastructure, lack of awareness, and market conditions are some of the challenges for the digital economy of Pakistan.
(Xu & Baigy, 2022) ⁵²	Individual perception of technology, weak regulations, limited resources, low technological maturity and organizational support.
(Amjad, 2023) ⁵³	Low technological skills, unavailability of data, data privacy,
(Bibi, Munazza, 2019) ⁵⁴	Complex Human resource departments, resistance to technology, fear of unemployment, lack of data and infrastructure non-availability.

Source: Author

⁵⁰ Maciej Kuziemski and Gianluca Misuraca, "AI Governance in the Public Sector: Three Tales from the Frontiers of Automated Decision-Making in Democratic Settings," *Telecommunications Policy, Artificial Intelligence, Economy, And Society* 44, no. 6 (July, 2020): 101976.

⁵¹ Mahrose Nadeem et al., "Barriers and Strategies for Digitalisation of Economy in Developing Countries: Pakistan, a Case in Point," *Journal of the Knowledge Economy*, (2023).

⁵² Pan Xu and Esmaeil Baigy, "Innovation Adoption Case Study and the Potential of Blockchain on Trade Single Window: Identification of Adoption Challenges and Suggestions for Pakistan Single Window," (Master's Thesis, Uppsala University, 2022), ProQuest, Retrieved from <http://urn.kb.se/resolve?urn=urn:nbn:se:uu:diva-480244>.

⁵³ Muhammad H. Amjad, "Artificial Intelligence (AI) and Policy in Developing Countries," (Islamabad: Pakistan Institute of Development Economics, 2023), <https://pide.org.pk/research/>

⁵⁴ Munaza Bibi, "Execution of Artificial Intelligence Approach in Human Resource Management Functions: Benefits and Challenges in Pakistan," *Sarhad Journal of Management Sciences* 5, no. 1 (2019): 119-124.

Discussion

The use of digital services like Artificial Intelligence in government departments impacts policy-making, expedites decision-making, and enhances communication and service quality, which can help improve the working of government organisations.⁵⁵ As the impact of the Industrial Revolution 4.0 continues to expand, the global economy is moving into a technological phase where it is imperative for the organisational survival that they adopt to the technological changes and keep in line with the new developments in this field. In these conditions, the role of digitalized public sector organisations is vital as these institutions perform the decision-making, planning, governance, and interaction with the public.

The public sector organisations in Pakistan are running on traditional systems that are out dated in terms of current technology.⁵⁶ As a result, there are governance-related issues in many public sector organisations that need an overhaul of their systems. The study aims to highlight the challenges faced by the public sector in terms of Pakistani public offices affecting the performance of these institutions. Also, the paper investigates the challenges that are present in the policy documents that need to lay down a road map for digital transformation and Artificial Intelligence adoption in government institutions in Pakistan.

The digital transformation initiatives by the government known as **Pakistan Vision 2025** documented the digital future of Pakistan. It focused on national capacity building in terms of the digitalization of the economy. The document focused on digitalizing various government departments, including the tax authorities and automating the tax record of the country. Also, another initiative highlighted in the document is the plan for smart cities and digital connectivity which is part of Vision 2025, where better connection and IT infrastructure development are part of the city planning. Pillar IV of the document highlights "the development of the knowledge economy of Pakistan through value addition."⁵⁷ The document also highlighted "laying foundations for the knowledge economy," section. The government will enable the education sector to adapt to digitalization including schools, colleges, universities, and vocational institutions. The document further talked about Pakistan's "Information and Communication Technology," (ICT) sector. Special initiatives will be taken to develop this sector and the educational institutions especially to enhance the nation's capacity building.

⁵⁵ Jamie Berryhill et al., "Hello, World: Artificial Intelligence and Its Use in the Public Sector," (Paris: OECD, November 21, 2019)

⁵⁶ Nadeem et al., "Barriers and Strategies for Digitalisation of Economy in Developing Countries."

⁵⁷ Planning Commission, "Pakistan Vision 2025."

The “**Digital Pakistan Policy 2018**” also laid out a plan for digitalising Pakistan. The policy focuses on the infrastructure development and capacity building of the ICT services. The main sectors that will be focused on include health, education, agriculture, e-commerce, and other socio-economic institutions.⁵⁸ Promotion of incubation centers for startups, e-government, and establishment of IT parks and STZs. The “**e-governance**” focused on the provision of official services to the people through an online platform for efficiency, e-procurement, the establishment of data centers for government organizations, and **G-Cloud services** to integrate the government IT infrastructure and secure the existing networks. Other services to use digital technologies are; e-Agriculture, e-Health, e- Energy, e-Commerce, e-Justice, and ICT Education. Section II (17 & 18) focused on AI, Cloud computing, IoT, Big data, and Robotics. Focus is given to the establishment of facilities that will enhance the use of these resources, upgrade the existing capacity collaboration between different partners for the promotion of services, engagement of different departments, including NADRA, FBR, ICT administration, and AGPR.⁵⁹ The purpose of the digital Pakistan policy is to ensure that the overall IT and digital capabilities of the country are improved. The document focuses on Public-Private collaborations, facilitation of government as well as private industries, promotion of IT exports, and development of the educational sector through HEC for the promotion of digital activities.

Documents issued by the government of Pakistan about its digital policy and vision 2025 focused on making Pakistan a digital product exporting country. There needs to be more mention of improvement of the public sector in terms of enhancing their digital capabilities. Although different policies have been highlighted in the document, a concrete plan in terms of the implication of Artificial Intelligence in government institutions needs to be discussed in detail. The document did not address any existing challenges and how the government plans to overcome them. The policies focus on is also the development of digitalization in the country rather than on implementing these services, especially in the public sector. The document also focused on the development of institutions that will be developers and content providers, like universities and educational institutions. The study noted that these policy documents focused little on how digital services, including AI and Cloud Computing will be used in public sector organizations. There are also issues related to policymaking in bridging the gap between public and government institutions personnel. There is a lack of active digital activities in

⁵⁸ MOITT, "Digital Pakistan Policy," (Islamabad: Ministry of Information Technology and Telecommunication, 2018), <https://moitt.gov.pk/>

⁵⁹ Ibid.

government organizations that focus on public-private interactions, use of AI -related decisional activities and adoption of digital decision-making.

Our findings showed that one of the challenges the public sector organisations face is the lack of funding. The use of AI in organisations is a vital tool, but the high costs associated with installation and maintenance is affecting its technological use.⁶⁰ The role of Artificial Intelligence in government organisations is vital, but challenges related to high cost are a major hinderance in adopting the technology. Although long lasting, the cost-benefit analysis of the technology, is preventing public sector organisations from adopting it. The government departments do not have enough developmental budget to spend on technological developments that could cost millions or billions to the state coffers. AI regulations for each sector, cloud policy, data protection and security policies can pave the way for AI adoption, particularly AI -based solutions integration in Pakistan's public sector organizations. Having an indigenous AI -based solution for less-sensitive problem areas and local data repository is better than spending a hefty budget on providing AI -based products from external sources (that may have a backdoor and cause data leakage). A lack of adoption of indigenously developed AI solutions is another reason. In a developing country, the majority of revenue is spent on providing basic services to the people and on non-developmental expenditures due to lack of planning. This leaves government institutions with little to no funds to be spent on adopting digital technologies.

Our second finding suggests that there is also a lack of practical knowledge in terms of operations. In order to materialize the transformative potential of AI, public sector organizations need to successfully assimilate AI in their operational activities. Implementing AI requires specialized knowledge and skills, which may be lacking in the public sector. Additionally, limited financial and technological resources can pose challenges to adopting and maintaining AI systems. In order to materialize the transformative potential of AI, public sector organisations need to successfully assimilate AI in their operational activities. Higher Education Commission, in collaboration with universities in the country, is offering programs in AI, but the output is at the beginners' phase to address the needs of the public sector. The public office holders also lack the knowledge of handling the technology, interpreting the data and using it for their benefit. Thirst to adopt AI will increase only after understanding the benefits of AI in government operations. People are reluctant to try the experience because of the detailed knowledge required

⁶⁰ Ali Tarab Rizvi et al., "Artificial Intelligence (AI) and Its Applications in Indian Manufacturing: A Review," in *Current Advances in Mechanical Engineering*, ed. Saroj Kumar Acharya and Dipti Prasad Mishra, Lecture Notes in Mechanical Engineering (Singapore: Springer, 2021), 825–35.

as an AI professional. Once, they are aware of the potential benefits of the technology, an attitude building towards AI adoption will occur.

Our third finding suggests that developing and implementing Artificial Intelligence compatible with individual institutional needs could be much higher. There are very few institutions that are using the technology at the moment. Other departments are still working on traditional practices. Despite the popularity and usefulness of Artificial Intelligence in government institutions, and the private/ public cloud still addressing availability, privacy and security issues on the cloud is another challenge.⁶¹ There is also no mechanism defined in the official organizational and government policies for development and adoption of digital technologies that cater to organizational needs. Although the policies and guidelines discuss improving digital services in the country, but how they will be developed, still remains to be seen. AI systems rely on large amounts of high-quality data to function effectively. Public sector institutions may face challenges in accessing and managing the necessary data for AI applications.

Our subsequent finding about cyber security and data confidentiality hinders Artificial Intelligence adoption challenges in public institutions. Pakistan is ranked one of the lowest AI and cyber security capable countries in the region and around the world poses a threat to the data breach.⁶² Because of the security and data privacy challenges, many government institutions are reluctant to adopt Artificial Intelligence in their departments. Digital existence is impossible without embracing AI and Cyber Security in true letter and spirit.

Our findings also indicate challenges related to data quality and information availability in government institutions. Artificial Intelligence models rely heavily on data quality and availability to model their programs. However, the necessary expertise and data sources are unavailable to the public departments to train these models. Also, some government organizations might struggle to collect and sort data for its use.

Another issue in light of the institutional theory found was the Institutional barrier. Public sector institutions often have established bureaucratic structures, processes, and regulations that can hinder the adoption of new technologies like artificial intelligence. These institutions may need to adapt their policies and procedures to accommodate AI implementation. There is paperwork involved, lack of acceptance to adopt

⁶¹ Slava Jankin Mikhaylov, Marc Esteve, and Averill Campion, "Artificial Intelligence for the Public Sector: Opportunities and Challenges of Cross-Sector Collaboration," *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 376, no. 2128 (August 6, 2018)

⁶² Oxford Insights, "Government AI Readiness Index 2021."

AI, challenges the man versus machine approach, and the fear of the unknown in decision-making are some of the issues that hinder technology adoption in the country. The case of NADRA, for instance, where the employees resisted the technological development for a long time, but the organisation ultimately succeeded in its technology adoption. The same challenges are observed in other public sector organizations where people hesitate to adopt technology. Other challenges and issues include lack of awareness, resistance towards change, inherent transparency of AI driven results, verifiability and repeatability of AI - driven results.

Conclusion

AI significantly contributes to the betterment and efficiency of public sector organizations as they are engaged in policy-making and public dealing. Adapting the latest technologies like AI can be of help to the improvement of efficient digital services in public sector organizations of Pakistan. There are already examples of technology adoption in the country where the result was an efficient organizational function. The digital technologies like Artificial Intelligence, cloud computing and cyber security, among other technologies, might be new in the country, but combined with the education, and planning and experiences of the institutions already equipped with these services, will benefit in taking over the challenges. AI has various benefits, but they come with challenges for benign technology states like Pakistan. International evidence suggests public sector organizations face challenges while adapting to AI or related digital technologies in their departments. With the passage of time and with careful planning, these institutions overcame the hurdles associated with digitalization. How these institutions achieved it could be studied and adopted in developing countries like Pakistan.

Technological challenges like adoption cost, lack of resources and budgets, technology adoption fear, lack of research and development, cost-benefit analysis, departmental collaborations, bureaucratic structures and ICT readiness are the issues that are faced by the public sector organizations. Policy-making in digitalization and overcoming the adoption challenges is a big challenge for the public sector organizations. Although government has taken initiatives like "Digital Pakistan," funds to the educational institutions to produce professional and allocation of budget towards technology adoption, there is a lot to do in terms of overcoming these challenges. This paper has identified some of the challenges in the industry where further research and policy-making can help overcome the issues for the public offices technology adoption and use. To address these issues, the government policy makers may need to devise a comprehensive plan including investment in training the personal, and increase awareness in the people on the benefits of inclusion

of Artificial Intelligence related technologies. The government needs to curtail the digital divide in the country and enhance the technological services so that the technological requirements of shifting towards AI models' fulfilled. There is also a dire need to allocate a sizeable budget towards adopting digitalized services. The lack of AI supportive legislations is another reason for non-adoption of AI in many sectors where the government needs to focus on and draft policy legislation that can ease the way of AI adoption in public sector organizations.

