**Title of TRB Paper Format Example**

**Carole Turley Voulgaris**

Assistant Professor of Urban Planning

Department of Urban Planning and Design

Harvard Graduate School of Design

Cambridge, MA 02138

Email: cvoulgaris@gsd.harvard.edu

**Charuvi Begwani**

Position

XXStateXX Department of Transportation

Department (if applicable)

City, State or Country, Postcode

Email: abc@dot.gov

**Private Practitioner Author Name**

Position

Company

City, State or Country, Postcode

Email: enj@abc.com

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*Submitted [Submission Date]*

**ABSTRACT**

The Abstract should be a stand-alone summary of the contents of the paper, equaling 250 words or less. It should present the primary objectives and scope of the study, techniques, methods or approaches briefly described and a concise summary of findings and/or conclusions reached.

**Keywords:** Format Example, Guide, Keyword, Keyword

**INTRODUCTION**

The development and widespread adoption of the general transit feed specification (GTFS) data format for transit route and schedule data has transformed the way travelers plan transit trips (McHugh 2013). In the fifteen years since this data standard was initially introduced by TriMET, the public agency operating mass transit in Portland, Oregon in partnership with Google, most –but not all—transit agencies have begun publishing their route and schedule information in this format. What might explain a transit agency’s decision about whether and when to adopt this data format?

Rogers’ (2003) work on diffusion of innovation highlights several characteristics of organizations that correlate with being early adopters of new technologies, including larger size, greater complexity defined as high level of knowledge and expertise among its members, social interconnectedness, presence of an innovation champion, and organizational slack recognizing the availability of additional resources, especially for high-cost innovations.

Little prior research has been done on the determinants of GTFS adoption. In one such study focusing on California, Frick et al. (2020) found that small transit agencies (reduced reporters) and rural transit agencies were less likely to have published GTFS feeds and independent public transit authorities are more likely to publish GTFS-r feeds than other types of agencies like departments within local governments.

Studies on the adoption of other technologies may be informative in identifying agency characteristics that are generally associated with openness to innovation. Existing literature on technology transfer and information sharing amongst transit agencies and more broadly, public institutions, is scarce. Iseki et al. (2007) have found that early adopters of smart cards for fare payment tended to be those with greater funding availability and those with established relationships with other transit agencies.

There is a need for empirical analysis to determine the factors that influence technology transfer and adoption. The purpose of this study is to evaluate the adoption of GTFS by 498 transit agencies in the United States that were providing scheduled transit service in 2006 at the time of its inception. The results of this analysis can inform efforts by state- and national-level agencies seeking to encourage innovation by identifying agencies most likely to be open to adopting new technology. It can also help local agencies identify peers who are likely to have experience with innovation and experimentation.

**DATA AND METHODS**

We identified 475 transit agencies in the United States that were providing scheduled transit services in 2006, when the GTFS data standard was initially published. Drawing on three sources of archived GTFS feeds (OpenMobilityData, GTFS Data Exchange, and transitland), we identified the earliest published GTFS feed for each agency, if any. We used the publication date of the earliest available feed for each agency to estimate the length of time it took for each agency to adopt the GTFS data standard. The figure below shows the percentage of transit agencies that adopted GTFS between its introduction in 2006 to 2020.

Chart

Description automatically generated

We compiled several variables from to understand their potential relationship with GTFS adoption. All our variables and data sources are mentioned in Table 1. We include variables that represent the following broad factors:

Size:

Institutional characteristics:

Organizational slack:

Technology penetration:

Locational characteristics:

|  |  |
| --- | --- |
| **Name of Variable** | **Source** |
| Agency Information | |
| Company Name | National Transit Database  Data Category: Agency Information  Link name: xxxx(year) Annual Database Agency Information |
| Time Period | National Transit Database  Data Category: Service  Link name: xxxx(year) Annual Database Service |
| Institutional characteristics | |
| Agency’s Type | National Transit Database  Data Category: Agency Information  Link name: xxxx(year) Annual Database Agency Information |
| Organization Type | National Transit Database  Data Category: Agency Information  Link name: xxxx(year) Annual Database Agency Information |
| Institution Type | National Transit Database  Data Category: Agency Information  Link name: xxxx(year) Annual Database Agency Information |
| Agency Size | |
| Service Area | National Transit Database  Data Category: Agency Information  Link name: xxxx(year) Annual Database Agency Information |
| Passenger Car Scheduled Revenue Miles | National Transit Database  Data Category: Service  Link name: xxxx(year) Annual Database Service |
| Vehicle Scheduled Miles | National Transit Database  Data Category: Service  Link name: xxxx(year) Annual Database Service |
| Unlinked Passenger Trips | National Transit Database  Data Category: Service  Link name: xxxx(year) Annual Database Service |
| Vehicle Revenue Miles | National Transit Database  Data Category: Service  Link name: xxxx(year) Annual Database Service |
| Expense Category | National Transit Database  Data Category: Expenses  Link name: xxxx(year) Annual Database Operating Expense |
| Fare Revenue | National Transit Database  Data Category (2005 – 2014): Expenses  Link name: xxxx(year) Table 26: Fare per Passenger and Recovery Ratio  Data Category (2015 – 2020): Fares/Funding  Link name: xxxx(year) Annual Database Fare Revenues |
| Vehicles Operated in Annual Maximum Service | National Transit Database  Data Category (2005 – 2014): Expenses  Link name: xxxx(year) Table 26: Fare per Passenger and Recovery Ratio  Data Category (2015 – 2020): Service  Link name: xxxx(year) Annual Database Service |
| Operating Expenses | National Transit Database  Data Category (2005 – 2014): Expenses  Link name: xxxx(year) Table 26: Fare per Passenger and Recovery Ratio  Data Category (2015 – 2020): Expenses  Link name: xxxx(year) Annual Database Operating Expense |
| Fare Recovery Rate | Fare revenue / Operating Expenses |
| City Size | |
| Urbanized Area | National Transit Database  Data Category: Agency Information  Link name (2005 – 2013): xxxx(year) Appendix D: 2000 U.S. Urbanized Areas (UZAs), Populations, Square Miles and Densities Reported by Transit Agencies  Link name (2014 – 2018): xxxx(year) 2014 Annual Database Agency UZAs  Link name (2019 – 2020): xxxx(year) Annual Database Agency Information |
| Population | National Transit Database  Data Category: Agency Information  Link name (2005 – 2013): xxxx(year) Appendix D: 2000 U.S. Urbanized Areas (UZAs), Populations, Square Miles and Densities Reported by Transit Agencies  Link name (2014 – 2018): xxxx(year) 2014 Annual Database Agency UZAs  Link name (2019 – 2020): xxxx(year) Annual Database Agency Information |
| Area (Square miles) | National Transit Database  Data Category: Agency Information  Link name (2005 – 2013): xxxx(year) Appendix D: 2000 U.S. Urbanized Areas (UZAs), Populations, Square Miles and Densities Reported by Transit Agencies  Link name (2014 – 2018): xxxx(year) 2014 Annual Database Agency UZAs  Link name (2019 – 2020): xxxx(year) Annual Database Agency Information |
| Population Density | National Transit Database  Data Category: Agency Information  Link name (2005 – 2013): xxxx(year) Appendix D: 2000 U.S. Urbanized Areas (UZAs), Populations, Square Miles and Densities Reported by Transit Agencies  Link name (2014 – 2018): xxxx(year) 2014 Annual Database Agency UZAs  Link name (2019 – 2020): xxxx(year) Annual Database Agency Information |
| Total Number of Households | 2000 Decennial Census (Variable code: H004001)  2010 Decennial Census (Variable code: H004001) |
| Total Number of Renter-occupied Households | 2000 Decennial Census (Variable code: H004003)  2010 Decennial Census (Variable code: H004004) |
| Percentage of Renter-occupied Households | Total number of renter-occupied households / Total number of households |
| Locational characteristics | |
|  |  |
|  |  |
| Technology Penetration | |
| Date of adopting GTFS data standard |  |
| Number of Agencies that has Adopted GTFS Data Standard | Summary of agencies by year and GTFS status |
| Total Number of Agencies | Summary of agencies by year and GTFS status |
| Percentage of Agencies Adopting GTFS Data Standard | Number of agencies that has adopted GTFS data standard / Total number of agencies |
| Organizational slack | |
| Operator’s Salaries and Wages | National Transit Database  Data Category: Expenses  Link name: xxxx(year) Annual Database Operating Expense |
| Other Salaries and Wages | National Transit Database  Data Category: Expenses  Link name: xxxx(year) Annual Database Operating Expense |
| Fringe Benefits | National Transit Database  Data Category: Expenses  Link name: xxxx(year) Annual Database Operating Expense |
| Total Salary of General Administration | Summary of the total salary of general administration (sum of operator’s salaries and wages, other salaries and wages, and fringe benefits) by agencies’ ID |
|  |  |

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**Level 2 Header**

We estimated a Cox proportional hazards model to determine how geographic and agency characteristics correlate with time between the availability of the GTFS data standard and its adoption by a given agency. In suscipit, tortor non pulvinar dignissim, sem nisi aliquet urna, at ullamcorper metus nisl sit amet mauris. Maecenas tempor, augue quis gravida suscipit, tortor nulla euismod turpis, at sagittis leo nisi quis justo. Etiam placerat massa aliquam elit sodales sagittis. Ut ut elementum velit. Ut nec feugiat urna.

*Level 3 Header*

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**Figure 1 Caption for figure**

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**RESULTS**

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**TABLE 1 Measurement Conversion**

|  |  |  |
| --- | --- | --- |
| **When You Know** | **Multiply by** | **To Find** |
|  |  |  |
| **Length** |  |  |
| inches (in.) | 25.4 | millimeters (mm) |
| feet (ft) | 0.305 | meters (m) |
| yards (yd) | 0.914 | meters (m) |
| miles (mi) | 1.61 | kilometers (km) |
|  |  |  |
| **Area** |  |  |
| square inches (in.2) | 645.1 | millimeters squared (mm2) |
| square feet (ft2) | 0.093 | meters squared (m2) |
| square yards (yd2) | 0.836 | meters squared (m2) |
| acres | 0.405 | hectares (ha) |
| square miles (mi2) | 2.59 | kilometers squared (km2) |
|  |  |  |
| **Volume** |  |  |
| fluid ounces (fl oz) | 29.57 | milliliters (mL) |
| gallons (gal) | 3.785 | liters (L) |
| cubic feet (ft3) | 0.028 | meters cubed (m3) |
| cubic yards (yd3) | 0.765 | meters cubed (m3) |

**DISCUSSION**

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 (1)

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 (2)

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**CONCLUSIONS**

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**ACKNOWLEDGMENTS**

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**AUTHOR CONTRIBUTIONS**

The authors confirm contribution to the paper as follows: study conception and design: X. Author, Y. Author; data collection: Y. Author; analysis and interpretation of results: X. Author, Y. Author. Z. Author; draft manuscript preparation: Y. Author. Z. Author. All authors reviewed the results and approved the final version of the manuscript.

**REFERENCES**

1.Dewan, S. A., and R. E. Smith. Creating Asset Management Reports from a Local Agency

Pavement Management System. *Transportation Research Record: Journal of the Transportation*

*Research Board*, 2018. Volume: doi or page range

2. Dawley, C. B., B. L. Hogenwiede, and K. O. Anderson. Mitigation of Instability Rutting of Asphalt Concrete Pavements in Canada. *Journal of Association of Asphalt Paving Technologists*, 2018. 59:481–508.

3. Ghiasi, A., J. Ma, F. Zhou, and X. Li. Speed Harmonization Algorithm using Connected

Autonomous Vehicles. Presented at 96th Annual Meeting of the Transportation Research Board,

Washington, D.C., 2017.

4. Sansalone, M., J. M. Lin, and W. B. Streett. Determining the Depths of Surface-Opening Cracks

Using Impact-Generated Stress Waves and Time-of-Flight Techniques. *ACI Materials Journal*, 2018. 95: 168–177.

5. Newland, D. E. Random Vibrations: Spectral and Wavelet Analysis. John Wiley & Sons, Inc., New York, 1998.

6. Morcous, G., K. Wang, P. C. Taylor, and S. P. Shah. *NCHRP Report 819: Self-Consolidating*

*Concrete for Cast-in-Place Bridge Components.* Transportation Research Board, Washington, D.C., 2016. http://dx.doi.org/10.17226/23626.

7. *Guide to Developing Performance-Related Specifications.* FHWA-RD-98-155, FHWA- RD-98-156, FHWA-RD-98-171, Vol. III, Appendix C. www.tfhrc.gov/pavement/pccp/pavespec. Accessed March 5, 2003.

8. Von Quintus, H. L., and A. L. Simpson. *Documentation of the Backcalculation of Layer Parameters for LTPP Test Sections.* Publication FHWA-RD-01-113. FHWA, U.S. Department of Transportation, 2002.

9. Shunk, G. A. Urban Transportation Systems. In *Transportation Planning Handbook* (J. D. Edwards, Jr., ed.), Prentice Hall, Englewood Cliffs, N.J., 1992, pp. 88–122.

10. Corbett, J. J. Toward Environmental Stewardship: Charting the Course for Marine Transportation. Presented at 83rd Annual Meeting of the Transportation Research Board, Washington, D.C., 2018.