Journal of Data Acquisition and Processing
ISSN: 1004-9037
https://sjcjycl.cn/
DOI: 10.5281/zenodo.778073

APPLYING ARTIFICIAL INTELLIGENCE TO GOVERN PUBLIC TRANSPORT

G. Priyadharshini M.Sc., MPhil#1, K. Suriya, MCA, M.Phil., #2 S. Manimaran, #3 S. Shalika, MCA, #4 K. Sujitha, MCA#5
PG Student#3 , Assistant Professor in Computer Science
Dhanalakshmi Srinivasan College of Arts and Science for Women(Autonomous) #1#2
Assistant Professor, Department of Civil Engineering,
SRM TRP Engineering College, Trichy#3
Shanmugha Arts, Science technology and Research Academy, Thanjavur#5
Perambalur, priyadarshini.g@dscollege.ac.in

Abstract
The goal of this research is to examine Artificial Intelligence management and how it is used in the field of public transportation. The obstacles and requirements needed to apply AI on public transportation to improve urban mobility are the main topics of data analysis using a qualitative methodology with data gathering from observation and literature review. In addition to the important components of AI management covered in the following topics: 1) Source finance for AI in Mass Public Transport Project 2) Reform of Traditional Procurement Process 3) Create bias-free AI Develop a legal and policy framework. 4. Avoid the temptation of over-relying on AI. The goal of this research is to provide a reference and recommendations for local governments as they formulate future AI and transportation policies. According to the research analysis, AI can solve difficulties with traffic management, traffic safety, public transportation, and urban mobility. The AI implementation in Chennai, India still requires work to make it more user-friendly and ensuring that it is integrated with a variety of public transportation options. It is advised to create an all-encompassing integrated application system with a single point of entry, as well as a legal and regulatory framework for the applications.

1. Introduction

Based on the research, about 32% of Chennai population uses public transportation, due to safety, comfort and lack of regulation of private vehicle ownership. The lack of use of public transportation causes a domino effect to financial losses, as well as the overcapacity of road space that leads to congestion and traffic accidents. If the number of vehicle usage keeps increasing, it may cause a land-use change from green area to concrete or road, more fuel consumption, more emission, more pollution, and many environmental harms and health risks following it. Chennai is categorized as a transitioning city, which is a state where population growth is increasing significantly through urbanization that leads to many challenges in infrastructure. The Tamil Nadu government has taken up the challenging task of migrating the state's bus transport system, among the better-run in the country, to a new paradigm. In tandem with climate change goals, this reform move aims to meet the UN Sustainable Development Goals (SDG) for safe, affordable, accessible and sustainable transport systems for all and improving road safety, notably by expanding public transport by 2030. [1] Chennai is undergoing some milestone covering 6 components of a metropolitan city which are: smart living, smart mobility, smart governance, smart environment, smart economy, and upgraded technology [1]. One way to ensure its realization is by utilizing ICT

effectively and efficiently. The more modern usage of ICT is known as Artificial Intelligence (AI).

Artificial Intelligence (AI) is a revolution in computer technology, by applying the intelligence of the human-like nervous system that enables decision making more effectively and efficiently. AI is programmed to receive information and acts according to a set of limitations with the given information. AI can perform reasoning with given data to predict outcomes and next events to create recommendations or suggestions. The founders of AI envisioned the notion of embedded intelligence as being conjoined between perception, reasoning, and actuation. The use of AI in the public transportation sector is expected to improve services in terms of quality and quantity to minimize the use of private vehicles and reduce the potential for other losses. According to Prime Minister Narendra Modi, "The system in our country were such that it used to take many years to complete projects. This lethargic approach hampered development. Our Government prepared the PM Gati Shakti master plan to overcome delays caused due to lack of coordination among departments". The transportation and logistics sector is expected to remain highly positive and will continue to expand for many years given Prime Minister Narendra Modi's continued focus on infrastructure development and the burgeoning e-commerce sector. However, in India, the literature source explaining details of AI application in the transportation sector is not clear, this is the main background of the author's research, the author would like to study existing usage of AI in the public transportation sector for Chennai's transportation, with main concerns on 1) What are the management aspects for applying AI in the public transportation sector 2) How should be the design of AI implementation model for the public transportation sector in Chennai. The purpose of this study is to analyze and recommend AI implementation models that are comfortable, convenient, effective, efficient, and wisely planned to support Chennai's people mobilization.

2. Theoretical Framework

2.1. Artificial Intelligence

Artificial Intelligence (AI) is an innovation in computer science that is very important in the present era and the future. Derived from the Latin "intelligo" which means "I understand", AI has the aim of understanding and taking action. The development of AI stems from the emergence of computers around the 1940s. At this time, attention is focused on the ability of computers to do something that can be done by humans. In this case, the computer can adopt the ability of human intelligence and behavior to solve problems. In late 1955, Newell and Simon developed The Logic Theorist, the first AI program. During the 20th century, several definitions of Artificial Intelligence(AI) were proposed. One of the early definitions of AI, which is still popular is "making computers think like humans", as shown by the large number of science fiction films promoting this view [3]. Also, Artificial Intelligence (AI) is a study of how to make computers do things which, at present, humans are better. Meanwhile, the field of artificial intelligence or AI is not only for understanding something but also for building intelligence entities. A system is called rational if the system is doing "the right thing", according to what it knows. A human-centered approach or a humane approach is part of empirical science, which involves observations and hypotheses about human behavior. The rationalist approach involves a combination of mathematics and engineering [4]. Some areas

in AI according to [3] are Expert System, Computer Vision, Natural Language Processing(NLP), Robotics and Navigation Systems, Games, and Theorem Proving.

2.2 metropolitan City

The word metropolitan comes from metropolis, which in Greek means mother city, made up of mētēr meaning mother, and polis meaning city. A person who lives in a metropolis, or city, is also called a metropolitan. It is to define new ICT applied concerning modern infrastructures within cities, how communities could become smart, and how a city could be designed to implement information technologies [5]. The aspect stressing that the diffusion of ICT in cities has to improve the way every subsystem operates, to enhance the quality of life. From the technology perspective, a smart city is a city with a great presence of ICT applied to critical infrastructure components and services. [7] To provide an overview of the state of the art sensors applications used for managing physical infrastructure digitally in a smart city. For example, energy sensors to maintain energy consumption, mobility sensors to improve traffic control schemes. [8] Regarding the dimensions of smart cities in the research made by Albino in 2015, there are 6 components described: smart economy, smart mobility, a smart environment, smart people, smart living, and smart governance. Those dimensions with each aspect of urban life. The smart economy is related to the presence of industries in the field of ICT or employing ICT in production processes. Smart mobility refers to the use of ICT in modern transport technologies to improve urban traffic. Smart people related to the education aspect, smart governance related to e-democracy, smart environment associated with sustainability and efficiency, while smart living associated with security and quality.

Smart City can be defined simply as a smart city or smart city that can provide a better quality of life and comfort for its people. Smart City is considered as a city that humanizes its citizens. Smart City is a concept of planning, structuring, and managing a city that is integrated into all aspects of life. Smart City is a planning concept by utilizing technological developments that will make life easier and healthier with a high level of efficiency and effectiveness. There are several indicators or supporting factors in realizing a Smart City, specifically; Smart Economy, Smart Mobility, Smart Environment, Smart People, Smart Living, and Smart Governance [9].

3. Public Transportation in Chennai City Under Artificial Intelligence

3.1. Aspects of Chennai City's Mass Transit

The Chennai Metro is a metro rail project serving the city of Chennai, Tamil Nadu, India. The project is owned and operated by Chennai Metro Rail Limited (CMRL). The metro rail network consists of five lines, two of which are currently operational and three are under construction. The project is being supported Japan International Cooperation Agency (JICA). The network has a single centralised operation control centre and ATP (Automatic Train Protection) and ATS (Automatic Train Supervision) have been installed. The telecommunication system is multi-functional embracing information, security and safety aspects. To avoid problems experienced on present operations and to facilitate cross-mode ticketing from the outset, CMRL proposed a computer-based automated fare collection system. An artificial intelligence(AI)-trained facial recognition system(FRS) has been installed at the Puratchi Thalaivar Dr. MGR Central railway station for detecting known culprits passing through the gates and alerting authorities. The database can be searched within the system by uploading images of the

suspected individual in seconds. The AI-based system will also help the police search missing children/persons within seconds. Tamil Nadu Chief Minister M K Stalin launched an Artificial Intelligence (AI)-enabled panic button-cum-CCTV surveillance project in 500 Chennai buses as part of an initiative to improve the safety of women and children, as reported by PTI. The state transport department has planned to provide this facility in about 2,500 buses under the Nirbhaya Safe City Project and in the first phase 500 buses in the metro city have been provided with four panic buttons, AI-enabled Mobile Network Video Recorder (MNVR) and three cameras each, respectively. The MNVR will be connected to a cloud-based control centre via a 4G GSM SIM card. In case of any inconvenience, discomfort or threat caused by fellow passengers while travelling, the women passengers could press the panic button to record the incident. While doing so, an alarm (bell) will be raised at the control centre along with a video recording of the incident on the bus. With this alarm, the operator at the control centre will monitor the situation and facilitate, in real-time, the next course of action. The control centre has been linked to the distress response centre of the city police and Greater Chennai Corporation. A release from the state government said about 31 bus depots and 35 bus terminuses of the Metropolitan Transport Corporation (MTC) have been brought under surveillance. The project would also aid in detecting missing persons and identifying criminals and other works of the GCC, transport department and the police. Furthermore, the public can engage directly with the government through the mobile app with feedback and comments, helping the government to improve its services. Tamilnadu MTC is an example of an enterprise that is leveraging technology to become an intelligent enterprise that provides the best service possible to the Indian public even as it expands. Tamilnadu MTC runs on the SAP technology platform, SAP is helping many Indian transportation companies to grow while at the same time improving efficiency and lowering costs. Communication based Train Control System (CBTC) with unattended train operation permitting an operational headway of 90 seconds.
Telecommunication: Integrated System with Optical Fiber Transmission System, SCADA, CCTV, Central Voice Recording System (CVRS) etc. [2]. Communication based Train Control (CBTC) Signaling system provides adequate safety level of CENELEC SIL-4(Safety Integrity Level) and permits an operational headway of 90 seconds with continuous automatic train control. The CBTC technology is suitable for UTO (Unattended Train Operation) / DTO (Driverless Train Operation). The proposed telecom system and transmission media will have following sub-systems: Optical Fiber Transmission System, Telephone Exchange, Mobile Radio Communication System, Public Address System, Centralized Clock System, Passenger Information Display System, Close Circuit Television, Central Voice Recording System (CVRS) and, Supervisory Control and Data Acquisition (SCADA) System. To ensure the safety of passengers, Half Height Platform Screen Doors is proposed to be provided at all elevated stations and Full Height Platform Screen Doors at all underground stations. It is proposed to provide computer based automatic fare collection system (AFC) with contactless smart token/card type ticketing cheaper which offers lower life cycle costs. The proposed AFC system shall be interoperable with existing system. The existing AFC System Central Computer (CC) has a capacity to cater for up to 256 stations. The AFC system shall also have functionality of interface to existing CCHS (Central Clearing House System) which is capable of handling up to 32 operators and 10 million transactions with provision of integration with

other transit (metro, bus etc.) and non-transit (parking, toll etc.) which may be planned in future in line with the state / national policy. In addition, the proposed AFC system shall also be NFC (Near Field Communication) enabled. Facility of recharging of travel cards using Cash, Debit/Credit Cards and Net banking/Web Portal shall also be available. AFC system shall also support offsite sales terminals also, wherein cards and tokens can be dispensed at locations outside metro premises. The government is now utilizing ERP (Enterprise Resource Planning) software, further efficiency gains can be improved particularly when the city government implements the electronic road pricing system. By using data analytics and by having a good ERP process, the city administration may be able to better manage traffic flows especially in highly congested areas. Road users may pay higher rates during peak hours and lower rates during off-peak hours, which benefits them as well as the city as a whole. They also create greater transparency in terms of pricing and good governance. In further plan, it may result to predict status, and even influence travelers' behavior and provide recommendations for transportations. Minister of Road Transport & Highways Government of India, Nitin Gadkari also talked in detail about iRASTE (intelligent Solutions for Road Safety through Technology and Engineering), an Artificial Intelligence-powered project, on a pilot basis in Nagpur in Maharashtra, with the aim of reducing accidents by 50 per cent in Vidarbha's biggest city. This is a collaborative effort between the government, Intel, INAI, IIIT-Hyderabad, CSIR-CRRI (Central Road Research Institute), Mahindra & Mahindra and Nagpur Municipal Corporation (NMC). The project will focus on vehicle safety, mobility analysis and road infrastructure safety to move towards a "Vision Zero" accident scenario. Aside from data management, the company provides solutions such as computer vision and real-time video analysis, which help in the development of government policies in areas such as smart governance and smart mobility. It has collaborated with the Indian National Police to provide surveillance at high-profile international events, including the 2022 International Chess Olympiad and the 2022 WTA Chennai open and International meetings. This is a new phase to start building AI communities in India, to create a government-supported program called AI India. AI technology in supporting the transportation sector in India covers functions: 1) License Plate Recognition: reads numbers and characters on license plates of any vehicle, even in bad weather, poor lighting, and even if the license plate has been modified; 2) People Counting: detects human traffic in a certain area. It can be used to count the number of people visiting the area and identify its peak hours; 3) Vehicle Counting: counts every passing vehicle and classifies them into motorcycles or small, medium, and large vehicles. 4) Vehicle Dwelling: identifies and calculates how long a vehicle stops at a certain spot. It can be used to monitor illegal parking and manage traffic; 5) Vehicle Intrusion: detects vehicles entering restricted areas, can be used to spot violations and send alerts.

3.2. Some Management Issues with AI in Public Transportation

Enhancing efficacy and efficiency through the use of high technology and AI can benefit corporate processes. On the other hand, large amounts of financing and resources are required for technological investments in order to computerize work units into a single, integrated system and enable them to provide the necessary information for decision-making. We will need the government's complete backing, as well as good cooperation with connected private

parties, banks, and society as a whole, in order to establish an AI-operated transportation system. All parties, including the government, private sectors, SOEs, and banks, should be involved in creating a Private Public Partnership (PPP) system for transportation management in order to have such strong capital and cooperation. Government and industry collaborate to finish a project and/or offer services to the general public. The management of this PPP will include several stimulus programmes from the government, SOEs, and banks that will stimulate the acceleration of AI development in the transportation industry. Profits will follow naturally once the best possible service for the general public has been developed, covering the initial high investment expenditures. There will be a lot of purchasing of goods and services required to establish the application of artificial intelligence in an existing system. The procurement procedure will be difficult because so many people will be participating. Reforming procurement systems is necessary since they can be seen as encouraging good governance reforms. A successful procurement process that is transparent, accountable, and involves stakeholders can be a helpful instrument for implementing good governance. One of the most useful tools the government has for long-lasting public sector change is procurement reform. It is fundamental to providing necessary services, carrying out initiatives and programmes, and turning governmental policy into observable results for citizens. Additionally, reforming public procurement can immediately enhance a nation's commercial, investment, and social environments. Effective public investment and economic growth depend on good public procurement. The improvement of public sector performance and governance reforms can both be strengthened and supported by public procurement reform Following the creation of Chennai Smart City or the use of AI, a contemporary and transparent procurement will increase public confidence in the government while also assisting vendors and the government in the acquisition of products and services. Due to the vendor's ability to support every procurement need in real-time, operation time is increased while lead time is decreased. When procurement is handled correctly, performance and productivity both greatly increase. Traditional procurement, on the other hand, is inefficient and opaque, takes too long, and incurs excessive administrative and indirect costs. Utilizing cutting-edge technology and taking the initiative to improve workplace culture will be necessary to promote procurement reform. To create AI in India, a robust procurement system is required, but AI itself may also be utilized to add "smartness" to the procurement process and learn from data points to influence future outcomes. In particular, AI can facilitate the first three stages of the services procurement process by enabling accurate project scoping, quick matching of needs to capable service providers, and best provider selection through expedited proposal submission. [10].

AI still only functions as a processing machine at its core. To offer a solution or recommendations, the system must be given the data to process. Similar instances of AI use in Chennai's transportation industry, for example, in the use of ERP software, can lead to higher pricing and excellent governance transparency. However, the data provided for the AI's input directly affects this result. Big data and up-front technology are two things that AI typically depends on, but both have drawbacks. The accuracy of AI systems can be impacted by inaccurate big data classification or inaccurate customer/personnel data. The system's error level may cause consumers to receive inaccurate information or recommendations. From the perspective of the customer, false information will undoubtedly increase mistrust for the use of

AI. These risks can be decreased by creating unbiased AI, which can be done by concentrating and niching down the business problems that the system will be solving, then organizing and gathering reliable data that allows for various options, designing data-driven algorithms, testing and deploying them, and continually monitoring and seeking user feedback using the most recent and real-world data. AI technology enhances human lives in a variety of ways by streamlining processes and creating simpler/more convenient experiences. AI, however, has two sides to it, and if people rely on it too much, it could hurt their quality of life. The one that is most obvious is data transparency. Due to the fact that AI feeds on data, there is a chance that there will be privacy violations, prejudice, or even manipulation for political rights. For example, if false information or inaccurate modelling contributes to traffic accidents, it will be the user, not the AI, who would be held accountable and punished. Indirect risks from this phenomenon include skill atrophy. AI can simplify employment through automation, which can result in less human touch or interaction in the process. Humans who become overly dependent on AI risk losing the motivation to simply think and learn new things. There is a concern that crucial decisions or events in our life may not be made with enough care as smart technologies get more and more involved in decision-making processes. The possibility of technology outages, for which all users must be prepared, is another concern that is frequently associated with the usage of AI technology.

Being underdeveloped, India faces the additional difficulty of having insufficiently competitive human resources. Both quantity and quality of human resources (HR) in the field of artificial intelligence (AI) are still lacking in India. Startup businesses still have a huge demand for professionals in the domains of information systems and computer science, notably artificial intelligence. Specific occupations will be required to enroll, such as professionals in data scientists, information technology, math, etc., in order to operate, manage, and create AI. However, talented individuals in India who would be able to run this firm may have already left for a developed nation. The development of AI might benefit some aspects of society while harming others. In order to protect user data privacy, for example, the government's involvement in preserving the usage of AI is crucial. The government must create just policies while allowing for the advancement and acceleration of technology, working with relevant parties.

4. Conclusion

The transportation industry in Chennai has a considerable market potential for AI. Large economies and populations provide significant issues, but they also present several opportunities for AI-based solutions. The issue for the transportation sector will be to use technology to control growth. This entails using artificial intelligence, data analytics, and machine learning technologies to power corporate processes. With AI management, this competitive advantage can be attained in an effective, focused, and balanced way. In terms of present development, which is still restricted to information on timetable and station density as well as electronic payments, the scope to develop AI in the Tamilnadu MTC transportation industry is still extremely great. There are still plenty of chances to add features and incorporate client data from different other areas. The following are challenges in putting AI into practice: 1) Finding money for AI in Mass Public Transport Project; 2) Reforming Traditional Procurement Process; 3) Developing Unbiased AI; 4) Avoiding the trap of over-relying on AI;

5) Finding Talent who Master AI; and 6) Developing Legal and Policy Framework. Government policy has a direct bearing on the growth of a smart city. To decrease the egocentric nature of any interest, it must be coordinated and integrated. Traffic management, traffic safety, public transportation, and urban mobility are among the transportation issues AI can solve. However, additional work needs to be done to guarantee that Chennai's AI implementation integrates with a variety of public transportation options and enhances the system's usability. The development of a one-gate integrated application system to access all public transportation information, as well as the creation of a legal and policy framework for the applications, are both advised.

5. References

[1] Chennai Metropolitan transport commission- 2022
[2] The Chennai Metro Rail Limited (CMRL)
[3] C. Warwick, "Studying users in digital humanities," in Digital Humanities in Practice, 2018.
[4] G. D. Joseph C. Giarratano, "Expert Systems: Principles and Programming," in Expert Systems: Principles and Programming, Brooks/Cole Publishing Co.Div. of International Thomson Publ. Co. 511 Forrest Lodge Road Pacific Grove, CAUnited States, 2005.
[5] A. D. Thierer, A. Castillo, and R. Russell, "Artificial Intelligence and Public Policy," SSRN Electron. J., 2017.
[6] S. Alawadhi and A. Morris, "The use of the UTAUT model in the adoption of e-government services in Kuwait," in Proceedings of the Annual Hawaii International Conference on System Sciences, 2008.
[7] M. Batty et al., "Smart citieBatty, M. et al., 2012. Smart cities of the future. European Physical Journal: Special Topics, 214(1), pp.481–518.s of the future," Eur. Phys. J. Spec. Top., 2012.
[8] U. De Lisboa, F. De Engenharia, and U. De Lisboa, "Analyzing the effects of routing in the sustainability of the city and on the operational efficiency of urban logistics services," Urbe 2015, 2015.
[9] R. Giffinger, H. Gudrun, and G. Haindlmaier, "Smart Cities Ranking," Archit. City Environ.,2010.
[10] N. B. Aletà, C. M. Alonso, and R. M. A. Ruiz, "Smart Mobility and Smart Environment in the Spanish cities," in Transportation Research Procedia, 2017.
[11]B. Report, "IACCM Benchmark Report 2019," no. September, 2019.