

## Graffiti-Free NYC

### I. Introduction

The company we are researching is NYC's Economic Development Corporation - a non profit, city agency that seeks to work with and for communities through every step of the economic development process—bringing emerging industries to the five boroughs; creating the spaces and facilities they need to thrive and create jobs; giving New Yorkers the tools and training to succeed in those jobs; and investing in public infrastructure and neighborhood development projects.

Among their many projects, Graffiti-Free NYC is a cooperative effort between the NY Economic Development Corporation, the NYC Department of Sanitation, and the Office of the Mayor. Initiated in 1999, GFNYC is a street-by-street graffiti removal service across all five boroughs of NYC. The program aims to provide no-cost graffiti removal for affected commercial, residential, and industrial properties throughout NYC, enhance overall neighborhood aesthetics, and increase property values.

### II. Strategy

As NYCEDC is a city agency that runs this program in conjunction with other governmental agencies, GFNYC does not have competitors in the public sphere. Rather, its competition comes from private graffiti removal companies. In the private sector, a quote is given to the prospective customer. A cleaning crew then comes out to the affected area and removes the graffiti for a fee. The public and private removal services have different competitive advantages and disadvantages:

#### **Private NYC graffiti removal companies:**

<u>Advantage</u>	<u>Disadvantage</u>
Revenue generating	Not free; customers hesitant to pay
Focused efforts; speed	Beholden to customer review
Likelihood for continuous business	Must generate profit

#### **NYC graffiti removal agencies:**

<u>Advantage</u>	<u>Disadvantage</u>
Free for customers	Volume

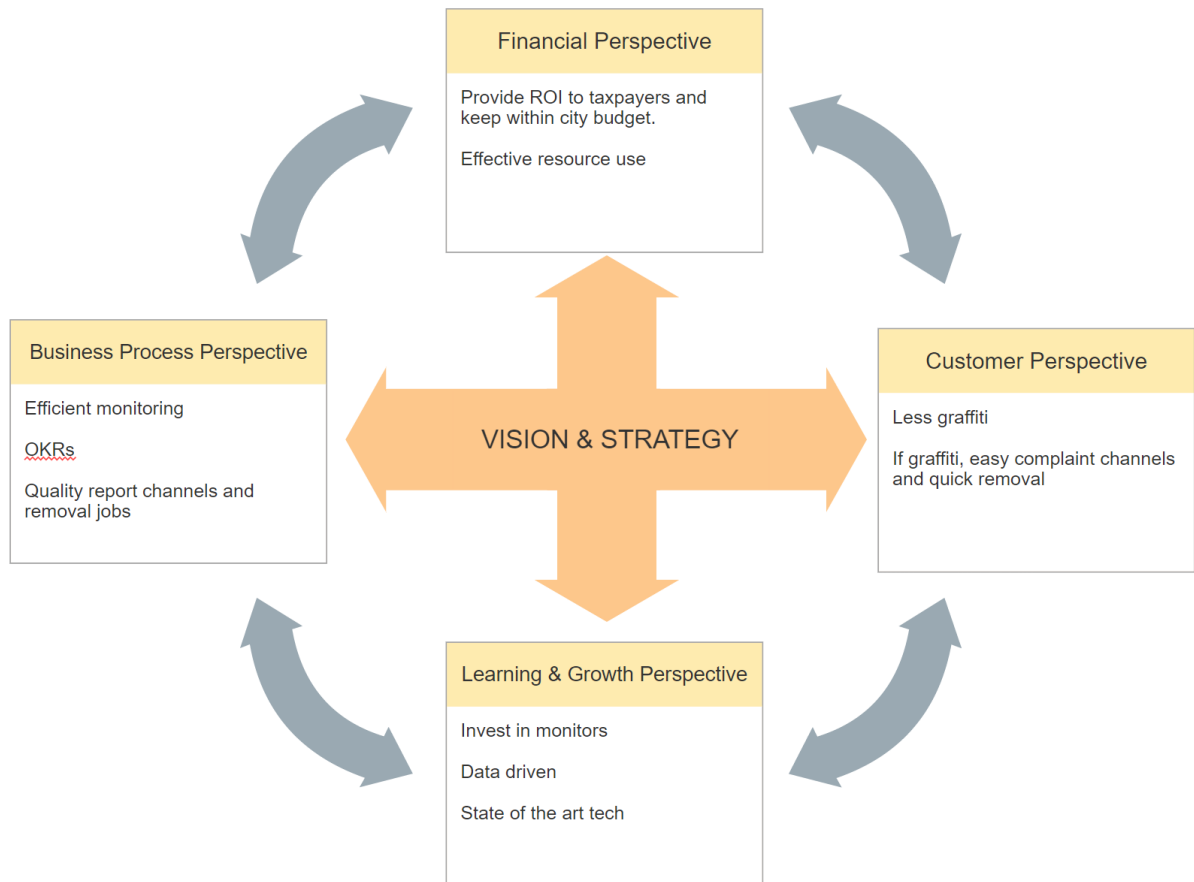
Large budget	Slow pace
No marketing needed	Government control

To summarize the above, private removal companies have the advantage of any normal business - mainly that they can generate revenue. If the company grows enough in profit, the owners and the employees can make more money. As part of growing their revenue, private companies can focus their efforts and do a cost/benefit analysis. Unlike a public agency - that has to cater to any graffiti complaint that comes in - private companies can determine which jobs to take that will be worth their time, money and efforts. Additionally, having the ability to be selective allows them to complete the jobs they do undertake quicker. A disadvantage to being a private company is that there is a free removal service to compete with - GFNYC. Most people will most likely first consider the free option before considering the paying option. Private companies must invest heavily in marketing to draw attention to their business. Additionally, as a private company, the business must cater 100% to the customer. It is beholden to customer reviews and opinions. Lastly, a private company has no choice but to generate revenue. If it does not, it cannot survive. There is no safety net.

NYC agencies have the advantage of a large customer base because most people are attracted to free services over paid ones.. Additionally, NYC agencies do not need to worry about money or marketing, as they receive a large budget from the city. On the other hand, because city agencies have free services, the volume of graffiti complaints is immense. NYCEDC reports that the Graffiti-Free program receives more than 10,000 requests per year. Not only is the volume immense, but NYCEDC must investigate each complaint and add each one to their removal routes. Therefore, graffiti removal by the city can take several months. Additionally, unlike private companies, GFNYC cannot remove or paint over graffiti when the temperature is near freezing, cannot address graffiti higher than the second floor, and cannot remove murals. Lastly, city agencies are beholden to the city. If the city decides to slash the budget, that is the end of the program.

For a private business, graffiti must be present for its removal services to be needed and for it to make a profit. Revenue is the main goal of a for-profit business. However, the government's goal is to ensure NYC's aesthetics. This can be accomplished by either stopping graffiti before it happens or removing it after it happens. As discussed above, the latter way is inefficient. The volume of graffiti instances slows down removal by months and takes up more time, energy, and money for re-beautifying the city. Therefore, to alleviate this burden, it behooves NYC agencies to take a preventive approach to try and stop graffiti before it is ever committed. The strategy is fleshed out by the scorecard and business model canvas below.

**Vision & Strategy Business Scorecard: Ensure NYC's aesthetics by alleviating the amount of graffiti needing to be cleaned.**



From the customer side, a consumer wants two things from the agency. The first is less graffiti in the city. The second - for the inevitable graffiti - is easy communication channels to report the instances and quick removal of the graffiti. As a non-profit, mission-driven organization, the EDC's financial perspective is focused on the return on investment for its taxpayers - fulfilling the customers' desires. It is also important that it remains within the budget provided to it by the city. The customer perspective also drives the company's business processes. This includes developing efficient monitoring systems to prevent graffiti, quality reporting channels and graffiti removal, and OKRs to keep the business on track. Such developments need EDC to invest in monitoring programs, state of the art removal technology, and data driven analysis.

**Business Model Canvas:** Our idea is to focus resources on preventative graffiti measures in order to alleviate graffiti volume and allow for quick graffiti removal, thereby maintaining NYC.

Business Model Canvas		Designed for: NYCEDC	Designed by: Group 5 - DDO	Date: 12/23/21	Version: Final
<u>Key Partners</u>  Who are our key partners and what resources do they provide?  Our key partners are the NYPD, Office of the Mayor, and the DSNY.  NYPD resources → monitoring  Office of the Mayor resources → 311 Channel  DSNY resources → graffiti removal	<u>Key Activities</u>  What key activities do we require for the business?  Develop and depoloy monitoring routes  Take graffiti reports  Remove graffiti  <u>Key Resources</u> What key resources we require for the business?  Tech for determinig routes  Humans for monitoring  Money for gas, cars, removal equipment, salaries	<u>Value Propositions</u>  What value do we deliver to the customer?  Value: a graffiti free NYC  By:  1. Preventing graffiti where possible  2. Removing graffiti where preventative action was not successful	<u>Customer Relationships</u>  How do we interact with customers?  311 channel - to place a complaint over the phone with a real person  People can open a graffiti incident that they can then track the progress on  <u>Customer Channels</u>  Through which channels are our customer segments reached?  311 channel	<u>Customer Segments</u>  For whom are we creating value?  NYC communities	
<u>Cost Structure</u>  What are the most important costs inherent in our business model?  Monitors (NYPD), 311 operators, and graffiti remover salaries are key costs.  Another key cost for graffiti not prevented are high tech equipment (power painters and washers)			<u>Revenue Streams</u>  For what do our customers currently pay? How are they currently paying?  Public pays for this graffiti free service via taxes. If the value proposition is met, the people and the city will likely retain the budget for this program.		

Now that we have our vision and strategy, with all its facets laid out, we will focus on some OKRs.

### OKR 1

Objective: Reduce graffiti in NYC

Key Result: This year, catch 20% of graffiti instances before they happen

Key Result: Improve AI accuracy in predicting new graffiti occurrences by 5% (AI optimizes police patrol routes)

Key Result: Remove 75% of graffiti instances this year

### OKR 2

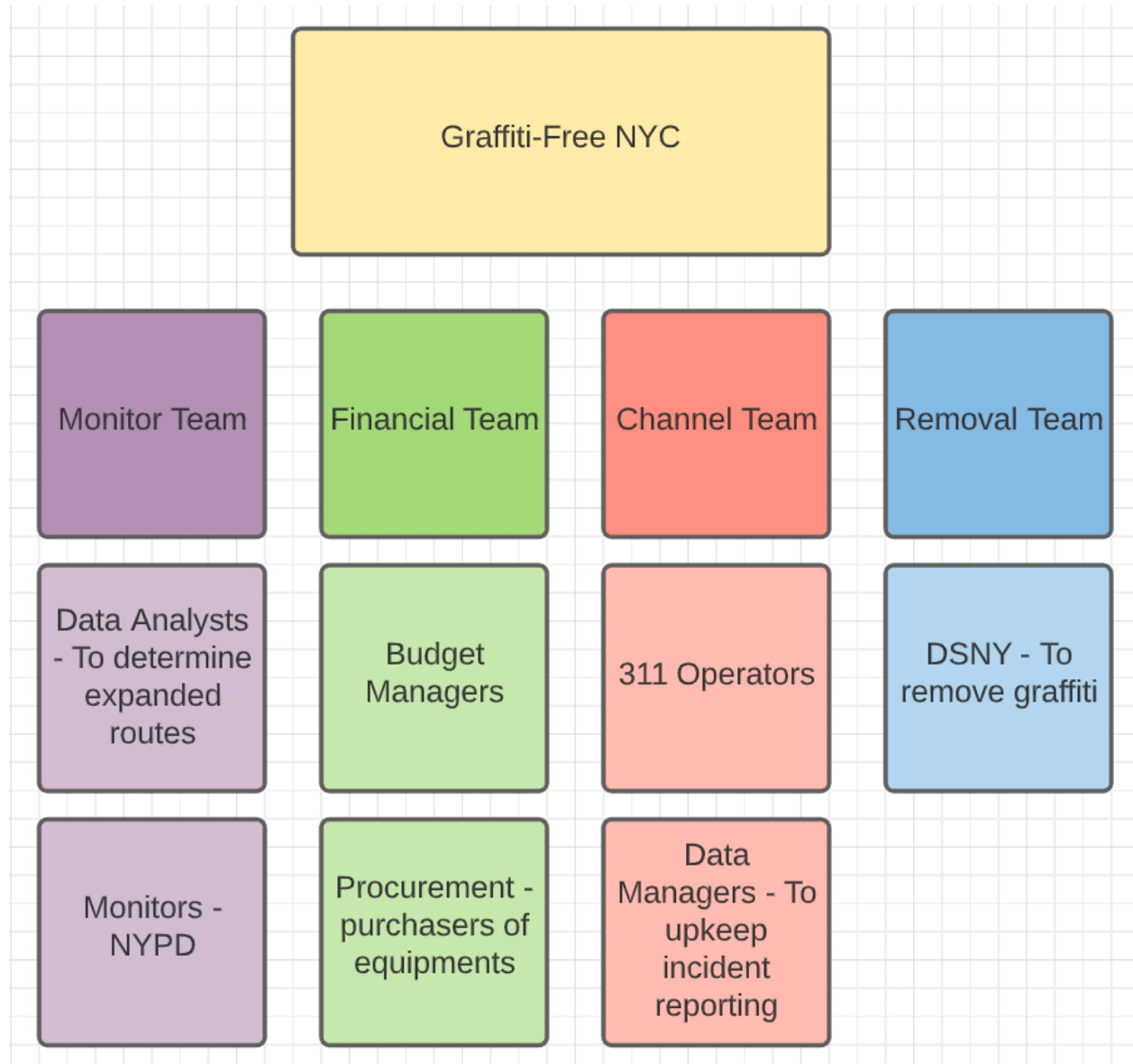
Objective: Remain in budget

Key Result: Reduce graffiti cleaning costs per square foot by 10%

Key Result: Allow 10% of graffiti instances to be covered by artists

Key Result: Check in with budget managers quarterly

Finally, we will examine the team chart that has the roles required to achieve the strategy for the organization.



### III.Design

#### Persona



**Marvel**

##### Goals

Reduce the graffiti removal program's annual budget  
Prevent new graffiti  
Protect areas that have been cleared  
Improve graffiti cleaning efficiency

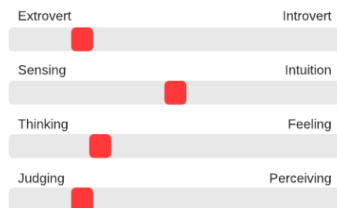
##### Frustrations

The budget grows every year  
New Graffiti appear all the time  
Cleared areas are always covered with graffiti again  
Citizens often complain the low efficiency

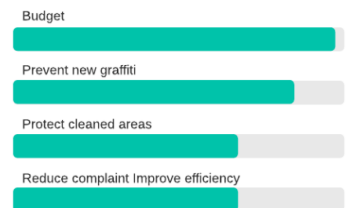
##### General info

**Age** 38  
**Location** New York City  
**Occupation** Official

##### Personality



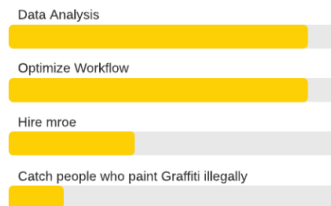
##### The most important job



##### Bio

He serves in the New York City government. His job is to run the Graffiti Free Project in New York City. 3.4 Million Square Feet of Graffiti Removed in The Bronx from 2014 to 2017. But new graffiti appears in a different place every day. This has led to a budget of \$3 million for the Graffiti Free project by 2020.

##### Preferred Methods



##### Cooperative departments



Journey map

Final journey map

Yuehao Wang | December 13, 2021



Marge Simpson

Scenario

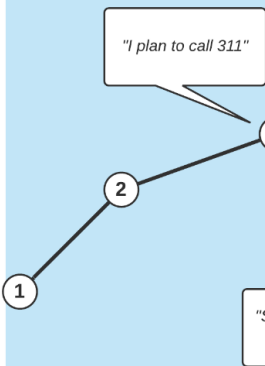
Simpson see a graffiti at her community. The graffiti was the third time she had seen him in a week. She calls 311 to report again.

Expectations

- NYPD/EDC clean graffiti immediatly
- No more graffiti at her community

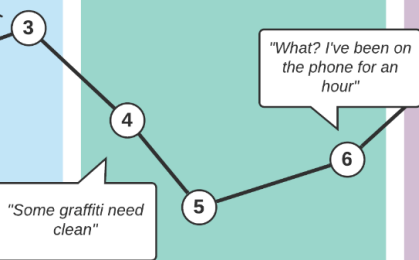
See

- Graffit appear near her community
- Decides to report what her found.
- To call 311



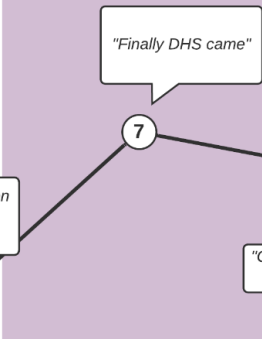
Call 311

- Dial 311
- 311 transferred the call to NYPD
- NYPD transfered the call to EDC



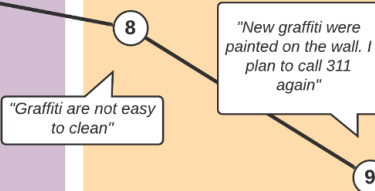
Wait EDC

- Wait EDC over few weeks

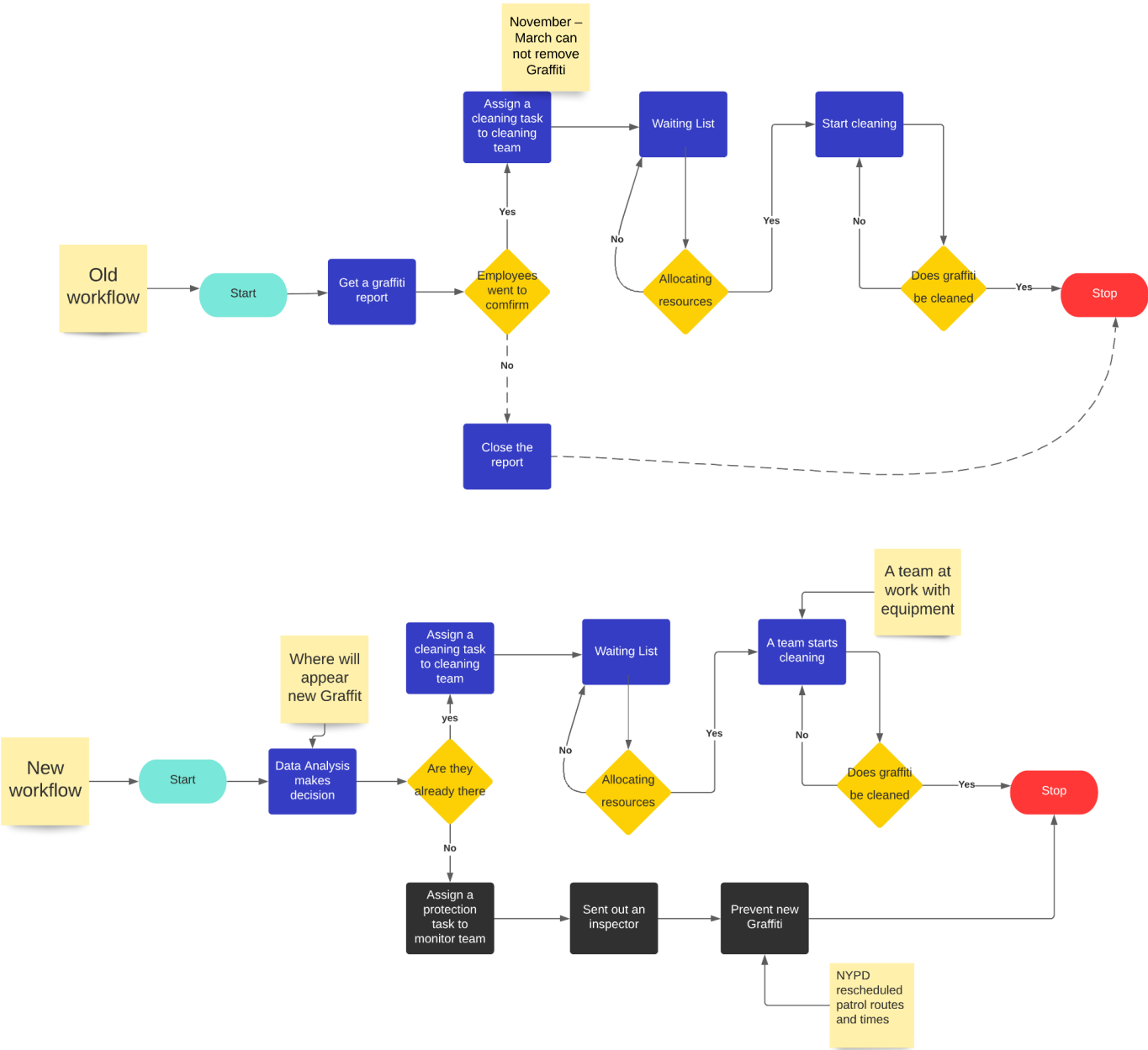


Graffiti come back

- A cleaning team spent 3 days to clean all graffiti
- The graffit came back when the cleaning team left.



Process workflow





#### IV. Analytics Use Case and Dataset

Graffiti is frequent throughout New York City's infrastructure. While some of this graffiti could be beneficial to the city's aesthetic, most is simply vandalism that needs to be removed. Graffiti-Free NYC's objective is to eliminate the aforementioned graffiti.

While Graffiti-Free NYC does a good job at removing graffiti, they're far from perfect. As per the Frequently Asked Questions on their website, "It generally takes several months to remove the graffiti. Graffiti-Free receives more than 10,000 requests per year." While this cleanup rate is certainly better than no cleanup, it is far from ideal. We would like to show how a more expansive use of data within Graffiti-Free NYC can help them become more effective in preventing graffiti.

Big data can help Graffiti-Free NYC predict the nature of graffiti before it happens. Based on past trends and other factors (such as season and population), Graffiti-Free would be able to determine the most likely places for graffiti to occur, when people typically create graffiti, and what type of graffiti would be created (aesthetically pleasing or vandalism). Calculating these factors could help Graffiti-Free become preventative in nature, allowing them to tackle issues of graffiti before they're reported. This will allow for less service calls post facto, and for each service call to be given immediate attention.

If properly utilized, big data combined with informed decision making can help Graffiti-Free NYC become an exponentially more effective organization. Our objective is to lay out the groundwork for how they can make use of their data and to suggest how to implement a data driven business strategy into their organization.

The [physical dataset](#) is provided on NYC Open Data. It contains incidents of reported graffiti throughout New York City. The dataset has approximately 22,140 graffiti incidents (rows) and 19 columns describing the nature of the graffiti (19). The fields included are incident address, borough, community board, police precinct, city council district, BBL, created date, status, resolution action, closed date, x coordinate, y coordinate, latitude, longitude, zip code, census tract, BIN, NTA, and location.

The cleaned version of the dataset, along with the code used to prepare the data for analysis, can be found [here](#). The original dataset had many observations with many missing variables. We deemed the most effective data cleaning method to simply be dropping all of the incomplete observations in the dataset. This cut the number of observations in half, and we will be working with this new dataset from now on.

## V. Dimensional Model



Sql of ER

<https://drive.google.com/file/d/1Mzesly3icXdALquG3nJWJoUv71q2HjAB/view?usp=sharing>

## VI.Governance Model:

The information from the below data dictionary was obtained either via NYC Open Data or general domain knowledge.

Column Name	Description	Data Type	Tags
INCIDENT_ADDRESSES	Street address of graffiti complaint	Text	Location
BOROUGH	One of the five boroughs of NYC	Text	Location
COMMUNITY_BOARD	One of the 59 community boards of NYC	Text	Location
POLICE_PRECINCT	One of the 77 police precincts in NYC	Text	Location
CITY_COUNCIL_DISTRICT	One of the 51 council districts that govern NYC	Text	Location
BBL	Numerical number that represents Borough, Block and Lot location	Text	Location
CREATED_DATE	Date graffiti was reported	Date	Time
STATUS	Status of reported graffiti complaint	Text	Report
RESOLUTION_ACTION	Description of actions taken to resolve the graffiti complaint	Text	Report
CLOSED_DATE	Date issue was closed	Date	Time
X_COORDINATE	Latitude coordinate of complaint address	Text	Location
Y_COORDINATE	Longitude coordinate of complaint address	Text	Location
LATITUDE	Latitude of complaint address	Text	Location
LONGITUDE	Longitude of complaint address	Text	Location

ZIP_CODE	Zip code of complaint address	Text	Location
CENSUS_TRACT	Census tract of complaint address	Text	Location
BIN	Building Identification Number for complaint address	Text	Location
NTA	Neighborhood Tabulation Area for complaint address	Text	Location
LOCATION	Latitude and longitude of complaint address	Location	Location

The information from the below business glossary was obtained either via NYC Open Data or general domain knowledge.

Term	Definition	High-Level Business Rule	Tags
Graffiti	Graffiti is defined as defacing property by etching, painting, covering, drawing upon or otherwise placing of a mark upon public or private property (Google)	Generally speaking, service calls made to Graffiti-Free are assumed to be legitimate graffiti that needs addressing.	Type
Vandalism	Action involving deliberate destruction of or damage to public or private property (Google)	Graffiti-Free should try to distinguish between aesthetical, legitimate graffiti and vandalism.	Type
Power Washing	The method used to remove graffiti from non-painted services, usually natural stone, brick, or concrete (Graffiti-Free NYC)	Power washing and painting are the two methods by which Graffiti-Free removes graffiti from the streets.	Removal
Graffiti Artist	A person who paints graffiti in public places, especially one who specializes in high-quality work rather than vandalism (Google)	The work of a graffiti artist is generally considered aesthetically pleasing, and these works of graffiti should remain in NYC.	Detail

Street Art	Visual art created in public locations for public visibility (Google)	This work is typically deemed aesthetically pleasing and preferable to graffiti from a graffiti artist.	Type
Forever Graffiti Free Waiver	Expedites Graffiti-Free's service of calls (Graffiti-Free NYC)	When someone submits this waiver, they no longer need to have consent from the owner to perform the graffiti cleaning.	Detail
Graffiti Removal Services	Graffiti-Free NYC power washes graffiti from non-painted building surfaces (e.g., natural stone, brick or concrete) and paints over graffiti on painted building surfaces (Graffiti-Free NYC)	Employees should know when to employ each method of graffiti removal services.	Removal
Murals	A painting or other work of art executed directly on a wall (Google)	Murals are often specifically created with a specific intent, and should remain intact.	Type
Building Identification Number (BIN)	Unique identifier for each NYC building (Google)	Every service call should have the BIN of the complaint address recorded.	Detail
Neighborhood Tabulation Area (NTA)	Aggregations of census tracts that are subsets of NYC's 55 Public Use Microdata Areas (Google)	Every service call should have the NTA of the complaint address recorded.	Detail

## VII. AI Use Case

We would analyze NYCEDC's graffiti data to determine where in the past NYC graffiti mostly occurred. Then we would use an AI model to predict what future NYC hotspots for graffiti might be. By pinpointing these zip codes, we can better funnel our monitoring resources to areas that need them the most. By stationing monitors in the most hard-hitting graffiti areas, we expect to prevent a large percentage of the crime from happening. Besides keeping NYC clean, this will also alleviate the thousands of graffiti complaints and removals that the city must currently deal with.

For our machine learning model, we can use the following variables as the features: time of year (created\_date in the EDC dataset), zip code (zip\_code in the EDC dataset), and the close time (how long it takes each incident to close from created\_date to close\_date)

Our label would be, for each location, high level (20-30+ graffiti instances per day), medium level (10-20), and low level (1-10).

This AI use case could prove helpful to NYCEDC in predicting where large (and medium and small) amounts of graffiti will be (or it can be tweaked accordingly using a different machine learning method). However, there are certain items to consider when using AI to determine these hotspots. For one, higher graffiti often goes hand in hand with lower income neighborhoods who often do not like policemen in their areas. For certain neighborhoods, NYCEDC could look into hiring non-policemen to monitor the areas. Second, if prevention resources are focused on certain areas, taxpayers in other neighborhoods may feel as though they are paying for a service they are not benefiting from. With these complaints, NYCEDC can explain that this preventative measure means less 311 volume, thereby allowing the taxpayers' graffiti reports to be resolved quicker. Another issue people might argue is that constant monitoring uses a lot of car gas. To that, it is best to explain that most graffiti routes would be an extension of routes cops already monitor around the city. Adding certain areas to already established routes will not produce a significant increase in gas. Further, there is a concern that catching people mid-graffiti will cause arrest rates to spike and jail cells to overflow. For this, the city can try reclassifying attempted graffiti as a minor misdemeanor. A person need not be brought in until his third time caught mid-graffiti.