Exhibit D

Research Project Requirement Template

Blockchain application on smart transportation systems

Recipient/Grant (Contract) Number: The University of Texas at Austin/Grant # 69A3552344815 and 69A3552348320

Center Name: Center for Understanding Future Travel Behavior and Demand (TBD)

Research Priority: Improving Mobility of People and Goods

Principal Investigator(s): Mahdieh Allahviranloo

Project Partners: N/A

Research Project Funding: $167,650 (Federal + non-Federal funding)

Project Start and End Date: 6/1/2024 - 5/31/2025

Project Description: Blockchain technology, predominantly utilized within cryptocurrency, is being increasingly adapted across diverse sectors, and transportation systems is not an exception. Despite presenting several challenges, blockchain technology also offers various advantages. Understanding Blockchain's potential applications and benefits in addressing future urban challenges is an emerging field of research which has not been fully investigated. In fact, what makes blockchain attractive for smart cities is the design scheme and underlying protocols. The decentralized computational aspect of blockchain enhances the reliability of data transmission across network nodes. Each data transaction between nodes is recorded with a unique identifier and it is validated by consensus among agents within the system. Transaction transparency mitigates the risk of passing inaccurate information throughout the network.

The proposed project aims at comprehensively studying the application of blockchain technology within various domains of transportation systems. Emphasis will be placed on growth areas, anticipated hurdles, research gaps, and potential integration solutions of blockchain in transportation system design. The comprehensive literature review will cover a broad spectrum ranging from information exchange in connected vehicles to supply chain logistics and smart transit payment systems. The analysis will extend further by constructing a simulation-based platform to investigate the implementation of a blockchain-based fare payment system in transit. Within this simulation analysis, security, risk mitigation, failure prevention, and privacy preservation will be delved into.

The research tasks are as following:

1. Kickoff the project: Set up the team and identify set of activities with the major milestones.
2. Conduct an overall literature review on the blockchain technology in various domains.
3. Conduct a thorough literature review on the blockchain technology in the design of smart cities and transportation systems.
4. Design a simulation platform in Python (or Java) environment for transit payment systems and perform different analysis to:
    - Illustrate how the blockchain would be used in transit system;
    - Analyze the potential risks and how to reduce them;
5. Deploy the codes and disseminate research findings in academic outlets.

US DOT Priorities: The proposed project is fully aligned with ‘new and novel technologies’ theme described as a research priority. We will conduct a review, supplemented by a simulation to analyze the application of blockchain technology in smart cities.

Outputs: The results of the project will be disseminated in different formats:
Academic outlets:

- Publications
- Conference presentations

Database:

- Project specific Github for code repository
- Interactive dashboard.

Outcomes/Impacts: A comprehensive review on blockchain in transportation, could reveal new opportunities, provide an updated understanding of the technology's capabilities and adoption challenges, and offer guidance to move blockchain applications in transportation forward. The insights gained would benefit both the public and private sectors. We will understand the current state of the technology that can highlight regulatory and adoption challenges. The simulation can help us to assess the benefits and costs of such technology in transportation and provide guidance on implementation.

The project will generate knowledge on an emerging topic that offers tremendous opportunities for transportation system. Considering connected vehicle technology around the corner, this research would serve as a new line of research in the intersection of blockchain technology and transportation.

Final Research Report: A URL link to the final report will be provided upon completion of the project.