Sustainable Built Environment National Research Centre

Project 1.63: The Potential for Blockchain and Artificial Intelligence to Enhance the Transport Sector

(October 2018 – March 2020)

Industry Steering Group Chair
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30th Governor of Western Australia
Western Australian Commissioner of Main Roads (1991-96)

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Project Overview

Advances in Artificial Intelligence and the emergence of Blockchain Technology stand to provide significant benefits to transport agencies, travellers and associated businesses, especially for those that move early.

This project is among the first to explore the potential for these revolutionary technologies to enhance the transport sector and allow well-informed early action.

Applied Research Methodology

1. Develop a clear working understanding of the functionality of Artificial Intelligence and Blockchain Technologies.
2. Investigate what potential there is for Artificial Intelligence and Blockchain technology to be used in the transport sector.

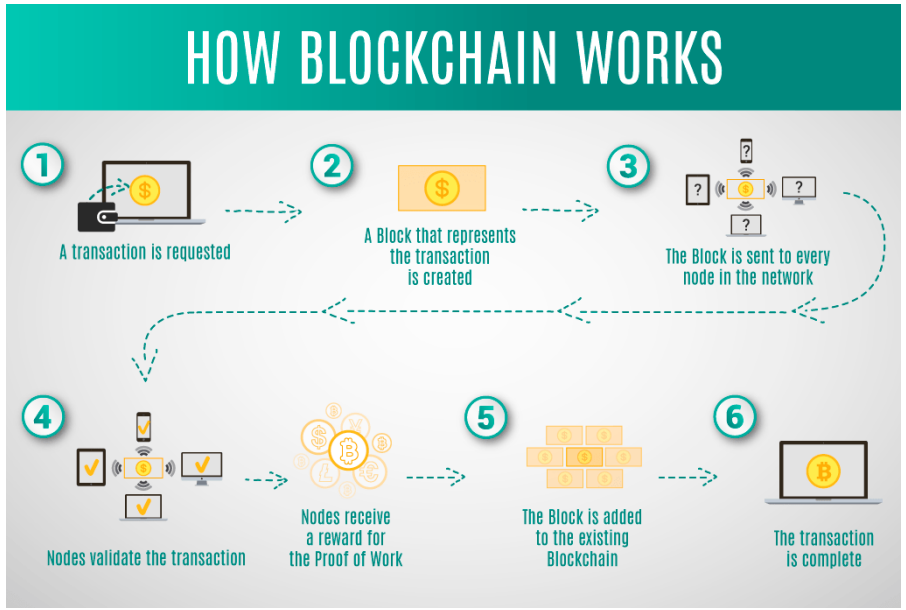
How can Ai be applied to the Transport Sector?

What is Ai?

- Rule Based vs Machine Learning
- Predictive capacity

- Self-Driving Vehicles
- Traffic Management
- Vehicle Behaviour
- Traffic Signal Optimisation
- Vehicle Prioritisation
- Route Optimisation
- Traffic Risk Management
- Ride-Sharing
- Fare Evasion
- Drones Deployment

How can Blockchain be applied to Transport?



- Decentralised Database
- Trust Protocol (Tamper Evident)

- Traffic Management
- Logistics Documentation
- Global Freight Tracking
- Supply Chain Transactions
- Identification (Drivers Licences)
- Establishing Provenance
- Establishing Authenticity

Applied Research Methodology

1. Develop a clear working understanding of the functionality of Artificial Intelligence and Blockchain Technologies.
2. Investigate what potential there is for Artificial Intelligence and Blockchain technology to be used in the transport sector.
3. Select a short list of use cases and identify risks and rewards for the transport sector to identify deep dive use cases.

Preferred Use-Cases for Artificial Intelligence

1. Identification of Network Characteristics (*including vehicle data, engineering data, and hazards*).
2. Traffic Optimisation (*including management and Signalling, interruptions to flow, predictive congestion management, based on real time conditions*).
3. Vehicle Prioritisation (*including emergency vehicles and Mass Transit*).
4. Asset Management (*including vehicles, IoT devices, lights, communications infrastructure*).

Preferred Use-Cases for Blockchain Technology

1. Real Time Road User Pricing (*including charging for time of day and road type usage*).
2. Establishing Identification (*including digital drivers' licences and vehicle ownership*).
3. Enhanced Freight Tracking and Authenticity (including r*eal time location and confirmation of delivery*).

Key Criteria for Use Case Selection for Deep Dive

- Level of capitalisation, maturity and uptake of technology?
- Potential for quick wins with low expenditure to catalyse efforts?
- Level of difficulty and need for external support?
- Capital and operational expenditure requirements?
- Potential for early efforts to underpin future applications?
- Level of integration required across departments?
- Potential for multiple benefits for various users and departments?
- Prerequisites for data availability, format and intervals?

Deep Dive Use-Cases

1. *The use of Artificial Intelligence to enhance Traffic Optimisation with a focus on traffic management and signalling.*
2. *The use of Blockchain Technology to enhance Freight Tracking and Authenticity, including real-time location and confirmation of origin and delivery.*

Applied Research Methodology

1. Develop a clear working understanding of the functionality of Artificial Intelligence and Blockchain Technologies.
2. Investigate what potential there is for Artificial Intelligence and Blockchain technology to be used in the transport sector.
3. Select a short list of use cases and identify risks and rewards for the transport sector to identify deep dive use cases.
4. Undertake Deep Dive research and recommend strategic approaches to implementation by research partners.
5. Identify specific policies and mechanisms to support application.

CIB World Building Congress 2019
Hong Kong SAR, China
17 – 21 June 2019

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The Potential for Blockchain and Artificial Intelligence to Enhance the Transport Sector

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Abstract

This paper outlines research that explores a range of digitally-driven opportunities and challenges in seeking to get cities moving and functioning better; with a focus on the application of Artificial Intelligence and Blockchain technologies. The paper identifies specific potential applications and outlines where such technology can provide tangible benefits for the transport sector and the associated policy and management structures. Specific benefits explored include cost savings (such as digital payment mechanisms, virtual toll collection and congestion charging, capital deferment through greater network utilisation); time savings (from improved transport network operation and management processes); improved operations (such as real-time pay-as-you-drive systems with network differential pricing ability); improved safety (from less collisions and reduced impacts); improved user experience (such as improved platforms and automated payments for parking and bookings); and improved freight and logistics (such as secure storage of time-stamped travel-related data). The paper presents a set of industry partner-preferred use cases such as congestion management, road user pricing, asset management, mobility-as-a-service and freight logistics. The paper outlines specific opportunities for Artificial Intelligence and Blockchain technology to provide value to transport agencies and service providers, either individually or in combination. The paper highlights risks and rewards for the transport sector, including a further review of early findings from the application of such technologies in transport sectors around the world. This research has been developed with funding and support provided by Australia's Sustainable Built Environment National Research Centre (SBEnrc) and its partners.

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Sheraton
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Mr. Martin Schmied

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Project 1.63: The Potential for Blockchain and Artificial Intelligence to Enhance the Transport Sector

(October 2018 – March 2020)

https://sbenrc.com.au/research-programs/1-63/

Project 1.63

Exploring the Potential for Artificial Intelligence and Blockchain to Enhance Transport

October 2018 - March 2020

Sustainable Built Environment National Research Centre

This project will explore a range of digitally-driven opportunities and challenges in seeking to get cities moving and functioning better, with a focus on the application of Artificial Intelligence and Blockchain technologies. The research will identify specific potential applications and outline where such technology can provide tangible benefits for the road transport sector and the associated policy and management structures. The project will focus on a set of partner preferred use cases such as congestion management, road user pricing, asset management, mobility-as-a-service and freight logistics. Following this, the project will seek to identify specific areas of application of the technologies going forward in collaboration with partners.

Objectives

Building on previous related SBEnrc research, this project aims to provide transport and mobility related agencies and service providers with guidance as to how the application of Artificial Intelligence and Blockchain can deliver tangible benefits.

The specific objectives are to:

1. Develop a clear working understanding of the functionality of Artificial Intelligence and Blockchain Technologies.
2. Investigate what potential there is for Artificial Intelligence and Blockchain technology to provide value to transport agencies and service providers, either individually or in combination.
3. Identify the risks and rewards for the transport sector, including a further review of early findings from the application of such technologies in transport sectors around the world.
4. Recommend strategic approaches around selected options for the implementation of Artificial Intelligence and Blockchain technologies in the transport sector. Such recommendations will provide a framework to inform a standard approach across agencies to allow shared knowledge.
5. Identify specific policies and mechanisms to support the future implementation of these technologies in the Australian transport sector.

Industry Outcomes

The project will deliver:

1. An increased capacity of road and transport-related agencies and service providers to understand the early stage use cases for Artificial Intelligence and Blockchain in order to best harness this emergent and rapidly advancing technology.
2. The identification of multiple use cases of value to the transport sector with consideration of lessons learned from early efforts and recommendations as to strategic approaches.
3. Specific benefits such as cost savings (digital payment mechanisms, virtual toll collection and congestion charging, capital deferment through greater network utilisation); time savings (from improved transport network operation and management); improved operations (such as real-time pay-as-you-drive systems with network differential pricing ability); improved safety (from reduced collisions and impacts); improved user experience (such as automated payments for parking and booking); and improved freight and logistics (such as secure time-stamped travel-related data).

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13 September 2018

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