



## CityLoop Enterprise Analytics Transformation

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## The Story

CityLoop™ is an environmentally friendly carsharing company operating in six cities. We have determined that our current analytical capabilities are weak and intermittent. CityLoop does not currently share electric usage, mileage, and ride summary statistics with its customers, nor does it optimize the location of its vehicles. Over 90% of its fleet currently resides in the least expensive long-term parking structures in each city. An overarching customer complaint is that CityLoop vehicles are located very far from most target market customers. Without a comprehensive ride history/ride summary dashboard, proper geographical positioning of its parking spaces, and better user experience (UX) design, the company will remain in stage #2 (Localized Analytics) of the Analytical Maturity Model (Eckerson, 2012).

We plan to follow Kotter's 8 Step Change Model for organizational leadership (Kotter, 2010) to move from stage #2 (Localized Analytics) to #5 (Analytical Competitors). Our sense of urgency is fueled by our desire to become the top carsharing company. Our key initiatives are divided into two project flows—one focusing on carsharing analytics and the other on optimizing parking locations. We will follow a CRISP-DM framework with Agile projects to achieve our initiatives.

The carsharing analytics will serve as descriptive and predictive metrics for the business and a dashboard for drivers. We will deploy a dashboard for drivers in the website and mobile app and a separate dashboard for CityLoop analysts, marketing, and C-level executives. We will utilize the analytic network process (ANP) method to optimize parking locations (Saaty, 2004). Despite the higher price tag on prime parking spots in high traffic areas, we are confident that suitable investments in optimal locations will increase demand from our current customers and attract new customers.

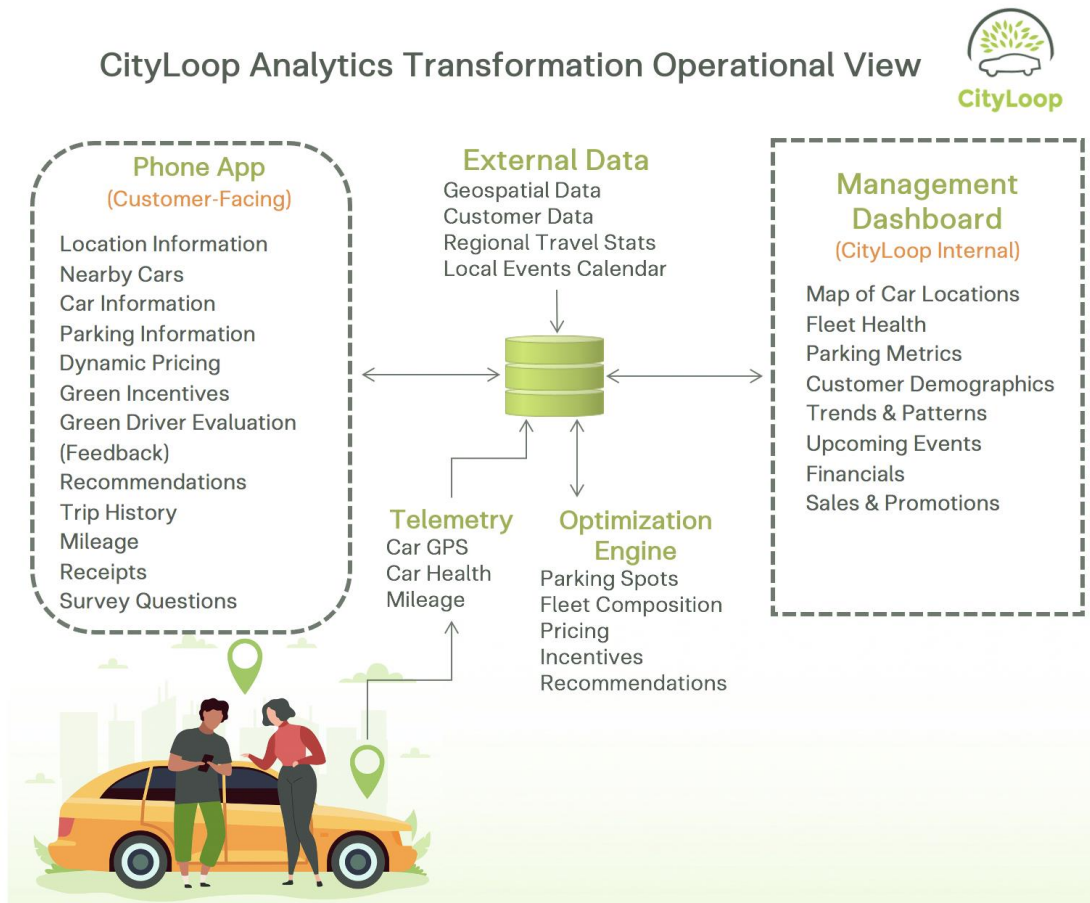


Figure A

## Transformation Framework

As a transformational framework, CityLoop uses Kotter's 8-step model for change (Kotter, 2010).

- Step One - Create Urgency:

Our marketing survey, which uncovered driver pain points regarding parking locations and lack of trip statistics, has created a sense of urgency throughout the organization. We realize that we must provide excellent customer service to compete in this space.

- Step Two - Form a Powerful Coalition:

CityLoop's leadership is committed to this change. We've identified the engineering and analytics teams building the parking optimization model and creating critical driver/internal dashboard metrics.

- Step Three - Create a Vision for Change:

Our vision is to be the premier environmentally-friendly carsharing service. We have determined that to reach this goal; we must become a data-driven organization. If not, we will fall behind the competition.

- Step Four - Communicate the Vision:

CityLoop has shared the vision throughout the organization. We have also shared our demonstration plan as a roadmap to making this change.

- Step Five - Remove Obstacles:

We are all-in on this transformation. We are ready to make any capital/personnel investments necessary and ensure that our transformation team members have been cleared to focus on this transformation plan.

- Step Six - Create Short-term Wins:

Using an agile methodology with sprints, we plan to deliver functional value at the end of each sprint. Teams will be recognized for meeting targets and for unique or elegant solutions.

- Step Seven - Build on the Change:

At the end of each sprint, we will be reviewing what we have learned and set our goals for the next sprint. We want to continue to evolve to improve our analytics IQ and our competitive advantage. The transformation will not stop with the end of the goals described here; we will continue to stretch ourselves with each sprint.

- Step Eight - Anchor the Changes in Corporate Culture:

We view the transformation to become an analytical competitor as integral to our business. As we move through this transformation, new technologies, new methods, and new opportunities are bound to emerge. We plan to be ready as an agile and transformational organization to stay ahead of the competition and be leaders in our industry.

#### Analytics Gap and Strategy

CityLoop currently maintains pockets of analytical activity. Our vehicles collect customer mileage, gas usage, GPS location, and reservation transaction data. Previously, we lacked the necessary tools for data visualization and UX design to share this information with our customers. Additionally, we lacked suitable statistical models for analyzing this customer data to create better organizational decision-making.

Enter our data engineering and app development team. Their priority is early delivery of our customer-facing dashboard, utilizing data we have already been collecting and displaying it in a user-friendly manner via the new CityLoop phone app and a corresponding email receipt. This will allow customers to gain new insights into their CityLoop usage and user profile during and after each reservation. This will be part of CityLoop Sprint 1, as denoted in Appendix A. We will deliver a minimally viable product for this first sprint to achieve a quick win: a simple dashboard. From there, we will continue to iterate, adding functionality and improving the user experience.

After the dashboard is tested in a limited environment, this team will launch new products and services laid out in the Customer-Facing portion of the CityLoop Analytics Transformation Operational View graphic displayed in Figure A. In particular, the Green Driver

Evaluation™ will provide customers with personalized data from their driving experience. Acceleration, RPMs, speed limit obedience, turning radii, vehicle proximity (to pedestrians, cyclists, and other drivers), and long-distance cruise control usage are just some of the features that will be collected and analyzed, forming each CityLoop customer's driving profile. CityLoop customers with the most environmentally-friendly driving tactics will enjoy discounts on future reservations. The introduction of our Green Driver Evaluation™ initiative is the very first of its kind in the carsharing industry, modernizing CityLoop's analytical prowess, giving us a competitive advantage over rival carsharing companies, and transitioning our organization to deeper stages of analytical maturity.

#### Pipeline of Demonstration Projects (Applications)

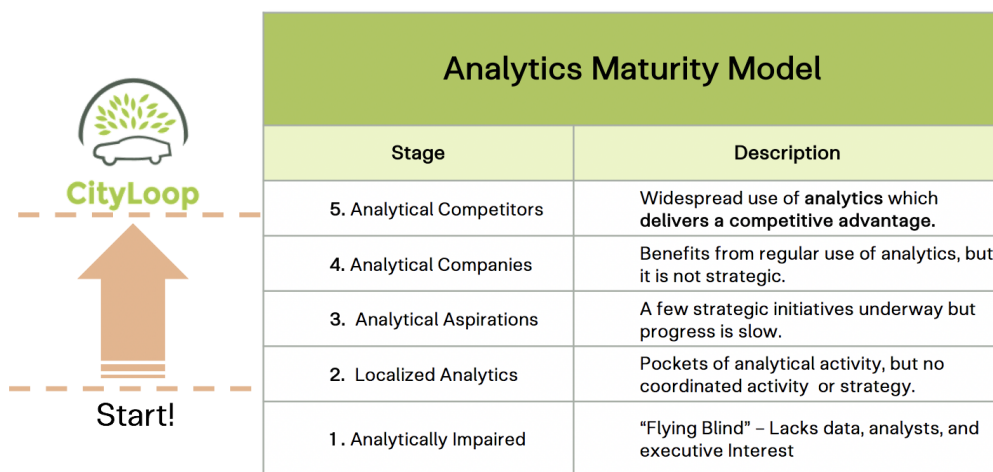
The pipeline of the implementation plan moves CityLoop from level three, analytical aspirations, to level five, an analytical competitor. The process of moving from level to level will reveal new ways to leverage our analytical capabilities. The Green Driver Evaluation™ is designed to reward CityLoop drivers and adds value as a stand-alone application. The Green Driver Evaluation™ is an offering that any transportation company could utilize. In the same way that UPS is legendary for its gas savings route optimization, CityLoop's Green Driver Evaluation™ is software that every driver can use to optimize their driving experience. The applications include functionality for all non-commercial drivers, commercial drivers, and potentially autonomous vehicles. The ability to monetize from CityLoop software is in line with our ethos of reducing pollution in transportation.

Management will decide when the Green Driver Evaluation™ application is available for independent sale. Even without monetization through software sales, optimized software will lower our cost of operation. When we encourage drivers to consume less energy in their daily

travels, they, in return, put less stress on the electric fleet and require less energy to recharge the cars. Furthermore, CityLoop as a software developer allows the company to diversify its income streams and compete in arenas outside of transportation. While CityLoop comes to the market as a transportation company, it is an analytical company that wants to compete through its analytical abilities. CityLoop will reach financial success through systematic business analytics that gives us a competitive edge.

### Demonstration Project

As stated, our goal is to move from being a Level 2 (Localized Analytics) in the Analytics Maturity Model (Davenport, Harris, & Morison, 2010) to Level 5 (Analytical Competitors). This Demonstration Project maps our journey beginning with Level 3 (Analytical Aspirations), where we start with two major strategic initiatives: Optimize Parking Locations and Car Sharing Analytics. Continuing to Level 4 (Analytical Companies), the Demonstration Project lays out our strategic initiatives analytics transformation and deployment. With our enterprises deployed, we will strive to reach Level 5 (Analytical Competitors) by using our analytics to drive competitive advantage.

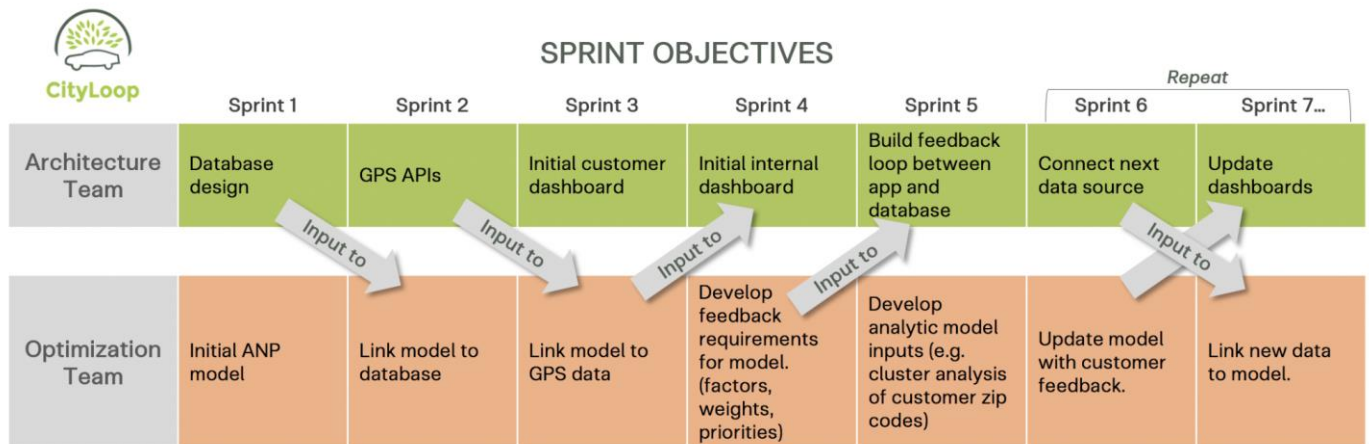


After Davenport & Harris, 2010.

There are currently 100,000 CityLoop customers dispersed among six major metropolitan areas in the midwestern United States. Previously, the analytics team minimized parking space rental costs by simply leasing in the cheapest parking lots of each city. While this approach decreased costs, it also reduced demand.

For our Car Sharing Analytics initiative, we will be building a dual-purpose app/dashboard. The first purpose of the dashboard will be an app for drivers to access metrics associated with the CityLoop driving experience. The second purpose will provide real-time analytics for CityLoop with views for analysts, marketing, and the CEO. Building the data architecture will entail ingesting multiple sources (car metrics such as GPS, mileage, driver ratings, car inventory stats, GIS location of inventory, driver demographics, etc.). The models will determine drivers of profitable trips, such as drivers for longer trips, higher driver experience ratings, and drivers for specific types of cars.

To set the stage for a total enterprise analytics transformation, the CityLoop analytics operation will divide into two significant efforts: a data engineering and app development team that will upgrade CityLoop's data architecture and an optimization team that will use the data to generate analytically driven options for CityLoop business decisions. The estimated cost for the analytics initiative is \$1.14M, which is detailed in Appendix A.





The data engineering and app development team will re-engineer CityLoop's existing customer database to accommodate incoming data streams. The team will then develop application programming interfaces (APIs) to connect to the data sources and enable the data to flow into the CityLoop database. The top priority data streams are the global positioning system (GPS) data from the customer phones and the car transponders. These streams will enable an initial minimal viable product. In addition, the app development team will begin building two dashboard views off the CityLoop database. The first will be piped to the customer-facing cell phone app (top priority and minimal viable product). The second view will be a CityLoop internal dashboard of crucial management metrics.

The optimization team will develop a multi-objective optimization model using the analytic network process (ANP) method (Saaty, 2004). This optimization approach has been applied to various business questions (Kheybari et al., 2020), including selecting optimal business locations given multiple competing objectives (Cheng, 2005). The initial optimization focus will be identifying parking locations that meet the needs and interests of the customers (convenience, safety, green options, competitive pricing) while also maximizing revenue for CityLoop (minimizing costs and fees, maximizing users). Subsequent sprints will focus on fleet composition, dynamic pricing, and green incentives.

The ANP method has several advantages. First, it includes both quantitative (tangible) and qualitative (intangible) factors in the optimization (Saaty & Vargas, 2006). This is particularly important to CityLoop's mission of providing a more environmentally-conscious option in the carsharing marketplace. A second advantage is that an initial model can be developed in parallel with the data engineering team's upgrade of the data architecture. Initial results can be produced before the data pipeline is completed (using existing market research

data in the first sprint) and refined after the pipeline is completed. Finally, the model can be developed using open-source Python libraries (PyANP) (Adams, 2018). This will allow the team to scale the model in subsequent sprints and seamlessly integrate it between the data streams and the dashboards without costly licenses for commercial software.

Simultaneously, the second subset – the data engineering and app development team – will create, develop, refine, and analyze the new CityLoop phone app and internal management dashboard. With the bulk of CityLoop's new Series A venture capital funding, this team will create an API/pipelining information system to connect several data types and integrate them onto a centralized dashboard for customers (in the form of a phone app and email receipt). Additionally, the team will dive deeper into the data, producing a comprehensive internal dashboard accessible to both subsets of the CityLoop analytics team.

To ensure that the resources applied to the internal dashboard and the phone app are used most efficiently, the development teams will use a workshop approach with the stakeholders to define their requirements. The metrics shown on the dashboard(s) must align with the viewers' actual questions to be answered. In addition, the teams must develop measures of effectiveness to assess whether CityLoop is doing the right thing for customers. Answering effectiveness questions may require the voice of the consumer via focus groups or survey questions. The cell phone app architecture will allow analysts to query customers on their preferences (e.g., What is more, important to you: parking location or the eco-friendly option of an electric car?) and satisfaction as new features are deployed.

The CityLoop project requires flexibility to absorb the constantly changing business environment and consumer needs. Two variables that introduce tremendous variability and unknowns to the project are how the global pandemic is shifting driving patterns and the global

chip shortage that has slowed the production and delivery of automobiles. To meet our project needs, we will deploy Agile Project Management (Agile PM). In addition to agile, we will deploy a scrum process framework to provide incremental deliverables. The deliverable is the initial customer dashboard that provides the end-user with more information than CityLoop's competitors. The first sprint and first iteration of the consumer-facing dashboard are visible in Appendix A.

### People and Technology Infrastructure Investments

As previously mentioned in the demonstration project, CityLoop will go after two strategic initiatives, optimized parking locations and carsharing analytics, that will take the company from Level 3 (Analytical Aspirations) to Level 5 (Analytical Competitors). We need to bring on additional talent for both projects, such as a software developer, project manager, data scientists, analysts, and engineer(s) who have analytical transformations experience, preferably in the transportation industry. The data engineering and app development team will re-engineer CityLoop's existing customer database to support the carsharing analytical transformation to allow new data streams. The optimization team will pull data from the customer database, such as locational and demographical data, to feed their models. The significant investment and support system for our car sharing analytics initiative is the GIS/GPS systems installed into our fleet of vehicles. This hardware will track everything within the vehicles from speed, acceleration, deceleration, g-forces, length of trip (duration and distance), energy usage, etc. All of this data will flow into our customer database after we connect the systems via APIs. The estimated amount of labor and hardware costs can be found in Appendix A.

Since CityLoop aspires to reach and stay at Level 5 (Analytical Competitors), we will invest in a training management system for existing and new employees to help them learn and

develop new skills. The analytical world is rapidly changing, so investing in our employees and training them on state-of-the-art analytics will better their skills, which will, in turn, help us become a better (if not the top) analytical competitor in the carsharing industry. Additionally, by creating our dashboards, we will provide quality reporting, keeping everyone in the company up to speed on critical metrics. Quality reporting allows employees to understand how CityLoop is performing each day, week, month, year, etc., in all aspects of the business. CityLoop will also have an innovation system for all employees to add (and view) ideas of new initiatives, models, and systems that will help CityLoop compete on analytics.

### Top Three Risks and Mitigation Strategies

Given the two strategic initiatives, the first critical risk that we have identified is the potential for misunderstanding or lack of understanding, resulting in inadequate solutions or outcomes for both initiatives. In large projects such as our dashboards and parking optimization, many of the problems that arise start with not clearly understanding the business, the purpose of the project(s), and the project's goals. Teams that lack a clear vision and understanding will not be on the same page and may produce unusable solutions to the business. To mitigate the risk of misunderstanding, we will apply agile CRISP-DM as it provides a framework to initially understand the company, the purpose for the project, and the goals before any data collection, prep, analysis, etc., takes place. The agile CRISP-DM method makes sure everyone working on our project(s) will be on the same page and achieve the same end goal(s). The rest of the CRISP-DM model, such as the data understanding, preparation, modeling, evaluation, and deployment, is much easier once the team understands the end product.

Another risk that gets mitigated by the agile CRISP-DM model is higher than expected costs and pushed deadlines. Projects can get sidelined and/or even canceled if they run over

budget or run past deadlines. To mitigate the risk, we will use the agile method and have two-week sprints. This way, our teams will only be focused on one mission at a time. Our first sprint, for example, is providing the end-user with a clean dashboard that gives ride summary statistics—only focusing on one feature at a time rather than bouncing around decreases costs and timelines.

The second critical risk is technology failures. We are developing a new mobile app with improved UX design, a dashboard for our customers and employees, and an optimization model to identify the best parking spaces for CityLoop. A lot can go wrong in terms of technology that could have a negative consequence on CityLoop. Deep-rooted programming bugs can push the CityLoop project behind its desired deadlines. The significant risks are customers leaving competitors because our platform does not work correctly and poor reporting from our dashboards that give our customers and employees wrong. As previously mentioned in the demonstration project, a lot of change will always bring risks. A workshop approach to get feedback from stakeholders and developing a measure of effectiveness to ensure that what CityLoop is creating is what our customers and employees want will help remedy that challenge.

The third critical risk is the inevitable learning curve that stems from an ambitious project. Our transformation is complex and will need top talent to execute. We will need to find experienced, top-tier data scientists, analysts, and software developers to mitigate this risk. We will hire an experienced analytics translator or someone skilled at interpreting customer requirements into analytics plans. The analytics translator will assist in determining the required skill sets, which will allow us to do targeted recruiting. We also need to find higher-level staff that can lead and direct such projects. It could be challenging to find talented data scientists and software developers as they are highly paid and tend to be employed at high-quality

organizations. As a small company, it may be challenging to get them to join CityLoop. We plan to entice them with stock options since we are an up-and-coming, fast-growing company with many financial opportunities.

### Revisit Initial Demonstration Project

Despite the risks identified, we are confident that we will be able to enact our analytical transformation. Communication is an important value of our organization, and we will be sure to maintain open lines of communication across the organization as we proceed. The CRISP-DM method builds in checkpoints throughout the process where teams can openly discuss their work status. We will monitor our software and hardware to address any technical issues that may arise proactively. Sharing our corporate culture, excitement, and passion for green technology will attract data engineers and scientists who want to work with a growing, environmentally friendly, and financially secure company.

### Personal Philosophy of Analytical Leadership

The two teams in charge of the analytics transformation (data engineering/app dev and optimization teams) are not alone in the enterprise analytics transformation. Firstly, they are overseen by the CEO and leadership team. Additionally, the marketing team -- previously the lone pocket of analytics at CityLoop -- rounds out the four-team contingent. The four vastly different groups of leaders and followers all have other task characteristics. For example, Engineers/App Builders need intellectual stimulation, want to participate in strategy/objectives, and understand the vision/goal. Each team's leadership approaches are listed in Figure B:

	Data Engineers & Developers	Data Scientists & Analysts	Leadership Team	Marketing
Inspirational Communication			✓	✓
Intellectual Stimulation	✓	✓	✓	
Participatory Leadership/ Collaboration	✓	✓	✓	
Parity/ Understanding	✓	✓	✓	✓


Figure B

Another example is the marketing team, which employs the Path-Goal leadership philosophy. They have a wide range of experience levels. Some marketing team is fresh out of undergraduate studies, while others have over two decades of experience. Leadership takes the varying experiences of followers into account before designating tasks. They provide less-experienced staff a high amount of direction. Meanwhile, leadership is more supportive to the senior team; defining goals is less critical than clarifying the path and removing obstacles.

In conclusion, CityLoop's 2021 enterprise analytics transformation will go down in the company's history as a monumental moment of modernization and renewal. The growth and enhancement of our analytical capabilities will give CityLoop a distinct advantage over rival carsharing companies; it will take many more cycles of analytical transformations for competitors to catch up. Parking spot optimization, intelligent and distinctive dashboards, the Green Driver Evaluation™, revolutionary IT initiatives, strategic analytics recruitment, and cutting-edge leadership methodologies will propel CityLoop into its final form as an analytical competitor.

## Appendix A

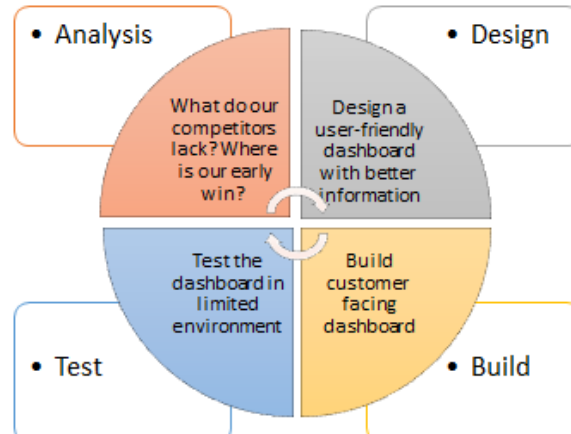
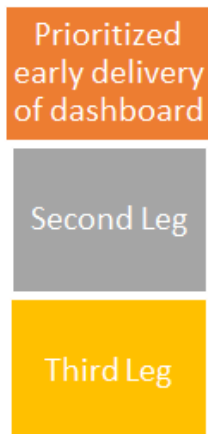
Detailed cost estimate:

 <b>CityLoop</b>	Labor Costs for IT Initiative			
	Project Management	Engineers	Analysts	Data Scientists/Modelers
Hourly Rate	\$35.00	\$40.00	\$30.00	\$60.00
Re-engineer Database (hrs)	20	50	50	5
Develop GPS APIs (hrs)	15	40	40	0
Build 2 Dashboards (hrs)	10	40	60	5
Optimization Modeling for Parking Spaces (hrs)	10	0	0	50
<b>Total Hours</b>	55	130	150	60
<b>Total Labor Cost</b>	\$1,925.00	\$5,200.00	\$4,500.00	\$3,600.00

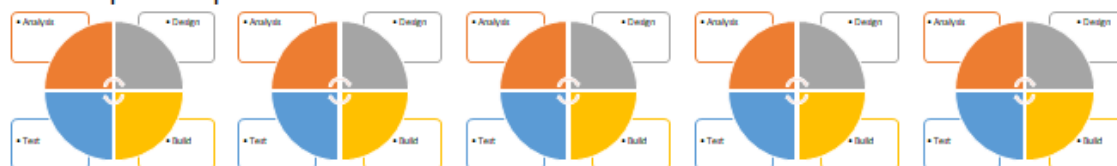
IT initiative Costs	
GIS/GPS hardware for cars	\$1,125,000.00
Labor Costs	\$15,225.00
<b>Total Costs</b>	<b>\$1,140,225.00</b>



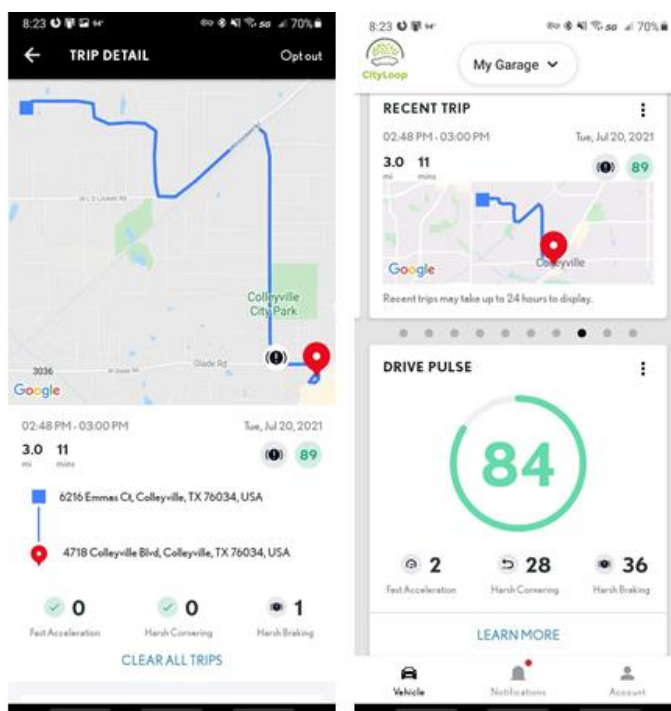
## CityLoop Sprint 1



## Subsequent sprints



## Dashboard samples



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