

Exhibit D – Research Project Requirement Template

Shifts in Work Arrangements and Travel Behavior: A Longitudinal Analysis of Heterogeneous Effects of Teleworking on Commuting and Non-Commuting Travel Based on Seattle Commute Surveys

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

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

Research Priority: Improving Mobility of People and Goods

Principal Investigator(s): Qing Shen, Professor of Urban Design and Planning, University of Washington

Project Partners: Commute Seattle and University of Washington Mobility Innovation Center

Research Project Funding: \$75,000 Federal grant plus \$75,000 match of non-Federal funding through the PI's University of Washington faculty salary

Project Start and End Date: 06/2026 – 09/2027

Project Description: Following the official end of the COVID-19 pandemic in May 2023, employer policies regarding work arrangements have continued to change dynamically. This proposed project will draw on unique data from the 2022 and 2024 Seattle Commute Surveys to analyze how shifts in work arrangements from the pandemic to the post-pandemic era heterogeneously shape employees' commuting and non-commuting travel frequencies and mode choices, using econometric models, machine learning models, and explainable AI methods. We will examine individual employees' post-pandemic work arrangements and patterns of change in commuting and non-commuting travel. The research will address three primary questions: 1) How have employees' work arrangements and travel patterns shifted from the pandemic to the post-pandemic era? 2) What is the relationship between work arrangement shifts and commuting mode choices? In what ways does the relationship vary across commuting distance strata and residential location types? 3) How are work arrangement shifts connected to non-commuting travel frequency and mode choices? Are these connections heterogeneous across employees' residential locations and commuting patterns? By employing econometric and AI models, this study aims to generate critical insights for transportation demand management and policy-making.

US DOT Priorities: This project will contribute to advancing the efficiency and accessibility of urban transportation systems by investigating how shifts in work arrangements heterogeneously influence post-pandemic commuting and non-commuting travel behaviors. Using large-scale survey data enriched with neighborhood and built-environment variables, the project will examine heterogeneous relationships between work arrangement transitions and travel patterns across commuting distance strata, residential contexts, and socio-demographic groups. The project directly supports U.S. DOT priorities and RD&T strategic goals by generating actionable evidence to improve system efficiency and enhance access to opportunities. By identifying which worker groups, neighborhoods, and travel patterns are more sensitive to changes in work arrangements, the project will guide targeted telework incentives, transit investment decisions, and multimodal integration strategies that elevate the performance of transportation systems and effectively improve access to jobs and essential services.

This research is potentially transformative because it combines econometric models with gradient-boosting methods (XGBoost and LightGBM) and explainable AI to analyze complex, multi-level travel behavior data collected at two times. This integrated modeling framework will reveal nonlinear and interaction-driven patterns in terms of the heterogeneous influences of changes in work arrangements on commuting mode choices and non-commuting travel frequency and mode choices. By integrating state-of-the-art

methods with detailed spatial and built-environment measures, the project will produce an analytical framework that agencies and employers in American cities and metropolitan areas can use to analyze dynamic travel behavioral changes and help design transportation demand management programs in response to future shifts in work and travel.

Outputs: This project will produce the following research outputs: 1) A project report documenting the research design, analytical framework and methods, findings, and recommendations to inform remote work policy design and transit planning across the Puget Sound region and in other American metropolitan regions, 2) A peer-reviewed journal article disseminating approaches and findings on the heterogeneous influences of post-pandemic work arrangement transitions on commuting and non-commuting trip frequencies and mode choices, 3) A conference presentation sharing findings with the broader transportation research community, 4) An analytical framework integrating econometric models, gradient boosting models (XGBoost, LightGBM), and explainable AI (XAI) methods with large-scale travel survey data and built-environment variables, applicable to future travel demand studies. In addition, a tangible and implementation-oriented product of this project will be a policy memo to the Washington State Department of Transportation recommending desired improvements to its existing questionnaire for the biennial employee commute trip reduction survey currently used by large employers to meet the State's Commute Trip Reduction requirement. Such improvements would enable better data collection on travel behavior, support more accurate forecasting of future travel demand, and enhance the overall effectiveness of the Commute Trip Reduction program.

Outcomes/Impacts: This proposed study aims to achieve the following outcomes: 1) It will advance understanding of how different post-pandemic work arrangement transitions heterogeneously affect travel behaviors across population groups, commuting distance strata, and residential locations, providing a broader and more nuanced empirical basis for transportation demand modeling and policy making, 2) The study will produce practitioner-oriented products, including a one-page findings brief summarizing actionable insights on post-pandemic work arrangements and travel demand, 3) The findings will provide employers in the technology industry, public, and healthcare sectors, as well as transportation agencies, with spatially and demographically differentiated evidence to design and evaluate policies addressing commute and non-commute travel demand, 4) The research team will deliver at least one webinar for relevant practitioner and policy audiences to disseminate key findings and demonstrate how to apply the study's analytical approach and results.

By achieving these outcomes, this project is expected to generate the following impacts:

- Practice change: Findings will inform the design of demand management strategies, such as teleworking incentives and staggered work schedules, tailored to residential location and commuting distance, supporting more efficient use of existing transportation capacity and more reliable access to jobs and essential services. Another expected impact is to help the Commute Trip Reduction office of the Washington State Department of Transportation improve its questionnaire for the biennial employee commute trip reduction survey.
- Transportation system effectiveness: By identifying how work arrangement transitions affect mode choices across population groups, the study will support more effective transit investment and mobility programs for transit-dependent and underserved communities.
- Scientific knowledge: The study advances transportation research by introducing an explainable AI framework for analyzing heterogeneous, nonlinear relationships between work arrangements and commuting and non-commuting behaviors, which can be applied in future travel demand studies.

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