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Implementation of artificial intelligence in Indonesia

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A B S T R A C T

In recent years, technology adoption in Indonesia has begun to use advances in artificial intelligence (AI) to improve services. This change has had a significant impact on several institutions. This article provides an overview of the many institutions in Indonesia that are leveraging AI. A comprehensive review of 35 papers from the Scopus database was used to develop our methodology. Education, health care, ICT, licensing, transportation, and economic services are all well-represented in the existing literature, which puts AI into practice in various disciplines. We provide a framework for organizing governance research that identifies gaps in the existing literature and suggests future directions for research utilizing technology.

1. Introduction

Historically, the administrative system in society has adapted to technological advances. Institutional activity embeds the principles of impartiality, fairness, and efficiency in the file-supported activity hierarchy, which is an improvement over the previous system (Weber, 1978). Concerns about the capacity of conventional institutions to deal with the complexities of modernity have been articulated since the mid-twentieth century (Elgin & Bushnell, 1975). Academics debate new methods for community management (Pollitt & Bouckaert, 2017). Some scholars have concentrated on the new public management process (Lynn Jr, 2001), which dates back to the 1980s and is characterized by market processes for addressing some of the problems of today's complexities and improving governance efficiency (Hood, 1995). Along with the changes in New Public Management, there has been progress in information technology innovation that affects people's activities (Margetts, 2012), especially the emergence of the Internet as a mode of rapid information transmission (Naughton, 2000). Artificial Intelligence (AI) technology has greatly influenced our lives, changed human intelligence, and created intelligent robots (Mohasses, 2019). Various fields, including physics, mathematics, philosophy, psychology, linguistics, and computer science, have conducted AI research in the last 60 years (Daugherty & Wilson, 2018). This article defines AI as a human instrument designed to perform various tasks. They quickly learn and adapt intelligently to their environment, including multiple demands and circumstances (Froese & Taguchi, 2019). AI has the potential to transform public administration; AI can be useful when the process is too complex. Several studies have begun to examine how the development of AI, administrative data collection, and information transfer provide new approaches to storing big data (Allard et al., 2018; Mergel et al., 2016). Other studies

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have shown that AI can completely replace human labor (Bovens & Zouridis, 2002). Institutions can no longer avoid innovation to achieve greater citizen transparency, accountability, and interoperability due to the rapid development of digital technology.

The field of AI has evolved through three waves of research: the first wave addressed computing constraints on capacity and processing power; In the second wave, artificial neural networks have developed that function in the same way as the human brain and computers with increased computing capacity; and deep learning is driving the current third wave, resulting in increased real-world applications (Kankanhalli et al., 2019). Artificial intelligence (AI) is still in its infancy in various fields due to a lack of study due to financing constraints or fear of implementation risk (Kankanhalli et al., 2019). AI is a catalyst for numerous novel service developments when it is empowered to interact with various things, including wearables, industrial sensors, smartphones, and security cameras (Harrison et al., 2019). While there is much room for research on the practical use of AI in the institutional sector, it is still in its infancy. In their discussion of AI applications, many academics and practitioners focus only on the technical aspects, ignoring the broader consequences of public administration governance. This includes only the anticipated effects of AI, which are inherently speculative. In light of these considerations, the urgent need for a comprehensive assessment of the potential impacts and implications of AI-based applications and the associated risks continues to emerge (Sun & Medaglia, 2019).

This study synthesizes the existing literature to identify gaps and recommends a future research agenda for AI applications in institutions. In addition, this study proposes a theoretical framework for understanding AI applications in the public sector, including the most researched sectors: education, health care, information, and communication technology, licensing, transportation, and the economy. The first part is to provide a brief overview of the research subject. The second part describes the literature sources, the research methodology, the search parameters used, and the number of studies classified by topic. The third part includes research findings and study discussion. The fourth section describes the gap between the study and the objectives of future studies, while the fifth section presents the conclusions.

2. Literature review

This study synthesizes the existing literature to identify gaps and recommends a future study agenda for AI applications in the public sector. Bovens and Zouridis (2002) find a trend where most of their work is now done behind a computer screen (institutional screen level), resulting in modifications to the function and scope of services. Reis et al. (2019), the concept of IT-based institutional transition from street-level to system-level services is a preliminary study. Bovens and Zouridis (2002) argue that information technology can eventually replace all communication and other information flow structures. According to the hypothesis, as information technology becomes more integrated into daily activities, this workforce shifts to person-to-computer interaction, a stage called "screen-level institution." At this stage of development, organizations are systems-level institutions with little or no room for traditional street-level institutions (Yigitcanlar et al., 2021). According to several studies, as digital progress continues, the environment will increase the digitization of institutions (Gil-Garcia & Martinez-Moyano, 2007). Initially, information technology used simple written accounting techniques; however, these advances have resulted in the development of complex technological systems in which AI systems perform functions previously handled by humans. These technological improvements allow for the addition of work, automation, and simplification of previously assigned tasks (Busch & Henriksen, 2018). In addition, the emergence of information technology creates barriers (Augier, 2002; Barth & Arnold, 1999; Bovens & Zouridis, 2002). While these limitations are not new, advances in AI, such as simple physical work and data entry automation, are now extending to cognitive and analytical work (Brundage et al., 2018). Some have suggested that street-level institutions could be phased out using online interfaces that offer virtual services to the public (Dunleavy & Margetts, 2015). Despite substantial work on the readiness of human resources in institutions (Leonardi, 2012), this approach has not been widely applied to government agencies. However, the efficient use of IT can continue to serve a positive function for institutions in some instances. AI's capacity for constant real-time data entry is a significant aspect. Previous research has focused on early ideas about AI (Hadden, 1986; Hurley & Wallace, 1986) or functional simplification (Cordella & Tempini, 2015). Some have explored the influence of learning technology on public administration activities and decision-making (Agarwal, 2018). A shift will follow this transition to learning technologies that provide procedural equivalence to systems that deliver similar results (Dunleavy & Margetts, 2015). However, empirical studies on the impact of AI on institutions are quite scarce. As AI advances, the potential for administration and governance applications expands; however, some agencies are notoriously slow to adopt new technologies, and public agencies are cautious about innovating software improvements. With today's technology, most human labor seems to be done more efficiently by AI. More than two decades after Bovens and Zouridis saw the emergence of system-level institutions; it was concluded that the work performed by street-level employees could be supplemented or mechanized by AI.

This paper synthesizes the existing literature to identify gaps and provides a future research agenda for applying AI in the public sector based on this theoretical framework. Additionally, this article presents a theoretical framework for comprehending AI's implementation in the public sector.

2. Method

AI applications in institutional governance are examined using a transparent and straightforward methodology. A step-by-step breakdown of the research process is provided in the following sections:

1. Identifying pertinent databases (Scopus).
2. Choosing search words and standards (for the initial inquiry).
3. The selection and analysis of the articles.
4. Sorting and categorizing the articles in accordance with their major ideas.
5. Another critical step is identifying research gaps and defining research objectives for future studies.

The articles were retrieved using Harzing's Publish or Perish tool with the terms “AI”, “institutions”, “program”, “public administration” and “Indonesia”. Articles are obtained and examined only if Scopus indexes them, English-language text (for accurate interpretation), and matches the provided query (Pohl et al., 2010). Initially, this resulted in a total of 111 articles from both databases. After manually using criteria for inclusion and exclusion based on abstracts and keywords and removing duplicate articles (8 publications), a list of 35 studies for future research was obtained. Figure 1 illustrates the study's flow diagram analysis.

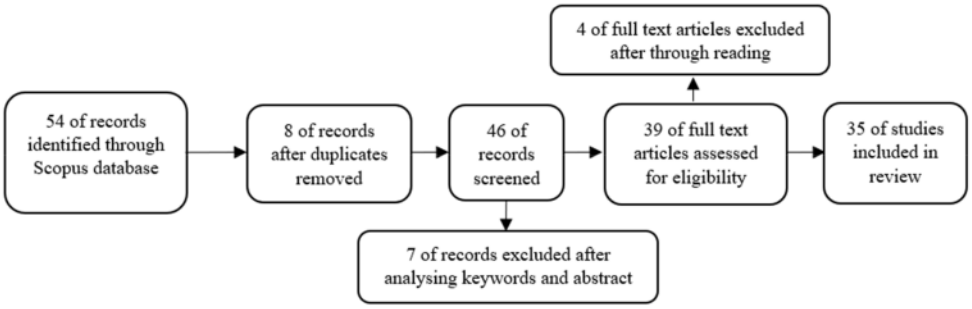

Fig. 1. Diagram of the study flow

3. Results

3.1 Trends in the existing literature

Several agencies apply AI for decision support, especially autonomous agents and predictive analytics. This technology has unexpectedly affected how public administrators provide public information. AI research on bureaucracy surged just after 2018, indicating a growing trend in scholars' interest in the relationship between artificial intelligence and the public sector (Mikhaylov et al., 2018). Fig. 1 presents the published bibliometric analysis for 2017-2018 (to date).

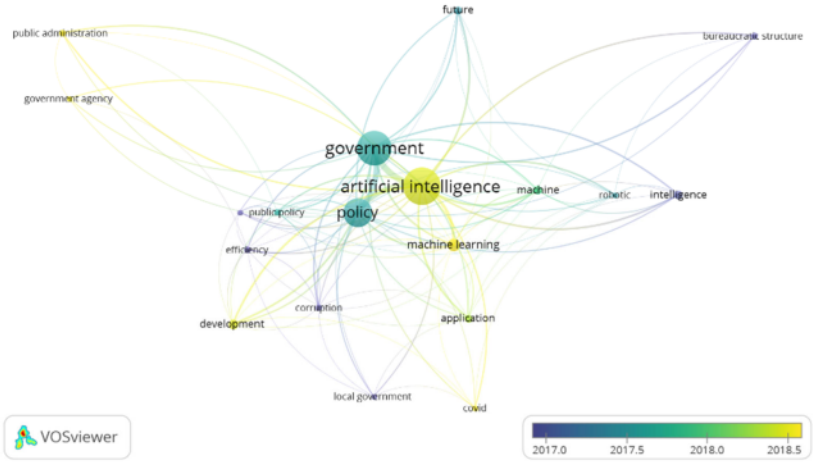

Fig. 1. Bibliometric analysis (from Scopus)

3.2 Thematic findings and discussion

Table 1
Summary of studies

Study	Description of Program	Major contributions of study to the knowledge base on AI
Agarwal (2018)	Outside of our public policy institutions, the rate of change is quicker than that of change inside. That is an issue. There is an urgent need for public officials to participate proactively; they cannot just wait for technology to transform the environment before erecting barriers.	Many of the current government structures and procedures that have emerged over the past several centuries will soon become obsolete. There is an urgent need to provide the basis for governments to reconsider how they will best serve their citizens.
Allard et al. (2018).	There is still a need to understand better how agency procedures, structure, and culture influence how agencies utilize administrative data and nurture stronger analytic capabilities. Managerial efforts to improve administrative data utilization usually need the modification of procedures, problem-solving methods, and resource allocation. As a result, research on how organizational settings influence data usage habits should be valuable.	Future studies should strive to classify agencies and multiple variables that impact data usage (e.g., internal personnel, presence of external data partners) and see whether "clusters" of agencies develop with comparable data capacity strengths or weaknesses. Researchers, campaigners, and policymakers looking to enhance administrative data usage might then consider technical help and best practices tailored to specific agency profiles, enabling the creation of systemic solutions that seem tailored to genuine agency requirements.
Androutsopoulou et al. (2019)	Machine learning and data mining technologies are used to develop a new digital communication channel between citizens and government by leveraging existing data in various forms (such as documents containing legislation and directives, structured data from government agencies' operational systems, social media data, and so on).	This channel, which uses suitably formatted and semantically annotated data, allows 'richer' and more expressive engagement of people with government in ordinary language, enabling and promoting information searching and transaction processing.
Bovens & Zouridis (2002)	The use of information and communication technology (ICT) is rapidly transforming the organization of several significant, executive-level government bodies. They used to be machine bureaucracies where street-level employees had a lot of administrative leeway's when dealing with individual clients. The street-level officials have vanished in certain areas.	The law's execution has been nearly finalized, thanks to ICT. However, several additional concerns have emerged: What about the decision-making authority of system-level bureaucrats? In challenging instances, how can we ensure due process and fairness? The paper concludes with several institutional changes that may aid in the integration of these system-level bureaucracies into the constitutional state.
Busch & Henriksen (2018)	Since they can put their imprint on public policies, street-level bureaucrats have historically had broad flexibility to apply discretion, igniting discussion. It is suggested that digital discretion be used to mitigate this impact by influencing or replacing their discretionary practices using ICT.	The reach of street-level bureaucracy is shrinking. An increasing number of street-level bureaucracies are being transformed into digital bureaucracies, with digital bureaucrats running computers instead of face-to-face with clients.
Corvalán (2018)	The primary challenge of the Fourth Industrial Revolution is to accelerate the transition to a Digital and Intelligent Administration and Government that supports the effectiveness of rights and inclusive technical development that ensures people's digital dignity.	The challenges and opportunities that arise due to artificial intelligence's transformational impact on public administration.
Froese & Taguchi (2019)	Analyze the progress made in artificial intelligence (AI) and robotics in resolving the meaning problem. Because of their precarious existence as adaptive autopoietic persons, things appear to be fundamentally significant to live beings. However, this approach inherits the problem of failing to account for how meaning as such might influence an agent's behaviour.	It can address the impotence of meaning by altering the concept of nature so that physical indeterminacy characterizes the macroscopic scale of the living.
Gil-Garcia & Martinez-Moyano (2007)	The evolution of e-government is, at least in part, the consequence of pressures from public managers aiming to solve problems and citizens, corporations, and other stakeholders wanting to exert control over public managers' actions. Both forces, relating to performance and accountability, have pushed for changes in the regulations that govern the design, execution, and usage of e-government initiatives.	First, e-government, in general, has progressed from its original Internet presence to more transactional and integrated programs. Second, national governments have begun to add technological and organizational sophistication as a general tendency, and state and local governments have followed.
Gong & Ordieres-Meré (2016)	Ozone threshold exceedances can be effectively predicted using pre-processing methods and ensemble algorithms.	To forecast daily maximum ozone threshold exceedances, use pre-processing and ensemble artificial intelligence classifiers.
Gulson & Webb (2017)	Modern education policy entails incorporating new types of data and the development of new data platforms, incorporating business concepts into school governance networks, and strengthening socio-technical relationships.	Policy rationalities based on prediction, openness, and data create the circumstances for AI to be incorporated into and intensify parts of what we call 'computational education policy.'
Gurstein (1985)	AI applications are more likely to emerge through an evolutionary process than through one or more spectacular discoveries. The aggregate of the changes that will occur because of the sequence of these suboptimal systems, on the other hand, will probably likely transform a wide variety of human activities.	Artificial intelligence (AI) will be a game-changer because it will enable old tasks to be performed fundamentally differently—whether cheaper, faster, or better.

Table 1
Summary of studies (Continued)

Study	Description of Program	Major contributions of study to the knowledge base on AI
Hadden (1986)	Intelligent advisory systems (IASs) are computer programs that use artificial intelligence to simulate human competence.	Although the breadth of IASs is now limited by technology and our understanding of human cognition, the benefits they can give within their proper realm are significant enough to warrant careful consideration.
Harrison et al. (2019)	Open Data, the Internet of Things, and Big Data are technological and organizational advancements that have enhanced the public sector's interest in policy analytics. This revised version of policy analysis builds on a long tradition of using statistical modeling to comprehend policy outcomes and decision-making better. It also includes additional computational methods, like artificial intelligence (AI) and computer modeling.	The promise of AI for social good depends on investments that are expressly focused on this social outcome, investments in developing trust in government data, and ensuring the data are ready and fit for use, both now and in the future.
Hengstler et al. (2016)	We emphasize the symbiotic relationship between reliance on innovation and confidence in the inventive organization and its digital interaction. As a result, we propose concrete techniques to expand confidence in science and demonstrate the importance of an electoral system for the evolution of application AI.	Digitization with intrinsic AI is becoming more common in various apps, such as driverless automobiles and medical support gadgets. Nonetheless, despite their increasing popularity, there is still widespread doubt about these uses in society.
Ho et al. (2019)	Radiologists must play a more active role in bringing in the digital era in medicine. In this sense, professional responsibilities include researching AI's therapeutic and societal benefits, bridging knowledge gaps to facilitate ethical evaluation, and campaigning for recognition.	Maintaining confidence and trustworthiness is a crucial goal of governance, which is required to foster collaboration among all stakeholders and ensure the appropriate development and application of AI in radiology and other clinical settings.
Hurley & Wallace (1986)	Because of the fast rate of technical advancement, previously discrete functions of the builder, designer, expert, and user can now be embodied in a single experienced individual, allowing prototyping to become the design method for constructing AI-powered decision support systems.	Assessing artificial intelligence's potential for supporting public sector decision-making.
Jiang et al. (2017)	Popular AI techniques include machine learning techniques for structured data, such as the classic support vector machine and neural network, and deep learning and natural language processing for unstructured data.	A primary goal of artificial intelligence (AI) is to imitate human mental processes as closely as possible. Increasing access to healthcare data and the rapid advancement of analytics techniques drive a paradigm shift in health care.
Kankanhalli et al. (2019)	The Internet of Things (IoT) is a network of objects/things equipped with electronics, software, sensors, and actuators, enabling them to connect, interact, and share data. Users, sensors, and networks generate huge amounts of data, which governments can use to develop applications and gain information by employing Artificial Intelligence (AI) techniques.	IoT and AI can help citizens, businesses, and governmental agencies build valuable services in various industries, including transportation, energy, healthcare, education, and public safety, among others.
Margetts (2012)	Big data in public affairs refers to traditional administrative data with large-scale data sets generated by sensors, computer networks, or humans while using the Internet.	New prospects for real-time insights into behavioural patterns emerge in public affairs, but they are constrained by protections limiting government reach.
Mikhaylov et al. (2018)	Teamwork between the private sector and colleges is required. This type of cross-sectoral collaboration is a global standard for applied AI centers of innovation.	In high-uncertainty contexts, public sector enterprises are increasingly interested in employing data science and artificial intelligence skills to provide policies and achieve efficiencies.
Milano et al. (2014)	Decision assistance and optimization approaches, game theory, and information and opinions mining in conjunction with advisor simulation are just a few Artificial Intelligence techniques that could help improve policymaking.	Policymaking is a highly complicated process in ever-changing circumstances and affects the three aspects of sustainable development the community, the industry, and the ecosystem.
Mittelstadt et al. (2016)	In information societies, operations, judgments, and choices formerly outsourced to humans are increasingly assigned to algorithms, which may advise, if not decide, on how data should be evaluated and what actions should be performed.	Algorithms are increasingly being used to mediate social processes, corporate transactions, governmental decisions, and how we perceive, comprehend, and interact with one another and the environment.
Mizoguchi (1994)	The primary research trends and requirements are organized into a three-dimensional framework: 1) a shared resource, 2) continuous communication, and 3) groupware.	AI can help to improve the efficiency and effectiveness of this high-speed network's use.
Mohasses (2019)	For the past decade, Dubai has been the top Smart City in the MENA area. The government's strong commitment to developing technology, particularly Artificial Intelligence, was the primary cause for the use of Chatbots in a variety of government bodies over the last three years.	Introduction to Chatbots and their applications in governmental sectors worldwide, review of existing Chatbot performance in the Dubai government. And recommendations on how the Dubai government may expand the deployment of Chatbots even further to serve its inhabitants better.
Mrowczynska et al. (2017)	Volume forecasting is frequently required in road freight transit. Such a study can contribute to identifying a market trend and aid big and small trucking enterprises in their decision-making.	The Bayesian network approach may consider past data on freight volume and data on the overall status of the national economy.

Table 1
Summary of studies (Continued)

Muthu et al. (2016)	Over two years, the licensing department collaborated extensively with the system designers, providing feedback on the E-Licensing system's design. All the work and money expended would be wasted if the employees did not plan to use the system.	In Penang, Malaysia, the licensing department of a local authority is the main department involved in the processing and issue of various sorts of licenses. The previous technique of manually processing licenses has been criticized by license applicants and the public due to processing delays and an ineffective feedback mechanism.
Noorbakhsh-Sabet et al. (2019)	Machine learning applications in health care, focusing on clinical, translational, and public health applications, as well as a review of the critical importance of privacy, data sharing, and genetic information.	Artificial intelligence (AI) study focuses on how computers learn from data and emulate human mental processes. AI improves learning capacity and delivers decision support systems at scales that are changing the face of health care.
Pohl et al. (2010)	Although the extended Boolean retrieval model produces ranked results, current complicated Boolean queries can be used directly as a formal description of the complex information needs in this domain.	When a comparable or greater number of documents are evaluated for relevance, Extended Boolean retrieval can find a bigger number of relevant documents than earlier approaches.
Rauch (2018)	Available studies place less emphasis on health, technology, education, cultural and social activities, and the fashion industry, ignoring the practical applications of AI in these industries.	A planning structure describes many areas linked to administration. It sheds identify study gaps in the existing research that can further be worked on to promote digital government research.
Reis et al. (2019)	The needs to conduct more in-depth scientific research in the sectors of public administration, governmental legislation, and commercial economics, where digital transformation still outperforms artificial intelligence.	Collaboration in the delivery of public services provides significant benefits for policymakers, but studies have also demonstrated that such collaboration has detrimental consequences.
Rogge et al. (2017)	Big data technologies, as well as related basic and statistical research, are gaining popularity. Many colleges have built big data research centers, which are illustrative (for example, the University of California at Berkeley, Columbia University, and the Eindhoven University of Technology).	Scholars' attention is warranted, given the necessity to develop a big data theory. A fundamental examination of big data theory would aid in understanding the features of big data and the development of technology and management models to work with big data.
Sharma et al. (2020)	We examine the academic literature and research on the use of big data analytics in the public sector and its impact on the performance and efficiency of public organizations. We discuss the benefits and drawbacks of employing big data in government enterprises.	The growing availability of statistical data opens new possibilities for 'big' data and learning analytics.
Sharma et al. (2019)	All printed material will now be digitized. This card provides the user's permanent address and is connected to the user's mobile number.	This effort will present a framework that will create an intelligent document that will track vehicle details and ensure that everyone follows the law in India's transportation setting.
Solihati & Indriyani (2021)	AI has the potential to solve transportation issues such as traffic control, reduce accidents, public transit and urban mobility are all components of urban mobility. However, AI deployment in Jakarta requires additional work to verify that the model is user-friendly and connected to all modes of public transport.	A single-point integrated application system has been developed to provide access to all detail on public transit while also creating a regulatory and policy structure to support the apps.
Sun & Medaglia (2019)	Adoption of the artificial intelligence (AI) system IBM Watson in socialized medicine in China, to describe how three groups of actors (government officials, medical control, and Information Technology (IT) business managers) see the challenges of ICT adoption in the public sector.	Different stakeholders have different, and sometimes contradicting, perspectives on the problems.

This section summarizes the application of AI in several fields, organized by theme, and provides an in-depth study of each:

3.3 Field of education

To ensure the digital implementation of society, intelligent public administration can assist in promoting the effectiveness of rights and inclusive technology development (Barth & Arnold, 1999; Corvalán, 2018). Various AI methods, such as optimization, decision support, and services, can help policymakers improve their performance (Milano et al., 2014). Governments can leverage AI in public services, where policy making is complex in a changing environment and affects economic, social, and environmental foundations (Milano et al., 2014). Chatbots are applications that assimilate knowledge, such as human nature, so that computers can interpret communications with their users (Guntoro et al., 2020). Chatbots can reduce barriers to in-person and phone services by enabling one to perform online events and perhaps increasing access and engagement to the service between demographic categories that may not use other digital channels. Other institutions that have implemented chatbots include education, e-commerce, and business. Chatbots in technology are very useful for the world of education, especially in universities; they try to serve or answer questions from students and prospective students (Guntoro et al., 2020). The results show that chatbots can do some of the work that humans do, but it will take a lot of human effort behind the scenes to make the science relevant and usable. As chatbots take over the regular jobs, the results suggest that there may be a new dynamic between the front office and their clients. AI is also used to assess scholarship acceptance by applying fuzzy multiple attribute decision-making, which is used to help determine scholarship recipients' decision-making in universities. The final result lists the probabilities, starting with the highest and working your way down to the lowest. Because the criteria have varying value weights, the results are obtained from the value of each standard. Scholarship recipients are the intended

alternative (Monemnasi & Rozi, 2017). AI can handle more sophisticated services than mechanical devices, such as online types and specialist assessments, and add new tools that can be used with current workers to offer better effectiveness in serving the public. Certain automated services are not only for academic assistance but also for prospective scholarship applicants. Such as value reporting by acting as computerized assistants for public services allows them to concentrate on numerical methods more sophisticated than administrative tasks. An academic official discussed how this type of artificial intelligence could simplify and automate extracting, converting, and loading assignments in various fields of a college application.

An expert discusses why researchers are beginning to examine software AI, which is essentially one piece of software pushing to optimize specific operations. Human activity may not be the most efficient use of available resources. If these academic services were processed, academic personnel would have more time to focus on more complicated, creative, and relevant data management projects. The interplay between technology and humans can lead to higher productivity by automating mundane operations and identifying biases and inefficiencies in information management that should be increased (Mittelstadt et al., 2016).

3.4 Field of health

The application of AI in public health is one of the most exciting and delicate topics, as service failure in this sector is intolerable, and many people's lives are at stake (Tuan et al., 2019). The potential of artificial intelligence to replicate human cognitive function has ushered in a paradigm shift in healthcare, aided by improved access to healthcare data and quick advancements in analytical methodologies (Jiang et al., 2017). Clinical applications and public health significance, such as disease prediction and diagnosis, treatment effectiveness, and outcome prediction, are examples of areas where AI is used for healthcare issues (Ho et al., 2019). Everything connected to pandemic outbreak prediction and precision health is health relevance (Noorbakhsh-Sabet et al., 2019). AI can transform the healthcare industry in various ways, including developing databases in the healthcare sector, where data is critical and must be processed properly to be valuable. Research in data mining transforms databases into knowledge that can identify ailments, such as chronic kidney disease, and is currently being investigated (Wijaya & Muslim, 2016). The approach to using AI through an expert system is a breakthrough in health in handling and managing various problems for patients, including in handling patients with emergency conditions. This approach with AI systems is essential to medical procedures, such as surgical tutorials for cognitive recognition steps (Hammad, 2018). The government has built a particular hospital for patients infected with Covid-19 symptoms; AI plays a role in helping medical robots deal with infectious diseases. Robotic nurses have an essential role in reducing the virus's rapid spread; this robot has also been designed to interact with humans (Marlon et al., 2020). The development of nurse robots has given positive results in nursing, such as reducing the spread of infectious diseases in nurses, helping elderly patients, nurses' lack of time for patients, and limited nurse resources. This expert system aims to assist public health service cadres in identifying obesity in children under five. In the application of AI, it is possible to locate toddlers with primary obesity or secondary obesity and provide solutions to patients with therapy for obese toddlers (Marlon et al., 2020). This expert system uses the forward chaining method and object-oriented programming language, namely Delphi 7 and the MySQL database.

Some argue that AI doctors will replace human doctors in the future, which is considered a fantasy; nonetheless, AI can help clinicians make better clinical judgments or even replace human judgment in specific health domains, such as radiology (Ho et al., 2019). Patients can now be treated from the comfort of their homes thanks to advances in health monitoring technologies (G. D. Sharma et al., 2020; Yaeger et al., 2019). Intelligent technologies are making predictive choices in the face of increasing complexity and time constraints (Rogge et al., 2017). These tools rely on computers rather than humans to make service-related decisions. Using machine learning approaches, they often rely on algorithms and preliminary data to anticipate future results. Sun and Medaglia (2019) have highlighted the most critical aspects related to the challenges of AI adoption in healthcare. They have described how stakeholders (policymakers, hospital doctors, and IT companies) will be confronted with social, economic, ethical, and political issues. They have also discussed policy, organizational, managerial, data, and future technological challenges.

3.5 Field of ICT

ICT is the hardware, software, networks, and media that collect, process, and transmit data, text, video, and images (Corvalán, 2018). This portion comprises the following components: first, the information environment contains the network, which is responsible for efficiently transferring information and data to and from users (Brooks, 1985; Mizoguchi, 1994). Second, chatbots aid government-citizen interactions (Androutsopoulou et al., 2019). Thirdly, information system and legislation analysis in the civil service employ statistical modeling and computer methodologies such as artificial intelligence to understand better policy and decision-making (Harrison et al., 2019). Fourth, data sharing, privacy, and security related to data vulnerabilities via Artificial intelligence against cybersecurity concerns such as data hacking and unlawful use of people's data obtained via devices or sensors, such as street cameras or motion sensors (Kankanhalli et al., 2019). For example, approximately 135 instances of government website hacking were reported in Indonesia in 2018 (Aswandi et al., 2020). The information environment and AI intervention enable rapid development and information exchange (Mizoguchi, 1994). Chatbots are intelligent machines capable of comprehending and processing spoken language and communicating at the user level. They assist public administration by facilitating communication between citizens and government in delivering essential services

(Androutsopoulou et al., 2019). Information privacy issues are inextricably linked to data ownership clarification; identifying data ownership is unavoidable and the benefits created by artificial intelligence applications (Kankanhalli et al., 2019). While considerable emphasis has been dedicated to developing data analysis capabilities, there is excellent room for understanding the function of data processing in the aspect of artificial intelligence in the public sector (Gong & Ordieres-Meré, 2016).

3.6 Field of Licensing

Artificial intelligence advances have transformed how businesses and services are done to benefit users and businesses. Utilizing technology to improve or enable service delivery can benefit users and service suppliers (Walker et al., 2002). The bureaucracy can use AI to respond faster to customer inquiries and problems, minimize personnel costs, increase internal efficiency and productivity, and achieve distinct competition (Walker et al., 2002). Licensing with AI is a system that enables the online processing of license applications and the retrieval of license-related information. This process is carried out online using a computerized e-licensing system. When the licensing department receives an application for a license, the data is entered into the e-licensing mechanism and quickly transmitted digitally to the appropriate officials for their remarks, suggestions, and confirmation (Muthu et al., 2016). Licensing with artificial intelligence (e-licensing) has been established and developed expressly for Indonesia's license department's demands and qualifications (Hantoro, 2012). It is a centralized legal structure that automates and improves the present manual procedure. It is web and internet-capable to improve licensing management efficiency, responsibility, accessibility, and receptivity. It generates composite licenses, which allow for submitting several license applications using a single application form. Downloadable license application forms are supplied, as is web submission. All available unoccupied sites will be dynamically publicized on the web to allow applicants access to this information. AI offers enormous promise for e-licensing concerns since it possesses detection of speech and translation software processing capabilities, machine vision via picture identification and categorization, analytics, and detection of patterns. Advanced machine learning and deep learnings are the most recent introductions and technologies employed (Rauch, 2018). The licensing sectors in which AI may be applied include licensing requirements, licensing processes, and permit issuing (Rauch, 2018). Although giving multiple prospects for more excellent governance and AI has also brought in many new problems for e-licensing, including information, data, organizational, managerial, legal, regulatory, environmental element, etc.

3.7 Field of Transportation

Transportation industry technological advancements are frequently influenced by various issues such as traffic, human error, and accidents (Antony, 2017). Artificial intelligence has flourished in the transportation business, which is used to forecast or make judgments through neural connections and evolutionary technologies. AI has been applied to various disciplines within the transportation industry, including real-time monitoring and medical aid (Hengstler et al., 2016) and real-time retrieval of crime-related data by police officers on patrol to keep residents safe (Antony, 2017). Implementation of AI devices on Transjakarta buses, firms can reduce passenger congestion on Transjakarta vehicles. Additionally, the availability of innovation in Transjakarta bus. Enables the vehicle's age to be predicted, reducing the effect on Transjakarta buses while utilizing the highway (Solihati & Indriyani, 2021). Implementing artificial intelligence in Transjakarta can assist the Jakarta administration in integrating all types of transportation. The tracking sensors implanted in each infrastructure mode will generate a cluster that will discover the point at which each transport moves into one. The administration uses ERP (Enterprise Resource Planning) software; additional efficiency advantages can be realized, mainly when the municipal administration components the computerized path charging mechanism. The municipal administration may effectively control traffic flows, particularly in crowded locations, by utilizing big data and having a robust ERP procedure (Solihati & Indriyani, 2021). Path users may be charged greater charges during peak hours and cheaper rates during off-peak hours, benefiting them and the city. They also increase pricing accountability and social stability. It may be possible to anticipate status, affect travelers' behavior, and make transportation recommendations in the future.

In Jakarta, artificial intelligence technology is used to serve the transportation sector (Solihati & Indriyani, 2021) in the following ways: 1) Plate Number Identification: reads the numbers and characters on any vehicle's license plate, even in inclement weather, dim lighting, or if the license plate has been altered; 2) Persons Counted: determines the amount of human traffic in each location. It can determine the number of visitors to a place and its peak hours; 3) Transportation Numbering: counts and classifies all passing vehicles like motorbikes. It can classify up to 23 different types of vehicles; 4) Transportation Housing: determines and estimates the duration of a vehicle's halt at a particular location. It can be used to monitor unlawful parking and traffic management; 5) Transportation Break-In: detects cars entering restricted zones and can identify and notify violators.

Accurate AI assessment strategies for quantity predicting in the route transportation system can also assist businesses in making profitable investment options (Mrowczynska et al., 2017). Congestion is a problem in Indonesia. AI can help manage traffic effectively by introducing more intelligent signal computation and monitoring in real-time to handle higher and lower traffic patterns (Kartika et al., 2018). Other application areas include predicting pedestrian and cycling routes to reduce traffic accidents, increasing efficiency, and decreasing the number of road disasters (Antony, 2017). And using smart register certificates to electronically monitor their owners if they admit to committing any crime on the road (J. Sharma et al., 2019).

3.8 Other areas of expertise

This section contains all articles not falling under one of the abovementioned topics, which discuss rationality and environmental policy prediction (Gulson & Webb, 2017). It focuses on the difficulties and possibilities of sustainability in the environmental area (Hutajulu, 2021), highlighting the management of robotics with intelligence (Mrowczynska et al., 2017). Which describes how artificial intelligence works and affects society (Kankanhalli et al., 2019) and describes the function of the Internet of things (IoT) in alerting small businesses (Mutaqin et al., 2021).

4. Study gaps and future study priorities

Figure 1 in the methodologies section shows the study diagram used to determine the future research agenda and identify research gaps. According to our analysis, the article concentrates on education, health, information, communications technology, licensing, transportation services, and other sectors. In the real world, the practical application of artificial intelligence in these fields has been implemented in several industrialized and developing countries. Because of the varying levels of technology adoption in industrialized and developing countries, the study results on AI adoption in the government sector may differ (Kankanhalli et al., 2019). The analysis of technology implementation (pre-adoption) and evaluation (post-adoption) in different industries is critically required (Kankanhalli et al., 2019). Many academicians and researchers focus solely on the technological aspects of artificial intelligence applications, failing to provide a detailed, comprehensive governmental model that explains the consequences of administrative state governance. In contrast, there is still a developing need to comprehend the reach and results of AI-based applications and the issues comprehensively associated with them (Reis et al., 2019). Future academics should concentrate on the problems and hazards of deploying artificial intelligence in each area.

5. Conclusion

In this study, we discussed the role of AI in administration in the approach, where a functional chart is offered based on a survey of 35 articles, through which several themes and gaps are found. The process then employs a transparent review technique in which publications are retrieved from Scopus and sorted according to the study's topic. Following the methodology section, the results and discussion area discusses the concept in the available articles, implemented by a conceptual examination of AI assistance in several administrative areas. The study gaps and future study objectives highlight the importance of additional studies in the other sector and focus on the obstacles associated with AI adoption and implementation. Because this study is restricted to articles found only in databases (Scopus), future researchers may choose to incorporate other study articles published in this field.

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