Phase 1 Systems Engineering Management Plan

Heart of Iowa Regional Transit Agency ITS4US Deployment Project

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Final Report — April 22, 2022
FHWA-JPO-21-917

COMPLETE TRIP
ITS4US

U.S. Department of Transportation

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16. Abstract

The Heart of Iowa Regional Transit Agency (HIRTA) is one of the 5 awardees for Phase 1 of the Complete Trip – ITS4US contract for its proposed concept ***"Health Connector for the Most Vulnerable: An Inclusive Mobility Experience from Beginning to End"*** (Health Connector) by the United States Department of Transportation (USDOT). The HIRTA Team previously developed a Concept of Operations (ConOps) document after going through a thorough stakeholder engagement process. The ConOps defines user needs and identifies relevant user scenarios for the Health Connector solution. The Systems requirements (SyRS) document was developed based on ConOps to define requirements for the Health Connector system. The Systems Engineering Management Plan (SEMP) document is the foundational document for system Lifecyle management in Phase 2/3 and beyond. It has been developed using details of the project established so far in Phase 1, and defines how the system deployment process will be managed through design, testing and launch in Phase 2. The document also provides relevant details on planned development work. Further, SEMP defines how operations and maintenance activities will be performed in Phase 3 and beyond. SEMP is a living document and will be updated as details emerge through the rest of Phase 1 and in Phase 2/3.

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1 Introduction

1.1 Document Purpose

The Systems Engineering Management Plan (SEMP) document is the foundational document for system Lifecyle management in Phase 2/3 and beyond. It has been developed using details of the project established so far in Phase 1 and defines how the system deployment process will be managed through design, testing and launch in Phase 2. The document also provides relevant details on planned development work. Further, SEMP defines how operations and maintenance (O&M) activities will be performed in Phase 3 and beyond. SEMP is a living document and will be updated as details emerge through the rest of Phase 1 and in Phase 2/3.

1.2 Project Overview

The Heart of Iowa Regional Transit Agency (HIRTA) is one of the 5 awardees for Phase 1 of the Complete Trip – ITS4US contract for its proposed concept ***"Health Connector for the Most Vulnerable: An Inclusive Mobility Experience from Beginning to End"*** (Health Connector) by the United States Department of Transportation (USDOT).

The Health Connector solution intends to demonstrate an innovative concept that will address various bottlenecks associated with healthcare access for HIRTA communities. Some of these challenges are the key reason behind missed appointments or unacceptable level of preventive or as-needed healthcare in HIRTA service area. For this deployment, the HIRTA team plan to implement a scalable and replicable solution that enables inclusive access to non-emergency medical transportation for all underserved populations and their caregivers by resolving access barriers with the use of advanced technologies. This solution will allow Dallas County residents without access to transportation who may be seeking a medical appointment to explore their transportation alternatives and book both medical and transportation appointments at the same time. Further, this solution will include information and wayfinding services to guide them at every step of their trip.

The referenced underserved populations' mobility needs vary based on the individual. This deployment will provide enhanced access to healthcare options for "all travelers" in Dallas County with a specific focus on underserved communities, including persons with disabilities, low income, rural, older adults, veterans, and persons with limited English proficiency (LEP).

In addition to addressing mobility needs, the proposed deployment will recognize the net impact that access to health services have on patient health care outcomes as well as both the financial and health outcomes from the perspective of the health care community/Dallas County Health Department (DCHD).

Figure 1 provides an overview of the Health Connector concept.

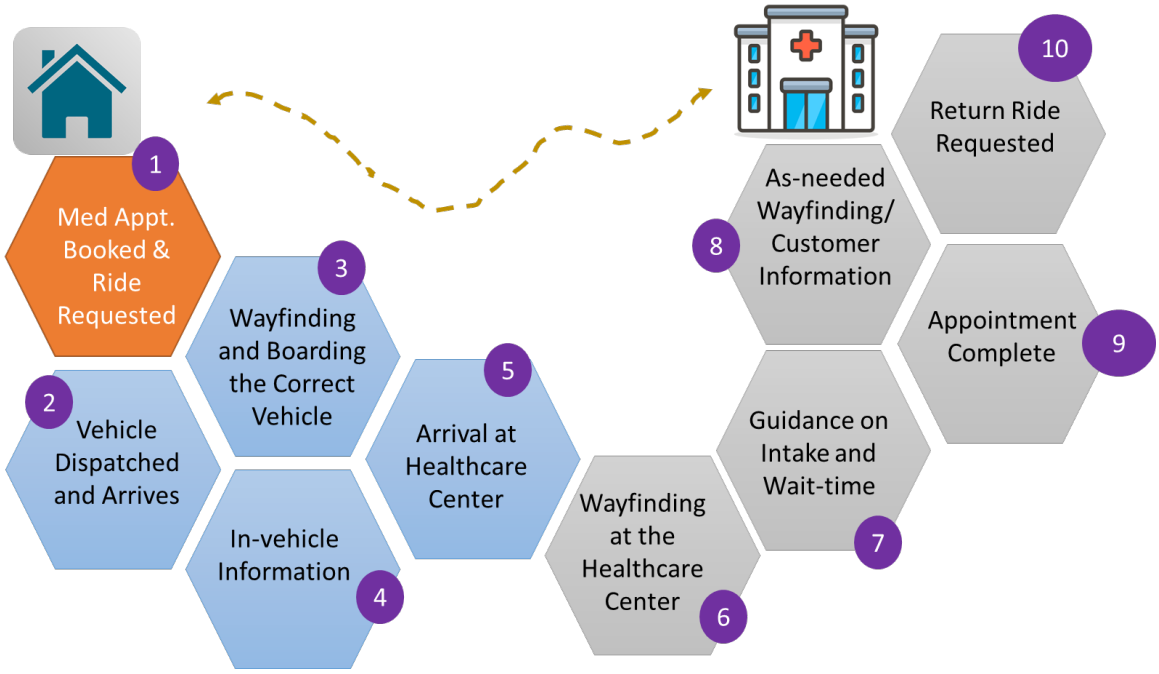

Figure 1. Overview of Health Connector System Concept (Source: HIRTA team)

1.3 References

The following documents were referenced when preparing this ETRA:

- USDOT, “Complete Trip- ITS4US Deployment Broad Agency Announcement (693JJ3-20-BAA-0004)”
- HIRTA, “HIRTA - USDOT Complete Trip - final Proposal - v1.0 2020-07-31 (Volume 1),” July 2020.
- Santosh Mishra et al., “Phase 1 Concept of Operations (ConOps), Heart of Iowa Regional Transit Agency ITS4US Deployment Project,” August 2021, US Department of Transportation
- Santosh Mishra et al., “Phase 1 Systems Requirements (SysRS) Document,” Heart of Iowa Regional Transit Agency ITS4US Deployment Project,” January 2021, US Department of Transportation.
- Santosh Mishra et al., “Phase 1 Integrated Complete Trip Deployment Plan (ICTDP),” Heart of Iowa Regional Transit Agency ITS4US Deployment Project, March 2022 (expected), US department of Transportation.

- Santosh Mishra et al., “Phase 1 Human Use Approval (HUA) Summary (HUA), Heart of Iowa Regional Transit Agency ITS4US Deployment Project, March 2021 (expected), US Department of Transportation.

2 Systems Engineering Process (SEP) Application

2.1 Systems Engineering Process Planning

This section provides a high-level structure of the Health Connector project and describes the systems engineering process at high-level to highlight the key deliverables, milestones and overview of the standardized process that will be used to successfully deliver on the deliverables.

2.1.1 Project Team Organization

Throughout Phase 1, the project team has been working closely with the Contract Office Representative (COR) and the USDOT team for meeting project requirements and finalization of deliverables. The team's approach to project management includes a clear delegation of roles and responsibilities; technology platforms to facilitate remote and in-person engagements and work coordination; and task approaches steeped in systems engineering process to provide organization to our work.

This project is being led by HIRTA and features a creative partnership in Phase 1. The project partner team's key personnel designated leadership include HIRTA and the IBI Group. Additional partners include Community Transportation Association of America (CTAA), Dallas County Health Department (DCHD), Uber Technologies, Capture Marketing Solutions, and NaviLens. Phase 1 deployment's key personnel feature HIRTA and IBI Group staff serving in the following project leadership roles:

- Concept Development Lead (CDL): Steve Wilks, IBI Group.
- System Development Lead (SDL): Santosh Mishra, IBI Group.
- Project Management Lead (PML): Brooke Ramsey, HIRTA.

As the project point of contact, the PML is responsible for all project management elements in the FHWA contract. Brooke and other members of the partner team as designated will also work with the USDOT designated Independent Evaluation team.

Building on the Phase 1 experience, Figure 2 provides the planned organizational chart of the HIRTA project team for Phase 2/3. It continues the involvement of Phase 1 staff and identifies roles and responsibilities as relevant to managing the systems engineering process in Phase 2/3 for deployment, operations and maintenance.

Key Individuals for Phase 2/3 are identified as follows:

- **Brooke Ramsey from HIRTA, Project Management Lead (PML):** Brooke has been the designated PML for Phase 1 and will continue to serve in that role. Also, she will be the primary point of contact (POC) for the USDOT for Phase 2/3.

- **Santosh Mishra from IBI Group, Systems Engineering Lead (SEL):** Santosh has been leading all systems engineering activities in Phase 1 and will continue in that role in Phase 2/3. He will lead all systems engineering deliverables and provide oversight for systems engineering process in coordination with the Deployment Lead.

- **Chris Zeilinger from CTAA, Deployment Lead (DL):** Chris has been leading stakeholder engagement, human use approval and training efforts in Phase 1 and will lead the deployment team in Phase 2.

The following individuals will support the key staff:

- **Heidi Guenin** from IBI Group will serve as the Technical Lead (TL), Heidi will work closely with the core leadership of PML, SEL and DL and coordinate activities with all other key members of the team, deployment partners, stakeholders and other staff.

- **Neena Soans** from IBI Group will serve as Software Development Lead (SDL) and will lead all aspects of open-source middleware development (please see Section 2.2.5.2).

- **Steve Wilks** from IBI Group served as the CDL in Phase 1 and will planning and policy related guidance to the team.

- **Hoki Tse** from IBI Group will lead system validation and verification efforts in Phase 2 and support development of systems engineering deliverables.

- **Carl Lingen** from Capture Management Solution will lead the outreach and marketing efforts.

- **Abigail Chihak** from DCHD to has been acting as the liaison with healthcare partners and will continue to serve in that role in Phase 2 and 3.

- **Dr. Shauna Hallmark** from ISU has been serving as the Advisor on performance management, data collection and human use approval tasks in Phase 1. She will lead the finalization of DMP and PMESP in Phase 2 and will lead evaluation effort in Phase 3.

- **Ryan Ward:** will serve as the Procurement Lead, bringing his many years of experience working at the Procurement Administrator the Iowa DOT and full familiarly of open and competitive procurement regulations.

HIRTA will select a Mobility on Demand (MOD) software vendor through a competitive procurement process in Phase 2. The MOD vendor will provide the core capabilities needed for riders, drivers, and dispatchers for trip planning, booking and management. The procurement will involve both purchasing a commercially off-the-shelf (COTS) product, and system configuration and integration services. Once selected in Phase 2, MOD vendor representatives will provide key support in finalizing design, test plans, training plans and several other Phase 2 deliverables.

Also, MOD vendor staff will lead the initial and at-scale deployment of the system and will serve as the single point of contact for resolving any reported issues with MOD software components.

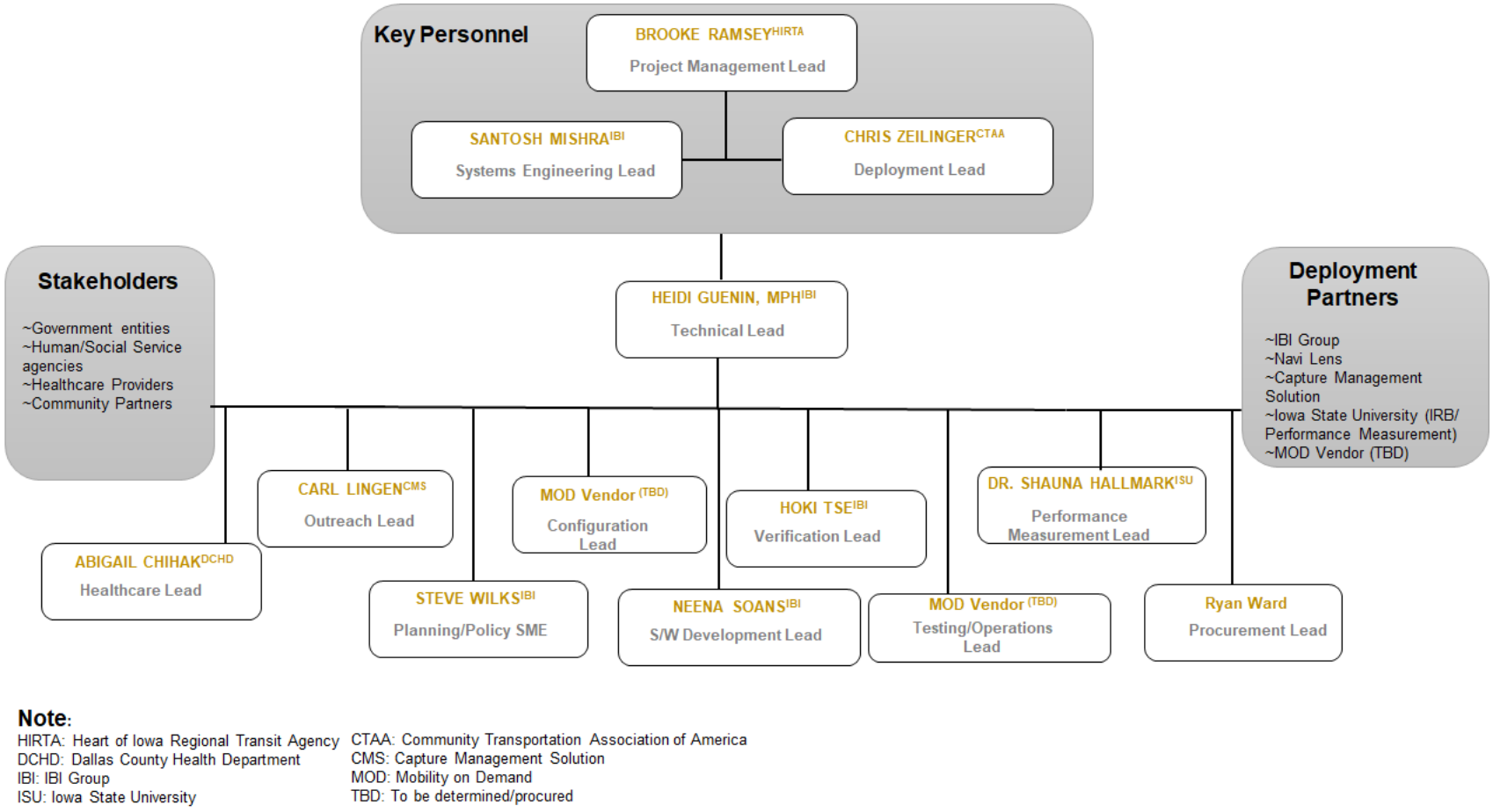

Figure 2. Organization Chart

2.1.2 Systems Engineering Deliverables

This section provides a list of deliverables for Phase 1, 2 and 3. For Phase 1, Table 1 also provides the status for each deliverable.

Table 1. Phase 1 Deliverables

Task	Deliverable	Due Date or Frequency	Status
1	Program Management Plan (Draft)	3/15/2021	Complete
	Program Management Plan (Final)	4/5/2021	Complete
	Monthly Reports (Includes Project Schedule and Risk Register)	Monthly	Ongoing
2	ConOps (Draft)	5/24/2021	Complete
	ConOps Walkthrough Briefing Deck	5/24/2021	Complete
	ConOps Comment Resolution Report (Draft)	6/7/2021	Complete
	ConOps (Final)	6/28/2021	Complete
	ConOps Comment Resolution Report (Final)	6/28/2021	Complete
	Public ConOps Webinar	7/19/2021	Complete
6	SyRS Document (Draft)	9/20/2021	Complete
	SyRS Walkthrough Workbook	9/20/2021	Complete
	SyRS Walkthrough Comment Resolution Report (Draft)	10/4/2021	Complete
	SyRS Document (Final)	10/25/2021	Complete
	SyRS Walkthrough Comment Resolution Report (Final)	10/25/2021	Complete
12	Systems Engineering Management Plan (Draft)	11/29/2021	Complete
	Systems Engineering Management Plan (Final)	12/27/2021	This document

Table 2 provides a list of deliverables as applicable to Phases 2 and 3.

Table 2. Phase 2/3 Deliverables

Phase	Task	Deliverable	Proposed Due Date
2	A	Phase 2 Kick-off Meeting	award + 4 weeks
2	A	Draft Project Management Plan (PMP)	award + 4 weeks
2	A	Revised PMP	as needed
2	A	Monthly Progress Report Part I	monthly
2	A	Monthly Progress Report Part II	monthly
2	A	Lessons Learned Logbook	monthly
2	A	Project Milestone Schedule	monthly*
2	A	Updated Task Schedules	monthly*

Phase	Task	Deliverable	Proposed Due Date
2	A	Project and Task Detailed Risk Register	monthly*
2	A	Bi-Weekly Coordination Teleconference Participation	bi-weekly
2	A	Participation in Monthly All-Site Coordination Teleconferences	monthly
2	A	Participation in Roundtable Teleconferences	as needed
2	B	Draft Systems Architecture Document (SAD)	award + 3 months
2	B	Systems Architecture Walkthrough and Workbook	award + 3.5 months
2	B	Revised SAD with Comment Resolution Report	award + 4 months
2	B	Final Systems Architecture Document	award + 6 months
2	B	Draft Systems Design Document (SDD)	award + 9 months
2	B	Systems Design Walkthrough and Workbook	award + 9.5 months
2	B	Revised SDD with Comment Resolution Report	award + 10 months
2	B	Final Systems Design Document	award + 12 months
2	B	Updated Phase 1 Deliverables	award + 12 months
2	E	Initial Software Development Schedule (SDS)	award + 4 months
2	E	SDS Update with Progress/Risk Summary	monthly*
2	E	Open Source Software and Supporting Documentation	per the SDS
2	F	Initial Training Implementation Schedule (TIS)	per PTSEP
2	F	TIS Update with Progress/Risk Summary	monthly*
2	F	Training Materials	per the PTSEP and TIS
2	F	Human Use Approval Confirmation Materials	per the HUAS
2	G	Draft System Test Plan	award+10 months
2	G	Revised System Test Plan with Comment Resolution Report	award + 12.5 months
2	G	Final System Test Plan	award + 13 months
2	G	Operational Readiness Concept Briefing	award + 6 months
2	G	Draft Operational Readiness Plan (ORP)	award + 11 months
2	G	ORP Walkthrough and Workbook	award + 11.5 months
2	G	Revised ORP with Comment Resolution Report	award + 12 months
2	G	Final Operational Readiness Plan	award + 13 months
2	H	Initial Installation and Operational Readiness Schedule (IORS)	award + 13 months
2	H	IORS Updated with Progress/Risk Summary	monthly*
2	H	System Test Results Summary Documentation	per the ORP
2	H	Operational Readiness Demonstrations	per the ORP
2	I	Draft Comprehensive Maintenance and Operations Plan (CMOP)	award + 15 months
2	I	Revised CMOP with Comment Resolution Report	award + 16 months
2	I	Final CMOP	award + 17 months
2	L	SDO-specific Technical Memoranda	per Standards Plan within the SAD
2	L	Participation in SDO Meetings/Activities	as required
3	A	Phase 3 Kick-off Meeting	NTP + 4 weeks
3	A	Project Management Plan (PMP)	NTP + 4 weeks
3	A	Revised PMP	as required

Phase	Task	Deliverable	Proposed Due Date
3	A	Monthly Progress Report Part I	monthly
3	A	Monthly Progress Report Part II	monthly
3	A	Lessons Learned Logbook	monthly
3	A	Project Milestone Schedule	monthly*
3	A	Updated Task Schedules	monthly*
3	A	Project and Task Detailed Risk Register	monthly*
3	A	Participation in Site-Specific Bi-Weekly Coordination Teleconferences	bi-weekly
3	A	Participation in Monthly All-Site Coordination Teleconferences	monthly
3	A	Participation in Periodic Roundtable Teleconferences	as needed
3	B	Initial System Operations and Maintenance Schedule (SOMS)	NTP + 1 month
3	B	Updated SOMS with Progress/Risk Summary	monthly*
3	E	Draft Comprehensive Transition Plan (CTP)	NTP + 12 months
3	E	Revised CTP with Comment Resolution Report	NTP + 13 months
3	E	Final Comprehensive Transition Plan	NTP + 14 months
3	F	SDO-specific Technical Memoranda	per Standards Plan within the SAD
3	F	Participation in SDO meetings/activities	as required

2.1.3 Configuration Management

The HIRTA team has established a change control board (CCB) for Phase 1, comprised of the key members of the project team, also included in the organizational chart provided in Figure 2. The CCB controls and directs any changes in the project direction in Phase 1. The same CCB will control configuration management activities and will approve or disapprove any changes in Phase 2 and 3. The configuration management process will be led by the SEL.

In Phase 1, for all accepted documents, once the need for any changes are identified, the following process will be followed:

- Identification of details of proposed changes by project team members.
- Assessment of rationale behind the changes and impact on deliverables.
- Assessment of impact on all documents completed so far, including but not limited to ConOps, DMP, SMP, SyRS and SEMP.
- Required changed reviewed and approved by the CCB.
- Modifications completed in the documents to address required changes.
- Modified documents reviewed and approved by the PML.
- Modified documents reviewed and accepted by the COR (AOR in Phase2/3). Any required changes for the document acceptance addressed by the HIRTA team will be followed per the established process in the PMP developed for individual phases.

- For every requested change, a change control form with approval status will be completed and included in the project file.

HIRTA team has also begun to use the traceability matrix, developed as part of the SyRS document as the tool to track any changes to needs, requirements, enabling technologies, applicable input and output datasets and performance measures as those related to needs and requirements.

A similar process for configuration management will be followed in Phase 2 and 3. The process for document development, quality control and acceptance will follow the steps defined in the Phase 2/3 PMP. Any changes, when identified (e.g., during architecture development, design, training), will be brought to the CCB for approval prior to making any changes to the relevant documents. Also, any changes to requirements will be reflected in the RVTM so verification can be conducted appropriately.

2.1.4 System Overview

The project proposes to deploy emerging and innovative technologies and services through an inclusive customer-focused design process to engage stakeholders to address the mobility needs of underserved populations. The proposed solution will utilize emerging technologies to enable the customer to schedule and manage medical appointments and transportation services through a unified application. Further, the application will provide context sensitive wayfinding and customer information to enhance end-to-end experience. This solution will leverage already existing demand response service management technologies at HIRTA and bring other advancements. Any additional capacity needs will be fulfilled by seamless integration with Transportation Network Companies (TNCs), taxis and other third-party service providers.

Key capabilities of the proposed technology solution are as follows:

- Enable the customer to use a smart device (e.g., smartphone, smartwatch) application or equally effective alternate methods to schedule and manage medical appointments and transportation services all in one location (Unified Health Connector App). Provide customers options to choose from available providers. Provide same day response if needed by customers.
- Send customers alert before arrival and again when the vehicle is approaching.
- Keep customers informed on trip progress.
- Provide directions (audible and visual) on where to meet the vehicle/driver. On arrival, drivers should have the ability to automatically confirm customer identity.
- The Health Connector App will enable the customer to utilize advanced wayfinding solutions with the help of indoor and outdoor navigation technologies to provide personal concierge-style travel from origin to destination. This will include:
    - Locating the vehicle outside origin and destination locations
    - Locating healthcare facility when dropped off by vehicles
    - Locating desired floor/room when inside the healthcare facility
- Customers will be able to use the Health Connector solution for any contactless payment needs at any point for transportation-related payments.
- If customers or their caregivers desire to book and pay for another local trip as an additional leg along with the medical trip they will be able to do that using Health Connector solution.

Customers booking non-healthcare trips will be responsible to pay for these trips out of pocket, as discussed in ConOps for operational scenario 8.

The systems and interfaces involved in the context of Health Connector (see Figure 3) can be defined as follows:

- **Traveler-end Subsystem**: this subsystem includes the tools and technologies (phone/interactive voice response (IVR), mobile/smart devices, web-based tools) to be used by travelers or patients seeking transportation services for their medical appointments as part of pre-trip, en-route trip, on arrival and return trip activities.

  Currently, HIRTA customers have access to the following Traveler applications from Routematch by Uber:

  - Amble App: used for requesting trip and finding out status of trips. No capabilities for planning are there in the Amble App.
  - RMPay: used for maintaining prepaid balance to pay for completed trips.
  - IVR: used to send night-before reminders to Travelers per their subscription preferences for upcoming trips. Real-time/same-day reminders are not available.

  Health Connector will deploy COTS unified application (procured from MOD vendor) for planning, booking and payment. Also, this new application will provide real-time status on trips on-demand and through push notification services.

- **Transportation Management Subsystem:** this subsystem includes the technologies used to assist customer care and operations staff with Traveler registration, eligibility management, reservations, scheduling, dispatching, billing and administration activities. These products are commercially available from various providers of paratransit/demand response vendors. Currently, HIRTA utilizes capabilities in the Routematch Demand application from Routematch by Uber for completing transportation management functions. While limited capabilities exist to address same day requests (e.g., return trips), primarily Routematch Demand application is used to schedule trips at least a day in advance.

  Given Health Connector is focused on addressing same day and real-time requests, commonly referred to as mobility on-demand (MOD), HIRTA will procure such capabilities through a COTS MOD platform. The MOD platform will also be fully integrated with the Traveler and Driver applications, also procured COTS through the MOD vendor. Further, this new platform will support utilizing third-party service providers for adding capacity when needed in real-time. Finally, limited access to this platform will be made available to Health Navigators and healthcare providers so they are able to book trips directly without involvement of HIRTA staff.

- **Vehicle Subsystem (HIRTA and non-HIRTA vehicles)**: this subsystem refers to the technologies deployed on vehicles to support Driver-end functions for driver-dispatch communications, manifest management, support just-in-time dispatching, turn-by-turn navigation and outdoor wayfinding (e.g., to locate Travelers at the time of pick up), on-board customer information and fare payments. All HIRTA-owned vehicles, Drivers will

use tablets running Driver app. On other vehicles, Drivers may use Driver app on their tablet or their phone.

- **Wayfinding Subsystem:** this subsystem refers to the technologies and infrastructure to be used for providing, outdoor wayfinding, indoor positioning, orientation, and step-by-step guidance on request to travelers**.** HIRTA team is planning to utilize the technology available from the deployment partner, Navi Lens.

- **External Systems:** These systems are external to Health Connector that have been identified for close coordination among HIRTA and partners for providing efficient transportation services for medical trips or for collecting data for performance measurement needs.

    - **Access2Care**: this subsystem refers to State of Iowa Medicaid Brooker's system used for booking and managing Medicaid trips. HIRTA is one of the providers used by Access2Care. Medicaid trips will be booked by Access2Care when requested by Travelers and will be ingested in the HIRTA system when assigned to HIRTA. At that point, Traveler using Medicaid benefits will be able to use Traveler tools provided by Health Connector.

      HIRTA is planning to build a new interface with Access2Care to automate the data exchange and improve coordination for Medicaid-funded trips. Please see discussion in Section 2.2.5 for the development plan for this interface.

    - **Health Navigator-end Subsystem**: This subsystem includes the following components:

        - An Information and referral (I&R) product that is used by Health Navigators and the Health Administrator at the Dallas County Health Department (DCHD) to track the status of referral activities and for coordination with Dallas County residents health navigation/social care services. Currently, DCHD uses Microsoft Access-based program that recently replaced the previously used product from Healthleads. No integration is planned with this product for Health Connector. However, access to data may be needed for measuring Health Connector performance.

        - Limited access to TMS components will be provided to Health Navigators to arrange transportation services for the patients /Travelers they may be working with and coordinate with HIRTA or healthcare staff on the status of trip. This will also allow Health Navigators to access customer feedback and trip performance data on transportation services provided by Health Connector.

    - **EHR/Medical Record Subsystem**: this subsystem refers to the systems used by partner hospitals and clinics for booking medical appointments and maintaining their appointments, including discharge and any subsequent referral activities. Please see discussion in Section 2.2.5 for the development plan for this interface.

Health Connector Middleware in Figure 3 refers to new development as identified above.

- **Other**: Additional relevant details for the system to de deployed are as follows:
  - **Supporting systems**: These are existing systems and are not part of Health Connector project. However, the TMS will exchange data with these systems or HIRTA staff may interact with these systems for certain operational functions, as needed. Specifically, this refers to driver or vehicle information management, vehicle maintenance management, customer service management, safety event reporting. HIRTA currently uses capabilities within Routematch Demand application for completing such functions but other off-the-shelf products are also commercially available.
  - **Data Storage**: Traveler applications will store data locally as allowed by their devices and as authorized by Travelers. Vehicle and TMS subsystems will communicate over cellular data communication for operational data exchange. All data is exchanged in real-time (at a configurable frequency). Data is temporarily stored on the vehicle to support offline operations in the event of communication failures. On the central side, TMS data will be stored in a relational database in the AWS cloud storage. Data is stored in a live database to support real-time operations and then processed and archived for reporting in a historical database.

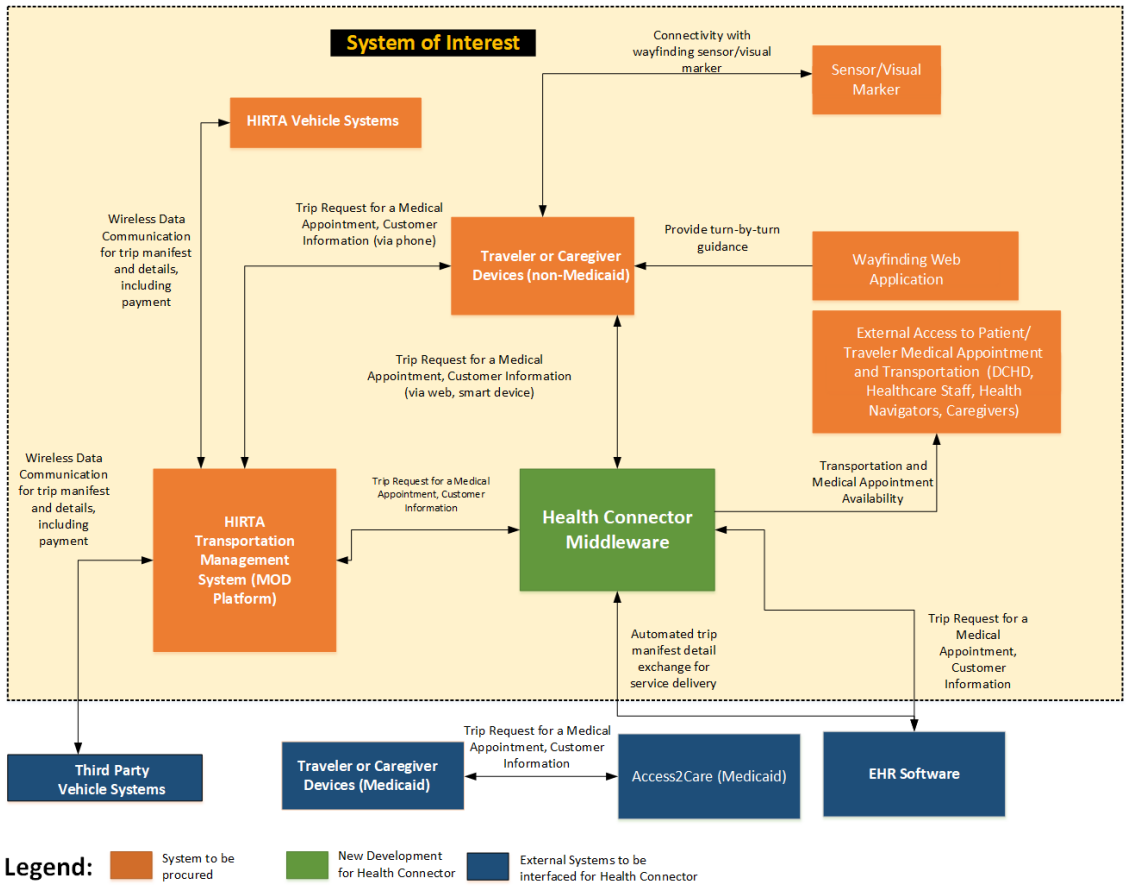

Figure 3. Generic System Context Diagram (Source: HIRTA team).

2.1.5 System Constraints

Anticipated constraints and changes in operational policies for HIRTA, DCHD and healthcare partners are listed below per HIRTA team's current understanding are listed in the following subsections. This discussion is provided for HIRTA and the two key partner groups: DCHD and healthcare providers.

2.1.5.1 HIRTA

Operational polices and constraints for HIRTA as anticipated in the context of Health Connector are as follows:

- **Hours of Operation:** Currently, HIRTA's services are available 7AM-5PM Monday through Friday. Given HIRTA is planning to provide after-hours services through Health Connector, new polices will have to be developed and published by HIRTA. These policies will be developed as part of Systems Operating Procures (SOP) development, as referred in Section 2.2.8.4.

  A key factor for finalizing hours of operation will be healthcare facility hours. HIRTA will also have to consider third party service providers that may be available in the area to provide after-hours services. Also, HIRTA will have to determine the need for having at

least one HIRTA dispatch staff standby to assist in the event of delays or incidents. All these factors will drive the determination of hours of operation.

Any future changes in service hours must be automatically communicated to appropriate parties (e.g., healthcare providers, DCHD) and communicated to customers through appropriate channels.

- **Third Party Service Providers:** With the deployment of Health Connector, HIRTA will have the capability to partner with third-party providers for providing services after office hours. However, detailed policies and procedures will have to be developed. These policies and procedures will be developed as part of SOP development, as referred in Section 2.2.8.4.
- **IT-related Policies:** No major IT infrastructure-related changes are anticipated as part of this project but partners will have to be provided access to Health Connector and HIRTA will be responsible for providing access and maintaining appropriate security and access levels for those partners. .
- **Staffing:** The project will not result in increased staffing levels but roles may have to be adjusted given efficiency gains observed due to reduced level of coordination per trip.
- **Budget/Financial Constraints:** HIRTA is still finalizing the list of vendor partners at this point so ongoing support fees are still to be determined. Also, additional funding entities and partners may get identified per subsidy levels as those are determined during financial planning in later stage of Phase 1.
- **Definition of Standard Operating Procedures** (**SOPs) for Health Connector:** While Health Connector will be part of HIRTA's DR Service, detailed SOPs will have to be developed, describing roles and responsibilities and organizational structure prior to system launch, most likely during Phase 2**.** The SOPs will cover how system will operate under different modes of operation as described in Section **Error! Reference source not found.**.
- **Service Level Agreements (SLAs):** The following types of SLAs will have to developed:
    - SLAs with vendors will have to be made available for providing Health Connector service to meet the required system performance needs. ConOps will be updated once these are finalized during system requirements development.
    - Partnership agreements will have to be made with healthcare partners for certain business functions (e.g., exchange of medical appointment data) and appropriate SLAs will be developed and agreed upon.
    - Additional SLAs may have to be identified and developed as part of the development of SOPs for Health Connector.
    - Also, once third-party contractors are determined, SLAs will have to be established for the provision of services through them.

2.1.5.2 Healthcare Providers

Constraints and changes to operational policies as applicable to healthcare providers are listed below:

- **Access to Health Connector:** As discussed earlier, HIRTA will have to provide an appropriate level of access to Health Connector system to authorized staff at healthcare providers for management of healthcare appointments and monitoring of transportation services for those appointments.

- **Access to Appointment Data:** Either using the currently established process for information release at healthcare provides or through new release authorization terms and conditions that healthcare providers are willing to adopt, healthcare providers will have to provide access to medical appointment data which will at least include 1) customer identifier; 2) customer/caregiver contact; 3) time of appointment; 4) day of appointment; 5) location of appointment; 4) doctor's office contact information. Required details, including a consent form regarding data release, will be finalized at the time of detailed design**.**

  HIRTA has been including healthcare providers as part of stakeholder engagement sessions (e.g., ConOps walkthrough, SyRS walkthrough) so they are aware of the data needed for coordinating medical and transportation appointments. HIRTA will continue to engage with healthcare partners throughout Phase 2 design for establishing the terms for informed consent form to be signed by the patients who will use Health Connector. Also, HIRTA team will closely follow the currently established terms used by the healthcare partners to share data with caregivers to avoid any deviations from the currently established practices.

- **Funding Source Definition and Billing:** Most healthcare providers have mentioned that they have access to funds which can be used towards covering the cost of persons with low income. HIRTA has the capability to define funding sources in its system and healthcare providers can be listed as a funding source. For eligible trips, such funds will be used and the healthcare providers will be billed per agreed upon terms and conditions. Accounting for such funding source will follow the same tools and established process used by HIRTA for other funds in use today.

- **Coordination on hours of operation:** When there is a change in healthcare provider service hours for non-emergency visits, Health Connector system will be updated and HIRTA will be notified.

- **Staffing:** HIRTA already coordinates with dedicated Social Worker/Health Navigator staff at healthcare providers. However, this process will have to be finalized and enhanced communication access through Heath Connector solution will be made available to minimize any manual coordination.

- **Tracking Transportation Access and Missed Appointments:** Currently, there is limited capability in linking missed appointments with transportation access and subsequent impact due to lost patient opportunities. With access to Health Connector, healthcare providers should define appropriate and relevant KPIs and track and analyze data for measuring the KPIs.

2.1.5.3 DCHD

Constraints and changes to operational policies as applicable to DCHD are listed below:

- **Access to Health Connector:** As discussed earlier, HIRTA will have to provide appropriate level of access to DCHD to authorized staff for management of healthcare appointments and monitoring of transportation services for those appointments, as authorized by their customers.

- **Access to Data and Reporting as relevant to Measuring health Outcomes:** DCHD currently relies on data in their I&R system for measuring the success of efforts in linking Dallas County residents with resources. Health Connector will provide the ability to track not just successful connections but will also allow follow-ups after appointments are complete and take any subsequent actions if necessary. However, polices for such additional efforts will have to be defined by DCHD.

2.1.6 System Milestones/Decision Gates

Milestones and decision gates will ensure that the system is verified and validated before moving to the next state in the systems engineering process.

Phase 1 to Phase 2 transition will have the following decision gates:

- Acceptance by USDOT of Task 1 systems engineering documents (e.g., ConOps, SyRS and SEMP); and data and performance management documents (e.g., DMP and PMESP), is critical to the success of the project. Other supporting documents developed as part of Phase 1- Task 1 through 12 activities must also be accepted prior to Phase 2 transition.

- Acceptance of Integrated Complete Trip Deployment Plan and Phase 2/3 proposal by the USDOT:

- Successful Competition of Deployment Readiness summary and briefing

Phase 2 will at least include the following decision gates:

- **Requirements assessment**: assessment of Phase 1 requirements to determine feasibility and to develop a baseline Requirements Verification and Traceability matrix (RVTM), discussed further in Section 2.1.8.

- **System architecture definition:** system architecture to be developed, reviewed, and accepted by the USDOT team.

- **Preliminary design review**: preliminary design of the system with details on how individual components will function, and will be defined along with details on interfaces and data flows. A list of system configurations will also be developed.

- **Critical design review**: comments on the PDR will be addressed and design will be finalized.

- **Unit testing:** Once the system components are configured per design, component-level testing will be performed to verify if unit-level functions can be verified. Any issues that are identified (e.g., design, configuration, feature deficiency, malfunction) will be addressed prior to proceeding with subsystem-level integration.

- **Functional testing**: Subsystem-level verification will be performed, and once successful, system level integration will be conducted in controlled environment (e.g., test database, simulations instead of real riders) to ensure requirements can be met. Once the

functional testing is complete, system will be considered ready for verification in real environment.

- **Installation testing:** Once the integration testing is successful, system will be installed for testing in real environment with a test database on limited set of vehicles and limited wayside infrastructure (e.g., wayfinding sensor/visual markers). While no real user will be used, system will be tested for end-to-end functionality demonstration for all system components. HIRTA vehicles and Drivers will be used to test end-to-end functionality with dummy users and test trips/runs. Drivers, Dispatchers and other users (e.g., healthcare providers, Health Navigators) as necessary will be trained prior to conducting Installation Testing.

- **User Acceptance Testing:** Once the installation testing is successful, HIRTA team will test the system with a select group of Travelers from HIRTA's customer database. Before participants can be engaged, HIRTA team will ensure human use approval from the Institutional Review Board is granted. Also, training plan per PTSEP will be executed. Traveler feedback will be documented, and all findings will be resolved before moving to the next stage.

- **Revenue Testing:** Once User Acceptance Testing is successful, the system will be tested in revenue operations for 30-days to assess the operational readiness. If no major issues are encountered, Go-Live will be scheduled. If any critical issues (defined in Test Plan) are encountered during revenue testing, the 30-days clock will be reset.

- **Go-Live:** System is fully launched once revenue testing is successful.

Please note that the activities and decision gates related to the new software development in Phase 2, as defined in Section 2.2.5, cannot be determined until the MOD vendor is selected.

Before the Phase 2 to 3 Transition can occur, the following must be completed**:**

- All requirements are met, and the system is operational at minimum of 20% at-scale deployment. 100% at-scale deployment shall be achievable within 4 months of the start of Phase 3.

- Data generated per DMP is of acceptable quality and ready to be used for performance management, per PMESP.

- All safety scenarios as defined in the SMP are successfully addressed and the system is safe to use.

- Phase 2 documents critical to system operations and maintenance (as described in Section 2.2.8) such as SOMS, SOP are accepted.

In Phase 3, the following decision gates will be used:

- Successful completion of 20%, 50% and 100% at-scale deployment activities.

- Successful operation of the system at a minimum of 80% at-scale deployment for a period of at least 12 months.

- Successful completion of outreach activities per the Outreach Plan, including the Operational Capability Showcase within 12 months of the start of Phase 3.

- Successful calculation of performance measures per PMESP and availability through the performance dashboard. The dashboard shall be setup within 4 months of Phase 3 start with data from 100% at-scale deployment.

- CTP is accepted for post Phase-3 O&M transition.

2.1.7 Standardized Processes

HIRTA Team is planning to follow the INCOSE SE Handbook to guide the systems engineering guidelines for managing the Health Connector system lifecycle to be followed in Phase 2 and 3 and beyond. This includes the guidelines for architecture definition, system design, integration, verification/validation, transition, and operation and maintenance.

2.1.8 Defect/Discrepancy Processes

HIRTA team will utilize the following tools for defect and discrepancy tracking for the COTS system components:

- **RVTM:** Throughout Phase 2, HIRTA team will track the compliance of each design and testing/verification activity as part of milestones discussed in 2.1.6 against systems requirements developed in Phase 1. Verification will be done by visual inspection, demonstration, analysis, and test results. Results will be recorded as Pass, Fail, Partial Pass, Partial Fail or Inconclusive in a Test Results Document (TRD). Items in the TRD that require tracking will be logged in an actions items log (AIL) to determine resolution with appropriate responsible party. RVTM will be used in a Microsoft Excel-based file format.

- **Action Items Log (AIL):** AIL will be maintained throughout Phase 2 and 3 to maintain a list of actions that require resolution. HIRTA team has successfully used Asana in Phase 1 for tracking actions and coordinating resolutions and is planning to use the same in Phase 2/3. A backup in Microsoft Excel file will also be maintained to share with those who may not have access to Asana program.

- **Risk Register:** HIRTA team has been maintaining a Risk Register. For any defects or discrepancies that may negatively impact the project, risk assessments will be performed, and risks will be tracked until closed.

- **Bug Reporting Systems:** Once the project moves into operations and maintenance stage in Phase 3, deployment partners' bug tracking system will be used for defect/discrepancy tracking and resolution. Severity and resolution plan will be determined per the service level agreement (SLA) with the deployment partner.

2.2 Systems Engineering Technical Processes

Figure 4 provides a typical V-diagram that is being applied to this project. The left half of the V diagram describes the process of concept development and design, most of which has been

already conducted as part of Phase 1. The right half of the V diagram includes installation, configuration and testing activities that will be completed as part of Phase 2 and 3.

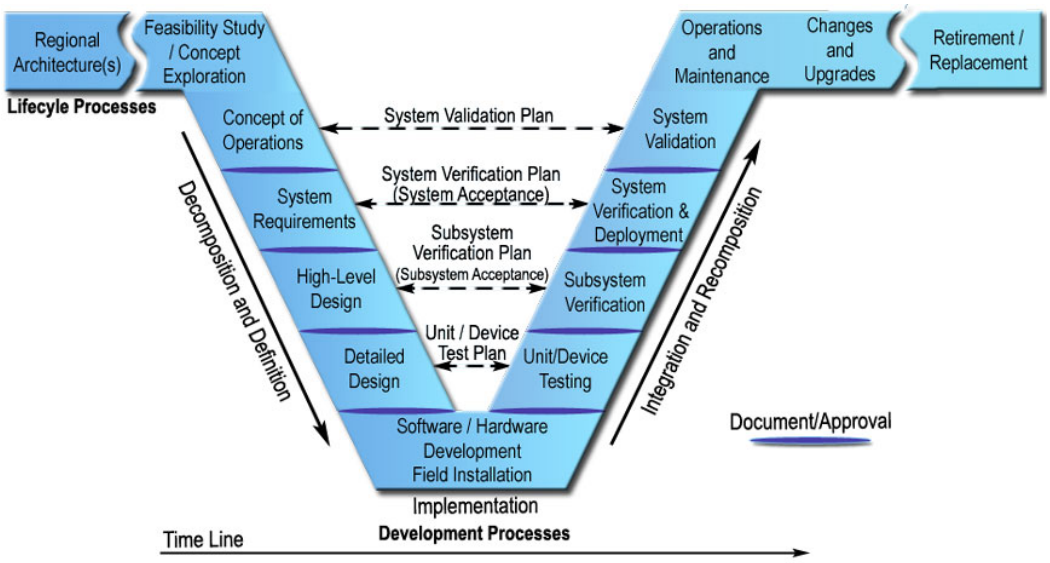

Figure 4. Systems Engineering "V " Diagram (Source: FHWA)

2.2.1 User Needs Processes

The user needs and ConOps development processes were led by the CDL with support from the Stakeholder Lead (SL) and other leads as necessary. In particular, the CDL worked closely with the SDL to ensure needs statements and other details of the ConOps followed the systems engineering requirements as outlined by the USDOT.

Section 2 of the User Needs Identification and Requirements Plan (UNIRP) document describes the user needs process and its relationship with ConOps and requirements development. An illustration of the process is provided in Figure 5.

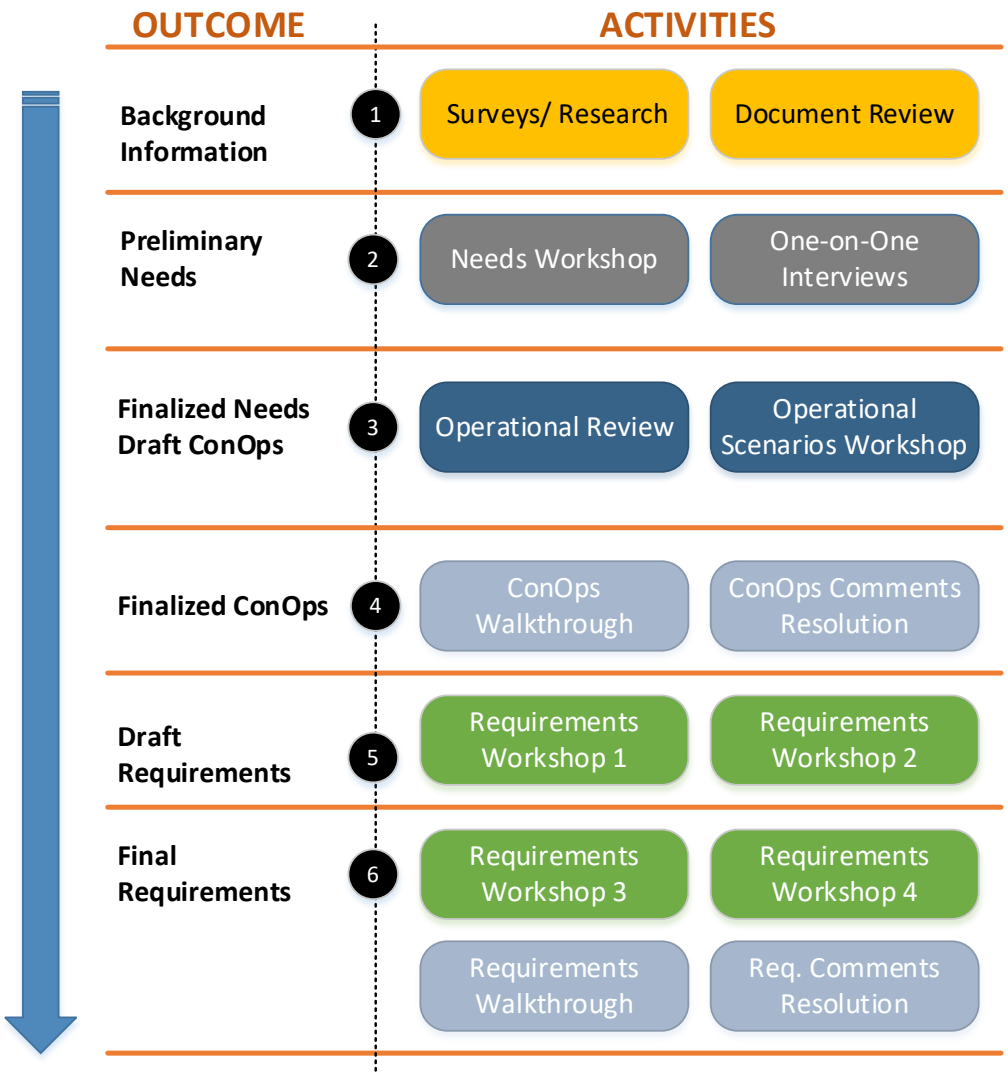

Figure 5. Needs Identification and Requirements Development Process (Source: HIRTA team)

2.2.2 Requirements Processes

Section 3 of the UNIRP provides a detailed description of the processed used to develop requirements. As shown in **Error! Reference source not found.**, the concepts explored and documented in the ConOps along with user needs and scenarios form the basis for developing various requirements for the system which indicate what functions the system will provide, what will be the performance criteria, what interfaces the system will accomplish and what data the system will generate, manage and share. Figure 6 illustrates how needs and scenarios described in the ConOps have led to the development of system requirements.

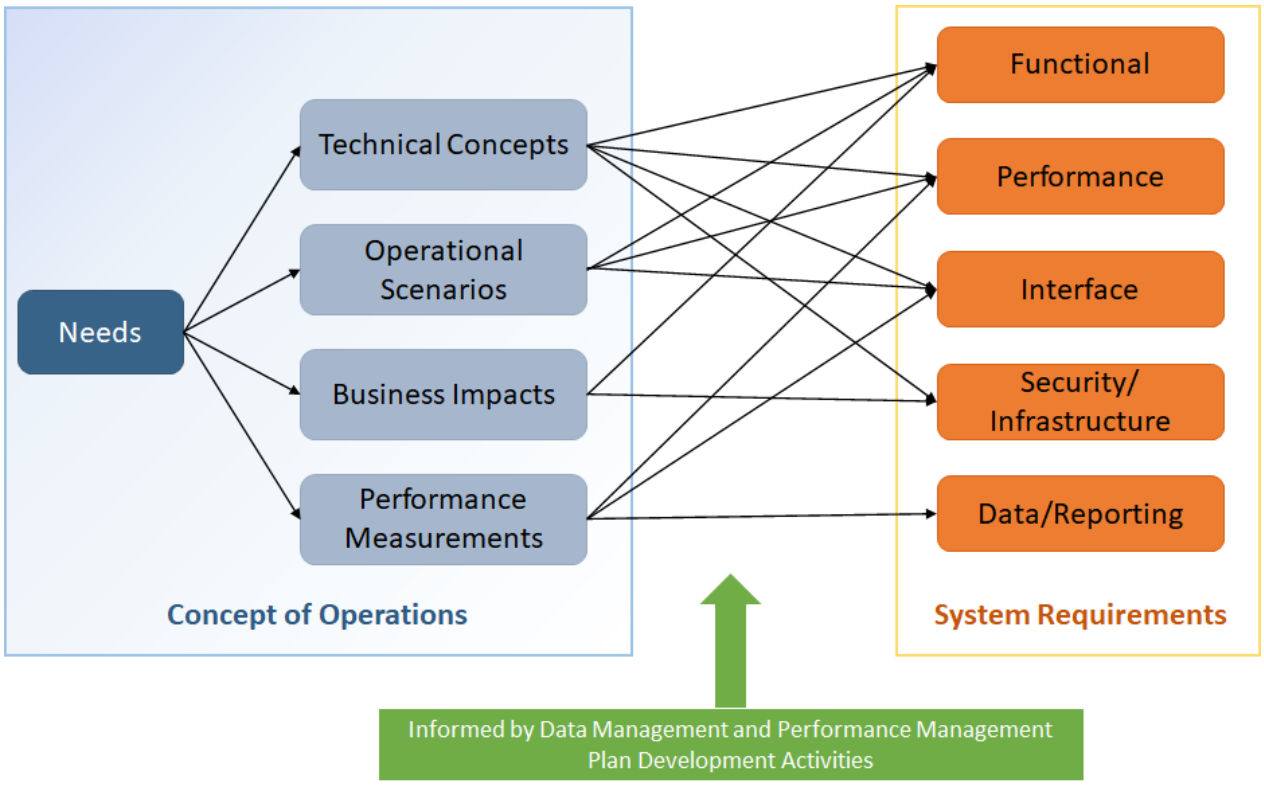

Figure 6. ConOps to Requirements (Source: HIRTA Team)

The requirements in the SyRS document focus on the following core aspects: functional definition, usability, performance criteria, interface and integration; and data management and reporting. These requirements are developed by individual functional categories or modules such as trip planning and booking by travelers, reservation intake module for appointments**,** real-time and batch scheduling, dispatching and real-time service monitoring, electronic manifest management for drivers, real-time information and wayfinding for customers and their caregivers, billing/cost-allocation and payments and others.

2.2.3 Architecture and Interface Development Processes

Using input from ConOps and SyRS, HIRTA team will develop a Systems Architecture Document (SAD) for the project. The team will develop systems architecture using the framework defined as part of The Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT) under National ITS Reference Architecture. The team will use SET-IT tool for developing the project level architecture. Per ARC-IT, the following viewpoints will be developed for the architecture:

- **Enterprise View**: refers to relationship between organizations and stakeholders involved.
- **Functional View**: refers to relationship between different functional elements or processes involved in the project and their data flows.
- **Physical View**: refers to physical objects (systems and devices) that operate in the field or central locations, and interactions between those physical objects

- **Communication View:** refers to communication flows needed for connectivity between physical objects

Applicable service packages will be identified for the project to develop the architecture and document flows between objects. Based on current understanding, applicable service packages are:

- PT01: Transit Vehicle Tracking
- PT03: Dynamic Transit operations
- PT05: Transit Security
- PT06: Transit Fleet Management
- PT08: Transit Traveler Information
- DM01: ITS Datawarehouse
- DM02: Performance Monitoring
- TI01: Broadcast Traveler Information
- TI02: Personalized Traveler Information
- TI03: Dynamic Route Guidance
- TI05: Travel Services Information and Reservation
- TI06: Dynamic Ridesharing and Shared Use Transportation
- TI07: In-vehicle Signage

Interfaces between objects, as applicable, will be identified and documented in the Interface Control Document. Per ConOps and SyRS, required system-level interfaces are:

- Vehicle to Center
- HIRTA TMS to Medicaid Brokerage Software Provider (Access2Care)
- HIRTA TMS to Healthcare Provider

Another potential interface, currently not planned, is the interface between TMS and third-party transportation management systems..

While standardized protocols (UDP/TCP, HTTP) will be used for communication between subsystems, none of these interfaces are fully supported by a fully developed data standards, except for the interface with Healthcare Provider, which is supported by Fast Healthcare Interoperability Resource, developed by Health Level Seven International (HL7).

Once the SAD and ICD are put together, HIRTA team will coordinate with the AOR to schedule walkthrough with the USDOT team.

The requirement IDs from the RVTM will be linked to the identified interfaces, flows and service packages to manage the traceability during the architecture development process. When any changes are identified in the SAD based on USDOT review or through subsequent systems engineering steps (e.g., design and testing), the configuration management process identified in Section 2.1.3 will be followed. Also, each version of the architecture within the SET-IT program will be archived after each change for any future reference. SAD will be submitted for USDOT acceptance when any changes are made per the process identified in the PMP.

2.2.4 Design Processes

The following subsections define the steps to be followed for completing the design stage. The RVTM will be updated to indicate the traceability of the design intent for the requirements and needs. If any changes are identified to requirements (and subsequently needs), the configuration management process as discussed in the Section 2.1.3 will be followed for modifying previously completed and accepted relevant documents.

2.2.4.1 Preliminary Design Review

Once baseline requirements are established in the RVTM, the HIRTA team will use the inputs from SAD and SyRS to decompose further and define in detail ***how the system will be implemented to meet the requirements***. Details of hardware, software, interfaces, user interfaces, data, reporting will be further defined. These details will be documented in the preliminary design document (PDD). HIRTA team will use the RVTM as the tool for tracking traceability of design with requirements to ensure the design intent of each requirement is fully established. Once the PDD is put together, HIRTA team will meet with stakeholders to discuss the gaps to finalize the design document.

2.2.4.2 Critical Design Review

Internal comments will be incorporated into the PDD to finalize the document to develop the Systems Design Document (SDD) for walkthrough with the USDOT team.

RVTM will be updated at PDR, CDR and SDD walkthrough stages.

2.2.5 Development Processes

HIRTA team is planning to deploy COTS components for its needs as indicated in Section 2.1.4, except for the Health Connector middleware which will require new development. Given the HIRTA team has decided to develop open-source middleware (e.g., to enable data exchange between EHR and MOD software; and data exchange between Medicaid broker/Access2Care and MOD software), HIRTA team is not expecting the MOD software vendor to write any new software specifically for this project. Software development and source code management will be done by HIRTA partner, IBI Group (see Section 2.2.5.2).

2.2.5.1 COTS System Components

The COTS components that will be deployed include:

- Traveler Application from the MOD platform provider.
- MOD platform- central and vehicle components.
- Wayfinding solution that includes Traveler component, central component and wayside component.

Navi Lens is the deployment partner for wayfinding solution. For MOD, HIRTA will conduct a competitive procurement. MOD vendor will be responsible to provide both COTS product and product implementation services to configure their product for HIRTA and Health Connector needs (i.e., their staff will participate in design and testing). HIRTA team will include the requirements developed for MOD software in Phase 1 in SyRS document as the scope of work (SOW) to be included in the procurement document (e.g., a request for proposal [RFP]). Once a vendor is selected, vendor representatives will participate in design discussions and subsequent testing stages.

HIRTA team will prepare a Comprehensive Acquisition Plan (CAP) for the systems to be procured and will identify the details of in-vehicle hardware, software, field hardware (e.g., wayfinding visual marker/sensor) and services. CAP will define the relationship of COS hardware/software with a requirement and list potential providers of such hardware/software.

For identified COTS systems, HIRTA team will also develop a Comprehensive Installation Plan (CIP) which will define hardware installation design, quality control process, pre/post-install checklist. For software, details on installation and configuration will also be documented in the CIP. A checklist will be developed to check component functionality post-install.

2.2.5.2 New Development

As discussed in 2.1.4, new development is needed for interfaces between MOD vendor, and Access2Care and EHR software.

During Phase 1, HIRTA team discussed with the existing system provider for HIRTA to develop required interfaces as part of delivering the MOD solution but terms and conditions associated with making the source code open or a release in a similar fashion (e.g., open API) could not be finalized within Phase 1.

HIRTA team has further conducted industry research in discussion with MOD vendors and the most feasible approach has been identified as the implementation of a middleware solution (referenced as Health Connector Middleware in Section 2.1.4) that can be utilized by any generic MOD provider, Medicaid broker and an EHR provider. Given the uncertainty associated with COTS MOD providers meeting open-source requirements for new development using USDOT funds, HIRTA team has decided that the HIRTA team partner, IBI Group, develops the open-source middleware and releases that under an open-source license. IBI Group, is an experienced developer of open-source software and is the development partner for Atlanta Complete Trip project.

The following subsections provide a high-level overview of middleware concept which will be further refined in the Phase 2 as part of design discussions.

2.2.5.2.1 MOD Software and Medicaid Broker Software Interface Middleware

Figure 7 provides a conceptual overview of the middleware application. It will facilitate the exchange of the following data messages:

- **Service request from Medicaid broker**: this message will send a request to the MOD software asking to confirm availability of a vehicle/driver to meet the trip request.
- **Service confirmation from MOD software to Medicaid broker**: MOD software will respond to the Medicaid Broker message with details of the driver, vehicle and expected fare.
- **Trip status**: MOD software will provide status of trip to Medicaid broker at a configurable interval or on-demand.
- **Trip performance**: MOD software will provide end of trip completion report to the Medicaid broker along with mileage and amount due.

The middleware will use the existing bi-directional APIs provided by MOD vendor and Medicaid broker to implement the above data flows so no software development will be needed by those entities. A translation engine will be used at both API-end points to translate data available from APIs to a standardized data schema (to be developed in Phase 2) to enable the data exchange by the middleware application.

To provide flexibility on information available to HIRTA staff and Access2Care staff, IBI Group will also develop a web application that will use the data available through the middleware to provide all relevant information for a Medicaid-funded trip in real-time.

All concerns related to Health Information Portability and Account Act (HIPAA) and Personally Identifiable Information (PII) compliance will be addressed as part of Phase 2 design to mask/anonymize (using the translation logic) any confidential or privacy information and not include that as part of data exchange.

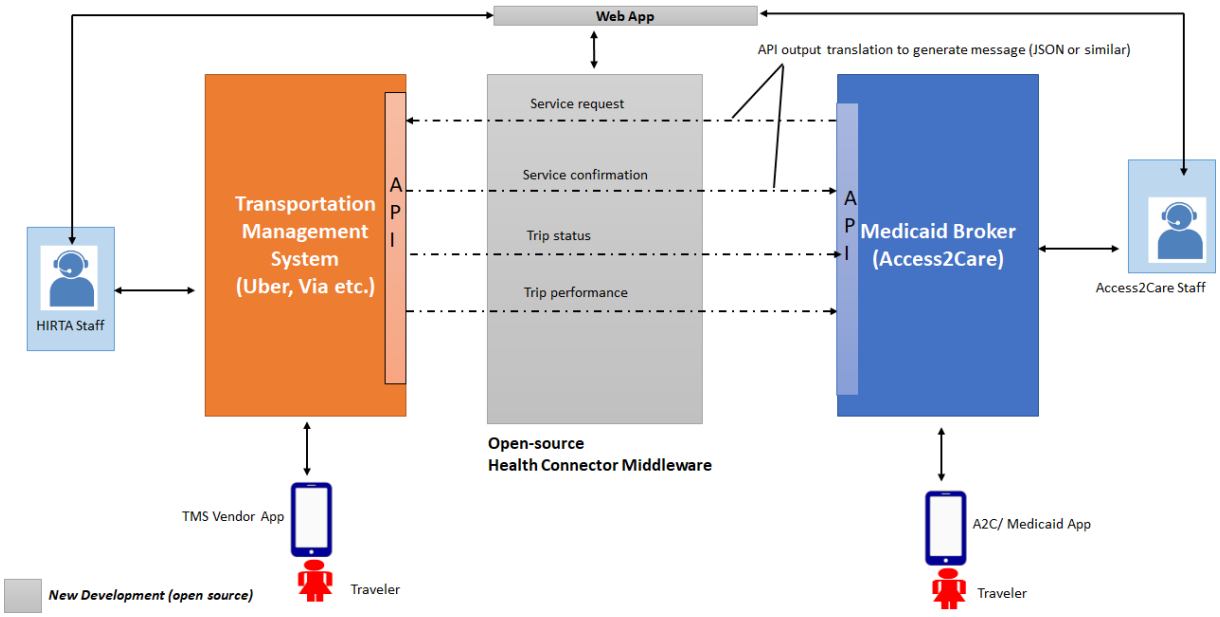

Figure 7. MOD-Medicaid Broker Interface Middleware

2.2.5.2.2 MOD Software and EHR Software Interface Middleware

Figure 8 provides a conceptual overview of the middleware application. It will facilitate the exchange of the following data messages:

- **Confirmed medical appointment data**: this message will provide the details of the medical appointment data (e.g., date, time, and location).
- **Trip booking confirmation**: MOD software will respond to the EHR software with confirmation of booking according for a medical appointment.
- **Medical appointment change or cancellation**: this message will provide the details of the modified medical appointment data and current status (e.g., active or cancellation requested).
- **Trip appointment change or cancellation:** this message will provide the details of the modified trip details and current status (e.g., scheduled, active, cancellation requested, no-show requested) for a booked trip.
- **Trip status**: MOD software will provide status of trip to EHR software at a configurable interval or on-demand.
- **Trip performance**: MOD software will provide end of trip completion report to the EHR software for their record.

The middleware will use the existing bi-directional APIs provided by MOD vendor and EHR software provider to implement the above data flows so no software development will be needed

by those entities. A translation engine will be used at both API-end points to translate data available from APIs to a standardized data schema (to be developed in Phase 2) to enable the data exchange by the middleware application.

Based on discussions in Phase 1, HIRTA team considers this as a low risk approach for interface since this allows vendors (e.g., transportation software providers and Medicaid brokers) to minimize the number of custom interfaces. Current approach assumes that the vendor will not have to do any new development unless they want to display the available information through the middleware to their users in a specific format. HIRTA has discussed with Access2Care regarding integration with transportation software using their public API. For MOD vendor, this will be a requirement in the RFP

To provide flexibility on information available to HIRTA staff and healthcare partner staff, IBI Group will also develop a web application that will use the data available through the middleware to provide all relevant information in real-time.

All concerns related to HIPAA and PII compliance will be addressed as part of Phase 2 design to mask/anonymize (using the translation logic) any confidential or privacy information and not include that as part of data exchange.

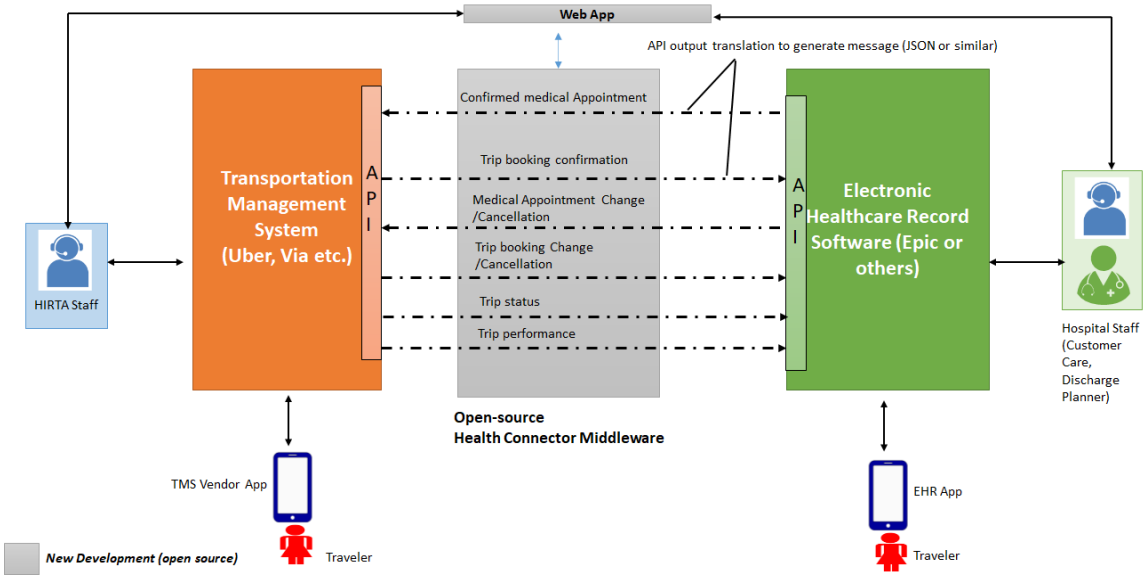

Figure 8. MOD-EHR Software Middleware

2.2.5.2.3 Release License and Source Code Repository

IBI Group will release the source code under MIT License (https://opensource.org/licenses/MIT) and will publish the source code at the IBI Group's public GitHub repository page at https://github.com/ibi-group.

2.2.5.2.4 Development Process

The open-source middleware to be developed by the HIRTA team will follow a well-defined Software Development Lifecycle (SDLC) Quality Assurance Plan to ensure software system

quality. The plan will cover the complete software development lifecycle, including all systems engineering and software development processes, documents and artifacts.

It is IBI Group's standard process (please see Figure 9) to begin with a Concept of Operations (ConOps) document and/or a Requirements Specification developed for a project. ConOps documents typically consist of collections of user stories and/or use cases, while Requirements Specifications typically take the form of a functional and performance requirements matrix. The ConOps serves as an invaluable tool for providing the operational context for functional and performance requirements.

Building on Phase 1 concept development effort, in the context of the Systems Engineering Methodology (SEM), the first task will be to review and synthesize the ConOps and SyRS into a RVTM, with explicit traceability to the Requirements Specification. RVTM will be used as the basis for revising the customer developed Requirements Specification, if necessary, and will serve as a separate configuration-controlled software engineering document. Requirements' traceability will be maintained across all formal software engineering documents during Phase 2 design, development, testing and release.

A Software System Design (SSD), will be developed as part of System Design Document (SDD) in Phase 2 and will include necessary details, including (but not limited to) the high-level architecture of the software system, subsystem or design requirements with explicit traceability to the Validated Requirements Specification, mock-ups for all workflow-significant user interface views, and preliminary endpoints and data models for external data interfaces. The SSD is a configuration-controlled software engineering document.

Once SSD is accepted (as part of SDD) by the USDOT team, it will serve as the primary input into the Development Process described in Section 3. The SSD, and its subsystem or design requirements in particular will serve as the basis for the development of the formal Acceptance Test Plan and Procedures. The Acceptance Test Plan and Procedures are configuration-controlled software engineering documents. Acceptance tests will be performed by IBI Group and will be witnessed by users, stakeholders and the USDOT. The primary purpose of Acceptance testing will be to ensure that the software system fully conforms with the SSD and requirements.

The ConOps and Validated Requirements Specification, which may be revised through the Software System Design and Development Process, will serve as the basis for the development of the Independent Verification and Validation (IV&V) Test Plan and Procedures by the HIRTA team. The IV&V Test Plan and Procedures will also be configuration-controlled software engineering documents.

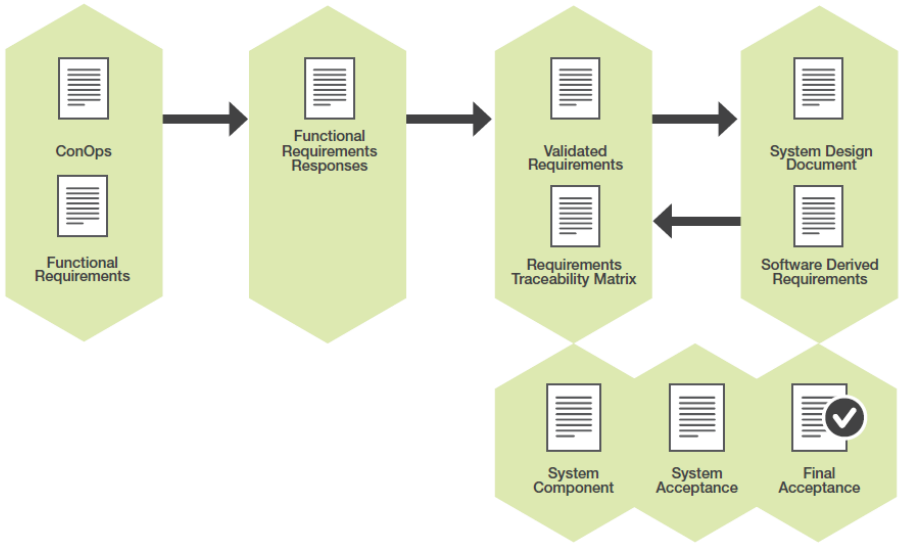

Figure 9. IBI Group's Standard Software Development Process (source: IBI Group)

HIRTA team will also develop a Software Development Schedule (SDS) that will provide a detailed breakdown structure of all task activities. A monthly update of all SDS items will be provided to the AOR and USDOT team.

2.2.6 Implementation, Integration and Testing Processes

The SEL, in coordination with PML, DL and the Technical Lead, will oversee all Phase 2 design, installation, integration, training, and verification activities. All installation details along with any integration/configuration details will be included in the CIP. Also, design documents (PDD, CD and SDD) will guide the installation and configuration process. Deployment partners will be part of regular bi-weekly check-in meetings and will provide any updates on the progress of system installation and configuration. In the event of any anticipated risks, risk register will be updated, and mitigation actions will be pursued by the PML.

A System Test plan (STP) and test cases will be prepared once the SDD is complete to define how each requirement will be demonstrated. Requirements could be demonstrated by visual inspection, demonstration, analysis, test results. Some requirements will likely be verified at multiple stages while others could be validated only when the system is fully integrated. These details will be identified in the RVTM at CDR.

Further, RVTM will indicate how a particular system requirement will be verified (e.g., test case results, demonstration, visual inspection, data analysis, manufacturer spec review). Also, test cases will be referenced as applicable for the requirements.

Findings from each test stage will be documented in the TRD and the RVTM will be updated with test results for each stage. Also, critical nature of issues identified in the TRD will be assessed based on the impact caused by those issues on HIRTA and partner operations, and Traveler experience. This methodology will be outlined in the Test Plan.

The following subsystems will need to be verified in parallel during system testing:

- MOD platform (includes Traveler and Vehicle-end subsystems)
- Wayfinding
- Health Connector middleware

For the MOD platform, primary responsibility of testing will be on the MOD vendor as they will be required per their contract with HIRTA to demonstrate that their system meets the Health Connector requirements for vehicle, central and Traveler-centric needs. However, MOD vendor representative will coordinate with HIRTA team Verification Lead (VL) while preparing their test plans and conducting tests. VL will witness all testing conducted by the MOD vendor.

For Navi Lens subsystem, HIRTA team VL will take the lead in planning and execution of testing.

For Health Connector middleware, the VL will coordinate with the SDL since the software development team will use agile development approach and will be conducting some tests independently until the product is ready for installation and integration testing (discussed below).

HIRTA team anticipates that the following testing stages will occur as part of system testing and operational readiness testing:

2.2.6.1 Unit Testing

Once the system components are configured per design, component-level testing will be performed to verify if unit-level functions can be verified. Any issues that are identified (e.g., design, configuration, feature deficiency, malfunction) will be addressed prior to proceeding with subsystem-level integration.

Unit testing in this case refers to functionalities at individual application level without any integration with rest of the subsystem components to verify if the application unit is configured per design. This could potentially be combined with functional testing (Section 2.2.6.2) but the HIRTA team is taking an additional step due to multiple vendors involved and specific needs (e.g., usability concerns) of underserved group.

For MOD platform, this test stage will involve verifying functionalities at unit level of a vehicle, Traveler or central component to ensure component units are configured as designed. In particular, the emphasis will be on addressing any usability concerns at unit level to meet the needs of underserved groups (e.g., Traveler app). Also, this refers to any testing conducted for the new middleware at unit level.

2.2.6.2 Functional Testing

Subsystem-level verification will be performed, and once successful, system level integration will be conducted in controlled environment (e.g., test database, simulations instead of real riders) to ensure requirements can be met. Once the functional testing is complete, system will be considered ready for verification in real environment. At this stage, MOD platform components, and the middleware application will be tested together. For Navi Lens, system test cases will be

designed to verify the wayfinding functionalities in the context of MOD functions (e.g., before pick-up and after drop-off).

2.2.7 Verification and Validation Processes

The HIRTA team will methodically verify system design, development and deployment through proven systems engineering-based approach. Throughout Phase 2, HIRTA team will utilize the RVTM developed since the beginning of Phase 2 to track compliance of each test case against system requirements developed in Phase 1. The RVTM will be updated throughout the following testing activities:

2.2.7.1 Installation Testing

Once the integration testing is successful, system will be installed for testing in real environment with a test database on limited set of vehicles and limited wayside infrastructure (e.g., wayfinding sensor/visual markers) . While no real user will be used, system will be tested for end-to-end functionality demonstration for all system components. HIRTA vehicles and Drivers will be used to test end-to-end functionality with dummy users and test trips/runs. Drivers, Dispatchers and other users (e.g., healthcare providers, Health Navigators) as necessary will be trained prior to conducting Installation Testing.

2.2.7.2 User Acceptance Testing

Once the installation testing is successful, HIRTA team will test the system with a select group of Travelers from HIRTA's customer database. Before participants can be engaged, HIRTA team will ensure human use approval from the Institutional Review Board is granted. Also, training plan per Participant Training and Stakeholder Education Plan (PTESP) will be executed. Traveler feedback will be documented, and all findings will be resolved before moving to the next stage. This testing will prove that the system is ready for revenue operations. At this stage, initial data will also become available for validation for the USDOT and performance management team. Also, given it will be live operation at this stage, the system will be available to be witnessed by the USDOT team.

2.2.7.3 Revenue testing

Once User Acceptance Testing is successful, the system will be tested in revenue operations for 30-days to assess the operational readiness. If no major issues are encountered, Go-Live will be scheduled. If any critical issues (defined in Test Plan) are encountered during revenue testing, the 30-days clock will be reset. This testing will be driven by the operational readiness test plan (ORTP) that the HIRTA team will develop. Once the revenue testing is concluded, the system will be ready for at least 20% at-scale deployment.

Once the revenue testing concludes, the system will be ready for end-to-end demonstration to the USDOT team for real-life use cases as shortlisted from ConOps. Figure 10 provides a visual overview of how test and demonstration activities will be conducted in Phase 2.

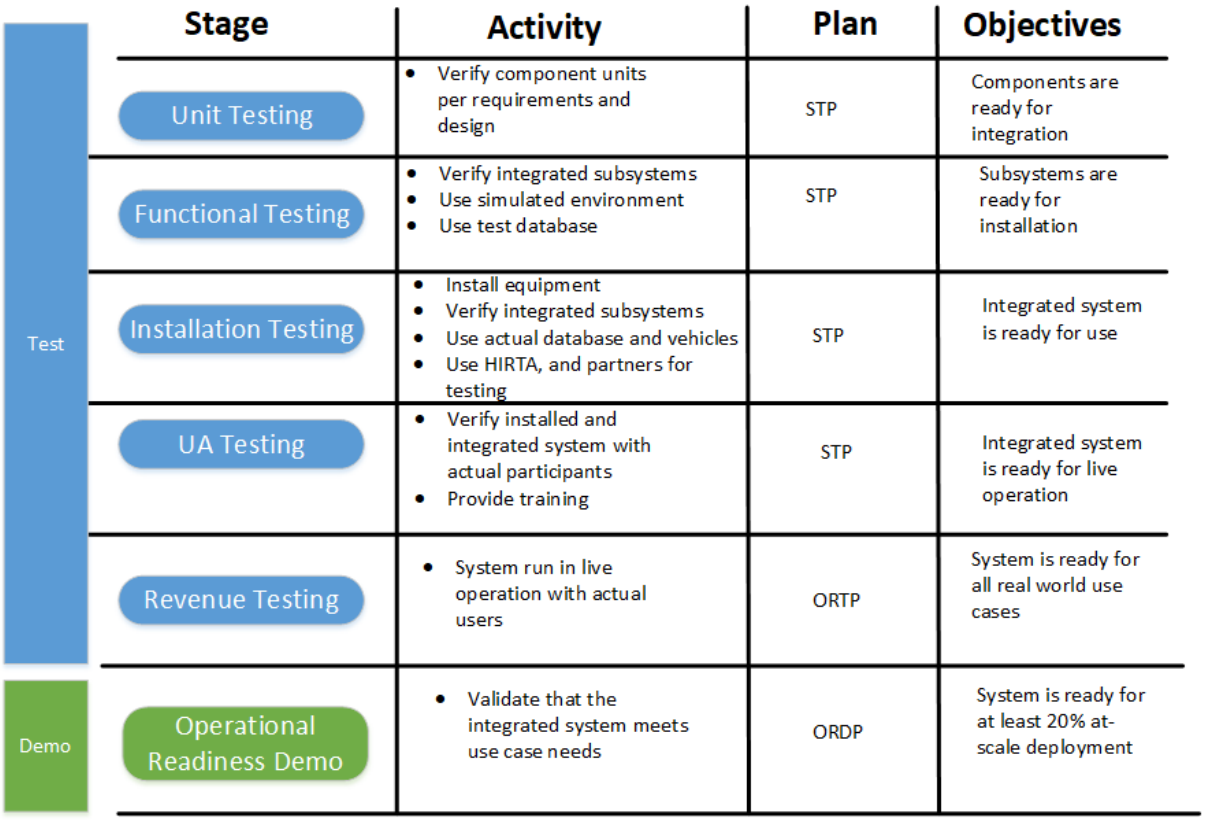

Figure 10. Testing and Demonstration

As required, once the system test is successful, HIRTA team will conduct operational readiness demonstration per operational readiness demonstration plan (ORDP).

2.2.8 Operations and Maintenance Processes

2.2.8.1 Staffing

A staffing assessment will be conducted to ensure HIRTA staff has availability to support the system. This may include Drivers, Maintenance, Dispatchers, Call Center staff or other professionals. While this is not a system engineering step, given ongoing shortage of labor, this is critical. Also, a matrix of required staff and needed skillsets in a spreadsheet will be prepared so appropriate training can be provided.

2.2.8.2 Training

2.2.8.2.1 Training Curriculum

HIRTA team will develop a detailed Training Plan for system users building on the PTESP. Training curriculum will be prepared for at least the following

- Traveler
- Driver

- Central System User
- System Administrator
- Health Navigator
- Healthcare Provider Staff

2.2.8.2.2 Training Schedule

Training will be provided based on Training Implementation Schedule (TIS) which the HIRTA team will prepare for approval by the AOR. As stated earlier, first testing is expected to occur prior to Installation testing for internal users and prior to User Acceptance Testing for Travelers participating. Training materials will be prepared to offer refresher and on-demand training which will be detailed in the PTESP.

2.2.8.2.3 Evaluation

PTESP will also define evaluation methods to assess the comfort level of users with the system. Targeted training will be scheduled to ensure users and participants are comfortable with the system prior to use.

2.2.8.3 Marketing and Outreach

Marketing and outreach activities will be conducted according to the Outreach Plan. HIRTA team will develop an Outreach Implementation Schedule (OIS) with detailed list of activities which will be reviewed and approved by the AOR. HIRTA team will update the OIS on a monthly basis and provide a report to the AOR.

2.2.8.4 Standard Operating Procedures

While not entirely related to systems engineering process, the HIRTA team plans to develop detailed standard operating procedures for the users focusing on the following system functions in the context of operational changes brought by Health Connector:

- Registration and Eligibility Management
- Reservations
- Scheduling
- Dispatching
- Driver Functions
- Billing
- Reporting
- DCHD/Health Navigator Coordination
- Healthcare Partner Coordination
- Safety Management
- Customer service
- Call center management
- Vehicle maintenance/availability

2.2.8.5 System Maintenance

HIRTA team will develop a Comprehensive Maintenance and Operations Plan (CMOP) for supporting all in-vehicle, central, wayside (e.g., wayfinding) equipment and supporting functions. The document will define in detail the process to be followed to operate the system per established SLAs in Phase 2. CMOP will be reviewed and approved by the AOR.

System Maintenance process will document the following:

- Continuous system monitoring provisions
- Support and escalation protocols
- Hardware warranty/replacement management
- Schedule and process for software maintenance updates
- Process for data center and database maintenance
- Schedule and process for upgrade of software
- Schedule and process for hardware upgrade/replacement
- Service level agreements for continued operations of the system

2.2.8.6 System Operations and Maintenance Schedule (SOMS)

The team will develop an SOMS with a detailed list of activities as defined in the CMOP and SOP. SOP in particular will be driven by the needs identified in the ConOps and Safety Management Plan (SMP) and all relevant activities will be included.

SOMS will be provided to AOR for review. Any comments received will be addressed to create a baseline SOMS that will be followed for the rest of the Phase 3.

2.2.8.7 Monthly SOMS Update

HIRTA team will make monthly updates to the SOMS in response to DOT comments on format and content, as well as to document progress against plan and track risks/issues. The updated SOMS will include a concise summary of activities underway, progress made since the last update, and any/all technical issues/risks/incidents with any/all mitigation actions taken since the last update.

2.2.8.8 Reporting of Issues during Operations and Maintenance

Once the project moves into operations and maintenance stage in Phase 3, deployment partners' bug tracking system will be used for defect/discrepancy tracking and resolution. Severity and resolution plan will be determined per the service level agreement (SLA) with the deployment partner.

For issues that are reported by users, HIRTA PML will log those issues in a spreadsheet-based tracker. HIRTA PML will consult those issues with SEL, DL and TL and then TL will coordinate with appropriate members of the HIRTA team (MOD vendor, wayfinding vendor, IBI Group) to resolve the issues per operations and maintenance agreement. This will also involve creating tickets in vendors' bug tracking system, as discussed above.

2.2.8.9 Performance Management and Evaluation Support

HIRTA team will collect, process, and distribute data and performance reports according to the Phase 1 Performance Measurement and Evaluation Support Plan (PMESP) and to support an independent evaluation effort. The collection, processing, quality control, and transfer of data

from the deployment site in support of performance measurement and evaluation is documented within the Data Management Plan.

HIRTA team will prepare a Performance Measurement and Evaluation Support Schedule (PMESS) that will include a work breakdown structure of activities and dependencies required to implement the PMESP for the specific purposes of the performance measurement and evaluation support. In particular, the PMESS will identify milestones, performance summary reports, and pre-deployment (“before”) data for coordination with USDOT.

2.2.9 Post Phase 3 Processes

This section provides an overview of the planned system operations and maintenance beyond Phase 3.

2.2.9.1 System Expansion to other Counties

HIRTA plans to expand Health Connector beyond Dallas County and implement in the rest of its service area. Plan for this expansion will be developed based on performance of Health Connector and any impact brought to the system to better estimate the demand (e.g., new riders gained due to improved level of service for same day response).

2.2.9.2 Support Replication at other Iowa Agencies in coordination with Iowa DOT

HIRTA plans to coordinate with Iowa DOT and other agencies in the State of Iowa for deployment of similar capability solution for other regions.

2.2.9.3 System Operations and Maintenance

HIRTA plans to continue to operate the system for at least 5 years beyond Phase 3. Details of financial sustainability will be included in the Task 10-Instutitonal Partnership and Financial Plan.

2.2.9.4 System Use Assessment

HIRTA will conduct periodic “system use” assessments so targeted improvements can be planned and executed for the system (e.g., system enhancement, training, configuration changes).

2.2.9.5 Data Validation and Sharing

HIRTA will continue to partner with researchers beyond Phase 3 for evaluating the benefits of Health Connector or similar systems on improved health outcomes.

2.2.9.6 System Enhancements

HIRTA will continue to work with deployment partners on adding new system functionalities and add additional capabilities as they become available in the future.

2.2.9.7 System Upgrade and/or Replacement

HIRTA will continue to monitor the industry and plan for implementing new trends and opportunities as they become available (e.g., autonomous shuttle) for providing improved access to healthcare.

3 Agile Process Application

3.1 Systems Using Agile Development

As discussed in Sections 2.1.4 and 2.2.5, new development is needed for the Health Connector middleware which includes the following:

- Interface between MOD software and Medicaid Broker software.
- Interface between MOD software and EHR software.

3.2 Systems Engineering-Agile Integration

Incorporating elements of Agile development into the traditional Systems Engineering Methodology (SEM) often results in the more rapid discovery of needed capabilities and workflows not contemplated or fully specified by functional requirements. While these elements tend to be user interface centric, the resulting findings (e.g., missing workflows) can significantly impact the optimal architectural design for a software module or system, making it critically important to leverage Agile methodologies during the initial software implementation phase.

Nonetheless, systems engineering discipline remains central to software system quality. IBI Group's Software Development Lifecycle (SDLC) Quality Assurance Plan incorporates a rigorous SEM to ensure maximum efficiency, managed risks, and conceptual integrity: ensuring what is delivered meets customer needs and expectations.

Upon the completion and approval of the functional and architectural design of a software system, module or enhancement, which typically includes design requirements, user interface mock-ups, and interface control/protocol specifications, the design will be decomposed into Work Items, of which there are several types:

- ***Epics*** – These are large scale collections of features, typically encompassing an over-arching feature set to deliver a large overall theme of functionality.
- ***Features*** – These are typically individual capabilities that could not be subdivided further and remain individually useful, comprised of one or more User Stories.
- ***User Stories*** – Typically represents a specific function that can be defined/built into the system, defined from the end user's perspective.
- ***Bugs/Issues*** – Represent identified issues, deficiencies, or undesired behaviors of a software system.

3.3 Agile Team Roles and Development Process

The Software Analyst/Engineer or Product Owner responsible for a given design and the derived Epics, Features, User Stories and Bugs/Issues attaches any reference documentation, diagrams, mock-ups, etc. that further inform the design and desired outcomes. All of the above detailed design artifacts will be recorded and tracked in Microsoft Azure DevOps as part of integrated development operations workflows.

At this stage, the Work Item will be considered finalized and ready to be assigned to (or selected by) a development team member for execution.

- ***Work Item Review*** – The development team member that is assigned to (or selected) the Work Item will review the details, including relevant user story descriptions, feature descriptions and attached documentation/mock-ups, and consults with the Software Analyst/Engineer or Product Owner responsible for the Work Item if any further clarification is required.

- ***Development*** – Code-level design and development work will begin, including unit/component testing and the development automated unit tests as applicable.

- ***Feature Review*** – The new or updated functionality will be presented to the Software Analyst/Engineer or Product Owner responsible for the Work Item, ensuring that the capability is implemented as intended in the context of the broader design. If additional development is required, the Development and Feature review steps will be repeated until the updated functionality is approved by the relevant Software Analyst/Engineer or Product Owner.

- ***Pull Request*** – Once completed and approved, the developer will submit the new/updated code as part of a 'Pull Request' to be merged into the core/primary development branch of the source code. The Pull Request will be linked to the Work Item, providing direct traceability between the code changes and the Work Item for which the changes were made.

- ***Code Review*** – The Pull Request mechanism will involve a review of the code by Lead Developers, Software Architects, and/or Subject Matter Experts (SMEs) as appropriate for the code base. The code will be reviewed for adherence to relevant design patterns, efficiency, adherence to coding standards, and unnecessary changes to established objects, methods and other code elements. Only after being approved by a senior development team member specializing in (with in-depth knowledge of) that area of the code base is the merge operation permitted/completed.

At this stage, the software development for the Work Item is considered complete. A Work Item is not considered 'Closed' until tested and verified by the Quality Assurance Team (QAT).

- ***Test Case Development*** – A QAT Analyst will review the functionality defined in the Work Item and derives suitable test cases, consulting with the Software Analyst/Engineer or Product Owner responsible for the Work Item if any clarification is required.

- ***Deployment to QAE*** – The QAT Analyst will deploy the latest update to the appropriate Quality Assurance Environment (QAE), hosted on Microsoft Azure. A separate QAE will be created for each customer or project, and set up to reproduce the relevant 'real world' production configuration to the extent possible.

- ***Test Performance*** – The QAT Analyst will perform the test in the QA environment to verify Work Item functionality in the context of a fully configured software system. If the test passes, the Task is 'Closed'. If the test fails, the QA Analyst will append the failure information/details to the Work Item and will engage the responsible development team member for remediation.

3.4 Communities of Practice

No communities are currently identified for this development work.

3.5 Sprint and Release Planning

Each software system, module or enhancement release will be planned based on the organization and prioritization of Tasks (typically at the Epic and Feature level) defined in the Microsoft Azure DevOps Backlog for the solution. Release versioning will be based on the SemVer syntax, with the Major release value only changing for significant software system changes, and in most cases the Minor release value incrementing by one (1).

- ***Feature Completeness*** – Only fully completed features will be included in the release, with in-progress Tasks remaining in separate code control branches.

- ***Regression Testing*** – Before a release is available for production use, an extensive set of regression tests will be performed, based on Test Cases defined by the Quality Assurance (QA) team, and often by a Software Analyst/Engineer or Product Owner working in close collaboration with a customer. The latter set of Test Cases will be typically developed for project or customer Acceptance Testing.

- ***Defect Resolution*** – If any regression tests fails as a result of identified issues, deficiencies, or undesired behaviors of a software system, new Tasks will be created to track these through to resolution, and regression testing is repeated until all tests are passed.

- ***Production Deployment*** – Once all regression tests are passed, the new release will be then scheduled for deployment using the relevant Automated Deployment Pipeline(s) defined in Microsoft Azure DevOps.

3.6 Agile Development Tools

Microsoft Azure DevOps will be used for carrying out the agile development process by roles as referenced in earlier subsections.

Appendix A. Acronyms and Glossary

Access2Care

A transportation broker for State of Iowa Medicaid program that performs booking and scheduling and works with service providers such as HIRTA for successful delivery of Medicaid-eligible trips.

ADA – Americans with Disabilities Act

Refers to the civil rights legislation passed and signed into law in 1990 to prevent discrimination against people with disabilities.

API- Application Programming Interface

Software middleware that allows two devices or applications to exchange data with each other.

APN: Access Point Name

A communication gateway for enabling cellular data communications over a carrier network. Public or private APN configurations are used depending on data security needs.

AWS: Amazon Web Service

A commercial cloud-based hosting service provided by Amazon.

BAA- Broad Agency Announcement

A procurement instrument used by USDOT.

Billing

Refers to the process of invoicing third-party funding sources (e.g., Medicaid) after a successful delivery of a trip. Billing is typically done on a monthly basis.

CHNA - Community Health Needs Assessment

Refers to the Community Health Needs Assessment Report developed by Dallas County in 2019.

CCB- Change Control Board

A body of subject matter experts tasked to manage change control process for work products, schedule or other relevant matters related to a project or program.

CDL- Concept Development Lead

Key project team member tasked with leading Phase 1 concept development activities.

CO: Contract Officer

The CO will serve as the USDOT point of contact for any concerns related to the contracts.

COR - Contract Office Representative

The Contract Office Representative will serve as the USDOT representative for this project and is responsible for coordination and review of the proposer's work.

Cost Allocation

Refers to the process of associating a funding source that should be billed for a trip in a shared ride scenario when riders covered by separate funding sources share the vehicle for their trips and trip purposes at the same time.

CSV- Comma Separated Value

A common text-based file format that is supported by many platforms and programs.

CT- Census Tract

A geographic region defined for the purpose of collecting census data.

CTAA – Community Transportation Association of America

One of the project Partners who will lead stakeholder engagement on this project.

DCHD – Dallas County Health Department

One of the project Partners who will lead integration with health care services.

DR-Demand Response

Refers to a service that is not run on a fixed route or a schedule (e.g., dial-a-ride, vanpool etc). This requires making trip booking by contacting the service provider (e.g., HIRTA). However, DR is different than an ADA Paratransit service which is provided as a complement to a fixed route and is governed by specific requirements provided in 49 CFR- Part F. HIRTA operates only DR Service in Dallas County and all discussion in this document is related to DR Service.

Dispatching

Refers to an operations management function which involves assigning vehicle, tracking fleet location, managing schedule adherence, managing trip manifests and other operational functions.

DMP – Data Management Plan

The Data Management Plan is Task 3 of Phase 1 and will describe the approach for data collection, processing, storage and utilization.

DOT – Department of Transportation

The government department responsible for transportation. In this report, this generally refers to either the State of Iowa's DOT or the United States DOT referred to as Iowa DOT and USDOT, respectively.

EDI – Electronic Data Interchange

In this context, refers to the electronic data interchange (EDI) format messages developed by HIPAA following American National Standards Institute (ANSI) X12 standard for electronic data exchange and are used to communicate with third-party health care provider systems (e.g., Medicaid).

EHR – Electronic Healthcare Record

Refers to the healthcare information management system used by hospitals for patients' healthcare-related appointments, transactions, and records management.

FHIR- Fast Healthcare Interoperability Record

A standard developed to describe and exchange health records in electronic format.

FHWA- Federal Highway Administration

A USDOT agency in-charge of highway transportation.

FTA- Federal Transit Administration

A USDOT agency in-charge of public transportation.

GTFS – General Transit Feeds Specification

GTFS is a standard to provide static public transportation schedule information. The standard has been expanded to include real-time passenger information (GTFS-real-time), flexible services (GTFS-flex) and accessible routing within stations (GTFS-pathways).

HIPAA – Health Insurance Portability and Accountability Act of 1996

Provides guidelines for data protection of sensitive patient health information.

HIRTA - Heart of Iowa Regional Transit Agency

Rural, regional public transit agency in central Iowa. HIRTA will serve as Proposer/Applicant for the Complete Trip - ITS4US project.

HL7 – Health Level Seven International

A not-for-profit, standards developing organization focused on electronic health information.

HN-Health Navigator

Refers to services provided by Dallas County Health Department to Dallas County residents in identifying resources as necessary for improving social determinants of health.

HUA- Human Use Approval Summary

A deliverable in Phase 1 for Task 8 that outlines the process to be used for human subject participation in the program for research and evaluation purposes.

HTTPS: Hyper Text Markup Language Secure

A protocol for accessing data/information over internet using Transport Layer Security (TLS)/ Secure Socket Layer (SSL).

ICTDP – Integrated Complete Trip Deployment Plan

The Integrated Complete Trip Deployment Plan is a deliverable of Task 13 under Phase 1.

I&R: Information and Referral

Refers to public and private entities that help their customers in identifying resources for health and human services and other needs.

IPFP - Institution, Partnership, and Financial Plan

The Institution, Partnership and Financial Plan is a deliverable of Task 10 under Phase 1.

IRB- Institutional Review Board

An institutional body that reviews and approves research methods to ensure ethical standards are followed, particularly when involving human subjects.

ISU– Iowa State University

Iowa State University is a public research university with multiple campuses in the State of Iowa and will be engaged as the research and evaluation partner in Phases 2 and 3.

IVR: Interactive Voice Response

A technology that allows humans relying on phone systems to interact with computer programs using natural voice or alphanumeric input using phone keys. This is an alternative used to provide services to populations that may not have access to web-based devices.

IP- Internet Protocol

A network layer protocol for enabling data exchange over Internet.

JSON: Java Script Object Notation

Open standard and human readable data format for storing and transmitting electronic data.

KPI – Key Performance Indicators

Represents primary metrics used to assess the success of a project or operations.

LEP – Limited English Proficiency

Refers to individuals who have a limited ability to read, speak, write, or understand English.

LTE: Long Term Evaluation

A telecommunication standard for wireless communications using mobile devices, also referred as 4th generation wireless.

MOD: Mobility-on-demand

A USDOT program that intends to support the develop of an ecosystem that provides safe, reliable and sustainable solution for all. MOD includes both trips made by Travelers or Trip replacements (e.g., courier network services (CNS) such as food delivery).

MPM: Mobility Performance Metrics

MPM is a program being led by the FTA to develop performance measures that focus on new mobility modes (e.g., micromobility, TNC).

NDSP- Non-Dedicated Service Provider

NDSP refers to operators providing service under contract (e.g., taxis) to an agency (e.g., HIRTA).

NEMT – Non-emergency Medical Transportation

The provision of transportation to patients for medical appointments, lab visits, and other routine care. Generally, used in the context of Medicaid service only.

NOFO- Notice of Funding Opportunity

Formal announcement of availability of funding by US federal agencies for one of the financial assistance programs.

PII – Personally Identifiable Information

Refers to any data that can distinguish an individual, either alone or when linked with other available data.

PML-Program Management Lead

HIRTA project team member in-charge of managing all project and program management activities.

Provider

Provider in this context mainly refers to an entity performing service delivery for requested trips, sometimes also referred as service provider. the HIRTA team have also used healthcare partners as providers in some cases but referred as 'healthcare providers.'

REL- Research and Evaluation Lead

HIRTA team member responsible for managing the research and evaluation as part of Phase 3 and guiding the concept development and deployment activities as part of Phase 1 and 2.

Reservation

Refers to the act of booking a trip based on a request from a customer. Reservation is available to only to registered customers.

REST- Representational State Transfer

A popular protocol to enable data exchange over the Internet using web APIs. HTTP/HTTPS is used for communication protocol and data in HTML, JSON, XML or other formats may be used for exchange.

SAE- Society of Automobile Engineers

Professional standards development organization, primarily focused on aerospace, automotive, and commercial vehicles (e.g., trucking).

Scheduling

Refers to the process of identifying driver and vehicle resources and their runs/shifts for a given work-day. Scheduling is typically performed for all requests received until 24 hours in advance. Booking within 24-hour notice and on-demand is offered but not encouraged due to limited system capacity and resources.

SDL- Systems Development Lead

HIRTA team member responsible for all systems engineering aspects of the project.

SEL- Stakeholder Engagement Lead

HIRTA team member responsible for stakeholder engagement focused activities.

SFTP- Secure File Transfer Protocol

Protocol used to securely transfer file between networked devices.

SEMP – System Engineering Management Plan

A System Engineering Management Plan describes how systems engineering process of planning, design, and deployment is applied to a project.

SHP- Shape File Format

Common spatial data format developed and regulated by Esri.

SMP – Safety Management Plan

A Safety Management Plan describes the steps to be taken to ensure the safety of the project stakeholders and beneficiaries.

Smart Device

Refers to smartphone, smartwatch and similar personal devices that may be internet enabled and are equipped with sensors.

TAG – Transportation Advisory Group

The TAG is a diverse group of community stakeholders and business representatives interested in the advancement and improvement of public transportation in the HIRTA service area.

TAZ- Traffic Analysis Zone

A geographical unit used to conduct traffic /transportation analysis, constructed using census block information.

TCP- Transmission Controls Protocol

A transport layer protocol that is focused on assured delivery of data packets over an IP network.

TDS: Transactional Data Standard

Open data standard for exchanging transactional data (booking, payment, service coordination) between different systems or system components. Available in TCRP Report 210 - Development of Transactional Data Specifications for Demand-Responsive Transportation (http://www.trb.org/Main/Blurbs/180593.aspx)

TMS- Transportation Management System

All systems and tools to be used by HIRTA for managing day-to-day delivery of transportation services. This will be provided by various products offered by Uber Technologies.

TNC – Transportation Network Company

Encompasses a group of companies that provide on-demand Ridehailing services.

UUID-Universal Unique Identifier

Encrypted label used for assigning a unique ID to a field in a computer system, network or program.

UDP- User Datagram Protocol

A transport layer protocol that uses connectionless datagrams for applications that need time-sensitive data transmission but do not require assured delivery

Wayfinding

Refers to the tools and technologies that assist in orientation, locating objects, and step-by-step navigation to destinations in outdoor and indoor environments using visual markers, sensors or physical signage.

Appendix B. Source Code Management Plan

Open-Source Software Components

As discussed in Sections 2.1.4 and 2.2.5, new development is needed for the Health Connector middleware which includes the following:

- Interface between MOD software and Medicaid Broker software.
- Interface between MOD software and EHR software.

Source Code Release

IBI Group will release the source code under MIT License (https://opensource.org/licenses/MIT) and will publish the source code at the IBI Group's public GitHub repository page at https://github.com/ibi-group.

Existing Software Development Processes and Policies.

A high-level approach to software development is described in 2.2.5.2.

IBI Group also follows a configuration management framework based on Systems Engineering Methodology (SEM) which has been documented and adopted by IBI Group's software development group. This is IBI group's internal quality control document and can be made available upon request for review.

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