Operation 3SL

Slow Speed Saves Lives

Phase I:
Problem Definition

CIS 9590
Section QMWA

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A. SUMMARY

The Operation 3SL (O3SL) Project is designed to support New York City's Vision Zero program, which seeks to decrease traffic fatalities. The main goal of Operation 3SL is to focus on the fatalities and injuries caused by New York City drivers and foster the process of reducing both fatalities and injuries caused mainly due to human fault. The objective is to reduce fatalities by 10% each year through 2021.

After the launch of Vision Zero in 2014 by New York City Mayor Bill de Blasio, there have been significant decreases in injuries and accidents. But while fatalities have been decreasing, the rate at which they decreased in the last three years started at 9.3%, dipped to 1.7% and ended at 7% in the most recent year. Maintaining a consistent reduction rate in fatalities is very important in the overall mission of vision 0, which is to get the number of traffic deaths down to 0. While the implementations in 2014 may have been good for the time, year to year updates are imperative in order to maintain the success of the overall program. Over time drivers become aware of camera locations and intentionally lower speeds to avoid tickets. While this may reduce speeding in camera locations, it does not reduce speeding overall in other areas.

The current environment needs a live reporting tool to measure all areas of the city where accident rates are reducing, but more importantly where the rates are increasing or remain high and steady. This will allow NYPD to re-assign mobile speed cameras more frequently to areas which require it. Just as speed cameras in schoolzone have caused a reduction in accidents and fatalities, we need to extend this same process across the city to curb reckless driving.

Operation 3SL is a data reporting product to analyze the areas within the 5 boroughs of New York City to determine the areas where fatalities most occur. Using the analysis produced by the report, the city will have the tools to take better precautions for possible future fatalities in the same areas.

B. SYSTEM SETTING

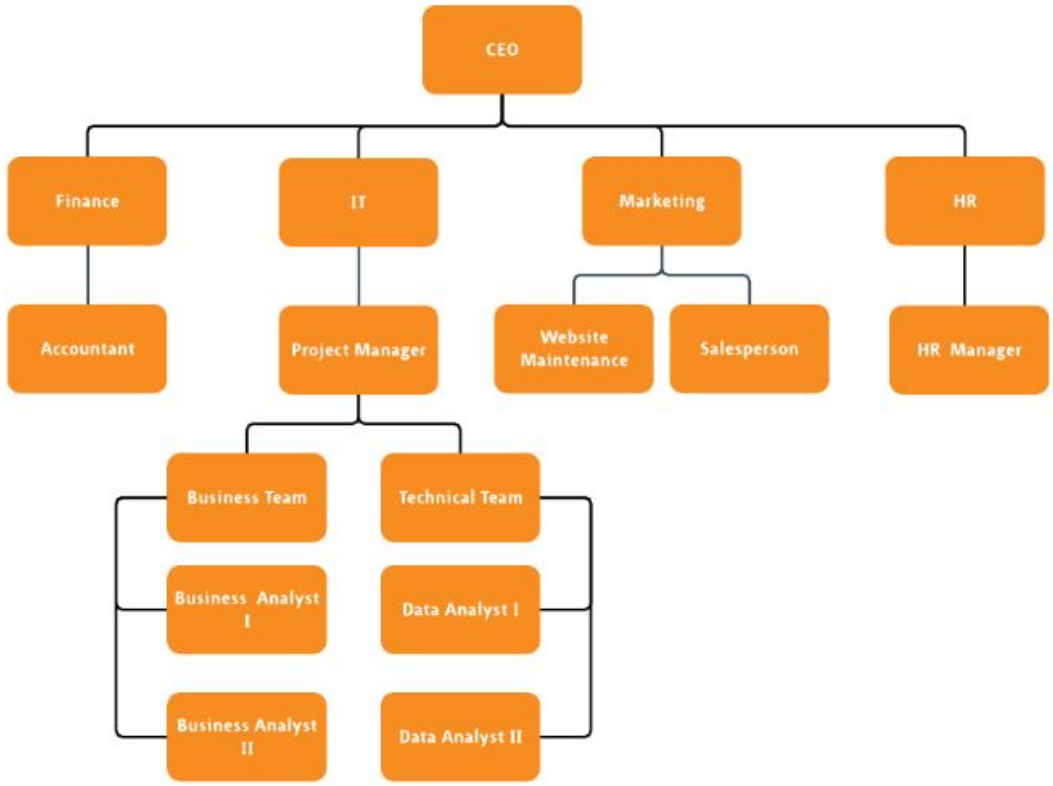
The Operation 3SL project is being built for the Police Department of New York City. It is meant to work in conjunction with the city's existing Vision Zero Program. There is no system dependence between O3SL and Vision zero, rather the analytics and results derived from O3SL can be used in implementing new policies for Vizion Zero.

The O3SL project will have an interactive dashboard with a recommendation engine. Users will be able to select specific criterias such as time range, and location constraints, and incident types, and the recommendation service will respond with the top 3 locations to set mobile cameras in order to reduce accidents and fatalities. Based on year to year historical data, the service will also list out expected reduction rates per recommendation.

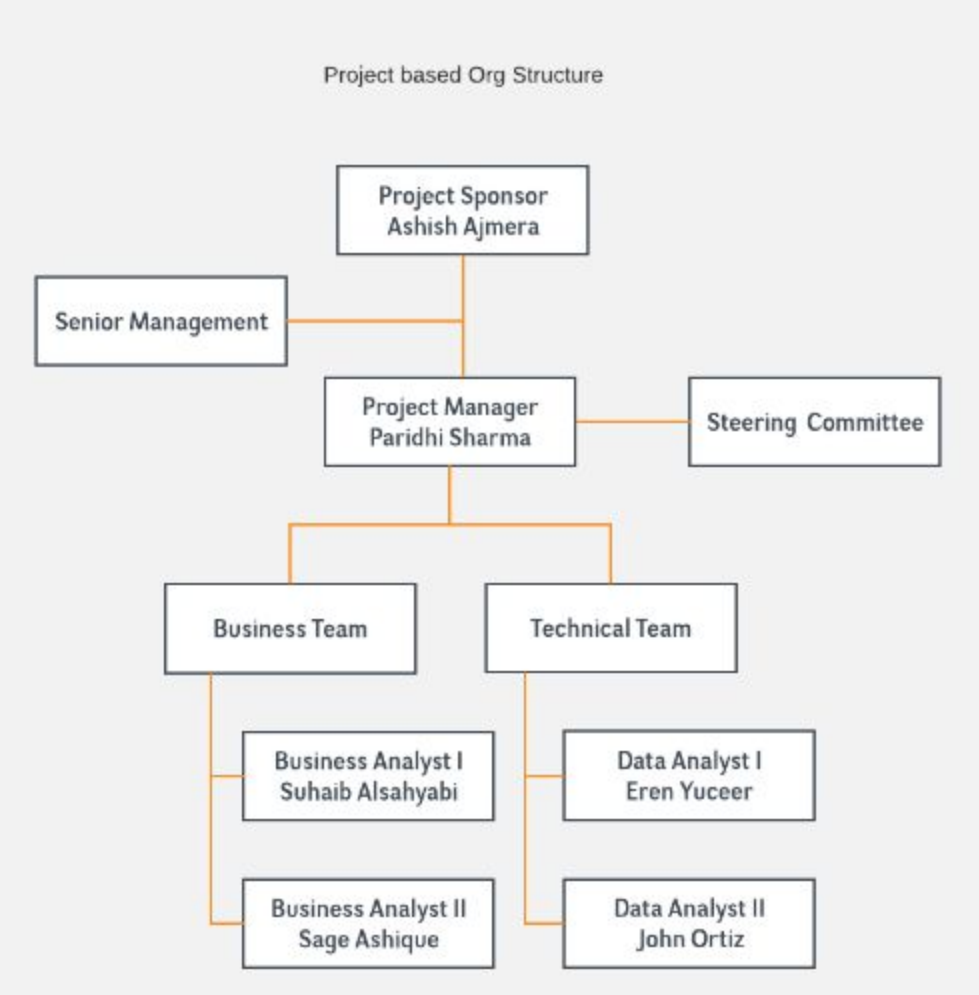
O3SL will further provide an interactive look over the NYC geographic map. Users will be able to select location, time range, incident categories, as well as other filter options to narrow down specific scenarios. The dashboard will allow users to see the number of accidents for that given scenario. The dashboard will also have interactive charts and graphs. The requirements for the outputs of these visualizations will be discussed with the project sponsor in order to determine which types and scenarios are of the highest priority. There will be a nightly automated data dump from a centralized NYPD database to the 03SL data warehouse allowing users to have fresh look at the data every morning.

There will be two automated reports (which are currently created manually) that O3SL will create on a scheduled basis. One report will be for high ranking NYPD officials to get a sense of accidents, fatalities, and speeding occurrences throughout the city. The second will be for the NYPD and DOT personnel who are working directly on the Vision Zero Initiative to have a detailed measure of traffic fatalities on a granular level, based on requirements provided by these stakeholders.

C. ORGANIZATIONAL STRUCTURE



Above is a diagram of the Organization Structure



Above is the Operation 3SL project based organization structure

D. PROJECT ENVIRONMENT

- **Program Start**: The existing process for deciding where to set speed cameras was completely manual. With the initial launch of Vision Zero, speed camera locations were limited to a small percentage of the City's school speed zones. The schools where most complaints and speeding tickets were issued were prioritized.
- **Current State**: The NYPD currently has 100 permanently set cameras around school zones and 40 mobile cameras. The Vision Zero program worked closely with NYPD and DOT personnel in local precincts around school zones to determine the best locations for cameras. In order to prioritize where the City would install fixed speed cameras, DOT analyzed each school zone and ranked

them according to the number of traffic injuries during school hours on school days.

While the permanent camera locations are set, Vision Zero adjusts their mobile speeding camera locations based on high complaints/calls by citizens to their local precincts. The city now plans on further expanding the speed camera network to a total of 290 plus.

- **Current Effectiveness**: The selected locations have helped reduce traffic fatalities by 55% and crashes by 15% within its first year. The overall number of people killed or severely injured in crashes in school speed zones with speed cameras declined by over 21% in the period after the cameras were activated.
- **System's users and responsibilities**: The current manual system is used by the NYPD information technology department. Reports, data, and assessments are shared with DOT. DOT then reviews the reports, and based on priority issues installations in the selected locations. Additional signage is also displayed to increase driver awareness of installed cameras.

E. EXISTING SYSTEM DESCRIPTION

- **The Current System:** The current system is mostly manual. Analysts with NYPD used existing precinct complaints/call, and accident reports (limited to NYC School zones) to create data reports for the Vision Zero Initiative. Higher level NYPD officials worked with DOT to select which schools to add cameras to. Once selected, a walkthrough and mapping of the school zone was done with both parties. The specific location to install the camera as well as locations to add additional signage is determined. Once approved, dates are set to install and start speed monitoring.

  For mobile cameras, locations are based around citizen complaints and accident reports, but based on a shorter term (i.e. number of speeding tickets issued at a certain location in the last 2 weeks). This is also a manual process. NYPD analysts create these reports weekly, and the decision to switch mobile camera locations is based on these reports.
- **Principal inputs for data collection:**
  i. Accident reports: When an accident takes place, a paper report is written up at the scene of the incident. This includes the reasons which caused the accident (i.e. driver negligence, speeding, DUI, etc.), time, location, and if any fatalities occurred. The report is entered into the NYPD database at the local precinct.
  ii. Speeding ticket information: Using radar technology, drivers who speed over the speed limit are pulled over and issued speeding tickets. These tickets include time, location, and the speed at which the driver was

speeding at. The ticket information is entered into the NYPD database at the local precinct.

iii. Citizen Calls/Complaints: The NYPD receives calls and complaints from concerned citizens regarding locations where drivers speed excessively. These calls, which include the time of the call, the time of the incident, and any other information the callers are able to detail, are entered into the NYPD database.

iv. Once data is entered into the NYPD database, it is accessible across precincts and to the NYPD as a whole.

- The NYPD current has multiple processes to handle data:
  i. **Motor Vehicle Accident:** Phone call to 911 to alert of accident → Relevant details taken from caller → Police officer(s) dispatched to location → Officer arrives at location and takes on scene notes → Notes are entered into the NYPD Database → Accident report drawn from data → Speed Camera Location Ranking report is based on aggregated data
  ii. **Speeding Ticket**: NYPD officer pulls over speeding driver → Driver is issued ticket → Ticket Notes are entered into the NYPD Database → Speeding report drawn from data →Speed Camera Location Ranking report is based on aggregated data
  iii. **Citizen Calls/Complaints**: Phone call to 911 to alert of incident → Relevant details taken from caller →
    If incident requires police immediate police intervention: Police officer(s) dispatched to location → Officer arrives at location and takes on scene notes → Notes are entered into the NYPD Database →
    Complaint report drawn from data → Speed Camera Location Ranking report is based on aggregated data
- The existing system has two output reports:
  i. **Accident Report:** Using the data collected, different reports are created for different departments in the NYPD. A report regarding accident rates, tickets issued, and complaints/calls among NYPD precincts is issued out periodically for higher ranking NYPD officials
  ii. **Ranking Report:** In order to determine the best locations to set permanent and mobile speed cameras, a ranking report is issued out for NYPD and DOT officials who directly working on the Vision Zero initiative. This report breaks down the areas which have the most accidents, highest fatalities, most speeding tickets issued, and also breaks down by precinct, as well as school zones.

F. EXISTING SYSTEM PROBLEMS IN ORDER OF IMPORTANCE

- **Problems**
  i. Data is not actually put to best use
  ii. Data is not combined with other datasets
  iii. Data is not completely clean or enriched
  iv. Data is not organized into a clear dashboard
- **Rankings**
  i. It is of critical importance to make the best use of the data available from different sources.However the existing system does not have a single tool feeding through data sources to optimally utilize the available information to make best decisions.
  ii. To increase value of the data through unified system, integration of multiple datasets can help draw specific conclusions
  iii. Next, Dirty data comprising of erroneous, inaccurate, incomplete data if not cleaned could lead to bad decisions.
  iv. There is no way in the existing system to get a clear view of all the statistics at a glance. So once the data is cleaned, organized dashboard can help turn big datasets into actionable insights.

G. GOALS FOR THE NEW SYSTEM

The main goal of the new system is to streamline the process of determining which locations are in most need of a mobile traffic camera. This tool will make use of the dirty and fragmented data currently available from the DOT and NYPD Traffic databases.
It will do so by:

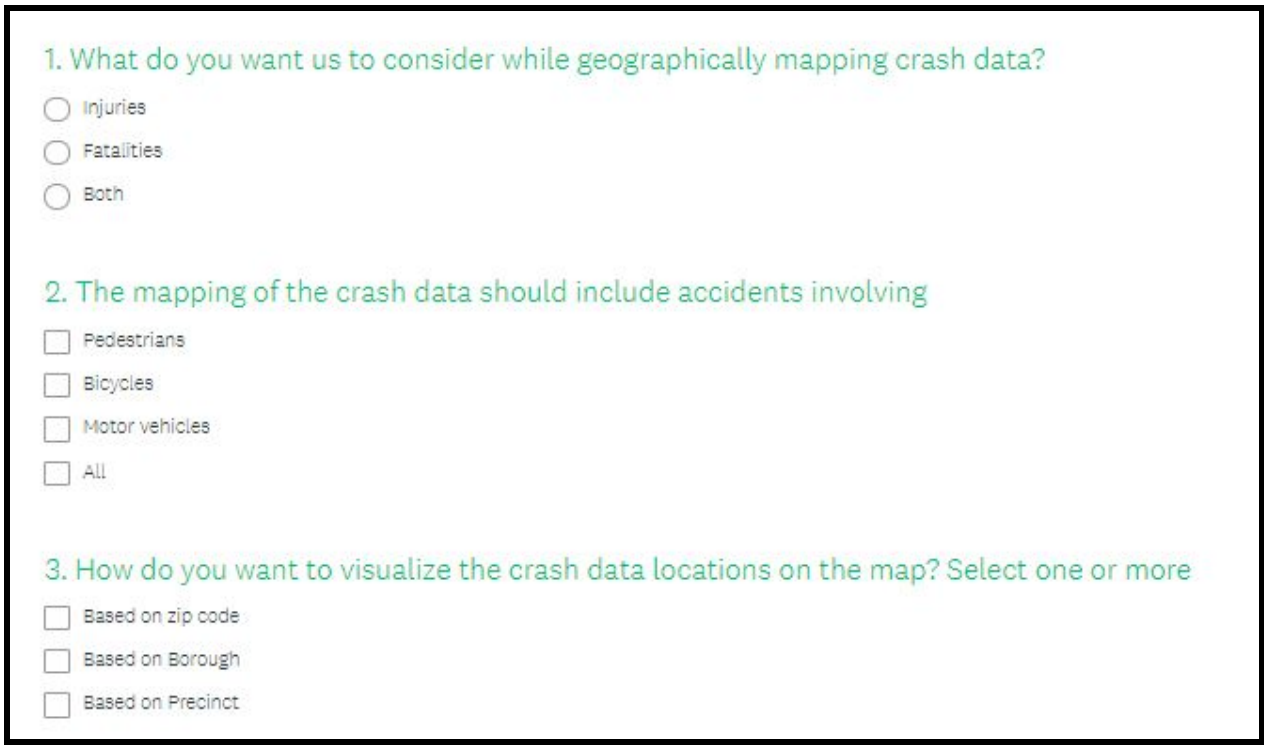
- extracting the data from their source systems and convert them into a consolidated data warehouse format which primes it for transformation.
- transforming the data. Which will involve, cleaning, filtering, splitting a column into multiple columns and vice versa, joining together data from multiple sources, transposing rows and columns, applying any kind of simple or complex data validation, and applying business rules.
- loading the data into a data warehouse where it will be used as the data hosting site for a Tableau analytics dashboard.

This tool will be able to output a ranking of the top areas in need of a mobile traffic camera based on the amount of traffic violations recorded within the area. Identifying these high risk areas will allow the DOT/NYPD to position their mobile traffic cameras optimally around the city at any given time. This will cause a “balancing effect” throughout the city that should result in an estimated 80% reduction over 3 years.

H. DATA GATHERING PLAN

Our data gathering plan consists of extracting data from the Open Data NYC, DOT Vision Zero data repositories.

Questionnaires



Above is the sample questionnaire of the surveys taken by Stakeholders which can help our team to understand specific,granular business requirement expected out of the project.

Sample interview questions

In addition to the surveys, interviews with Stakeholders can also help us understand vision of the project , success criterias, challenges impacting the projects which in turn can help us better plan the project and execute aligned with business requirements.
Some of the sample interview questions are:-

PROJECT VISION

What is your vision for this project?
What defines success for this project?
What are the potential pitfalls?

USERS
Who are the primary users of this tool?

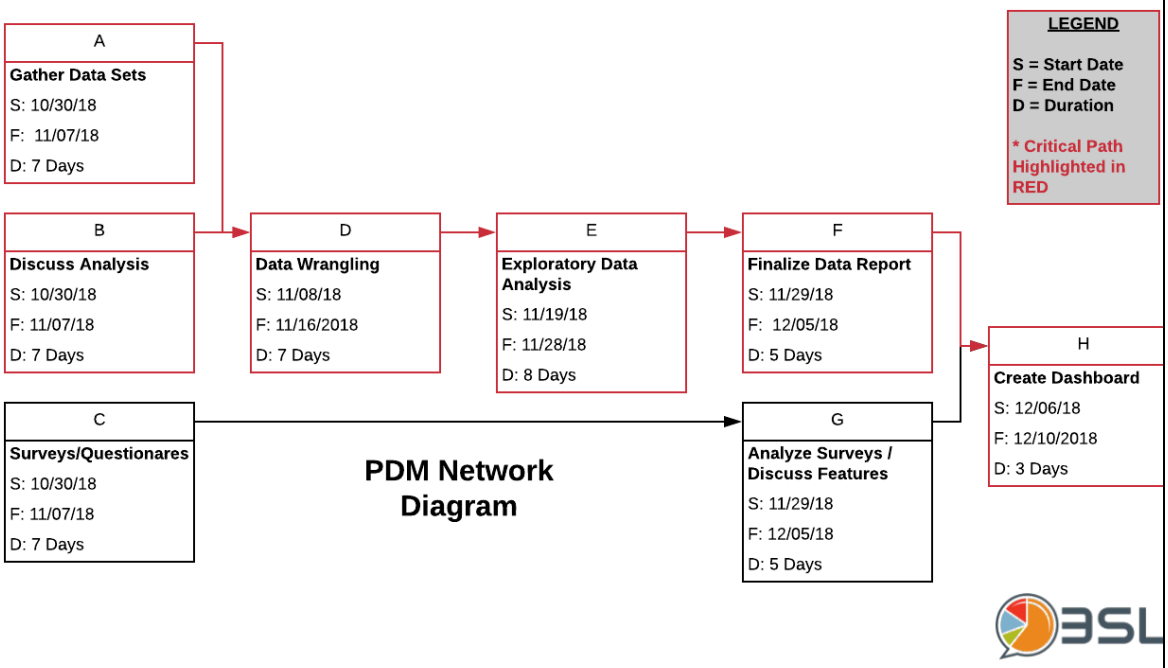
VALUE PROPOSITION
What problem we are trying to solve?

EXISTING TOOLS and METHODOLOGIES
Is there any existing tool in use?
What are their relative strengths/weaknesses?
How is this offering different?

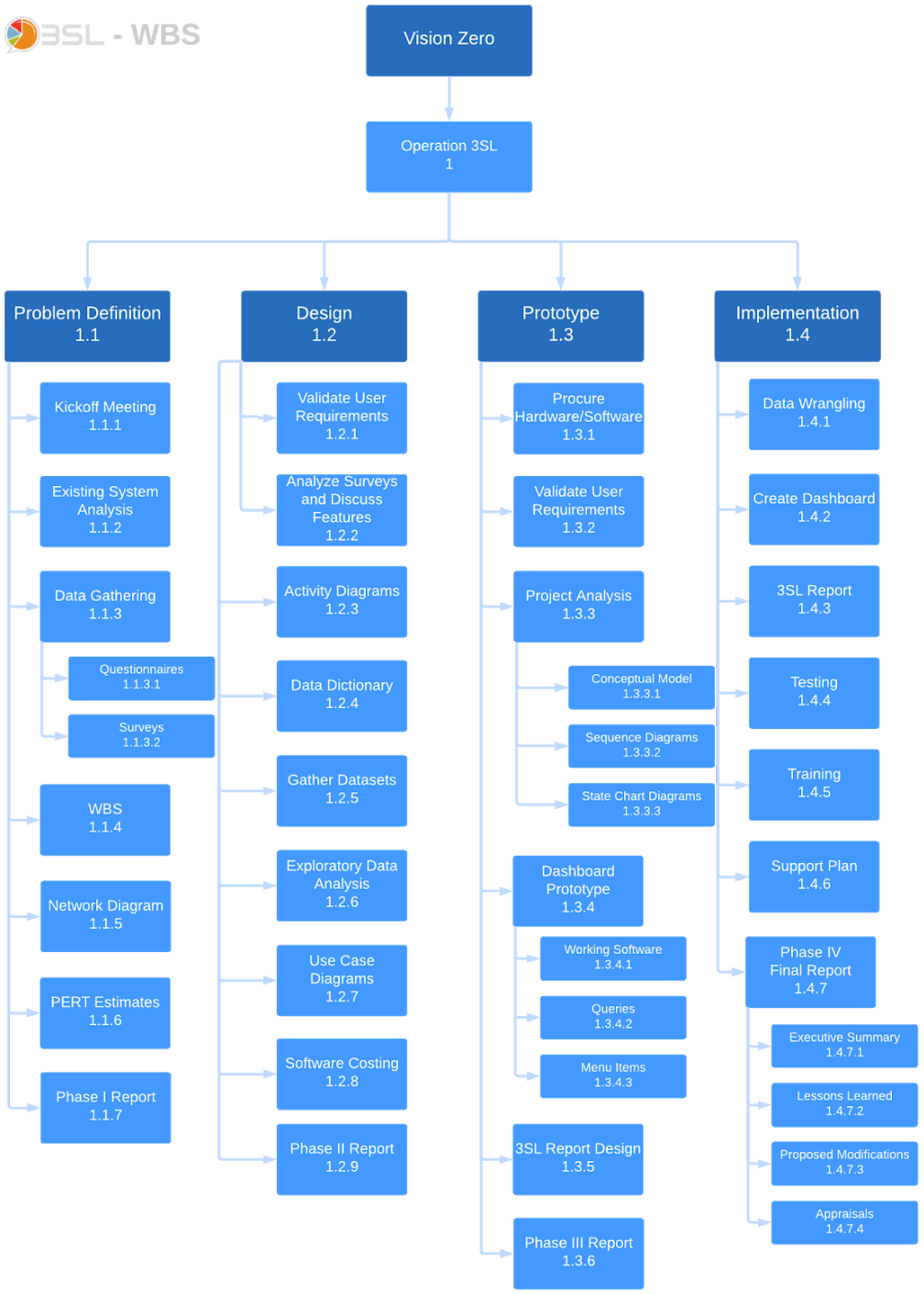
Other data sources
Motor Vehicle Collisions -The Statistical information on motor vehicle collisions can be found on https://data.cityofnewyork.us/Public-Safety/NYPD-Motor-Vehicle-Collisions/h9gi-nx95

Data and APIs of traffic injury and fatality crashes in New York City can be found on NYC Open Data, the City's central data store.

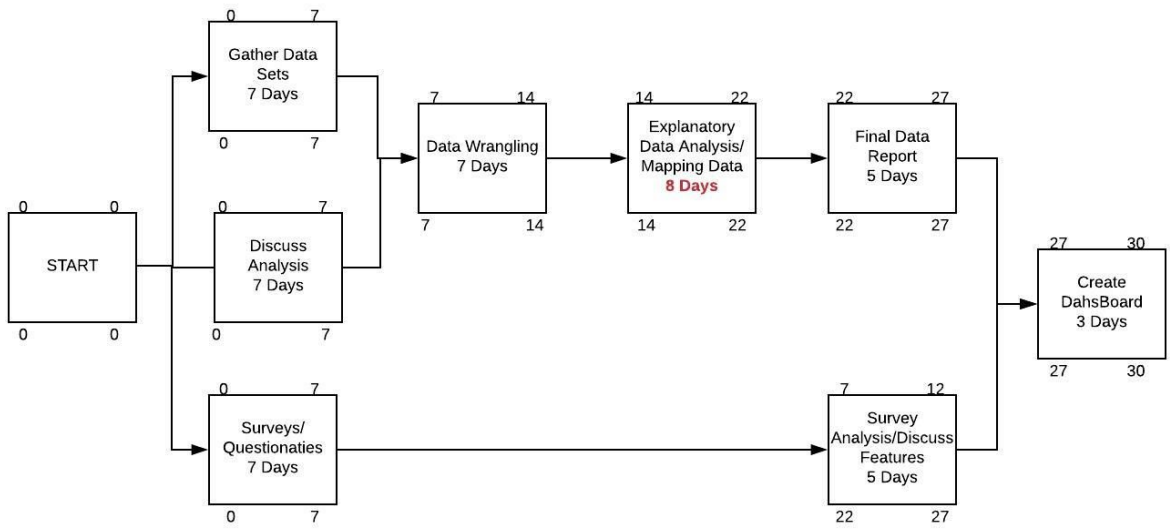
I. OUTPUTS FROM PROJECT SCOPE & TIME MANAGEMENT



Network Diagram


3SL - WBS
Vision Zero
Operation 3SL
1
Problem Definition
1.1
Design
1.2
Prototype
1.3
Implementation
1.4
Kickoff Meeting
1.1.1
Existing System Analysis
1.1.2
Data Gathering
1.1.3
Questionnaires
1.1.3.1
Surveys
1.1.3.2
WBS
1.1.4
Network Diagram
1.1.5
PERT Estimates
1.1.6
Phase I Report
1.1.7
Validate User Requirements
1.2.1
Analyze Surveys and Discuss Features
1.2.2
Activity Diagrams
1.2.3
Data Dictionary
1.2.4
Gather Datasets
1.2.5
Exploratory Data Analysis
1.2.6
Use Case Diagrams
1.2.7
Software Costing
1.2.8
Phase II Report
1.2.9
Procure Hardware/Software
1.3.1
Validate User Requirements
1.3.2
Project Analysis
1.3.3
Conceptual Model
1.3.3.1
Sequence Diagrams
1.3.3.2
State Chart Diagrams
1.3.3.3
Dashboard Prototype
1.3.4
Working Software
1.3.4.1
Queries
1.3.4.2
Menu Items
1.3.4.3
3SL Report Design
1.3.5
Phase III Report
1.3.6
Data Wrangling
1.4.1
Create Dashboard
1.4.2
3SL Report
1.4.3
Testing
1.4.4
Training
1.4.5
Support Plan
1.4.6
Phase IV Final Report
1.4.7
Executive Summary
1.4.7.1
Lessons Learned
1.4.7.2
Proposed Modifications
1.4.7.3
Appraisals
1.4.7.4

WBS Chart



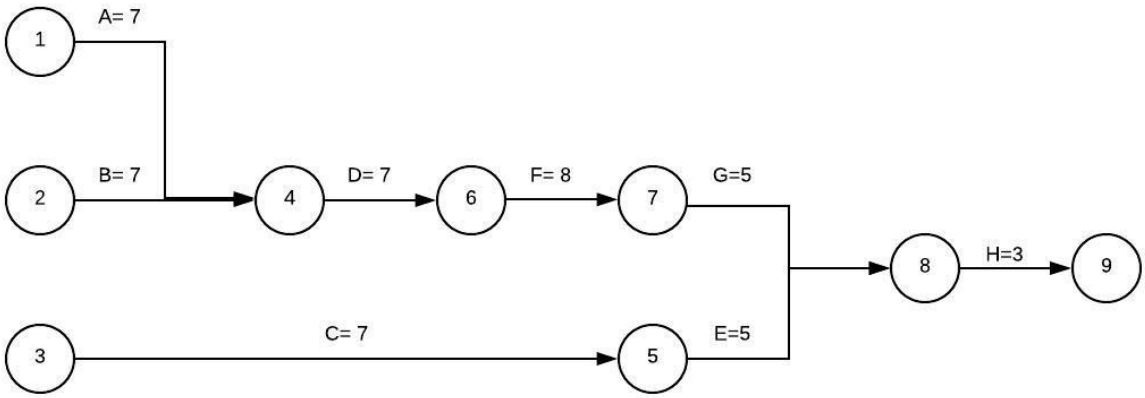
According to the the initial plan, the duration of the project will take 27 days. This duration is estimated and planned after the discussion with stakeholders and the team planning. Before going ahead with the most likely time, three point estimation is done at the below to see whether any adjustment is needed or not for the current duration:

Optimistic Time : 25 Days
Most Likely Time: 27 Days
Pessimistic Time: 47 Days

(Optimistic Time + (4*Most likely time) + Pessimistic time) / 6 =

(25 + (4*27) + 47) / 6 = 30 Days

Therefore, we would use 30 Days on the network diagram instead of 27 when using PERT for above chart. Exploratory Data Analysis/Data Mapping can possibly need 3 more days and we can use these 3 days in that part:



Critical Path:

Path1: A+D+F+G+H = 7+7+8+5+3 = 30 Days

Path2: B+D+F+G+H= 7+7+8+5+3 = 30 Days

Path3: C+E+H = 7+5+3= 15 days

Even there are two path with 30 Days duration, the Critical Path of the project is Path 1 since the Task A(Gathering Data Sets) is more important than task B(Discuss Analysis) in the project.

J. MEETING LOGS AND SIGNED APPRAISAL FORMS

Group Meeting Log Sheet

Date of Meeting: __10/06/2018____ Time of Meeting: _____3:00 PM_____

Group : ____Make It Better_____ Recorder: _____Suhaib Alsahybi_____

Attending: ____Sage Ashique_____ ____John Ortiz_____
____Eren Yuceer_____ ___Suhaib Alsahybi_____
___Paridhi Sharma____ _____

Absent: ___None_____ Excused (circle)?: YES / NO

Topics Discussed:

- Researched additional datasets
- Attempted to clarify and narrow the scope of the project
- Discussed potential problems / opportunities
- Created Draft Phase I Document
- Created Draft Phase I Slides
- Assigned responsibilities

Tasks Assigned	Team Member	Delivery Date
Workon Part F	John Ortiz	10/09
Work on Parts A & B	Sage Ashique	10/09
Work on Part C & D	Eren Yuceer	10/09
Work on Part G	Paridhi Sharma	10/09
Work on Part I	Suhaib Alsahybi	10/09

Meeting Ending Time: _____6:00pm_____

Performance Appraisal & Sign-off

Team member name (print)	Signature	Weekly Contribution
_____John Ortiz_____	_____	__20__ %
_____Eren Yuceer_____	_____	__20__ %
_____Sage Ashique_____	_____	__20__ %
_____Paridhi Sharma_____	_____	__20__ %
_____Suhaib Alsahybi_____	_____	__20__ %

Group Meeting Log Sheet

Date of Meeting: __10/13/2018___ Time of Meeting: _____4:00 PM_____

Group : ____Make It Better_____ Recorder: _____Suhaib Alsahybi_____

Attending: ____Sage Ashique_____ ____John Ortiz_____
____Eren Yuceer_____ ___Suhaib Alsahybi_____
___Paridhi Sharma____ _____

Absent: ___None_____ Excused (circle)?: YES / NO

Topics Discussed:

- Discussed what the existing system really is. This was difficult to nail down because it made us clarify even further what the definition of our system actually is.
- Discussed remaining workload
- Everyone took responsibility for additional sections
- Assigned presentation sections

Tasks Assigned	Team Member	Delivery Date
Complete Doc & Slides	John Ortiz	10/15
Complete Doc & Slides	Sage Ashique	10/15
Complete Doc & Slides	Eren Yuceer	10/15
Complete Doc & Slides	Paridhi Sharma	10/15
Complete Doc & Slides	Suhaib Alsahybi	10/15

Meeting Ending Time: _____7:00pm_____

Performance Appraisal & Sign-off

Team member name (print)	Signature	Weekly Contribution
_____John Ortiz_____	_____	__20__ %
_____Eren Yuceer_____	_____	__20__ %
_____Sage Ashique_____	_____	__20__ %
_____Paridhi Sharma_____	_____	__20__ %
_____Suhaib Alsahybi_____	_____	__20__ %