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Mobility on Demand (MOD) Sandbox Demonstration: Chicago Transit Authority (CTA) Ventra–Divvy Integration Case Study

JUNE 2021

FTA Report No. 0196

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U.S. Department of Transportation
Federal Transit Administration

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Metric Conversion Table

SYMBOL	WHEN YOU KNOW	MULTIPLY BY	TO FIND	SYMBOL
LENGTH				
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
VOLUME				
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
NOTE: volumes greater than 1000 L shall be shown in m^3				
MASS				
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
TEMPERATURE (exact degrees)				
^oF	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	^oC

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14. ABSTRACT

The Federal Transit Administration's (FTA) Mobility on Demand (MOD) Sandbox Program provides a venue through which integrated MOD concepts and strategies, supported through local partnerships, are demonstrated in real-world settings. This case study documents lessons learned from the Chicago Transit Authority (CTA) MOD Sandbox Demonstration, called Ventra–Divvy Integration. The case study is a part of an independent evaluation of the MOD Sandbox Demonstrations sponsored by the USDOT Intelligent Transportation Systems Joint Program Office (ITS JPO) and FTA. The case study includes background on CTA's MOD Sandbox Demonstration, technical and institutional challenges encountered in the demonstration's first phase, payment integration and unbanked access as part of the second phase of the demonstration, and discussion of lessons learned and recommended practices identified from this demonstration.

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Abstract

The Federal Transit Administration's (FTA) Mobility on Demand (MOD) Sandbox Program provides a venue through which integrated MOD concepts and strategies, supported through local partnerships, are demonstrated in real-world settings. This case study documents lessons learned from the Chicago Transit Authority (CTA) MOD Sandbox Demonstration, called Ventra–Divvy Integration. The case study is a part of an independent evaluation of the MOD Sandbox Demonstrations sponsored by the USDOT Intelligent Transportation Systems Joint Program Office (ITS JPO) and FTA. The case study includes background on CTA's MOD Sandbox Demonstration, technical and institutional challenges encountered in the demonstration's first phase, payment integration and unbanked access as part of the second phase of the demonstration, and discussion of lessons learned and recommended practices identified from this demonstration.

SECTION 1

Introduction

Overview of MOD Sandbox Program

The Federal Transit Administration's (FTA) Mobility on Demand (MOD) Sandbox effort developed around a vision of a multimodal, integrated, automated, accessible, and connected transportation system in which personalized mobility is a key feature. FTA selected 11 MOD Sandbox Demonstration projects that are testing strategies that advance the MOD vision. In partnership with public transportation agencies, the MOD Sandbox is demonstrating the potential for new innovations to support and enhance public transportation services by allowing agencies to explore partnerships, develop new business models, integrate transit and MOD strategies, and investigate new, enabling technical capabilities.

Evaluation of each project's benefits and impacts will guide the future implementation of innovations throughout the U.S. Broadly, MOD Sandbox projects take several approaches, including the development of new or improved trip planners, integration of innovative mobility services with traditional public transit functions, and implementation of new integrated payment and incentive structures for travel using public transit. Several Sandbox projects focus on improving first/last-mile access to public transportation through collaboration with private sector operators, including bikesharing, carsharing, ridesourcing/ Transportation Network Companies (TNCs), and other shared mobility operators. Table 1-1 provides a summary of all demonstration projects in the MOD Sandbox Program.

Table 1-1
Overview of MOD Sandbox Projects

Region	Project	Description
Chicago	Incorporation of Bikesharing Company Divvy	Phase 1 releases an updated version of Chicago Transit Authority's (CTA) trip planning app incorporating Divvy bikesharing. Phase 2 will allow users to reserve and pay for bikes within the app.
Dallas	Integration of Shared-Ride Services into GoPass Ticketing Application	Releases updated version of Dallas Area Rapid Transit's (DART) existing trip planning app. Updated version incorporates shared-ride services to provide first/last-mile connections to public transit stations and allows users to pay for services within the app.
Los Angeles and Puget Sound	Two-Region Mobility on Demand	Establishes partnership between Via and LA Metro. Via provides first/last-mile connections for passengers going to or leaving from transit stations. There is a companion project in Seattle, WA.
Phoenix	Smart Phone Mobility Platform	Releases updated version of Valley Metro's existing trip planning app. New version updates trip planning features and enables payments.

Table 1-1 cont'd

Overview of MOD Sandbox Projects

Region	Project	Description
Pinellas County (Florida)	Paratransit Mobility on Demand	Improves paratransit service by combining services from taxi, ridesourcing/TNCs, and traditional paratransit companies.
Portland	Open Trip Planner Share Use Mobility	Releases updated version of TriMet's existing multimodal app. New version provides more sophisticated functionality and features, including options for shared mobility.
San Francisco Bay Area	Bay Area Fair Value Commuting (Palo Alto)	Reduces SOV use within Bay Area through commuter trip reduction software, a multimodal app, workplace parking rebates, and first/last-mile connections in areas with poor access to public transit.
	Integrated Carpool to Transit (BART System)	Establishes partnership between Scoop and BART. Scoop matches carpoolers and facilitates carpooling trips for passengers going to or leaving from BART stations with guaranteed parking.
Tacoma	Limited Access Connections	Establishes partnerships between local ridesourcing companies/TNCs and Pierce Transit. Ridesourcing companies provide first/last-mile connections to public transit stations and park-and-ride lots with guaranteed rides home.
Tucson	Adaptive Mobility with Reliability and Efficiency	Builds integrated data platform that incorporates ridesourcing/TNC and carpooling services to support first/last-mile connections and reduce congestion.
Vermont	Statewide Transit Trip Planner	Releases new multimodal app for VTrans that employs fixed and flexible (non-fixed) transportation modes to route trips in cities and rural areas.

This case study documents lessons learned from the Chicago Transit Authority (CTA) MOD Sandbox Demonstration, called Ventra–Divvy Integration. The case study is a part of an independent evaluation of the MOD Sandbox Demonstrations sponsored by the US Department of Transportation (USDOT) Intelligent Transportation Systems Joint Program Office (ITS JPO) and FTA. The case study is organized into four key sections, as follows:

1. Background on CTA's MOD Sandbox Demonstration
2. Technical and institutional challenges encountered in demonstration's first phase
3. Payment integration and unbanked access as part of second phase of demonstration
4. Discussion of lessons learned and recommended practices identified from demonstration

SECTION 2

Demonstration Background

CTA is a regional transit system operating bus and heavy rail service in the Chicago metropolitan area, including the city of Chicago and 35 suburban communities. As of 2019, CTA provided 82% of the public transit trips in the six-county Chicago metropolitan area, with either direct service or connecting service to sister transit agencies.

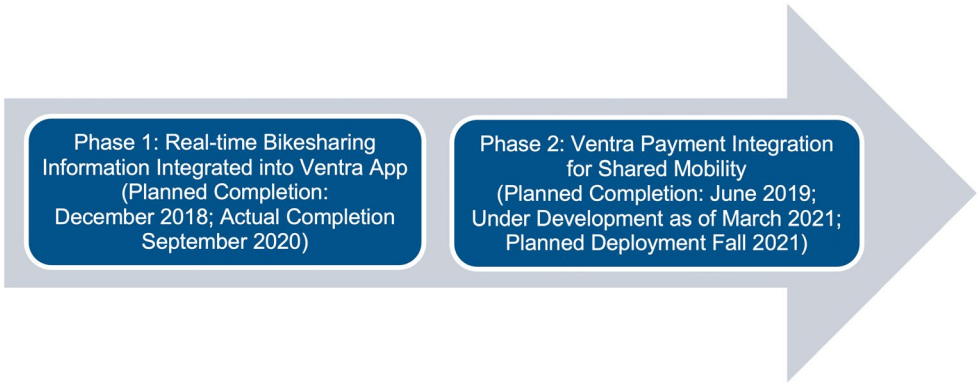
In 2013, CTA introduced customers to Ventra, a contactless open fare payment system. This account-based system is also used by CTA's sister agencies Metra (commuter railroad) and Pace (suburban bus lines) and provides seamless connectivity between these regional service providers. In 2015, the Ventra app, designed by Cubic, was launched to allow customers to purchase fares, manage accounts, and track train and bus arrivals from their phone. Since launching the Ventra app in 2015, it has been downloaded six million times and is the primary payment method for many CTA transit customers. Recent enhancements to the system include the use of mobile wallets (Apple Pay) within the app to purchase transit fares or passes.

Through a partnership between the Chicago Department of Transportation (CDOT) and CTA, travelers have access to more than 650 Divvy Bike Share stations and over 9,500 bicycles located throughout the region. CTA customers are able to make connections to Divvy at 84% of CTA 's rail stations and nearly 70% of CTA's bus stops. These connections greatly increase CTA's reach throughout the Chicago metropolitan region. Divvy bikes are used by commuters, tourists, and recreational riders for convenient and healthy trips around the downtown and in 58 Chicago neighborhoods and Evanston.

To increase access to the bikesharing program, Divvy continues an alternative fee structure to encourage ridership and has launched a citywide system expansion and modernization effort. By 2022, Divvy's geographic service network will double to over 230 sq. mi., and 10,500 new pedal-assist e-bikes will increase the total fleet to 16,500. All new Chicago bikes will also have hybrid locking capabilities that allow them to be locked at a station or to a regular bike rack.

In a partnership among CTA, CDOT, Cubic Transportation Systems, and Lyft (previously Motivate), the CTA MOD Sandbox Demonstration project proposed two modifications to the Ventra app that would provide customers with improved access to Divvy bikes and establish a platform to expand this opportunity to other shared modes in the future. CTA's Ventra–Divvy integration comprises two phases, as shown in Figure 2-1.

Figure 2-1
CTA MOD Sandbox Demonstration Phases



Phase 1 of the project incorporated Divvy station locations and system status into the Ventra trip planner to allow customers to check real-time availability of bikes at transit stops and the availability of docking stations at their destination. The initial phase also included a "deep link" that connected the Ventra trip planer to the Divvy app so new customers could create a Divvy account and existing Divvy members could obtain an unlock code to access a bicycle. Phase 1 was initially scheduled to be deployed in December 2018 and was completed in September 2020.

Phase 2 will further integrate Divvy functionality into the Ventra app so customers can pay for their Divvy bike with their Ventra transit value or other payment source to receive an unlock code. This innovation will allow Ventra customers to use their Ventra transit value to pay for shared mobility. CDOT is especially interested in using the Ventra fare payment integration as a mechanism for allowing unbanked households to use cash payment for bikesharing. CTA has a robust network of Ventra locations at which users can load cash onto their fare cards at rail station vending machines and approximately 900 community retail locations, such as Currency Exchanges, CVS, Target, Walgreens, Walmart, and others. Phase 2 was initially scheduled to be deployed in June 2019, but is now planned to launch in Fall 2021.

Due to delays in deploying Phases 1 and 2, this case study presents emerging lessons learned to-date from the CTA MOD Sandbox Demonstration. Findings for this case study were obtained through interviews conducted with project partners (expert interviews) in October 2020. Table 2-1 summarizes the roles of organizations participating in the CTA MOD Sandbox Demonstration.

Table 2-1

CTA MOD Sandbox Demonstration Partners

Participating Organizations	Role in MOD Sandbox Demonstration
Chicago Transit Authority (CTA)	Operator of mass transit in Chicago; recipient and lead organization of Demonstration.
Chicago Department of Transportation (CDOT)	Executive department of City of Chicago, responsible for vendor contract and oversight of Divvy, Chicago's bikesharing program.
Motivate/Lyft	Divvy, originally operated by Motivate, transitioned to Lyft as part of corporate acquisition in 2019.
Cubic Transportation Systems	Development of CTA's Ventra app and integrated fare payment products; CTA responsible for vendor contract and oversight of Cubic.

SECTION
3

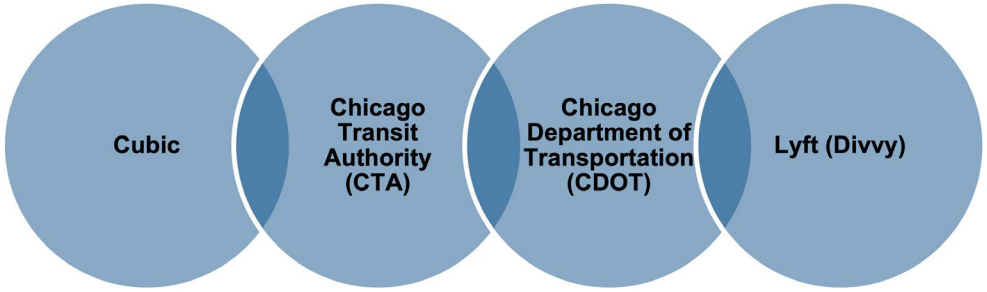
Phase 1 – Institutional and Technical Challenges

Many of the challenges with Chicago's MOD Sandbox Demonstration can be attributed to complex vendor relationships and a series of vendor merger and acquisitions that contributed to a combination of delays and changes in program partners. This section discusses the initial timeline envisioned for the Divvy integration and the institutional and technical challenges encountered due to private sector mergers and acquisitions that contributed to program delays and that resulted from these changes and prior federal funding limitations, limiting the ability of the project partners to upgrade their technology to enable advanced bikesharing and fare payment integration.

When CTA's MOD Sandbox project was initially conceived, Divvy was operated by Motivate. In July 2018 Lyft purchased Motivate and assumed operational control over Divvy in 2019, a transition that required technical work to be placed on hold because Lyft used different software than Motivate. Based on conversations with Lyft and Motivate, CTA recognized that the change in bikesharing vendors could create a situation that would require technical work to be repeated if they proceeded to design Ventra integration around the outgoing vendor. CTA intentionally delayed some integration work to ensure this work would not have to be discarded following the transition to Lyft. The project partners used this time to discuss how to integrate payments, limit the financial risks of all parties, and maintain Payment Card Industry Data Security Standard (PCI) compliance when integrating two separate payment platforms. In addition to the transition from Motivate to Lyft, CTA's fare payment vendor also transitioned during the MOD Sandbox project. Initially, CTA planned to partner with the vendor that created the original Ventra app. Once it became apparent that the original Ventra app would not accommodate the enhancements requested by CTA, the discussions pivoted to developing contractual relationships with a new vendor. Due to a change in business focus, Moovel decided to step away from the Ventra app and CTA began to engage Cubic, which runs CTA's gate and fare systems, mobile application, and fare payment.

As part of the transition to Lyft, CDOT began negotiating a revised bikesharing service provider agreement. In April 2019, the Chicago City Council approved a new agreement that required Lyft to spend $50 million on stations and bikes and expand access to neighborhoods lacking bikesharing service. The City would also receive $77 million in revenue over the course of the nine-year contract.

Figure 3-1
CTA MOD Sandbox Demonstration Partner Relationships



These relationships created a complicated scenario in which CTA and CDOT were the partners connecting separate vendors with unique challenges—Chicago's bikesharing vendor was in the process of being acquired by Lyft, and Cubic was replacing Moovel. These separate contractual relationships likely contributed to increased complexity because each vendor reported to a different public agency even though all parties had a relationship prior to the MOD Sandbox.

At the project's onset, Divvy was operating on a relatively basic software platform that showed the number of stations and docks available. However, over time, Motivate and later Lyft began moving the software to a different vendor platform. This transition encountered numerous technical challenges that could not be immediately resolved and required additional development time to address. Additionally, CDOT was engaged in negotiations with Lyft. While the business terms for these agreements were being worked out, CTA continued to push for the integration of the two systems and ensure ongoing progress on the Divvy–Ventra integration.

In addition to software challenges, hardware and equipment challenges also were reported. Because Divvy was initially funded by the Congestion Mitigation and Air Quality Improvement (CMAQ) program, CDOT could not upgrade Divvy kiosks that would collectively accommodate the new software with Ventra integration until the federally-funded interest in the project ended in Summer 2020. The project was in the process of being released from federal interest because the Divvy system had transitioned from reliance on federal funds to a private funding/sponsorship model under the 2019 amendment to the City's Bicycle Sharing Agreement with Lyft. CMAQ is administered by the Illinois Department of Transportation (IDOT), and IDOT was going to require that each new or upgraded station kiosk go through an environmental review process comprising a crash analysis for each bikesharing station and a project delivery review. This multi-tiered review process was estimated to take 6–12 months.

These challenges created a scenario in which the Divvy system was operating on two different software platforms for an extended period of time, which created additional challenges. The Divvy app was developed by Lyft but the back-end

software was developed by PBSC Urban Solutions. A software bridge allowed these two systems to co-exist but made it difficult to integrate Ventra, both technically and institutionally, because integration into a legacy software platform would eventually have to be redone. This relationship was further complicated by a complex equipment ownership structure in which CDOT owns the original Divvy equipment and stations and Lyft owns all new stations and bikes until it no longer operates the program (e.g., contract ends or company goes out of business).

CTA launched the new Ventra app in September 2020, which, with Phase I Divvy integration, combines bikesharing with public transportation through a deep link that allows users to unlock a bikesharing bicycle. For security reasons, checking out a bicycle is done in the Divvy app so Divvy can identify fake accounts to help prevent bicycle theft. As part of the first phase of deployment, each partner owns its own data and then shares data on the number of customers using the Ventra app to unlock a bicycle. CTA is currently adding a tool to the Ventra app that can measure and track use of the deep link feature used to unlock a bike in the Divvy app. Project stakeholders reported that the Phase 1 challenges fostered good technical planning discussions on how to improve the development and rollout the second phase of Ventra-Divvy integration.

SECTION 4

Phase 2 – Payment Integration and Unbanked Access

Prior to the MOD Sandbox Demonstration project, CDOT established the Divvy for Everyone (D4E) program to provide a one-time $5 annual membership for qualifying residents without banking or smartphone access. With the Demonstration, a primary goal for CDOT was the integration of Ventra and Divvy to leverage CTA's cash payment so unbanked residents could pay for Divvy use. CTA has a network of approximately 1,350 cash payment locations, including 449 Ventra vending machines in 145 CTA rail stations and a large network of nearly 900 retail partners (including 141 Walgreens, 11 Walmart, and 19 CVS stores, among many others). CDOT believes that integrating Divvy and Ventra will allow underserved communities that lack a credit card, debit card, or bank account to access bikesharing.

The second phase with payment integration, under development as of January 2021, will allow any traveler with Ventra transit value to purchase bikesharing use and unlock a bike. It is anticipated that Phase 2 may go live in November 2021. Some emerging challenges that will need to be overcome as part of this second phase of integration include:

- Technical – How to integrate two systems, accounts, and logins.
- Data privacy and security – How to protect personally identifying and financial information and the handoff between Ventra, Divvy, and other mobility service providers.
- Fraud – How to prevent fraud and stolen bikes (e.g., a bike accessed using transit value that is stolen and not returned). Ventra currently does not track users unless they self-register their Ventra card; however, CTA is in discussions about requiring Ventra registration to unlock a bicycle.
- Use of pre-tax dollars for mobility services – Partners also discussed upcoming challenges with mobility integration and current tax policy about the use of pre-tax dollars for mobility services. To conduct fare payment integration, CTA and Cubic will need to track two different types of account balances, a pre-tax balance and a total account balance, which can create traveler confusion. For the average traveler, it will be difficult to explain and understand why pre-tax transit values cannot be used for bikesharing. Pre-tax and post-tax benefits will also likely create challenges bundling services together and offering mobility-as-a-service discounts.

The technical and business-related challenges of implementing Phase 2 will be addressed in the program development and commercial agreements currently in process.

SECTION 5

Lessons Learned and Best Practices

The Ventra–Divvy Integration CTA MOD Sandbox Demonstration identified the following recommended practices and lessons learned:

- **Trip planning and fare payment integration requires patience.** The project is overcoming challenges of ready, willing, and able stakeholders integrating complex technologies, different partnerships, and customer segments into a seamless multimodal system. In some cases, trip planning and fare payment integration challenges can come down to branding challenges (e.g., branding a platform, a public transit agency, or a mobility service provider).
- **There can be tradeoffs between program pace and efficiency.** In the case of CTA, the partners slowed down their timeline from what had been originally proposed in their cooperative agreement with FTA. While much of this delay is attributable to factors largely outside the control of the grantee (e.g., Lyft acquisition of Motivate), CTA intentionally delayed some integration work to ensure that this work would not have to be discarded following the transition from Motivate to Lyft.
- **Public-private partnerships can present unforeseen risks, such as mergers and acquisitions.** The Chicago MOD Sandbox Demonstration encountered a novel risk among MOD Sandbox grantees—the acquisition of a primary project partner/vendor by another company. Although these acquisitions were beyond the control of the grantee, it is one of the most notable factors that contributed to the project's delay. However, project stakeholders worked diligently to ensure continuity in this transition through consistency of personnel, strong communication, and commitment to following through with the initial scope and goals of the initiative.
- **Internal due-diligence is important.** Because many public agencies do not have in-house technical expertise on fare payment and trip planning integration, interviewees recommended that future program grantees conduct an internal public-private partnership feasibility assessment prior to commencing a project. Such a step can help ensure that a partnership augments and fills identified technical and institutional gaps prior to its execution.

Project partners emphasized the importance of "seed funding" provided by the FTA MOD Sandbox Program, which enabled diverse stakeholders in the Chicago region to collectively develop mobility innovations that can be replicated

elsewhere. Further, project partners emphasized that FTA could assist with mobility innovation by developing a common interface and fare payment standard that all public transit systems and mobility service providers could use, similar to General Transit Feed Specification (GTFS) and Payment Card Industry (PCI) standards. Finally, project partners emphasized that FTA should clarify the use of pre-tax dollars and commuter benefits for shared mobility, how money is handled and moves between these entities, and what transit value can be used based on tax laws.

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