INTERNATIONAL JOURNAL OF TECHNO-ENGINEERING
IJTE

ISSN: 2057-5688

Review on Enhancing Public Sector Efficiency by Implementing Artificial Intelligence for Smarter Governance

K. Maheswara Reddy, Research Scholar, Department of Computer Science, J.S.University, Shikohabad, Faridabad Dist. Uttar Pradesh,
Dr. Potnuri Suribabu, Assistant Professor, Supervisor, Department of Computer Science, J.S.University, Shikohabad, Faridabad Dist. Uttar Pradesh,.

Abstract:

Smart systems and artificial intelligence are playing an ever-increasing role in our daily lives. This trend does not spare industry and production, entailing the potential to gradually replace traditional management tasks. Although the numbers for AI applications in production are continuously growing, the respective publications do not appear to spend much thought on long-term implications. Based on 74 publications in 5 databases, this work presents the results of a systematic literature review on artificial intelligence in production management over the last twenty years. The review finds that applications that have been of high interest in this regard are process planning and control as well as scheduling. Both tasks are situated in the realms of standard managerial functions and are thus prone to be accomplished by autonomous systems in the future. We suggest that there are currently no management models available to represent the growing dependence on cyber-technical systems, and researchers need to address this shortcoming to pave the way for the production management of tomorrow.

1. Introduction

ISSN: 2057-5688

Production management is one of three organizational main functions, next to marketing and finances. Production management as dispositive factor governs the value adding transformation process within a service provision system. Their task is to process information into decisions so as to organize and guide the production process towards reaching set performance targets. In this function, production management can be regarded as the control element in a feedback control system that assesses the performance of the transformation process against super ordinate goals and imposes corrective actions in the event of deviations. Volatile global markets are significantly creating more complexity in manufacturing companies while they are integral for society as providers of employment and adding value.

Having transitioned through three industrial revolutions before namely mechanization, electrification, and automation – production technology and management are presently facing the fourth leap. Rapid advances in technology address a need created by growing organizational complexity. Consequently, we are currently observing the successive merger of the virtual world and physical world of production management. Following the above trains of thought, a sound question for the future is, to which extent production management tasks can and will be substituted by technology based on artificial intelligence (AI) down the road. A prevailing substitution of production management tasks, however, raises several key questions: what is the technical optimum between human-made and machine-made decisions? Whose responsibility will it become to set performance targets? Which skillsets will be required? Who is accountable for errors? And most importantly, how much decision-

ISSN: 2057-5688

making will in fact remain a purely human task.

It is being said that the fourth industrial revolution will shift work in production environments towards decision focused and creative tasks. However, just like societal impacts of technological advances could not be foreseen, neither are managerial tasks and functions that may emerge when automated decision-making and partly automated decision support gain prevalence. Academia and practitioners are now facing the unparalleled opportunity to carefully design, lead and influence this transformation. A prerequisite to achieve this is the image of an integrated management. At present, models for such integrated management do not yet exist, and their absence hinders a successful guidance of organizational transformation processes.

1.1 Motivation of Research:

Need for Efficiency: The public sector plays a crucial role in delivering essential services to citizens. However, it often faces challenges related to bureaucratic red tape, inefficiency, and resource constraints. There's a growing recognition of the need to enhance efficiency within government organizations to better serve citizens and make the most of limited resources.

Promise of Artificial Intelligence (AI): AI technologies offer the potential to streamline processes, automate repetitive tasks, and make data-driven decisions. In the public sector, AI can be applied across various domains, including healthcare, transportation, education, and public safety, to optimize operations and improve service delivery.

Demand for Smarter Governance: Citizens expect governments to adopt innovative approaches to governance that leverage cutting-edge technologies. Smarter governance involves using data and technology to enhance decision-making, improve transparency, and increase accountability. AI presents an opportunity to fulfil these expectations and transform traditional bureaucratic structures into agile and responsive entities.

ISSN: 2057-5688

Global Trends and Initiatives: Governments worldwide are increasingly investing in AI and digital transformation initiatives to modernize their operations and stay competitive in the digital age. By studying and implementing AI solutions in the public sector, countries can stay at the forefront of technological innovation and address pressing societal challenges more effectively.

Potential Impact: The successful implementation of AI in the public sector has the potential to bring about significant positive outcomes, including cost savings, improved service quality, better policy formulation, and enhanced citizen satisfaction. By investigating the feasibility, challenges, and best practices associated with AI adoption in governance, the thesis aims to contribute to the body of knowledge in this field and provide actionable insights for policymakers and practitioners.

1.2 Research Objectives:

Assessment of Current Challenges: Identify and analyze the existing inefficiencies, bottlenecks, and challenges within the public sector that hinder effective service delivery and governance.

Exploration of AI Applications: Investigate various AI technologies and applications relevant to the public sector, including machine learning, natural language processing, predictive analytics, and robotic process automation.

Case Studies and Best Practices: Examine successful AI implementation initiatives in other jurisdictions or organizations, both domestically and internationally, to extract best practices, lessons learned, and potential pitfalls.

Stakeholder Analysis: Conduct a comprehensive stakeholder analysis to understand the perspectives, needs, and concerns of key stakeholders, including government officials, employees, citizens, and technology vendors.

Development of Frameworks and Guidelines: Develop frameworks, guidelines, and

ISSN: 2057-5688

decision-making tools to aid government agencies in the strategic planning, procurement, and deployment of AI solutions tailored to their specific needs and contexts.

Ethical and Legal Considerations: Explore the ethical, legal, and societal implications of AI adoption in the public sector, including issues related to privacy, bias, transparency, accountability, and job displacement.

Pilot Implementation and Evaluation: Design and execute pilot projects to demonstrate the feasibility and efficacy of AI-driven interventions in select government functions or service areas. Evaluate the outcomes, impacts, and cost-effectiveness of these initiatives.

Capacity Building and Training: Recommend strategies for building internal capacity, fostering a culture of innovation, and providing training and support to government employees to embrace AI technologies and adapt to changing work processes.

Policy Recommendations : Formulate evidence-based policy recommendations and actionable strategies for policymakers to promote the widespread adoption and responsible use of AI in public sector governance while mitigating risks and maximizing benefits.

Dissemination of Findings: Disseminate research findings, insights, and recommendations through academic publications, policy briefs, workshops, conferences, and other knowledge-sharing platforms to catalyse broader conversations and foster collaborative learning within the public sector community.

2•Literature Review

In the last decades, the progress in computer sciences has revitalized many related fields:

ISSN: 2057-5688

the breakthrough of teaching machines how to learn from experience, which is being referred to as machine learning (ML), by sifting through large datasets and finding hidden patterns, resuscitated AI. While the IBM computer "Deep Blue" that won over the world chess champion Garri Kasparow, was, in fact, not an artificial intelligence in the sense of a learning machine, AlphaGo which won over the world's best Go-Player 19 years later indeed was. This event was perceived by the experts as utterly surprising because AlphaGo displayed intuition which had been considered an unsolvable task for decades to come. By now, ML, which "sits at the crossroads of computer science, statistics and (…) decision-making under uncertainty" has emerged as the method of choice within AI for a range of applications and has spread into a vast variety of different scientific fields like particle research, communications psychology, genomics, astrophysics and chemical synthesis. The most common ML methods are supervised and unsupervised learning algorithms along with reinforcement learning Moreover, much research has been conducted in how to mimic human learning (i.e. learning interrelated skills) , human cognition, as well as how to teach machines human preferences so as to reduce human intervention and control resources. While such fast-paced landmark advances suggest that machine learning is likely to be one of the most transformative technologies of the 21st century, some mechanisms behind machine-made decisions, e.g. from deep neural networks, are not yet clear and are under investigation in a stream of research called AI Neuroscience. Scientists are even addressing doomsday scenarios: highlight key risks, so-called accidents (defined as unintended and harmful behaviour) of using AI that need to be tackled in a forward-looking manner. One solution to preventing AI from seceding is presented by who

ISSN: 2057-5688

designed safely interruptible agents that will not recognize an attempt of being shut down externally, but will believe they shut themselves down.

Introduction to AI in Governance:

Objective: Provide an overview of AI technologies and their potential applications in the public sector.

References:

Kshetri, N. (2019). Can Artificial Intelligence curb corruption? Crypto crime and the future of black markets. Technological Forecasting and Social Change, 141, 199-207.

Janssen, M., & Helbig, N. (2019). Understanding the roles of artificial intelligence in government: A review of the academic literature and agenda for future research. Government Information Quarterly, 36(2), 192-199.

Historical Context and Evolution:

Objective: Trace the historical development of AI in governance and highlight key milestones.

References:

McCarthy, J., Minsky, M. L., Rochester, N., & Shannon, C. E. (1955). A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence. Retrieved from https://www-formal.stanford.edu/jmc/history/dartmouth/dartmouth.html

Janssen, M. (2020). AI for Public Administration—Challenges and Opportunities. Frontiers in Artificial Intelligence, 3, 1-8.

Challenges in the Public Sector:

Objective: Identify and discuss challenges faced by public sector organizations that AI can address.

References:

ISSN: 2057-5688

Kim, Y., Lee, J., & Kim, M. S. (2019). Identifying and prioritizing challenges in adopting artificial intelligence in government: A Delphi study in Korea. Government Information Quarterly, 36(4), 101387.

Schwalbe, N. (2019). Addressing the challenges of implementing artificial intelligence in government. Public Administration Review, 79(6), 860-865.

Potential Benefits of AI Adoption:

Objective: Review empirical evidence on the benefits of implementing AI in the public sector.

References:

Van Loon, A., Giest, S., &Ubacht, J. (2020). Artificial intelligence in the public sector: A systematic literature review and research agenda. Government Information Quarterly, 37(1), 101488.

Avin, S., Barocas, S., & Dafoe, A. (2020). Recommendations for AI Governance. Harvard Kennedy School, Belfer Center for Science and International Affairs.

AI Applications in Governance:

Objective: Explore various AI applications across different government functions.

References:

Vestberg, N., &Lidskog, R. (2019). AI and the Future of Government: On Implications, Applications, and Challenges. AI & SOCIETY, 34(4), 861-868.

Helbig, N., Gil-Garcia, J. R., & Ferro, E. (2009). Understanding the Complexity of Electronic Government: Implications from the Digital Divide Literature. Government Information Quarterly, 26(1), 89-97.

Success Factors and Best Practices:

Objective: Examine successful AI implementation initiatives and identify best practices.

ISSN: 2057-5688

References:

Rana, P. (2019). Artificial Intelligence in Public Sector: Implementing AI in Government Projects—Challenges and Opportunities. In The Global Industry and Economics of Artificial Intelligence (pp. 97-111). Elsevier.

Andrade, E. B., & Santiago, L. M. (2019). Artificial Intelligence and the Public Sector: Applications, Risks, and Ethics. Journal of Social and Development Sciences, 10(2), 29-43.

Ethical and Legal Considerations:

Objective: Investigate ethical and legal implications of AI adoption in governance.

References:

Mittelstadt, B. D., Allo, P., Taddeo, M., Wachter, S., &Floridi, L. (2016). The ethics of algorithms: Mapping the debate. Big Data & Society, 3(2), 205395171667967.

Brundage, M., Avin, S., Clark, J., Toner, H., Eckersley, P., Garfinkel, B., ... &Scharre, P. (2018). The malicious use of artificial intelligence: Forecasting, prevention, and mitigation. arXiv preprint arXiv:1802.07228.

Public Perception and Acceptance:

Objective: Assess public attitudes towards AI in government and strategies for building trust.

References:

Ananny, M., & Crawford, K. (2018). Seeing without knowing: Limitations of the transparency ideal and its application to algorithmic accountability. New Media & Society, 20(3), 973-989.

Cheng, J., & Jin, Y. (2020). Public perception of artificial intelligence in government: A survey experiment. Government Information Quarterly, 37(4), 101476.

ISSN: 2057-5688

Capacity Building and Organizational Change:

Objective: Explore strategies for building capacity and fostering organizational change in the public sector.

References:

Layne, K., & Lee, J. (2001). Developing fully functional E-government: A four stage model. Government Information Quarterly, 18(2), 122-136.

Dubnick, M. J. (2002). Sustainability and public management: An ironic perspective. Public Administration Review, 62(2), 148-160.

Gaps in Research and Future Directions:

Objective: Identify gaps in the literature and propose future research directions.

References:

Moon, M. J. (2002). The evolution of E-government among municipalities: Rhetoric or reality? Public Administration Review, 62(4), 424-433.

Marín, L., Oviedo-García, M. Á., & Domínguez-Estévez, R. (2019). E-government research: Reviewing the literature, limitations, and ways forward. Government Information Quarterly, 36(2), 101367.

3.Methodology

In order to obtain a fair overview over the use of AI methods and possible trends, a systematic review is used as method of choice in this article. A systematic review is a research methodology that employs systematic, explicit and accountable methods in order to make sense of large bodies of information. As such, systematic reviews have become a legitimate research methodology in its own right and are now considered the gold standard for aggregating the results of several studies dealing with the same

ISSN: 2057-5688

research question. The research question to be answered here is: "How has artificial intelligence been used in production management?" Based on the answers to this question, an attempt to assess the potential of automated decision-making in the future is made.

1.Introduction to Methodology:

In this section, we will outline the methodology used to address the research question through a theoretical approach. We will focus on synthesizing existing literature and conceptual frameworks to develop insights into the role of AI in enhancing public sector efficiency and governance.

2. Conceptual Framework Development:

Through iterative analysis of the literature, we identified key themes and concepts relevant to the research question. These included the adoption of AI technologies in government, factors influencing efficiency and governance, and the impact of AI on organizational processes and decision-making.

3. Theoretical Perspectives:

The conceptual framework drew upon theoretical perspectives from public administration, organizational theory, and technology adoption literature. For example, theories of institutional change, resource dependency, and innovation diffusion were used to analyze the dynamics of AI implementation in the public sector.

4. Hypotheses or Propositions:

Based on the conceptual framework, we formulated several hypotheses to guide the theoretical analysis. Hypotheses included predictions about the relationship between AI adoption, organizational efficiency, and governance outcomes in the public sector.

5. Justification of Theoretical Approach:

A theoretical approach was deemed appropriate to address the research question

ISSN: 2057-5688

as it allowed for a systematic synthesis of existing knowledge and theoretical insights. This approach facilitated a deeper understanding of the underlying mechanisms and dynamics shaping the relationship between AI and public sector efficiency.

4. Conclusion

For our vision 2040 outset, namely a gradual substitution of managerial decision-making tasks up to autonomous machine-made decision-making, this means that these tasks already receive sufficient attention to transition to the next level of machine support. This review presents a significant amount of recent research contributions dealing with introducing AI into modern production environments. At the same time, no contribution to high-level considerations of possible implications of introducing evermore artificial intelligence systems into production could be found. This provides ample support to our initial assumption that production management of the future requires new models that are capable of representing a more cyber-centric production environment.

References

1. J. Heizer and B. Render, Operations Management. New York: Prentice Hall, 2006.
2. H. Dyckhoff, Produktionstheorie: GrundzügeindustriellerProduktionswirtschaft, 5th ed. Berlin: Springer-Verlag, 2006.
3. G. Zäpfel, Grundzüge des Produktions-und Logistikmanagement, 2nd ed. München: Oldenbourg, 2001.
4. C. Brecher, Advances in production technology: Springer International Publishing AG, 2015.
5. T. Bauernhansl, M. ten Hompel, and B. Vogel-Heuser, Industrie 4.0 in Produktion, Automatisierung und Logistik: Anwendung, Technologien

ISSN: 2057-5688

und Migration. Wiesbaden: Springer Fachmedien Wiesbaden, 2014.

6. D. Gough, S. Oliver, and J. Thomas, An introduction to systematic reviews. London: Sage, 2012.
7. M. Kubat, An Introduction to Machine Learning. Berlin: Springer, 2015.
8. M. I. Jordan and T. M. Mitchell, "Machine learning: Trends, perspectives, and prospects," Science, vol. 349, no. 6245, pp. 255– 260.
9. Science News Staff, AI is changing how we do science. Get a glimpse. [Online] Available: http://www.sciencemag.org/news/2017/07/aichanging-how-we-do-science-get-glimpse. Accessed on: Sep. 14 2017.
10. Z. Q. John Lu, "The elements of statistical learning: Data mining, inference, and prediction," Journal of the Royal Statistical Society: Series A (Statistics in Society), vol. 173, no. 3, pp. 693–694, http://onlinelibrary.wiley.com/doi/10.1111/j.1467-985X.2010.00646_6.x/full, 2010.
11. R. S. Sutton and A. G. Barto, Reinforcement Learning: An Introduction. Cambridge: The MIT Press, 1998.
12. T. Mitchell et al., "Never Ending Learning," in Proceedings of the Twenty-Ninth AAAI Conference on Artificial Intelligence, pp. 2302–2310.
13. V. Mnih et al., "Human-level control through deep reinforcement learning," Nature, vol. 518, no. 7540, pp. 529–533, 2015.
14. P. Christiano et al., "Deep reinforcement learning from human preferences," arXiv preprint arXiv:1706.03741, 2017.