Artificial Intelligence (AI)

in Transit

KEOLIS

Artificial Intelligence (AI)

Employing AI is less of a race and more of a journey. The potential to achieve objectives that go straight to the core of growth and expansion is seemingly limitless, specifically, for applications within public transportation.

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In this paper, we will spotlight learnings from Keolis networks around the globe and showcase how employing AI requires the adoption of a new mindset that avoids the myth of a one-shop approach. We will also show how, as a global leader in shared mobility and multi-modality, Keolis continues to be a pioneer.

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Creative Exercise

Imagine a puzzle.

Once you choose a puzzle box from the shelf, you open it and begin to sort pieces by shapes and colors. As you work, a frame begins to take shape. But there's a complication: some pieces are just white squares without an image or jigsaw shape. A further complication: the box appears to be missing pieces for entire sections of the final image. It's entirely possible they have never even been manufactured.

This is where the transit industry stands now as it relates to Artificial Intelligence (AI). There are clear opportunities for its application—route optimization, fuel efficiency, ridership predictability—to name a few. However, the pieces needed for these benefits are either unclear or not yet known. Still, we have a picture of what we're building towards, and confidence should be maintained that the appropriate resources can be pulled together in support of that final puzzle.
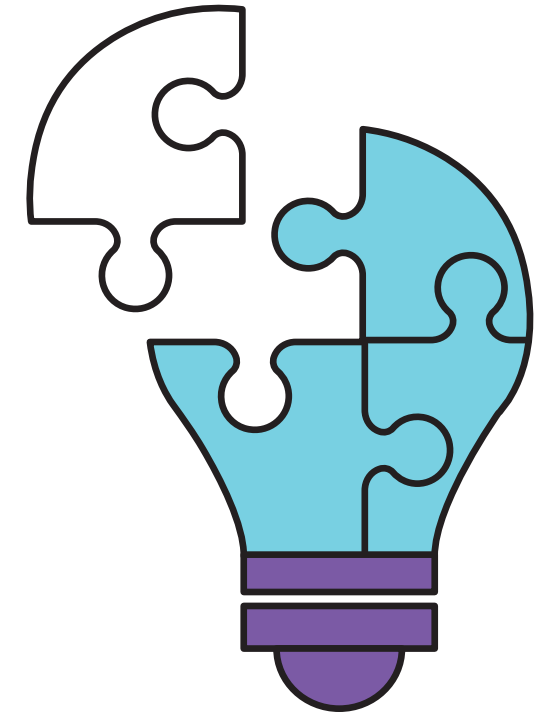
① DEFINING ARTIFICIAL INTELLIGENCE

NO LONGER CONFINED TO ARENAS LIKE ROBOTICS

Artificial intelligence, or AI, is continually evolving. Over the last decade, people have embraced automation and access to seemingly unlimited data sources.

NO LONGER DISMISSED AS "MERE HYPE"

Organizations that have invested in digital transformation are now keen to tap into this technology to streamline operations, improve service, and increase profits.
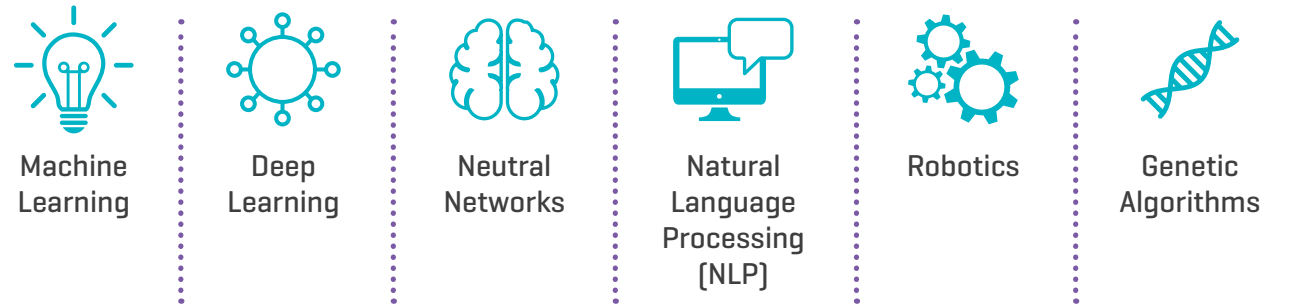
SOME ASSEMBLY REQUIRED

No turn-key or push-button solution for harnessing AI applications exists worldwide. Truly novel AI necessitates human input to build, adapt, and utilize it.

> *As an operator our core goal at Keolis is to ensure safe delivery of passengers and vehicles from point A to point B. AI dates back to the 1950's and is 'not new' but a widely transformative technology being used in some form by 97 percent of organizations today* (New Vantage Partners, 2022)...

MANY OF THE CORE CAPABILITIES OF AI ARE DEFINED BY SIX CATEGORIES:

Machine Learning	Deep Learning	Neutral Networks	Natural Language Processing (NLP)	Robotics	Genetic Algorithms

> *...Today, our teams around the globe are actively employing new technology to enhance everything from real-time rerouting to predicting (and avoiding) the deterioration of vehicles and equipment.*

Alex Wu
Vice President of Digital Transformation and Chief Information Officer
Keolis North America

The potential to achieve **objectives that go straight to the core of growth and expansion** is infinite. Specifically, for applications within public transportation, this is a technology that meets the following criteria:

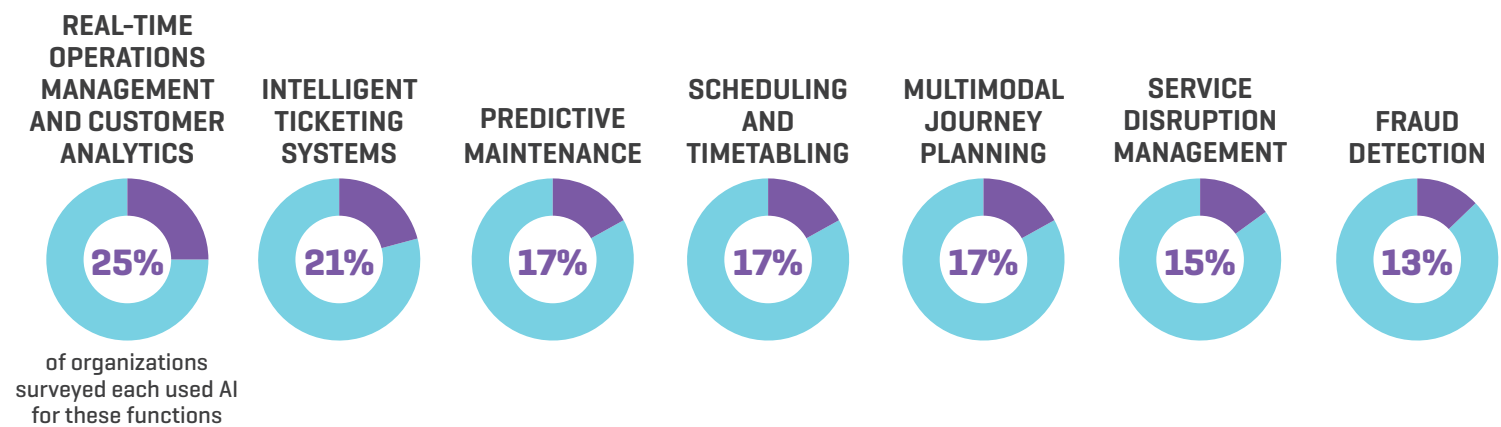| **ABILITY**	TO LEARN FROM AND ADAPT TO DATA
APTITUDE	TO SHOW CREATIVITY IN SOLVING ISSUES
SKILL	TO IMPROVE PROCESSES THAT ALREADY EXIST

Empowered with these standards, agencies can accomplish data collection; develop prediction models; and inform and adapt capital vehicle acquisition and deployment strategies. Objectives are well worth the laborious task of building and discovering new puzzle pieces.

RECOGNIZING THE POTENTIAL OF AI:

- Reduce traffic congestion
- Cut travel times
- Lower operation and maintenance costs
- Improve customer experience
- Enhance system safety
- Increase revenues
- Reduce energy consumption

② AI CAPABILITIES AND COMPETENCIES

As with most strategic development, a phase of learning is essential to educate transit leaders on the current benefits and future potential of AI. According to a survey report by the International Association of Public Transport (UITP), surveyed organizations conveyed the most frequent AI uses were:

REAL-TIME OPERATIONS MANAGEMENT AND CUSTOMER ANALYTICS	INTELLIGENT TICKETING SYSTEMS	PREDICTIVE MAINTENANCE	SCHEDULING AND TIMETABLING	MULTIMODAL JOURNEY PLANNING	SERVICE DISRUPTION MANAGEMENT	FRAUD DETECTION
25%	21%	17%	17%	17%	15%	13%

of organizations surveyed each used AI for these functions

An impressive start but compared to other industries like aviation, significant application opportunities remain for public transportation.

The same UITP report notes that as of 2020, ten percent or less of surveyed organizations used AI for:

SAFETY MANAGEMENT

NETWORK PLANNING AND ROUTE DESIGN

MASS CUSTOMIZATION SERVICE

CUSTOMER SUPPORT

ADMINISTRATIVE TASKS

To further build out the infrastructure required to deploy new technology, it's important that agencies are somewhat familiar with the core competencies of AI:

TRANSIT PRIORITY	AI COMPETANCY	AI DEFINITION
Revolutionize service planning and delivery	Analytical capabilities	Critical thinking skills: identify problems, find relevant information, and come up with logical solutions
Solve issues in real-time	Anomaly detection	Or outlier detection: a technique that identifies events, observations, or data points that are different from what is expected or normal
Minimize fuel consumption	Grow sustainability	Expansion goals emphasized by a harmonious blend of economic prudence, social responsibility, and environmental stewardship
Deliver outstanding customer care	AI-driven analysis	Also, data analytics, machine learning with minimal human intervention to collect and analyze large data sets, identify patterns, and uncover insights
Equip agencies with insights on operational efficiency and the state of their fleets	Predictive maintenance (PdM)	Proactive method that uses data-driven analytics to anticipate equipment failures and schedule maintenance when and where it's needed most

❝

Investing in AI, in combination with cyber security and cloud technologies, agencies can radically transform service delivery and back-office operations. Investments not only modernize systems and service but increase rider behavior predictability, help manage operations, optimize routes, allocate resources, and minimize costs as well as foster innovation and sustainability within the sector, making transit more attractive and accessible.

Miroslav Katsarov
CEO, Modeshift

3 AI ECOSYSTEM

In addition to looking to alternate industries, initiatives are underway to dive deep into the potential impact of AI within public transportation. **As a global leader in shared mobility and multi-modality, Keolis has been a pioneer in autonomous mobility since 2016.**

In response to accelerating urban growth and increasing traveling requirements, Keolis operates innovative, high-performance, and environmentally friendly autonomous mobility solutions. Deployed by Keolis in France and six additional countries, autonomous vehicles provide passengers and public transport authorities with an efficient, safe, and appropriate response to present and future mobility needs.

AUTONOMOUS VEHICLES:

a pertinent solution to global mobility issues

178,000
kilometers covered

40,000
hours of operation

55
deployments in **7** countries

>218,000
passengers, and counting

With deployments in France, the U.S., Australia, Canada, Belgium, the UK, and Sweden, the Keolis Group has fostered a reputation as an expert in the operation of autonomous vehicles for passenger transport. Whether small-capacity shuttles or buses, autonomous vehicles travel without a driver on pre-determined routes, in dedicated or shared lanes.

More than a driverless car, the vehicles use cameras to analyze obstacles, laser remote sensing (LIDAR) to represent a 3D environment, satellite GPS navigation systems, and motion sensors. Safety is further ensured by a safety operator on board with access to an emergency stop button, and intercom for secure communication with

supervisors—all customized to create a seamlessly connected infrastructure. Plus, Keolis' ambition is to develop 100 percent autonomous driving without an operator in attendance, or "No-Op".

Federal Investment

Notably, **SmartTransit AI** is the latest real-world case study to watch as findings and data continue to emerge. This federally funded remit is to develop AI software that analyzes rider demand, traffic congestion, and vehicle energy use. In 2020, U.S. federal agencies: the Department of Energy (DOE), and the Department of Transportation's (DOT) Federal Transit Administration (FTA,) were allocated a grant for advanced vehicle technologies research (portion of $130 million).

In March 2024, Tennessee's Chattanooga Regional Transportation Authority (CARTA) launched a pilot program, which aims to improve energy efficiency and affordability in its public transit system. This investment allowed CARTA to partner with Vanderbilt University and the AI company SmartTransit AI to develop **an AI software platform that analyzes rider demand, traffic congestion, and vehicle energy use.**

Ecosystem

Department of Energy | **Department of Transporation** | **Federal Transit Administration** | **Vanderbilt University** | **Chattanooga Area Regional Transportation Authority**

Objective

- Artificial intelligence and real-time data analysis at scale

Strategic Approach

- Models to estimate the load factors and real-time energy consumption of mixed-vehicle transit fleets
- Predict and optimize operations to lower overall energy impact
- Ensuring that system-wide capacity remains unaffected

Investing in Transit

In addition to significant federal commitment, a key takeaway demonstrated by the CARTA pilot is how AI today is not turnkey and requires multiple partnerships, initiatives, and phases. While the larger ecosystem of organizations looking to establish their expertise within AI, *Metro magazine* (February 2024) identified the leading organizations that have recently invested in transit:

HoloVIZ
Server and dashboard framework that runs Jupyter Notebook integration

Hayden AI
A provider of vision AI and spatial analytics technologies, automated bus lane technology

LYT.transit
Provider of intelligent connected traffic technology solutions, transit signal priority solutions

Snapper Services
Mosaiq Insights, Snapper's analytics platform is utilized by transport providers to understand trends impacting punctuality and service delivery

4 AI BUILDING BLOCKS

Accessing this potential to employ AI through its core competencies to drive growth and expansion is less of a race and more of a journey. The main takeaway from this paper is the adoption of a new mindset that avoids the myth of a one-shop approach. The below building blocks from the California Transit Association (CTA), offer a roadmap as transit agencies explore opportunities, build out an ecosystem of expertise, and establish partnerships to work in fluid collaboration.

CALIFORNIA TRANSIT ASSOCIATION'S BUILDING BLOCKS OF AI

Lead with an innovation mindset without fear of failure

Develop a long-term, comprehensive, and sustainable data management strategy

Foster a multidisciplinary collaborative stakeholder management approach

Move towards a data-oriented organizational culture

5 CONCLUSION

In addition to the overview provided here, Keolis can help agencies and partners develop strategies to implement AI best-practices in operation and management, as well as find opportunities for improved sustainability, fleet maintenance, route optimization, and much more.

Contact Keolis North America at Media@KeolisNA.com to discuss specific needs and solutions.

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