

# CO-MONITORING FOR TRANSIT MANAGEMENT

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*USING WEB-BASED  
RIDER INPUT FOR  
TRANSIT  
MANAGEMENT*

## TABLE OF CONTENTS

|                                                      |    |
|------------------------------------------------------|----|
| Table of Contents.....                               | 1  |
| Executive Summary.....                               | 2  |
| Introduction .....                                   | 3  |
| The changing face of transit riders .....            | 4  |
| Co-monitoring and Crowdsourcing in Use.....          | 5  |
| Current reporting systems for transit agencies ..... | 9  |
| Effectiveness of Rider Satisfaction Surveys .....    | 10 |
| Reporting system design and recommendations .....    | 13 |
| Proposed Co-Design Framework Flow.....               | 14 |
| Potential Benefits of Co-Monitoring.....             | 16 |
| The Challenges of Co-Monitoring .....                | 17 |
| Policy Recommendations.....                          | 18 |
| Appendix – Rider Evaluations .....                   | 21 |

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## EXECUTIVE SUMMARY

Emerging technologies offer transit agencies an opportunity to transform fundamental aspects of their operations and the way they communicate with their riders. With nearly ubiquitous smartphones and social media tools among growing ridership patterns, transit providers can use aggregate mobile phone data and social media posts to improve system management.

Data-based reports can reach the operations center faster than field personnel, with mobile phone networks indicating station crowding or a passenger posting a photo of another pulling the emergency brake. Exceeding traditional reporting mechanisms (exclusive information from personnel) would save time and lower the costs of field monitoring while raising the trust between transit agencies and their customers.

Public feedback mechanisms are growing both within and tangentially to government services, allowing users to collaborate on planning projects, report on quality-of-life issues, and crowd-fund local initiatives. While transit agencies historically rely on periodic rider surveys, this method of data collection is outdated and often inaccurate when compared to real-time social media posts.

By employing “co-monitoring” - the monitoring of field conditions through a combination of staff reports, data analysis and public observations – transit agencies will save time and costs for information gathering, improve their responsiveness, and establish working partnerships between the agencies and their customers. This report proposes a framework for a co-monitoring system, and discusses the expected benefits and challenges, as well as policy recommendations for agencies pursuing co-monitoring systems. Keys to successful co-monitoring systems are agency openness to new streams of data and respectful dialogue from both management and riders. Well-designed co-monitoring tools will put transit on track to manage smarter, more versatile transit systems for the twenty-first century.

## INTRODUCTION

Emerging technologies offer transit agencies an opportunity to transform fundamental aspects of their operations and the way they communicate with their riders. As smartphones and social media become nearly ubiquitous, transit providers can use aggregate mobile phone data and social media posts to improve system management.

Data-based reports can reach the operations center faster than field personnel, with mobile phone networks indicating station crowding or a passenger posting a photo of another pulling the emergency brake. Exceeding traditional reporting mechanisms (exclusive information from personnel) would save time and lower the costs of field monitoring while raising the trust between transit agencies and their customers.

The growth of public involvement in government has generated numerous tools for collaborating on planning projects, reporting quality-of-life issues, and crowd-funding local initiatives. Transit agencies historically rely on periodic rider surveys tied to their fixed infrastructure; it is time for transit agencies to loosen their ties to traditional operations. By employing “co-monitoring” – the monitoring of field conditions through a combination of staff reports, data analysis and public observations – transit agencies will save time and costs for information gathering, improve their responsiveness, and establish working partnerships between the agencies and their customers.

This report will consider current rider reporting systems and propose a co-monitoring system framework.

## THE CHANGING FACE OF TRANSIT RIDERS

Transit ridership patterns are undergoing fundamental change: popularity has increased, travel has grown significantly during off-peak hours, and most importantly, the customer base is digitally-focused.<sup>1</sup> In fact, many people of the Millennial generation, a quickly growing portion of urban residents, would rather have internet access than a car.<sup>2</sup> Seventy-five percent of Millennials own smartphones, and 39% are doing work on the go.<sup>3,4</sup> Millennials aren't the only demographic using smartphones: in a recent survey of Los Angeles Metro passengers, 53% were carrying smartphones.<sup>5</sup>

The information shift from paper to apps indicates a broadening of transit agencies' purpose to include information gathering and distribution. As a result, transit agencies worldwide are developing real-time communications, open data for app creation, and system-wide mobile phone and wi-fi access.<sup>6</sup>

App-using transit riders will come to expect customer service from transit agencies via social media, a growing trend in the private sector: 62% of consumers have used social media to report customer service issues, and nearly 30% of customers expect a service response within one hour when contacting a company via social media.<sup>7,8</sup> These same consumers will expect a similar digital dialogue from their transit agencies, both in ease of reporting issues and speed of responses. Transit agencies can benefit from communicating via social media, text message, or other short-form communications, which are less expensive and onerous than customer call

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<sup>1</sup> Metropolitan Transportation Authority, "Looking Ahead: A Context for the Next Twenty Year Needs Assessment," July 2013. [http://web.mta.info/mta/news/books/docs/TYN\\_Vision\\_7-22-13.pdf](http://web.mta.info/mta/news/books/docs/TYN_Vision_7-22-13.pdf)

<sup>2</sup> <http://www.uspirg.org/sites/pirg/files/reports/A%20New%20Direction%20vUS.pdf>

<sup>3</sup> Millennial Marketing, "Latest Stats: What's New With Mobile and Millennials?" July 2012.

<http://millennialmarketing.com/2012/07/latest-stats-whats-new-with-mobile-and-millennials/>

<sup>4</sup> Sakaria, Neela and Natalie Stehfest. "Millennials & Mobility: Understanding the Millennial Mindset and New Opportunities for Transit Providers," Transportation Cooperative Research Program, Transportation Research Board, July 2013. [http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp\\_w61.pdf](http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_w61.pdf)

<sup>5</sup> Los Angeles Metro, "Spring 2013: Metro System-wide Customer Satisfaction Survey Results (May and June 2013)," [http://media.metro.net/projects\\_studies/research/images/annual\\_survey\\_results/system\\_results\\_s13.pdf](http://media.metro.net/projects_studies/research/images/annual_survey_results/system_results_s13.pdf)

<sup>6</sup> MTA, Twenty Year Needs Assessment.

<sup>7</sup> <http://mashable.com/2012/09/29/social-media-better-customer-service/>

<sup>8</sup> <http://www.businessinsider.com/these-companies-are-major-brands-that-are-the-best-and-worst-at-using-social-media-for-customer-service-2012-6>

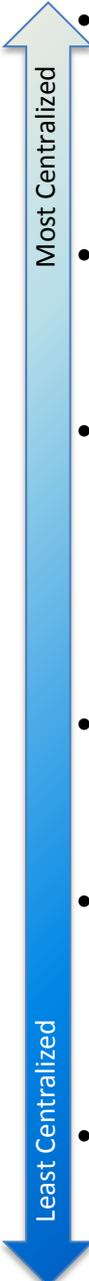
centers. Further, social customer service is a powerful way for agencies to gather information about conditions around their transit systems – in short, co-monitoring conditions.

## CO-MONITORING AND CROWDSOURCING IN USE

Community collaboration with public services is growing worldwide. Basic applications, like digital 311 functions, have given way to complex independent mechanisms like a community-funded bikeway in Memphis. Digitally-enabled public involvement in government services has emerged in three categories of ownership:

### GOVERNMENT-ADMINISTERED

Several local governments and transit agencies have already embarked on crowdsourcing projects to bring their established information gathering and community input practices into the twenty-first century. The following list summarizes several examples of government-administered crowdsourcing, from most to least government-centralized:

- 
- **MyMTPD** is an app from the Washington Metropolitan Area Transit Authority (WMATA) Police Department that allows users to text a number with concerns about “suspicious activity, unattended bags, panhandling and other non-emergencies.” Users cannot view others’ submissions.<sup>9</sup>
  - **Citizens Connect** is a City-run app for Boston residents to submit non-emergency issues like damaged signs and graffiti; it is primarily concerned with aesthetic matters. App users may view others’ submissions, but not comment on or add to their posts.<sup>10</sup>
  - **Open311** is a web platform of the 311 city-services phone number that provides room for users to submit location-based issues and add information to others’. It is used in Washington, DC, San Francisco, New York, Boston, Chicago, Toronto, among others, and can run within other apps, such as ParkScan, the parks observation-reporting tool in San Francisco.<sup>11</sup>
  - **Change by Us** is a website run by New York City where the public posts ideas, uses the site to find other interested individuals to build task completion teams, and find resources through official government channels.<sup>12</sup>
  - **Government Microtasking** is the hypothetical notion that officials can delegate their needs to citizens by “employing” them for no pay. Finland uses a game, Digitalkoot, to help them decipher scanned historic texts into readable formats; 50,000 people have played, completing more than four million microtasks.<sup>13</sup>
  - **Adopt-a-siren** users in Hawaii listen to specific tsunami-warning sirens and report problems on the site, run by the state government. This emergency management

<sup>9</sup> “See something, text something: Metro Transit Police launch Text Tips service,” [http://www.wmata.com/about\\_metro/news/PressReleaseDetail.cfm?ReleaseID=5584](http://www.wmata.com/about_metro/news/PressReleaseDetail.cfm?ReleaseID=5584)

<sup>10</sup> City of Boston, “Citizens Connect: Making Boston Beautiful,” <http://www.cityofboston.gov/doi/apps/citizensconnect.asp>

<sup>11</sup> “What is Open311?” <http://open311.org/learn/>

<sup>12</sup> <http://nyc.changeby.us/about>

<sup>13</sup> Eggers, William D. and Charles Tierney, “Microtasking: the Next Frontier in Government Work?” *Governing.com*, October, 2011. <http://www.governing.com/columns/mgmt-insights/microtasking-crowdsourcing-technology-online-solve-government-problems.html>

system is the most decentralized government-administered co-monitoring system today.<sup>14</sup>

### THIRD-PARTY/GOVERNMENT-PUBLIC BRIDGE

The most common form of crowdsourcing for public services, third-party applications, provides a bridge between governments and their constituents. These third-party applications are especially appropriate for governmental entities looking to gather public input but lacking the resources to implement a useful public interface. Several popular tools for crowdsourced planning and operations are:

- **SeeClickFix** provides a website and city-specific apps for constituent reporting on nearby issues, like potholes, with report tracking and feedback, often using the Open311 platform. One-hundred sixty cities are full partners, meaning that they actively use SeeClickFix and have applications for residents. Government employees at all levels may respond, providing unprecedented access to inner layers of bureaucracy.<sup>15</sup>
- **MindMixer** and **Shareabouts** are both used by governments looking to start a dialogue on planned or existing projects, including public commenting and promoting others' ideas. Mindmixer is focused on policy and planning discussions, like revitalizing a downtrodden park, while Shareabouts uses map-based tools to feature location-related issues, like pointing out dangerous intersections.<sup>16, 17</sup>
- **FixMyTransport**, United Kingdom-specific, takes write-ups of user experiences and routes them to the proper transport authority, with added support from other site users.<sup>18</sup>
- **Key to the City** is an application under development with the city of Austin, Texas, in which residents can suggest changes to the streetscape through annotated photos.<sup>19</sup>

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<sup>14</sup> <http://sirens.honolulu.gov/>

<sup>15</sup> McCann, Bailey. "SeeClickFix adds verified accounts for public sector workers," CivSource, October, 2013. <http://civsourceonline.com/2013/10/07/seeclixfix-adds-verified-accounts-for-public-sector-workers/>

<sup>16</sup> <http://www.mindmixer.com/>

<sup>17</sup> <http://openplans.org/work/shareabouts/>

<sup>18</sup> <http://www.fixmytransport.com/#how-it-works>

- **Hatch** is an open-source tool to facilitate dialogues between government personnel and constituents on Twitter, measuring public opinion on specific topics. This new tool would be most useful for co-monitoring transit systems.<sup>20</sup>

## INDEPENDENT

Applications, groups and individuals not associated with government also produce dynamic civic change. Some of those independent works applicable to transit are:

- **Crowdsourced public transit information apps**, including Moovit, Tiramisu and Roadify, enable riders to build on existing transit data with items of interest, like bus crowding or unexpected re-routes.
- **Waze** augments traffic information with user-generated data, both passively, using their phones' GPS signals, and actively, through user-posted data, like "three-car accident near exit 23."
- **Neighborhood collaboration tools** like IOBY and Neighbors for Neighbors, help groups work together on a specific, local problem, like building community gardens or ensuring safe routes to school, with no government involvement. One notable project is the Boston SnowCrew, in which individuals work together to shovel out snowed-in neighbors.<sup>21</sup>
- **Crowdfunding** uses public micro-investments to create products and services. In the urban planning sector, crowdfunding is now being used to build a bikeway in Memphis<sup>22</sup> and a park in Portland, Oregon,<sup>23</sup> among other projects.

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<sup>19</sup> <http://keytothestreet.com/>

<sup>20</sup> <http://openplans.org/work/hatch/>

<sup>21</sup> Boston MA SnowCrew, <http://neighborsforneighbors.org/page/snowcrew>

<sup>22</sup> IOBY Hampline Project - <https://ioby.org/project/hampline>

<sup>23</sup> Maus, Jonathan, "A crowdfunding test for Gateway Green bike park project," Bike Portland, September 2013. <http://bikeportland.org/2013/09/03/a-crowdfunding-test-for-gateway-green-bike-park-project-91498>

- **Ushahidi** is best known as a platform for mapping crisis communications (such as danger zones after the Haiti earthquake and medical needs in Kenya), displaying maps and images of danger zones and supply needs.<sup>24</sup>

## CURRENT REPORTING SYSTEMS FOR TRANSIT AGENCIES

Despite the availability of real-time feedback and collaboration tools, most transit agencies still use traditional methods of communication, such as rider surveys, which are valuable as longitudinal studies, but not as co-monitoring devices. See the “Effectiveness of Rider Satisfaction Surveys” section below for more information.

Many transit agencies use social media extensively: to distribute service information, improve customer satisfaction and enhance the agency’s image. In a study of transit agency social media use, 80% post agency news on Facebook, 77% post service alerts on Twitter, and 40% post feature stories on blogs. However, these agencies have yet to harness social media as a feedback tool. Of the agencies responding, seventy-eight percent deemed it “important” or “very important” to use social media to “Obtain feedback on projects;” they recognize crowdsourcing’s potential, even if they are mostly unable or unwilling to use it in practice.<sup>25</sup>

A study of tweets about Chicago’s El demonstrated that it is possible to glean from Twitter important public sentiment, with clues to service problems and public perception. Using sentiment analysis, which measures positivity and strength of comments, researchers determined exclusively from tweets that there had been a nearby fire causing delays on the Blue line.<sup>26</sup> Had an event instead taken place inside a rail car or at a bus stop, El officials may not have been aware of the incident; a formal process of co-monitoring through social media analysis would alert them to an adverse situation.

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<sup>24</sup> <http://www.usshahidi.com>

<sup>25</sup> Bregman, Susan. “Uses of Social Media in Public Transportation,” Transportation Cooperative Research Program, Transportation Research Board, 2012.

<sup>26</sup> Collins, Craig, Samiul Hasan, and Satish V. Ukkusuri. “A Novel Rider Satisfaction Metric: Rider Sentiments Measured from Online Social Media Data,” Purdue University, Journal of Public Transportation, Vol. 16, No. 2, 2013. P31.

## EFFECTIVENESS OF RIDER SATISFACTION SURVEYS

Five of the top six major U.S. transit agencies conduct regular rider satisfaction surveys attempting to study longitudinal changes in rider satisfaction. They collect information in similar categories, including the following:

RIDER SATISFACTION SURVEYS, TOP U.S. TRANSIT AGENCIES

| Rider Evaluations - Key Categories         |                                                        | NY MTA (subway) Customer Satisfaction Survey <sup>1</sup> | Chicago CTA Customer Satisfaction Survey <sup>2</sup> | Washington D.C. WMATA Voice of the Customer Survey (Rail) <sup>3</sup> | Los Angeles LACMTA Customer Satisfaction Survey <sup>4</sup>    | San Francisco BART Customer Satisfaction Survey <sup>5</sup> | Average |
|--------------------------------------------|--------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------------------|------------------------------------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------------------|---------|
| Service                                    | Overall Satisfaction                                   | 76%                                                       | 83%                                                   | 80%                                                                    | 85%                                                             | 84%                                                          | 82%     |
|                                            | Speed/On-Time Performance                              | ✓                                                         | ✓                                                     | ✓                                                                      | ✓                                                               | ✓                                                            |         |
|                                            | Reliability                                            | ✓                                                         | ✓                                                     | ✓                                                                      | ✓                                                               | ✓                                                            |         |
| Safety                                     | Safety from accidents                                  | ✓                                                         | ✓                                                     | ---                                                                    | ---                                                             | ---                                                          |         |
|                                            | Personal security                                      | ✓                                                         | ✓                                                     | ✓                                                                      | ✓                                                               | ✓                                                            |         |
| Value for money                            |                                                        | 67%                                                       | 77%                                                   | ---                                                                    | ---                                                             | 70%                                                          | 71%     |
| Atmosphere                                 | Station condition                                      | ✓                                                         | ✓                                                     | ✓                                                                      | ✓                                                               | ✓                                                            |         |
|                                            | Vehicle Cleanliness                                    | ✓                                                         | ✓                                                     | ✓                                                                      | ✓                                                               | ✓                                                            |         |
|                                            | Temperature                                            | ✓                                                         | ✓                                                     | ✓                                                                      | ---                                                             | ✓                                                            |         |
|                                            | Crowding                                               | ✓                                                         | ✓                                                     | ---                                                                    | ---                                                             | ✓                                                            |         |
|                                            | Communications                                         | ✓                                                         | ✓                                                     | ✓                                                                      | ✓                                                               | ✓                                                            |         |
| Information                                | Announcements                                          | ✓                                                         | ✓                                                     | ✓                                                                      | ---                                                             | ✓                                                            |         |
|                                            | Staff (courtesy, helpfulness)                          | ✓                                                         | ✓                                                     | ✓                                                                      | ---                                                             | ✓                                                            |         |
|                                            | Posted info in stations                                | ✓                                                         | ✓                                                     | ✓                                                                      | ---                                                             | ✓                                                            |         |
| Website                                    | ---                                                    | 89%                                                       | 100%                                                  | ---                                                                    | 78%                                                             | 89%                                                          |         |
| Fare payment systems                       |                                                        | ✓                                                         | ✓                                                     |                                                                        | ✓                                                               | ✓                                                            |         |
| Recommend service to a friend              |                                                        | ---                                                       | 91%                                                   | 79%                                                                    | ---                                                             | 93%                                                          | 88%     |
| Survey Summary (most recent survey)        | Frequency                                              | Annual                                                    | 3 years                                               | Quarterly                                                              | Annual                                                          | Biannual                                                     |         |
|                                            | # respondents                                          | 1,729                                                     | 32,317                                                | 770                                                                    | 18,804                                                          | 6,700                                                        | 12,064  |
|                                            | Respondents as percentage of daily riders <sup>6</sup> | 0.03%                                                     | 1.97%                                                 | 0.10%                                                                  | 1.29%                                                           | 1.79%                                                        | 1.04%   |
|                                            | Methodology                                            | Random phone                                              | Randomly selected riders, plus email lists            | Random phone                                                           | Randomly selected riders, non-English web surveys, focus groups | Randomly selected riders                                     |         |
| Other web-based customer feedback formats? | Email form on website w/photo option                   | Online form; topic-specific separate surveys              | Online form                                           | Topic-specific "Quick Polls" online                                    | Email                                                           |                                                              |         |

*Full chart with sources is in Appendix A; Regular, overall survey not conducted by Massachusetts Bay Transportation Authority.*

These surveys only address the concerns of at most two percent of riders—surely not a representation of the overall experience. In addition, as a transit managers’ adage goes, “You’re only as good as your last rush hour.” That is, while these surveys attempt to evaluate rider experiences in the long term, they depend primarily on riders’ most recent experiences. An article in the Washington Post questioned the validity of the Washington Metropolitan Area Transportation Authority’s surveys: “The quarterly reports instituted in 2010 under General Manager Richard Sarles are a form of accountability for the managers of Metrorail, Metrobus and MetroAccess, but they’re not the form of accountability that customers relate to. For example, Metrorail riders who have endured weeks of erratic performance on the Red Line are going to look at the stats for rail system reliability and wonder what transit system is being measured.”<sup>27</sup> In comparison, app and social media posts provide real-time reviews of the same conditions these delayed surveys seek to measure:

TRANSIT SURVEY TOPICS AND RELATED SOCIAL MEDIA POSTS

| Survey Subject            | Agencies Measuring                                                                  | Tweet                                                                                                                                                                                                      |
|---------------------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Overall Satisfaction      |  | “The @cta has to be the most hated public transit system in the country. Never on time, dirty, outdated, slow, dangerous, etc. #ctafail” - @KyleDeGiulio                                                   |
| Speed/On-Time Performance |  | “the m train super slow, everyone told to get off at myrtle-bway, <a href="http://mta.info">http://mta.info</a> has no updates to explain this @MTA” - @MJalonschi                                         |
| Reliability               |  | “Hey @MTA! My friend @Kirz NYC waited 3 hrs & 3 buses b/c lifts not working & drivers not trained <a href="http://pic.twitter.com/civkGgMiSX">pic.twitter.com/civkGgMiSX</a> ” - @gemaree                  |
| Safety from Accidents     |  | “Either there’s something seriously wrong with this bus, or the driver doesn’t understand how an accelerator works. #sfmuni” - @nonsoccermom                                                               |
| Personal Security         |  | “filing complaint on @wmata website to report attempted assault by bus driver— which drop-down menu choice applies? <a href="http://pic.twitter.com/HCYdBIIFAY">pic.twitter.com/HCYdBIIFAY</a> ” - @IMGoph |
| Value for Money           |  | “Did @wmata really put out an ad bragging about how much of our money they’re spending? <a href="http://pic.twitter.com/HGqd5BOxvh">pic.twitter.com/HGqd5BOxvh</a> ” - @kctimpf                            |
| Cleanliness               |  | “getting complaints about garbage @cta red line. personally, i just saw actual human waste on that train. u? (cc: @LittleBirdBill) #DreadLine” - @tracyswartz                                              |
| Temperature               |  | “Hey #BART it’s 70 degrees and your train is packed. Heat is really really unnecessary” - @KCalder3                                                                                                        |
| Communications            |  | “Started tracking the 9 minute bus when it was 18 minutes away ... over 40 minutes ago. @CTA #FAIL <a href="http://pic.twitter.com/2o0FmnREcj">pic.twitter.com/2o0FmnREcj</a> ” - @tankboy                 |

<sup>27</sup> Thomson, Robert. “Metro report to show service improvements.” Washington Post, December 3, 2013. <http://www.washingtonpost.com/blogs/dr-gridlock/wp/2013/12/03/metro-report-to-show-service-improvements/>

Twitter was used in this chart due to its popularity for short-form communications, but several social networks host commenting platforms that are more current, accessible and useful than the customer surveys. Even Yelp, the review site for goods and services, has reviews of train lines and stations.<sup>28</sup>

Agencies' methods of gathering, routing and acting on rider information are rudimentary when it comes to social input. Rider report cards provide a long view of riders' experiences, but not actionable issues. What if the agency could ask a respondent for more specific information? Perhaps the commuter who finds his station dirty every morning could specify when he rides? Perhaps his morning commute occurs at 10am, when rush-hour commuters have already made the place dirty. But if his morning commute is at 5am, perhaps night cleaning services must improve. The ability to ask follow-up questions, electronically possible, is essential to both short and long-term transit system improvements, and tapping the micro-tasking of real-time rider feedback can profoundly assist in these needs.

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<sup>28</sup> <http://www.yelp.com/biz/the-c-train-new-york>

## REPORTING SYSTEM DESIGN AND RECOMMENDATIONS

The following is a hypothetical design for a co-monitoring system to accept, evaluate and act on rider feedback.

Rider feedback can come from a variety of sources in a plethora of styles. Below are recent social media posts that could be used as actionable information sources to serve as an example of the types of feedback available:<sup>29</sup>

### Sample Social Media Posts for Analysis

**Twitter (CTA)**  
"@cta why is the blue line announcing delays at Division for "emergency" reasons but nothing on the tracker?"

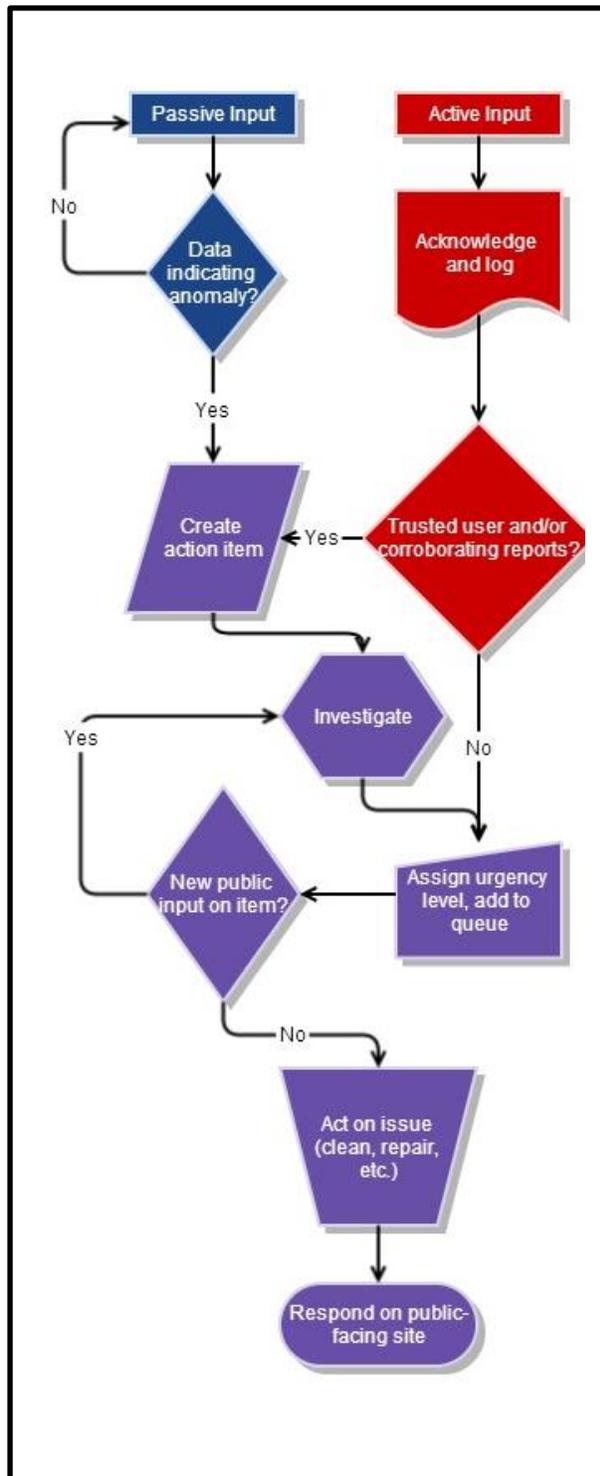
**Facebook (WMATA)**  
"The train operator who runs the train that arrives at Grovesnor at approx. 10:10am each weekday (heading to Silver Spring) couldn't be a nicer guy and VERY good at what he does. Clear announcements and smooth train handling. I am almost always on his train and always am in the front car and he always greets me when he pulls in and made it a point to make sure I had a good holiday this morning (my first day back for the year). Hopefully this message can be passed along to his supervisor or the like. He is a good guy. Wish I knew his name."

**Foursquare (BART)**  
"Montgomery BART station: where it smells so bad, the air has a flavor."

**Instagram (MTA)**  
A screenshot of an Instagram post showing a person sitting on a subway platform next to a train. The post includes a caption and a list of users who interacted with it.

<sup>29</sup> Post sources: Twitter: <https://twitter.com/JBone024/status/426372935964573696> Facebook: [https://www.facebook.com/MetroForward/posts/754161417946683?comment\\_id=7852329&offset=0&total\\_comments=1](https://www.facebook.com/MetroForward/posts/754161417946683?comment_id=7852329&offset=0&total_comments=1) Foursquare: <https://foursquare.com/v/montgomery-st-bart-station-san-francisco-ca/455f77abf964a520903d1fe3> Instagram: <http://instagram.com/p/jLbiDNxFOz/>

## PROPOSED CO-DESIGN FRAMEWORK FLOW



The flow of activities at left demonstrates the mechanisms of system co-monitoring, a mix of software calculations and human interpretation. Public inputs come from both active (social media sources, 311 information, direct emails and text message reports) and passive (mobile phone location data showing crowding and mid-route stoppages). Pulling data from these existing sources, rather than developing a new app, ensures a wider user base and less technical investment. Sentiment analysis, “where each word is assigned a value, and machine learning techniques, which use counting methods to determine the sentiment of a body of text,” can pinpoint appropriate social media posts.<sup>30</sup> The software will develop a queue of these reports to be evaluated for further action.

Over time, a set of trusted users will develop – those contributors of information that is accurate, specific and actionable; their posts will be moved up the queue. In addition, multiple reports from the same location will be combined to move up the queue, indicating a larger-scale issue. The queue will be publicly visible with a tool for markup, so that others may add commentary, images or corrections.

<sup>30</sup> Collins et al

Once the reports are analyzed by transit personnel, they are acknowledged to the senders and forwarded to the proper authority with priority levels for action (e.g. station managers for peeling paint issues), with continued logging for issue resolve. Once issues are resolved, the original report will be publicly closed out.

Finally, even after issues are put to bed, they will be logged by the system for long-term analysis: is a particular driver often considered erratic by passengers? Is a trashcan often overflowing during evening rush hour? These issues may be resolved through analysis of real-time reports that reveal patterns and long-term solutions.

## POTENTIAL BENEFITS OF CO-MONITORING

Co-monitoring offers manifold potential benefits in the areas of administration, service management, and rider sentiment:

- **Improved feedback process:** Many transit agencies lack clear methods of submitting feedback, and often processes are onerous: calling an 800 number or filling out a web form. A clear feedback process using already-popular tools like Twitter, and accessible while in transit, will see much greater use by the public, bringing in more actionable reports.
- **Immediate awareness of field conditions:** Incident information from trusted reporters and/or numerous riders can provide detailed multimedia accounts to transit managers before official field reports come in. For example, passengers may report an erratic bus driver, which would not warrant an emergency call, but should be addressed by the transportation agency. Similarly, on-board crimes may not be visible to train conductors, but may be recorded by fellow passengers. In these scenarios, centralized supervision of field conditions would be substantially enhanced through rider co-monitoring.
- **Cost and time savings of infrastructure monitoring:** Agencies can benefit from being aware of a situation before arriving to the scene. For example, a user's photo and location report of a broken bench on a station platform helps transit personnel address the issue more quickly.
- **Rider empowerment:** With a direct channel to transit agencies, riders will know their input matters to the system's operation, and will be more inclined to develop a sense of ownership of the system. Ownership will likely lead to curtailing behaviors like littering or disrespecting staff.
- **Improved relations:** Information-exchanging relationships will lead to increased trust between agencies and users.

## THE CHALLENGES OF CO-MONITORING

Combining public sentiment with public services can be messy, with regular issues ranging from excessive criticism to technical issues. Specific challenges expected from a co-monitoring system are:

- **Regulatory:** Legal concerns over records retention, acknowledgement and response requirements, and agency oversight of reported issue.<sup>31</sup>
- **Internal:** Lack of internal support for both new technologies and outside information; lack of resources to build and staff new tools; issues coordinating message between agencies; difficulty balancing number of reports about an issue with that issue's urgency.
- **Technical:** Digital divide (both potential users lacking access to technology, and inaccessibility to disabled users)<sup>32</sup>; system discovery of meaningful posts.
- **Social:** Riders "rarely encounter infrastructure problems that meet the perceived cost-benefit threshold for reporting."<sup>33</sup> Anonymous participation, if allowed, could invite inappropriate and excessively critical posts; if anonymity is forbidden, it could lead to a lack of participation.
- **Public perception:** Is the public humiliation of public complaints worthwhile?<sup>34</sup> Social media users tend to report more in the negative than the positive, both in weather<sup>35</sup> and transit<sup>36</sup>, leading to a perception of incompetence by the named transit agencies.

Most of these challenges are surmountable, and are often due to growing pains (acceptance of outside information) or the necessary acknowledgement of public criticism. These issues should

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<sup>31</sup> Giering, Scott. "Public Participation Strategies for Transit," Transportation Research Board: Transit Cooperative Research Program Synthesis 89, 2011. [http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp\\_syn\\_89.pdf](http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_syn_89.pdf)

<sup>32</sup> Bregman, Susan. "Uses of Social Media in Public Transportation," Transportation Research Board: Transit Cooperative Research Program Synthesis 99, 2012. [http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp\\_syn\\_99.pdf](http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_syn_99.pdf)

<sup>33</sup> Yoo, Daisy, John Zimmerman, Aaron Steinfeld, Anthony Tomasic. "Understanding the Space for Co-design in Riders' Interactions with a Transit Service," CHI 2010: Bikes and Buses, April 10-15, 2010.

<sup>34</sup> Akwagyiram, Alexis. "Are Twitter and Facebook changing the way we complain?" BBC News, May 17, 2012. <http://www.bbc.co.uk/news/uk-18081651>

<sup>35</sup> Wilson, Mark. "Infographic: How Weather Tweets Compare To Real Weather Data," Fast Company, May 21, 2012. <http://www.fastcodesign.com/1669829/infographic-how-weather-tweets-compare-to-real-weather-data#8>

<sup>36</sup> Collins et al

be addressed in an agency social media plan and updated as needed, especially the regulatory and social.

The most serious challenge concerns public perception: agencies have an opportunity to take tough criticism and turn it around by acknowledging comments, acting on them, and reporting back to the public. Giving the public ownership of their transportation systems will make them more respectful, understanding of operations, and less publicly critical.

## POLICY RECOMMENDATIONS

The establishment of a co-monitoring system will improve system awareness and management for transit agencies and a sense of ownership by the riding public. Although co-monitoring will require major investments of time, energy and resources in the short run, the gains in system management and efficiency will be significant in the long run. To build a truly valuable and dynamic co-monitoring system, several guidelines should be followed:

### **1. Define and teach social media responsibilities.**

Management of a co-monitoring system should be determined well before implementation, including both day-to-day operations and crisis actions, and workers must be trained in acceptable social media use and styles. SAS, the software company, requires new hires to “receive a special training in social best practices during orientation. An internal portal started last year helps employees understand the purpose behind each of SAS's social media accounts, and who runs them.” While most public agencies designate staff for public communications, all public employees should be taught to answer questions and post project information as needed.<sup>37</sup>

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<sup>37</sup> CNN Money, “Social Media Superstars: SAS,” January, 2013.  
<http://money.cnn.com/gallery/technology/2013/01/17/best-companies-social-media-stars.fortune/6.html>

## **2. Systems must be accessible to all.**

Riders who are disabled, lack smartphones or for any other reason cannot access a co-monitoring system should be equipped with a texting option or other tool to communicate with the transit agency.

## **3. Remain open to both criticism and change.**

Transit agencies using co-monitoring systems should dismiss traditional notions of an uninformed public, and open themselves up both to criticisms and change. For example, JetBlue eliminated a bicycle fee policy after a social media firestorm erupted around it, demonstrating the ability for customers to point out improvements that the company had not foreseen.<sup>38</sup> By collaborating with the public, agencies will learn from riders' experiences, which may help discern operational improvements. Agencies should remain open to the idea that outside perspectives can be useful.

## **4. Transparency leads to quality interactions.**

When public agencies are publicly honest about their resources, processes and needs, they are more likely to receive understanding, helpful reports and respectful dialogue from the public. Transparency leads to more active citizen participation; for example, if a neighborhood learns its transit agency lacks resources to clean its bus stop frequently, the neighbors can redirect their frustrations to organizing community-based cleanup efforts.

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<sup>38</sup> Gianatasio, David. "JetBlue Knows How to Communicate With Customers in Social, and When to Shut Up," AdWeek, September, 2013. <http://www.adweek.com/news/advertising-branding/jetblue-knows-how-communicate-customers-social-and-when-shut-152246?page=2>

**5. Dialogues must produce accountability.**

Reporting problems will result in double accountability: first, for the agency receiving the report (to acknowledge, act on and report back, as necessary), and secondly, for the individuals producing these reports: only truthful submissions will generate action, and false or erroneous reports will result in users being ignored.

**6. Flexibility is essential.**

Agencies must remain amenable to trying new tools and tones as a co-monitoring system matures. Likewise, riders must understand the importance of remaining flexible about the timing of their concerns being addressed.

**7. Promote respectful dialogue.**

Respectful language, in which each party acknowledges the challenges and resources of the other, will help further a co-monitoring system and improve relationships between agencies and riders. When agencies recognize a rider's discomfort in excessively heated trains, and riders acknowledge the system's limited operations in snow, both parties will come to a more productive relationship.

Following these policy guidelines and the framework laid out above will bring about a collaborative, well-managed transit system. Growth of an eternally-connected public and maturation of tools to administer public participation in government indicate a coming sea change in how public services, including transit, will be managed. Investing in co-monitoring mechanisms will harness the wisdom of the riding public, coupled with the intelligence of field agents, bringing transit management into the twenty-first century.

## APPENDIX – RIDER EVALUATIONS

| Rider Evaluations - Key Categories |                               | NY MTA (subway) Customer Satisfaction Survey <sup>i</sup> | Chicago CTA Customer Satisfaction Survey <sup>ii</sup> | Washington D.C. WMATA Voice of the Customer Survey (Rail) <sup>iii</sup> | Los Angeles LACMTA Customer Satisfaction Survey <sup>iv</sup> | San Francisco BART Customer Satisfaction Survey <sup>v</sup> | Avg    |
|------------------------------------|-------------------------------|-----------------------------------------------------------|--------------------------------------------------------|--------------------------------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------|--------|
| Service                            | Overall Satisfaction          | 76%                                                       | 83%                                                    | 80%                                                                      | 85%                                                           | 84%                                                          | 82%    |
|                                    | Speed/On-Time Performance     | ✓                                                         | ✓                                                      | ✓                                                                        | ✓                                                             | ✓                                                            |        |
|                                    | Reliability                   | ✓                                                         | ✓                                                      | ✓                                                                        | ✓                                                             | ✓                                                            |        |
|                                    | Safety                        |                                                           |                                                        |                                                                          |                                                               |                                                              |        |
| Safety                             | Safety from accidents         | ✓                                                         | ✓                                                      | ---                                                                      | ---                                                           | ---                                                          |        |
|                                    | Personal security             | ✓                                                         | ✓                                                      | ✓                                                                        | ✓                                                             | ✓                                                            |        |
| Value for money                    |                               | 67%                                                       | 77%                                                    | ---                                                                      | ---                                                           | 70%                                                          | 71%    |
| Atmosphere                         | Station condition             | ✓                                                         | ✓                                                      | ✓                                                                        | ✓                                                             | ✓                                                            |        |
|                                    | Vehicle Cleanliness           | ✓                                                         | ✓                                                      | ✓                                                                        | ✓                                                             | ✓                                                            |        |
|                                    | Temperature                   | ✓                                                         | ✓                                                      | ✓                                                                        | ---                                                           | ✓                                                            |        |
|                                    | Crowding                      | ✓                                                         | ✓                                                      | ---                                                                      | ---                                                           | ✓                                                            |        |
| Information                        | Communications                | ✓                                                         | ✓                                                      | ✓                                                                        | ✓                                                             | ✓                                                            |        |
|                                    | Announcements                 | ✓                                                         | ✓                                                      | ✓                                                                        | ---                                                           | ✓                                                            |        |
|                                    | Staff (courtesy, helpfulness) | ✓                                                         | ✓                                                      | ✓                                                                        | ---                                                           | ✓                                                            |        |
|                                    | Posted info in stations       | ✓                                                         | ✓                                                      | ✓                                                                        | ---                                                           | ✓                                                            |        |
|                                    | Website                       | ---                                                       | 89%                                                    | 100%                                                                     | ---                                                           | 78%                                                          | 89%    |
| Fare payment systems               |                               | ✓                                                         | ✓                                                      |                                                                          | ✓                                                             | ✓                                                            |        |
| Recommend service to a friend      |                               | ---                                                       | 91%                                                    | 79%                                                                      | ---                                                           | 93%                                                          | 88%    |
| Survey                             | Frequency                     | Annual                                                    | 3 years                                                | Quarterly                                                                | Annual                                                        | Biannual                                                     |        |
| Summary                            | # respondents                 | 1,729                                                     | 32,317                                                 | 770                                                                      | 18,804                                                        | 6,700                                                        | 12,064 |

|                                                   |                                                               |                                              |                                            |                                     |                                                                 |                          |       |
|---------------------------------------------------|---------------------------------------------------------------|----------------------------------------------|--------------------------------------------|-------------------------------------|-----------------------------------------------------------------|--------------------------|-------|
| <b>(most recent survey)</b>                       | <b>Respondents as percentage of daily riders<sup>vi</sup></b> | 0.03%                                        | 1.97%                                      | 0.10%                               | 1.29%                                                           | 1.79%                    | 1.04% |
|                                                   | <b>Methodology</b>                                            | Random phone                                 | Randomly selected riders, plus email lists | Random phone                        | Randomly selected riders, non-English web surveys, focus groups | Randomly selected riders |       |
| <b>Other web-based customer feedback formats?</b> | Email form on website w/photo option                          | Online form; topic-specific separate surveys | Online form                                | Topic-specific "Quick Polls" online | Email                                                           |                          |       |

<sup>i</sup> <http://www.mta.info/mta/news/books/docs/2013-Subway-CSS-Board-Presentation.pdf>

<sup>ii</sup> <http://www.rtachicago.com/about-the-rta/rta-annual-report.html>

<sup>iii</sup>

[http://www.wmata.com/about\\_metro/board\\_of\\_directors/board\\_docs/120612\\_4CCustomerSurvey.pdf](http://www.wmata.com/about_metro/board_of_directors/board_docs/120612_4CCustomerSurvey.pdf)

<sup>iv</sup>

[http://media.metro.net/projects\\_studies/research/images/annual\\_survey\\_results/system\\_results\\_s13.pdf](http://media.metro.net/projects_studies/research/images/annual_survey_results/system_results_s13.pdf)

<sup>v</sup> <http://www.bart.gov/sites/default/files/docs/BARTCustSat2012.pdf>

<sup>vi</sup> Ridership numbers based on average weekday numbers from agency sources:

MTA subway (5,042,263) <http://www.mta.info/nyct/facts/ridership/>

CTA, all modes (1,640,000) <http://www.transitchicago.com/about/facts.aspx>

WMATA rail (758,489) [http://www.wmata.com/about\\_metro/docs/Vital\\_Signs\\_Q2\\_2013.pdf](http://www.wmata.com/about_metro/docs/Vital_Signs_Q2_2013.pdf)

LACMTA, all modes (1,452,109) <http://www.metro.net/news/ridership>

BART (373,945) [http://64.111.127.166/ridership/Ridership\\_January2013.xlsx](http://64.111.127.166/ridership/Ridership_January2013.xlsx)