NYC Analytics

NYC by the Numbers
Annual Report – 2013

Michael R. Bloomberg
Mayor
City of New York

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Mayor's Office of Data Analytics

December 2013

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Mayor's Office of Data Analytics Team

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Sohaib Hasan	Chief Analyst
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Staff departed in 2013

Benjamin Dean	*Chief Analyst, 2010-2013*
Lauren Talbot	*Chief Programmer, 2011-2013*
Catherine Kwan	*Analyst, 2011-2013*

Letter from the NYC Chief Analytics Officer

Mayor Michael R. Bloomberg created the Mayor's Office of Data Analytics (MODA) with the straightforward mission of leveraging City data for more effective, efficient, and transparent government. While what follows is a brief overview of MODA's significant achievements in a relatively brief time, the pioneering advances in data-driven government detailed in this report had their beginning in Mayor Bloomberg's vision that people have the right to expect their government to be as well-managed as the most modern organizations in the world. While MODA was formally established at the beginning of 2013, citywide analytics is the natural culmination of twelve years of steady and wide-ranging reforms that leveraged technology to create transparent and measurable government performance at a previously unimagined scale. With the support and assistance of the Mayor's Chief Policy Advisor, the Deputy Mayors for Operations and Economic Development, the Chief Information and Innovation Officer, and our agency partners and clients, our core mission from the beginning has been to facilitate the continued advancement of these systemic improvements.

Over the last three terms, our agencies have developed information systems that they use to make our streets safer, our businesses vibrant, and our parks cleaner. Through a blend of statistical analysis, engineering skills, and deep investigation of the missions and organizational structure of the agencies – the why, what and how of city government – MODA ties these systems together, enabling the City to tap into our collective knowledge and experience to tackle our thorniest challenges. While technology has enabled this development, it was enlightened and forward thinking leadership – from senior City officials and veteran civil servants – that made it a reality, and it has lead to dramatic improvements in both the delivery of government services and engagement with New Yorkers.
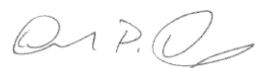
We believe this represents a paradigmatic shift in how government works – one that is guided not only by data, but also the expertise, experience, people and history behind the data. By leveraging all of this intelligence, the Bloomberg Administration has undertaken a new form of government that embraces New York City's infinite nuances. We are not alone in our view. Over the last twelve years, the City has been widely lauded and emulated both here and abroad, as much for the results of the Mayor's vision as for the vision itself.

It is important to note that your government is part of New York City's broader data-driven ecosystem, which draws on the strength of our business, technology, and research and development communities and our well-informed residents. "Silicon Alley" – which spans all five boroughs – is home to some of the world's most innovative firms in data analysis. NYU, Cornell-Technion, Columbia, CUNY and most recently Carnegie Mellon are all developing programs here that will position New York as the academic center of applied data science. Private Citizens who volunteer their time to advocate for transparency deserve much of the credit for both the passage and implementation of the City's Open Data Law, and many of our analytics projects come directly from public suggestions. In short, New York City's government is evolving in tandem with New York City itself, as it should.

Through this first annual report on the state of data-driven government in New York City, we hope to provide some insight into the Administration's efforts to put the City on a sustainable path to leverage data to improve services. Yet the efforts briefly described in this report are also a vivid testament to the potential of data analytics to improve the lives of millions – residents and visitors, entrepreneurs and academics, City leaders and civil servants – through a deeper, more holistic understanding of our City. We invite you to review and critique them through our website, www.nyc.gov/analytics, and help us understand, respect and serve New York City, the greatest city on earth, better than ever before possible.

Thank you for the opportunity to serve. It has been an honor and a privilege.

Michael P. Flowers

EXECUTIVE ORDER #306 ESTABLISHES THE MAYOR'S OFFICE OF DATA ANALYTICS (MODA)

In April of this year, Mayor Bloomberg signed Executive Order 306, formally establishing the Mayor's Office of Data Analytics. The signing was a formal recognition of the importance of using data to tackle problems in NYC, helping to improve services across city government.
Executive Order 306

April17, 2013

WHEREAS, the City of New York has become a national model for collecting data to measure government operations; and

WHEREAS, City agencies routinely collect various types of data on the buildings, streets, infrastructure, businesses and other entities within the City, including but not limited to tax records, building permits, crime-related data, noise and other 311 complaints; and

WHEREAS, much of the data collected by the City is stored within each collecting agency, impeding the ability to aggregate, analyze and synthesize it to better allocate public resources; and

WHEREAS, the establishment of an Office Of Data Analytics and a centralized data sharing and analysis capacity will enable the City to aggregate and analyze data from across City agencies and other sources to more effectively address crime, public safety, and quality-of-life issues by prioritizing risk more strategically, delivering services more efficiently, and enforcing laws more effectively; and

WHEREAS, under Local Law 11 Of 2012 (the "Open Data Law"), The City Of New York must make relevant city data publicly available online, giving priority to data sets that can be used to increase agency accountability and responsiveness, improve public knowledge of the agency and its operations, further the mission of City agencies, create economic opportunity, or respond to a need or demand identified by public consultation; and

WHEREAS, the establishment of a centralized data sharing and analysis capacity will assist in the achievement of the objectives of the Open Data Law;

NOW, THEREFORE, by the power vested in me as Mayor of the City of New York, it is hereby ordered that:

Section 1. There is established in the Office of the Mayor The Mayor's Office Of Data Analytics (the "Office").

§ 2.The Office will be headed by a Chief Analytics Officer. The Chief Analytics Officer shall report to the Mayor's Chief Advisor for Policy and Strategic Planning and shall consult regularly with the Deputy Mayor For Operations, the Deputy Mayor For Economic Development, and the Commissioner Of the Department Of Information Technology And Telecommunications (DoITT).

§ 3. The Office shall develop and work with agencies to implement data-driven solutions to City service delivery issues. The Office's responsibilities shall include but not be limited to the following:

a. Collaborative, Data-Driven Solutions. The Office shall work with City agencies to identify how data held by those agencies can be analyzed and combined with other agencies' data to best fulfill their respective missions, shall develop strategies based on such data, and shall assist agencies in implementing those strategies

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b. Citywide Data Platform. The Office shall develop and implement a citywide data platform that aggregates and updates data from City and other governmental agencies and other sources and that connects and synthesizes data regarding a single address, business, or individual that was previously isolated within individual agencies. In collaboration with DoITT, The Office shall:

1. Work with city agencies to ensure that they have proper technology to provide and retrieve data from the citywide data platform;

2. Train agency staff to use the citywide data platform; and

3. Develop practices for performing ongoing and new data analytics with each agency.

c. Oversight of Data Projects. The Office shall, as appropriate, oversee agency data projects to ensure that agencies use best practices and such projects are appropriately prioritized by need, impact and feasibility.

d. Data Liaison duties. The Office shall serve as the designated point of contact for outside partners contributing to or using City data.

e. Implementation of the Open Data Law. The Office shall work with DoITT to ensure compliance by City agencies with the Open Data Law. The Chief Analytics Officer will also serve as the City's Chief Open Platform Officer (COPO) as defined in DoITT's Open Data Policy and Technical Standards Manual.

§ 4.The Deputy Mayor for Operations shall convene and chair an Analytics Steering Committee Consisting of representatives of the Office Of Data Analytics, The Commissioner of DoITT, and any other Mayor's Office Representative designated by the Deputy Mayor for Operations. The Steering Committee shall first meet within 30 Days of the effective date of this Order and shall develop a citywide analytics strategy.

§ 5.City Agencies shall cooperate with the Chief Analytics Officer to ensure appropriate implementation of this Order. Such cooperation shall include but not be limited to the sharing of relevant data in a timely fashion, and agencies shall facilitate and encourage real-time data exchanges whenever possible.

§ 6. Strategies, processes, and solutions developed by the Mayor's Office of Data Analytics, including the Citywide Data Platform, shall be aligned with the Citywide Information Technology Strategy, as well as the security requirements and enterprise architecture standards as set forth by DoITT.

§ 7. This Order shall take effect immediately.

Michael R. Bloomberg
Mayor

Year in review executive summary

The Mayor's Office of Data Analytics (MODA) worked to provide insight to NYC leadership and agencies, to lead the City's expansion of the Open Data Portal, and to liaise with outside data organizations.

MODA continued to focus on its greatest legacy to NYC operations, DataBridge, the City's single repository of operational data. The data infrastructure that supports DataBridge went fully live in 2013, and MODA continues to support ongoing efforts to liberate new data from NYC agencies, transfer it to DataBridge, and integrate the data in a way that makes it accessible to analysts across the City, as well as to the public through the Open Data portal.

MODA's analytics projects generally fall into several categories: aiding disaster response and recovery through better information; helping NYC agencies improve the delivery of services; using analysis to deliver better insight for economic development; and sharing data with NYC agencies and encouraging best practices in analysis.

During 2013, MODA strengthened its relationships with three of the City's largest operations departments: NYPD, FDNY, and the Department of Buildings (DOB).

- On a project sponsored by Deputy Mayor for Operations Cas Holloway, and incorporating information from the NYPD 911 system, the FDNY dispatch, and the EMS call systems, MODA programmers calculated the City's first complete 911 end-to-end response time measurement.

- At DOB, MODA worked with the Queens illegal conversion investigation team to pilot a new risk algorithm for identifying unsafe apartments, a project that has now been expanded to the entire City.

- At FDNY, the newly-created internal analytics team worked with MODA to launch

the City's Fire Risk Based Inspection System (RBIS).

- Additionally, Hurricane Sandy proved to be a major analytics challenge. MODA worked to integrate and analyze data from the recovery effort, generating the daily reports that informed City Hall of the storm's impact. The reports included daily improvements in conditions, and highlighted where further actions needed to be taken. Since then, MODA has continued to work closely with the Office of Emergency Management (OEM) and the Office of Long Term Planning and Sustainability (OLTPS) to ensure that the City has the insight it needs to best prepare for and respond to the next catastrophic event.

MODA expanded this year into working with Small Businesses Services (SBS) and the New Business Acceleration Team (NBAT) to help drive economic development for NYC's tens of thousands of small businesses. That effort began with a very simple question after Hurricane Sandy: where are all of the businesses in the City? MODA conducted the City's first census of NYC businesses, providing better insight into economic activity at the block level. With NBAT, MODA calculated NBAT's efficacy in helping businesses navigate the City inspection process and open doors more quickly to new customers. In collaboration with SBS and DoITT, MODA developed the City's first Business Atlas, which provides granular information into neighborhood economic activity, including the establishment of new businesses, and information on market demographics.

In addition to its core functions of DataBridge and analytical projects, MODA added a new skill to its tool belt in 2013, working with City Hall policy makers and the City Council to model the different effects of proposed legislation. By building fact-based, objective models, MODA is

able to support better fact-based decision making in the legislative process.

All of this work, from DataBridge, to predictive analytics, to legislative analysis, belongs to the people of the City. NYC is committed to having the nation's best Open Data portal, and MODA continues to lead the charge on making it so, while safeguarding and respecting the privacy rights of New Yorkers. This year, the City revamped its Open Data portal, adding important new data sets, as well as finalizing its open data implementation plans with each of the City agencies.

Finally, MODA is committed to partnering with outside agencies to expand the capabilities of the office, and to share best practices with other cities around the Globe. In 2013, MODA launched research partnerships with NYU's Center for Urban Science and Progress, Columbia's Center for Data Science, the Rensselaer Polytechnic Institute, and sent its first Chief Programmer to the inaugural class of the Cornell Technion program. MODA has developed fruitful corporate partnerships, including a test demonstration with Microsoft Labs that makes use of machine learning to automatically respond to 311 SMS messages. MODA continues to work directly with members of the public, participating in hackathons, taking new project ideas directly from citizens, and soliciting feedback on risk filters at community forums across the City.

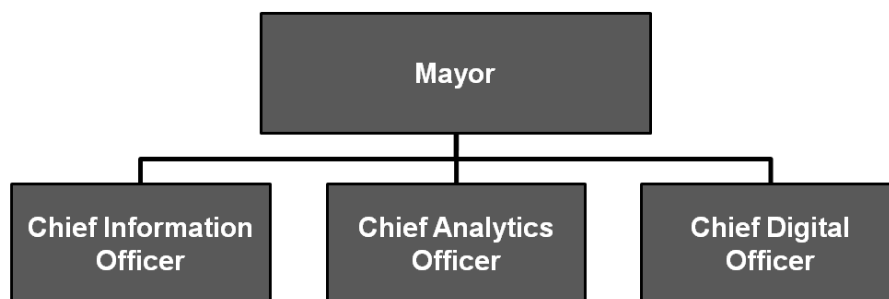## Team Structure: Lean Startup, Maximum Impact

MODA sits within City Hall, working closely with the Deputy Mayors for Operation and Economic Development, as well as the City's Chief Information and Innovation Officer (who also serves as the Commissioner of DoITT). Along with the CIO and the Chief Digital Officer, the Chief Analytics Officer serves on the Mayor's technology council, executing City Hall's policy of infusing analytical rigor into all aspects of City operations.

The MODA staff is a relatively small team of analysts, and technical and administrative support staff. At the core of MODA's structure are the analysts, who have a mixture of statistical, economic, and computer science backgrounds. City data projects are rarely straightforward, and MODA's analysts are experienced in taking ambiguous problems, and often data of varying degrees of quality, and finding a workable solution.

Finding those solutions often means a mixture of new techniques and experimental technology. It's important to note that when it comes to analytical work, MODA is tool, method, and platform agnostic. MODA is not committed to any single approach, but is instead committed to a common outcome: using data to create a better functioning City.

NYC Technology Organization

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DataBridge Warehouse: Enabling the City to Know What We Know, and Act Accordingly

DataBridge infrastructure

The task of integrating New York City's critical data into a single database was the necessary first step in building the system that MODA would use for its day-to-day analytics. With hundreds of data systems, whose age and architecture varies widely, MODA's talented technology team, in cooperation with the Mayor's Office of Operations and DoITT, set off to construct a powerful, but agile, data system. Aggregating cross-agency data is often first a political, legal, and cultural discussion. Once it's agreed to share data, there has to be a method to share, and a place to park the data, in a manner that respects privacy and statutory obligations. Making use of existing data transfer systems within the City to minimize cost and logistical disruption to ongoing processes, MODA built upon 311's database, to construct a powerful but agile DataBridge.

With an eye toward predictive data analytics, MODA created the DataBridge warehouse to assist the City in using its data resources to generate the greatest performance improvement. DataBridge permits cross-agency data analysis from over 40 different agencies. Through detailed analytics, MODA finds previously unknown patterns and relationships that lead to better decisions and resource allocation. All data from the City's data element exchange program (DEEP) is loaded into the DataBridge warehouse as it is brought online.

DataBridge itself is a combination of technologies, including database management and statistical analysis tools. The foundation is an analytics data warehouse/repository with a suite of analytic and data fusion tools, making the data available to analysts across the City.

By virtue of assembling the data into a common repository, MODA also improved the quality of the data accessible to the City's analysts. For instance, MODA uses a geocoding system, developed jointly with DoITT that associates geo-identifiers with NYC addresses and other geographic information, so that the data stored in DataBridge is all keyed to a common location language. This allows data from multiple agencies to be easily merged and used together in analysis.

While significant progress has been made to date, much remains to be done. Indeed, due to the size and diversity of the City's operations, citywide data integration will be a perpetual effort. In the coming year, MODA anticipates the addition of dozens of additional data sources, both from City agencies and other sources. Moreover, while the current system resides in a physical warehouse structure, MODA has begun planning for a transition to a cloud-based analytics architecture, leveraging DoITT's growing expertise in cloud computing.
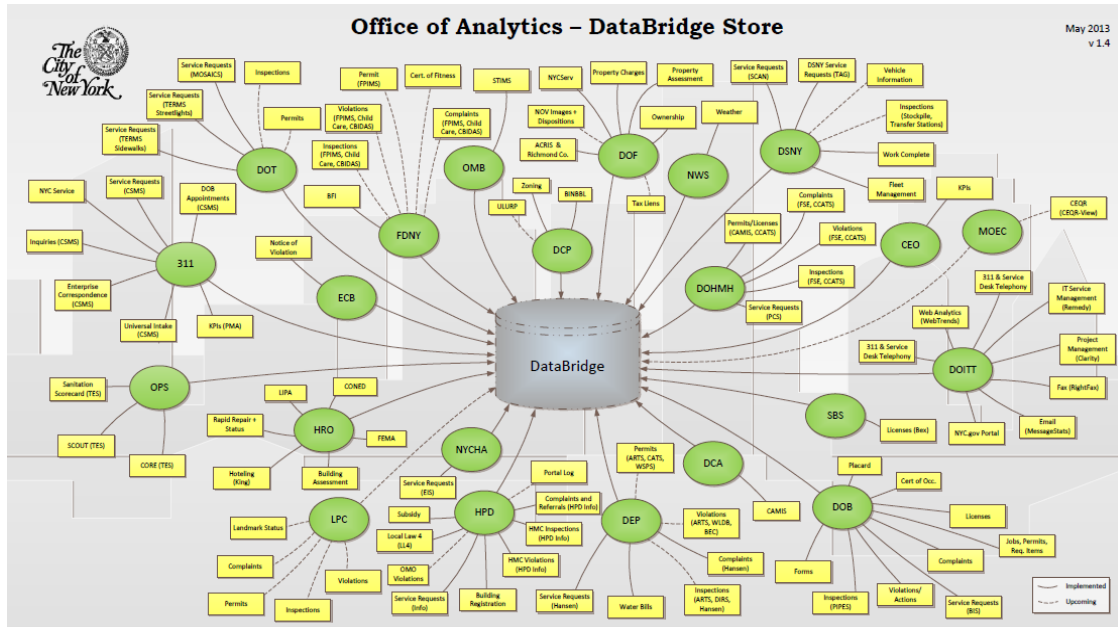
The above data map illustrates the data collected, by agency, and agency system, and fed into DataBridge.

Data Element Exchange Program (DEEP)

In a City of more than eight million people, it is crucial that agencies are efficient and able to respond quickly to the needs of the public. Having all the information necessary to make decisions that affect the public often means collecting data from several different agencies within the City. As a central analytics unit, MODA has exposure to the hundreds of data systems within the City, and through the authority of the Executive Order, MODA possesses the ability to serve as a data broker, making sure that agencies are sharing information as needed to drive better City operations.

Sponsored by MODA, the Data Element Exchange Program (DEEP) has successfully connected many City agencies, and streamlined the process involved in sending information across agencies, effectively replacing outdated methods of transferring data, such as email and fax, which were time consuming and inefficient. Whereas in the past, analyst between agencies literally relied on an analyst sending an email at a certain time of the month, creating a single point of failure, MODA through DEEP has encouraged the automation of data sharing, to strengthen access to data, and to ease the troubles of information gathering.

The NYC agencies involved in DEEP are able to send and receive information in a consistent format, on a regular, scheduled basis. One of the key features that DEEP allows is real time exchange of information, which was not possible before the implementation. Regardless of the sophistication of the base system (mainframe or brand new) within an agency, new records are constantly being created and pegged with a timestamp. Nonetheless, because of the sheer number and variety of systems, it was very difficult to share those records in anything close to real time. Using the City's DataShare platform, DEEP automates agency processes, boosts internal efficiencies, and reduces customer wait time.

While the specific systems from agency to agency vary, the methods of transmitting the data are relatively common. With a single new method, DEEP is able to extract and transfer data for a variety of agencies. The architecture makes it possible to add new agencies regardless of the technology used, effectively laying the groundwork for future information sharing.

To date, DEEP has implemented more than 200 automated exchanges between 30 city

agencies, external vendors, and other government domains. Entities include:

- 311
- Dep't of Buildings (DOB)
- Dep't of City Planning (DCP)
- Dep't of Environmental Protection (DEP)
- Dep't of Finance (DOF)
- The Fire Department (FDNY)
- Dep't of Health (DoHMH)
- Housing Preservation and Development (HPD)
- Housing Recovery Operations (HRO)
- The Police Department (NYPD)
- NYU Center for Urban Science and Progress (NYU CUSP)
- Consolidated Edison (ConEd)
- Long Island Power Authority (LIPA)
- National Grid

These agency integrations have resulted in many benefits to the public and the City. One instance of this has been FDNY sending specific violations to the Environmental Control Board (ECB). Prior to DEEP, sending violations were a manual process that allowed for many errors, and the violations would take up to 30 days to reach ECB, resulting in lost funds for the City. DEEP has managed to create an automated, electronic process; the turnaround time was brought down to 1-2 days. The elimination of errors has increased revenue collection by $1.2 million.

Enabling Citywide Analytics by the Agencies

In addition to serving as the backbone of MODA's analytics efforts, the data that is integrated and accessed through DataBridge is increasingly used by analysts who work inside the agencies. MODA is a relatively small team, with only a handful of analysts, but across the City there exist a far greater number of analysts who work with their department's data every day. These analysts range from business analysts who report on the day-to-day operations of agencies to GIS analysts who are focused on visualizing the operations of the City to researchers that are conducting large scale, longitudinal studies, to computer science experts who are improving the City's IT backbone.

While MODA maintains a strong foundational understanding of the data and operations across the City, working directly with these agency analysts greatly improves MODA's expertise in agency data. That understanding in turn improves the quality of analysis that's coming out of MODA. For instance, the analysts at the Department of Buildings have been invaluable in

helping to educate MODA analysts on the importance of building code changes over time in New York City.

In addition to working with these subject matter experts to further understand the data of the agencies, MODA works with these analysts, through DataBridge, to enhance the data set available for their analyses as well. In the past, when agency analysts have worked on the tough problems of their department, they've often been restricted to the data sets within their walls, and have had difficulty understanding what's going on citywide that could provide greater insight into how to solve the problem. Now, with access to DataBridge, these analysts can use citywide data in their analyses, and paint a more accurate picture of what's going on. Better information leads to better analysis, which in turn leads to better decision making by agency leaders.

As we build the technological capacity of city agencies to leverage city data, we are also

training city personnel in how to use it. To that end, MODA has worked with analysts from over a dozen City agencies, including the Department of Buildings (DOB), Department of Consumer Affairs (DCA), the office of Corporation Counsel (Law), the Office of Emergency Management (OEM), the Department of Environmental Protection (DEP) the Fire Department (FDNY), The Department of Finance (DOF), the Department of Housing Preservation and Development (HPD), the Human Resources Administration (HRA), the New Business Acceleration Team (NBAT), the Department of Parks and Recreation (DPR), the Police Department (NYPD), the Department of Sanitation (DSNY), the Sheriff's Office, Small Business Services (SBS), the Office of Special Enforcement (OSE), and more, all of whom have benefited from DataBridge data. Moreover, partnering with the Department of Citywide Services (DCAS), we have established a series of training workshops for city analysts – effectively initiating a course in "Citywide Analytics 101," that will train dozens of civil servants in how to leverage Big and Open Data in their day-to-day responsibilities as well as strategic decision-making.

Building on MODA's example, the Fire Department recently established its own analytics team. The team includes several talented statisticians, and owns the continued development of the Risk Based Inspection Model. MODA was privileged to work with FDNY on the revamp of RBIS, and transitioning that project directly to the agency is precisely the way that MODA was designed to function: work directly with the agencies on some of their toughest data problems, and work with them to develop their own, independent ability to leverage city data on an ongoing basis.

The Department of Finance (DOF) has made great use of DataBridge, and in particular, its Palantir tool, to better understand tax fraud in NYC. DOF was an early adopter of DataBridge, and has launched several projects that make use of the data warehouse and analysis tools. Similarly, the Sheriff's Office has used DataBridge and Palantir to track illegal cigarette importation rings, developing their own in-house intelligence team.

Working closely with the Office of Special Enforcement (OSE), MODA has put DataBridge on the road. On a pilot project with Palantir, MODA and OSE have developed a tablet application that allows inspectors in the field to easily see everything that the City knows about a given location.

Improving Citywide Operations

Measuring 911 End-to-End Response

Incident Response Times 11DEC2013 - 11DEC2013
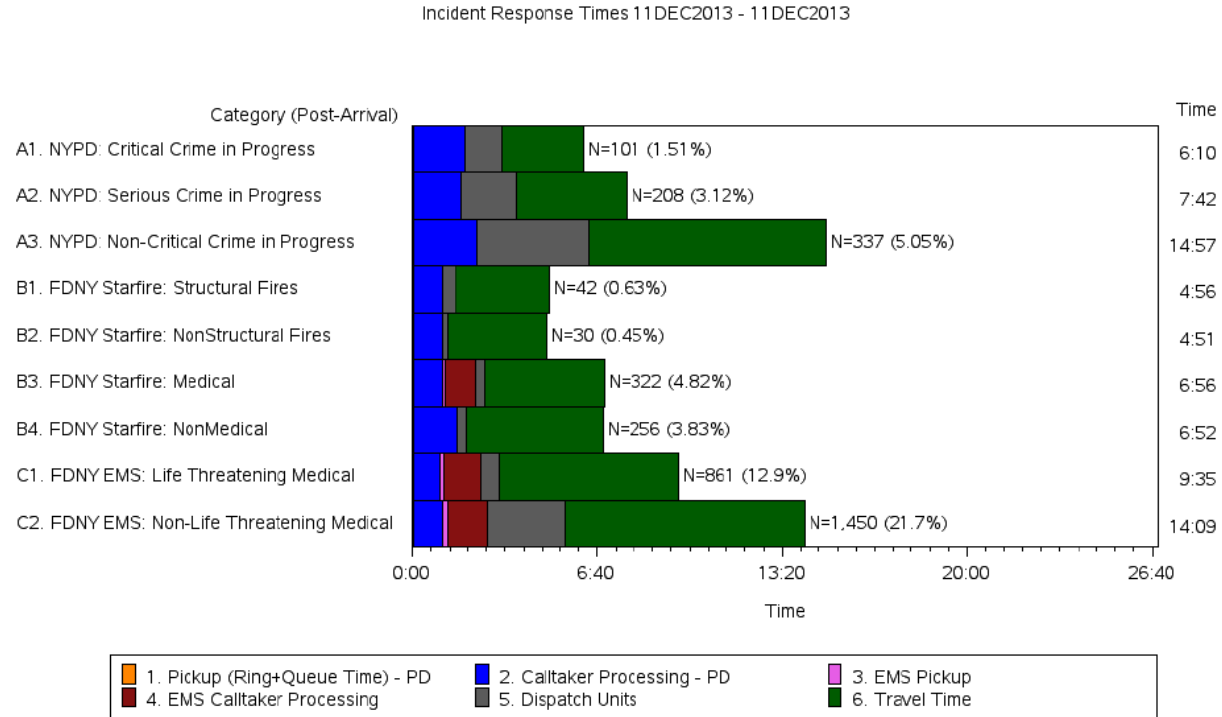
The 911 end-to-end analysis is generated every morning and delivered to the Deputy Mayor for Operations and other emergency services leadership, to monitor's the City's response time to nearly 25,000 calls to 911 every day.

Emergency response is among the most fundamental services the City provides to New Yorkers. From the New York Police Department responding to crimes in progress, to the Fire Department rolling trucks to dangerous fires, to Emergency Medical Services quickly treating threatening medical events, NYC emergency response services arrive on scene within minutes of emergency 911 calls, which total 25,000 day.

Following the management mantra, "if you can't measure it, you can't manage it", MODA was commissioned by the Deputy Mayor for Operations to calculate the City's first complete end-to-end analysis of 911 response times. Prior measurements of 911 response had accurately measured all the individual components of the call process, including the initial call relay from the telecommunications provider and the

transfer times between agencies, but due to certain technological and data analytic limitations, the entirety of an individual call was not previously calculated. In situations where second truly matter in life and death situations, an accurate analysis of the 911 end-to-end response time helps the City to make better decisions about managing response time.

When a New Yorker dials 911, they receive one, integrated experience. From the initial routing of the call through Verizon to NYPD telephone operator fielding the call until emergency services are on the scene, the caller is served by a staff of trained professionals who are collecting the vital information quickly and efficiently. But behind the scenes, 911 is a system of systems. Those systems vary in age from one-year-old to systems that have been around for decades. These systems were all

built at different times, for different technology owners, with different features required; there is no single identifier data field that unites the data among every system.

Digging into the data behind each of the systems, MODA was able to connect data from one system to the other using identifiers like time, location, nature of the event, and individual call taker identification values. With greater than 95% of events traceable in that way, MODA constructed an analysis that tracks 911 response time by incident type down to the second for every segment of the 911 transaction. Across the City, "Critical Crimes in Progress" are routinely responded to in fewer

than eight minutes. While it is difficult to reduce that time by making police cars race even faster through NYC streets, the City is taking action to reduce time to respond, including shortening the initial operator script, improving the relay between agencies, and more effectively routing services to the location. The information provided by the 911 end-to-end analysis will lead to a better understanding of emergency services, and decision making that leads to faster responses at the most critical times for New Yorkers. Moreover, in another first in data-driven government, NYC has made this analysis available to the public. A regularly updated 911 Analytics report is now available at www.nyc.gov/911reporting.

Using Predictive Analytics to Improve City Services

FDNY's Risk Based Inspection System (RBIS)
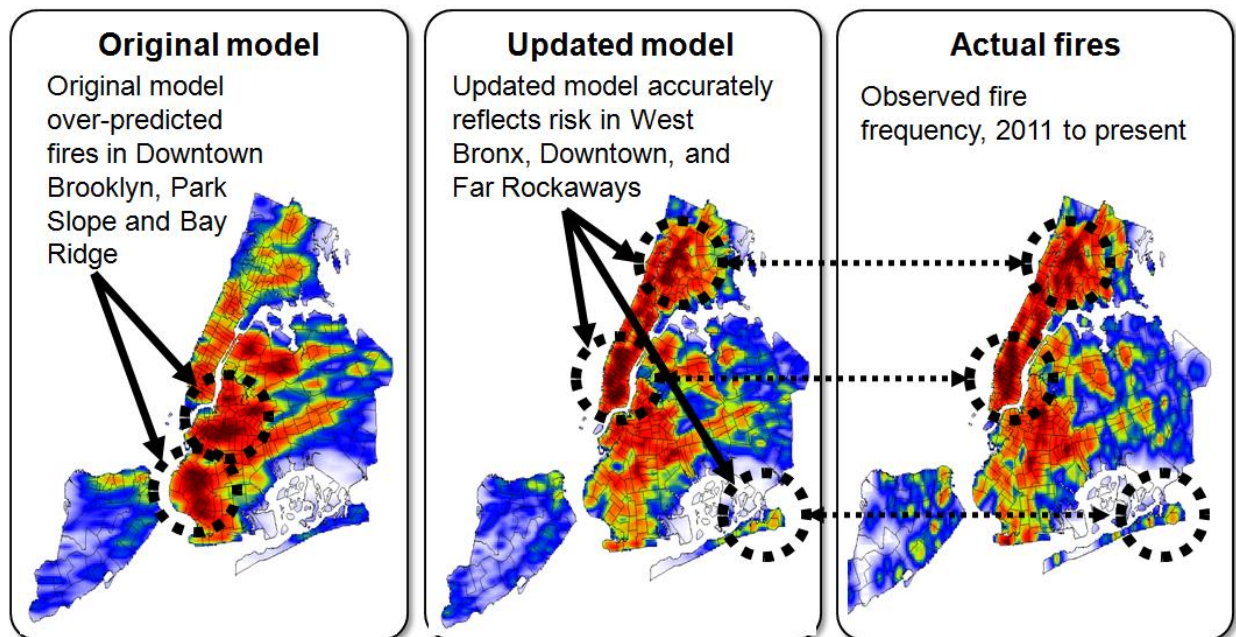
The three maps above of NYC represent the progress of the risk based inspection system algorithm that MODA created with the Fire Department (FDNY). At left is the original map of high-risk zones from the first version of the FDNY RBIS model; center is the updated model, weighting risk criteria based on MODA's statistical regression; at right is an actual map of recent fires in New York City.

FDNY has inspection jurisdiction over roughly 300,000 buildings in New York City. These include buildings with commercial activity, including retail stores, restaurants, and high-

occupancy towers as well as densely populated apartment complexes, schools, and senior facilities. These are the buildings at which large

groups of people live and work, and where a single fire could cause mass casualties.

FDNY does an excellent job of monitoring fire risk, and as a result, there were fewer than 80 fire deaths per year in the last five years, in a City of over 8 million permanent residents and millions more in daily commuters and visitors.

Veteran firefighters know what dangerous buildings looks like. They know how important it is for a building to have an operable sprinkler system, the impact that the improved building and fire codes have had over centuries of construction, and what type of business activity is most frequently correlated with dangerous fires. If you ask a veteran of the fire department, their gut can give you a list of criteria for dangerous buildings nearly as effectively as a statistical regression. Working with the inspectors, MODA validated the statistical rigor of that list, and also worked with a set of historical fires from the last several years to train the fire risk model and appropriately weight each of those inputs. Whereas the first version of the fire risk model had weighted inputs based on focus group discussion, the MODA model used a data set of historical fires to hone the weighting of the risk inputs.

The improved model does a much better job of predicting buildings at risk of serious fires. The diagram above shows three maps. Furthest left is the visualization of the initial fire risk analytic; the middle map is the output from MODA's improved model; the map at right is the actual set of historic fires. It's easy to see that MODA's model does a much better job of identifying places that are likely to have fires — whereas the old model had failed to identify high-risk zones in Harlem, Downtown Manhattan, and the Rockaways, the new model more closely reflects reality.

The model's value comes into play practically by reducing the number of days that any resident or customer in a building is at risk of fire injury. Each year, the Fire Department inspects more than 25,000 buildings proactively. The two graphs in the diagram on the next page demonstrate how important it is to consider the risk of a building during scheduling inspections.

In each chart, you see a 45° lines that represents the outcomes of a completely random inspection order. That's to say that if you send inspectors out to a random 25% of buildings, you'd expect to find 25% of the dangerous buildings in the City; they go out to 50% of all buildings, they find 50% of all dangerous buildings. You can see in the chart at left that as inspectors used the first version of the model, where the inputs were weighted based on gut intuition, the outcome one would expect is about average, and in fact, in the beginning, a little worse than random.

With the updated model that's trained on real events and analyzed through statistical regression, the City is able to send inspectors to 25% of all buildings and find about 70% of the bad places. By going to the worst places first, NYC is remediating dangerous conditions, and reducing the number of days that New Yorkers are at risk.

Moreover, MODA's transference of custody and responsibility for the RBIS model to the nascent FDNY Analytics Unit has led to even greater efficiencies. Since taking over the risk algorithm, FDNY AU has made the model more reflective of FDNY operational practices, determined additional data sources that promise even better risk assessment, and overall has ensured the implementation and dynamism of the concept. RBIS is a prime example of why MODA is designed not to simply generate insight, but enable agency-level citywide analytics.

The diagram below shows the improvement by reweighting the risk based inspection system (RBIS). At left is the initial version of the RBIS model that used anecdotal information to weight the risk criteria. At right, the updated model shows that the first 25%of inspections will yield nearly three-quarters of bad outcomes, by reweighting the analytical model.
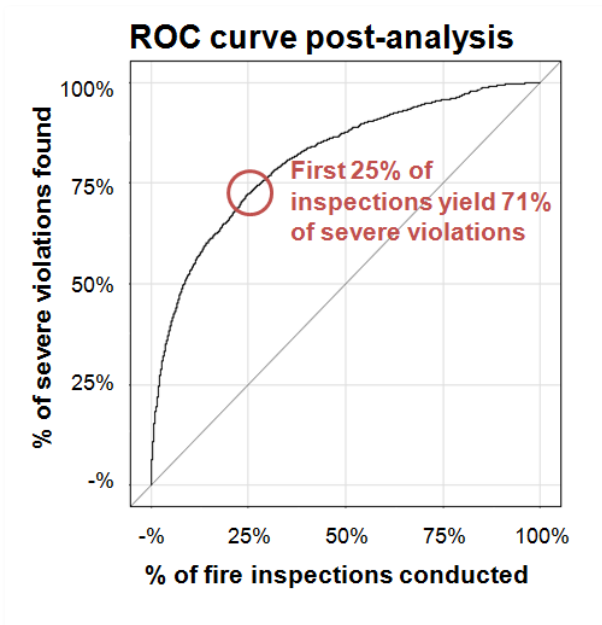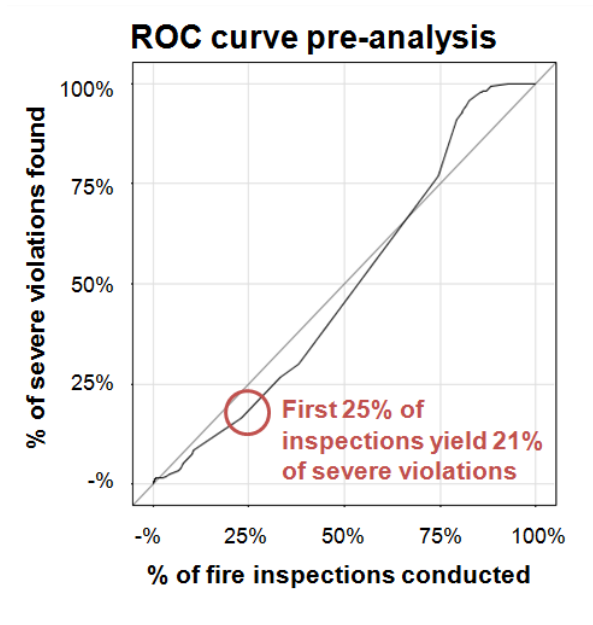
An automated filter for the Department of Buildings (DOB) B+ program

The Department of Building's "B+ Program," was conceptually similar to the Fire Department's RBIS program: how can the City use all that it knows about buildings to identify those that are most at risk. The process of this project differed in two significant ways from RBIS: first, the universe of buildings that fall under DOB's jurisdiction is more than three times as large as those that FDNY inspects. Secondly, integrating the analytic into the day-to-day operations would require a creative solution to a technical challenge.

The more than 18,000 illegal conversion complaints that DOB receives every year come in primarily through 311. For example, someone living in NYC notices that there's a lot of transient activity in the house next door; or they see an inordinate amour of trash and recycling for the building; or maybe they've seen construction going on without a permit posted; and then they call 311 to tell the City that they think it's a dangerous building.

In general, the veracity of a 311 complaint is largely dependent upon the type of incident in question. Streetlights have a very high complaint to foundedness ratio, nearly one-to-one. That is

to say, when someone calls in about a streetlight that's out, there is almost always a streetlight out. It's easy to see, and there's limited room for interpretation. However, an illegally converted apartment is much more complicated; many of the well-meaning neighbors who report the dangerous conditions have never seen the inside of the apartment, and are reporting their suspicions, rather than their actual knowledge of the situation; for these reasons, fewer than eight of every 100 illegal conversion complaints lead to a truly dangerous, vacatable condition.

That means that of the 18,000+ complaints that come in each year, approximately 1,400 will be identified as so dangerous that immediate actions must be taken to remediate the environment. To reduce the amount of time New Yorkers are at risk, the better the City analytically identifies the complaints that are most likely to contain dangerous conditions, the better the City can deploy inspectors to really reduce the risk.

Similar to the RBIS tool, MODA analyst worked with a historic set of illegal conversion violations to identify the criteria that were commonly found: age of the building; a history of complaints and

violations; liens against the building and unpaid taxes. With a few rules, MODA created a risk filter that meant by targeting 30% of complaints, DOB would catch 70% of bad outcomes.

The challenge for MODA quickly moved from the analytical to the technological. The filter made sense to DOB leadership and inspectors, but in order to streamline the delivery of the risk intelligence, MODA would need to place a "high risk" label on each complaint as it came out of the printer at the DOB commands across the five Boroughs. Relying on coordinators to go back and check complaints days later against a risk list was inherently inefficient; the information needed to be an instant, technological fix. The problem for MODA was that the system in place

at DOB was a mainframe system several decades old; there are limited options for altering the technology.

Working with a talented team of programmers at DoITT and DOB, MODA developed a web methods protocol (online tool) that would intercept every new illegal conversion complaint coming in through 311, analyze it against MODA logic, and deliver it to the DOB mainframe with a risk indicator. This project was significant because it demonstrated that not only can analytics conceptually be deployed in pilot, but also that analytics can be deployed even within legacy technology systems. Today, the DOB illegal conversion risk filter is running citywide.

Disaster Response and Recovery

Sandy Analytics, Q4 2012 through Q1 2013
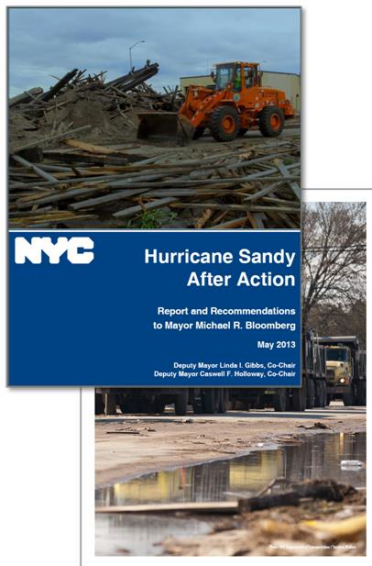
Total Universe	6+ Stories	3+ Units, <6 Stories	1 & 2 Family	Non-HPD Multifamily	Total
Tax Parcels	416	4,973	64,448	8,108	77,945
Buildings	606	7,328	79,754	11,322	99,010
Residential Units	62,458	30,332	109,313	203,006	405,109
Customer Accounts	56,606	29,661	108,834	201,045	396,146
Rapid Repair Registrants	59	1,036	13,230	585	14,910

Uninhabitable Total	6+ Stories	3+ Units, <6 Stories	1 & 2 Family	Non-HPD Multifamily	Total
Tax Parcels	1	140	821	48	1,010
Buildings	1	149	1,276	52	1,478
Residential Units	188	347	1,375	902	2,812
Customer Accounts	165	197	665	712	1,739
Rapid Repair Registrants	-	16	339	5	360

Red Placards	6+ Stories	3+ Units, <6 Stories	1 & 2 Family	Non-HPD Multifamily	Total
Tax Parcels	-	19	345	18	382
Buildings	-	25	672	20	717
Residential Units	-	109	715	33	857
Customer Accounts	-	-	27	-	27
Rapid Repair Registrants	-	3	157	4	164

Power Out (Other)	6+ Stories	3+ Units, <6 Stories	1 & 2 Family	Non-HPD Multifamily	Total
Tax Parcels	1	121	476	30	628
Buildings	1	124	604	32	761
Residential Units	188	238	660	869	1,955
Customer Accounts	165	197	638	712	1,712
Rapid Repair Registrants	-	13	182	1	196

	6+ Stories	3+ Units, <6 Stories	1 & 2 Family	Non-HPD Multifamily	Total
Tax Parcels	(4)	(41)	(572)	(32)	(645)
Buildings	(4)	(85)	(777)	(45)	(907)
Residential Units	(349)	(303)	(1,063)	(770)	(2,136)
Customer Accounts	(85)	(216)	(989)	(72)	(1,277)
Rapid Repair Registrants	-	(18)	(201)	(7)	(226)

The report at right is an example of the daily Hurricane Sandy status report that was organized by MODA and delivered to City hall leadership.

Hurricane Sandy brought unprecedented disruption to New York City, displacing an eighth of the City's residents, leaving twice that many without power, shutting down the buses and subways, and bringing the City to a standstill. During the immediate response and the

prolonged recovery, analytics were a critical component of the City's response.

Working closely with Deputy Mayor for Operations Cas Holloway and his staff, and the leadership of the Office of Emergency Management (OEM), MODA integrated data

from City agencies, National Guard surveys of affected residents, and daily outages from Consolidated Edison (ConEd), the Long Island Power Authority (LIPA), and National Grid. The day-to-day progress was delivered to City Hall through the "Recovery Report," a two-page summary of recovery efforts that was used to allocate disaster response resources, and ensure that vulnerable populations received needed attention.

In addition to tracking, MODA supported the operations of the recovery, helping feed the tree debris removal process. Downed tree service requests are normally created in the 311 system from citizen calls or online entries. Those service requests are picked up by the Parks Department, and the process of removing the downed tree begins. During every storm, a handful of downed tree calls go to 911, and 911 operators diligently file the 311 services requests. During hurricane Sandy, there were thousands of 911 calls of downed trees, creating a service request entry backlog. It was important to generate the service requests quickly, so that Parks could assess the conditions, then Parks and/or FDNY could cut down the tree, and DSNY could remove and recycle the debris. Because it was important to clear the trees, to clear roadways and sidewalks, manually entering thousands of service requests collected at 911 to 311 was a time delay that the City couldn't afford. MODA dove in to work with the Deputy Mayor for Operation, OEM, and Parks, to write a script that would search through the 911 notes, geocode the downed trees in a common format, and that loaded the data into a scheme acceptable to 311. Conditions at the MODA offices prevented the use of normal computers and development tools, but the team was flexible in using Open Source technology to solve the problem.

The application of analytics to daily tracking of Hurricane Sandy, and to recovery operations, demonstrated the power of the office's integrated analytics platform, DataBridge. DataBridge also was the foundation of intelligence for driving long-term housing

recovery planning and program delivery. MODA facilitated data integration among City and Federal data sets that allowed the Mayor's Office of Housing Recovery Operations to build a model quantifying storm-related housing damage, repair need, and ultimately guide the initial $648 million allocation of federal Community Development Block Grants for housing programs. MODA continues to support Housing Recovery Operations, leveraging DataBridge for streamlined data exchange and intelligence verification in the delivery and operations of the NYC Build It Back programs.

Subsequently, MODA has been closely tied to the development of the Hurricane Sandy Tracker with the City's Housing Recovery Office and the Office of Management and Budget. The Sandy Tracker Portal is NYC's online platform that aims to provide the City and the public with access to how federal disaster recovery funds from FEMA and the U.S. Dept. of Housing and Urban Development have been allocated. The Sandy Funding Tracker provides a funding summary, giving an overview of all disaster recovery and resilience dollars allocated to date by funding type and funding details. The Sandy Funding Tracker also provides further detailed information about projects and programs in each major category of disaster relief funds. With the development of this tool, all interested parties can have an in-depth view on the status of recovery efforts throughout the five boroughs.

By providing access to the public, the Sandy Tracker Portal increases accountability related to the expenditure of Hurricane Sandy federal recovery dollars. Additionally, the Sandy Tracker provides information on NYC's Build it Back program, which assists homeowners, landlords, and tenants in the five boroughs whose homes and properties were damaged by Hurricane Sandy. The tracker is in line with the Mayor's vision of giving New Yorkers a more transparent government, with a user friendly website that everyone can visit and view the allocation of Sandy funding through comprehensive, easy to understand charts and graphs.
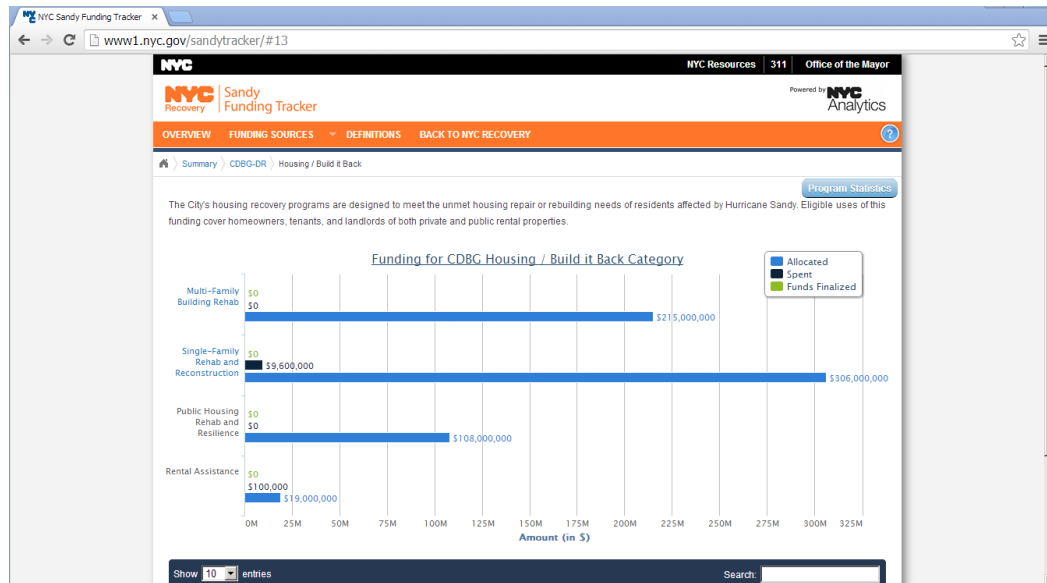
Driving Small Business Growth with Analytics

Comprehensive Business Census

After the waters receded, residents were safely housed, and power was returned to lower Manhattan, one of the most important questions in the aftermath of Hurricane Sandy remained, "what was the economic damage of the storm, and how can the City make sure that businesses reopen their doors quickly?" Small businesses in the outer boroughs were the ones most vulnerable to the damage that Sandy wrought, and they employ tens of thousands of New Yorkers — making sure that those New Yorkers were able to continue to work and draw income during the recovery was very important to the families who were affected.

Before the City could truly assess the complete economic impact, it was important to know how many businesses were affected, and that question requires a basic understanding of where businesses are in New York City, and how many were in the inundation zone. Prior to MODA's work on this project, there was no

comprehensive census of commercial activity in the City; the Department of Consumer Affairs (DCA) licenses many different types of businesses (like those that use scales; sell cigarettes; serve alcohol; etc.); the Department of Health and Mental Hygiene (DoHMH) licenses restaurants and bars; the Department of Environmental Protection (DEP) regulates the removal of restaurant grease. Even so, large sets of commercial activity, including retail clothing and shoes, are often unseen in City data. To get a more complete picture of where all the commercial activity in the City is, MODA paired the PLUTO commercial space data, and overlaid all of the data from its various sources. What emerged was the most complete picture of where businesses are in the City.

By taking this multi-data-source approach, MODA developed a NYC business census that was much more comprehensive than the private economic data that had been provided by 3rd

party data aggregators. You can see in the diagram that the 3rd party data missed huge portions of economic activity in Brooklyn and Queens. The new, updated census provides the City with a clearer picture of where economic activity is occurring.
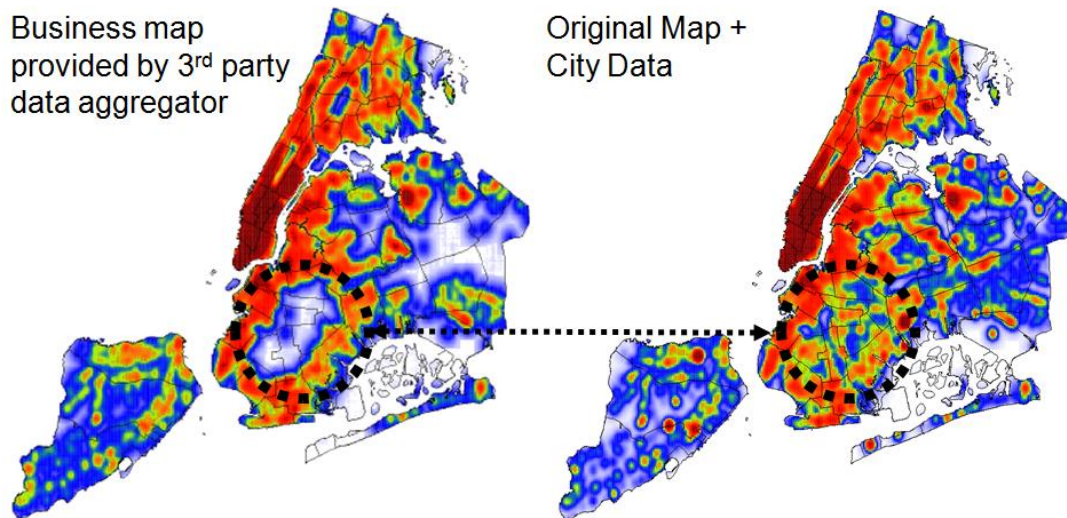
The heat map above shows the density of commercial space in New York City. The map at left, formed with an initial set of third party commercial data, missed much of Central Brooklyn and Eastern Queens. The updated map at right, produced by MODA with additional City data, presents a clearer picture of commercial activity in the City.

Measuring time-to-open with the New Business Acceleration Team (NBAT)

The New Business Acceleration Team (NBAT) was founded by the Bloomberg administration to expedite new food service businesses opening in the City. On average, it takes 217 days from the time that a restaurant first files its plans with the Department of Buildings to the day that the final permits are issued. That's 217 days of business planning, construction, permits, and inspections when the restaurant is not in service and generating revenue.

For a small business, those seven months are especially important to the success of the business. Because small businesses are the greatest driver of new job growth in the City, it is a priority of the administration to support their development, and that's why NBAT works with restaurants, providing guidance on the planning and regulatory approval process, and even reviewing restaurant plans and helping to coordinate inspections.

NBAT has been operating for a few years, helping small businesses get their doors open

faster. They came to MODA with a very simple, but hard to measure, question: how much faster are businesses working with NBAT opening their doors?

Small business economic conditions are often the hardest part of the economy to measure. These firms often have fewer resources devoted to tracking business activity; they have fewer regulatory reporting requirements than large companies; because of these reasons, the White House Office of Technology and Science Policy, took special interest in this NBAT – MODA Project. This project would ultimately serve as a showcase project for MODA to other Cities across the country.

MODA analysts worked with NBAT to develop the "time-to-open" metric. As with many of challenges, the hardest part was connecting the data. Buildings, Fire, and Health all have permits and inspections on the City's Open Data portal — the information is easy to access — but there's no single unique identifier that ties a

restaurant through all agencies. Further complicating matters, while the Department of Health and Mental Hygiene is primarily focused on the business, the Department of Buildings often works with the property owner, which means that a single project could have two totally different business owners listed on different permits depending on which agency it's working with at any point in time.

Using a combination of geo-tagging the data, using a name matching tool, and looking and matching concurrent construction projects in different City databases, MODA was able to track the average amount of time it takes for businesses from start to finish with the regulatory process.

MODA found that businesses that take full advantage of NBAT's services open their doors 79 days faster than those that go it on their own. That's a 36% reduction in time to open, or nearly two and half months of extra operations and revenue for a new restaurant in its first year of business. More days of revenue means more workdays for New Yorkers; the fewer days that businesses remain shuttered, the stronger the economy for the entire City.

Armed with the information on the effectiveness of NBAT in reducing restaurant time-to-open, the City can now pursue an informed consideration of expanding business opening help to other service areas.

NYC Business Atlas

When a major national retailer looks to open a new storefront, they often commission sophisticated neighborhood market research that helps the company decide where to locate the new business. Consultants pour over neighborhood trends, including information on demographics, local spending, and what other businesses are in the neighborhood. While retailer entrepreneurs are experts in their trade (e.g., restaurateurs; chefs; hair stylists; florists), they often lack access to high quality information about economic conditions in the neighborhoods they're considering for storefronts.
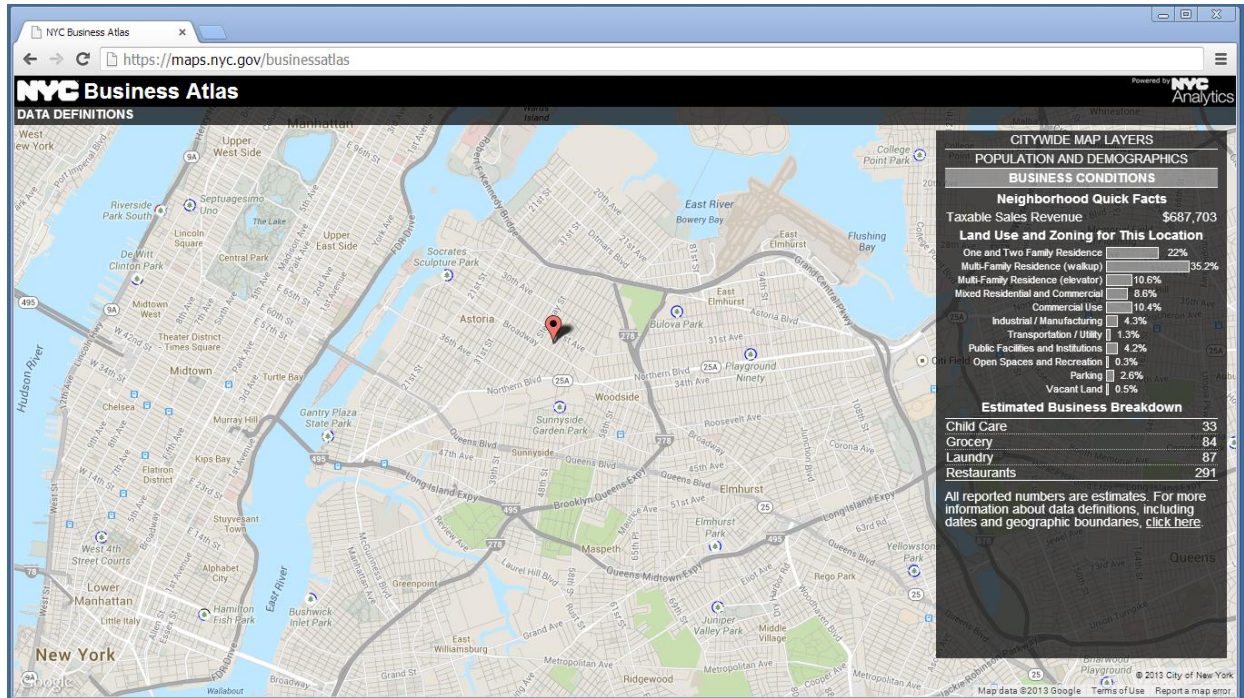
The NYC Business Atlas is designed to help solve that informational gap by providing a public tool that gives small business entrepreneurs access to high quality information that helps them decide where to plan their new business or expansion. Economic data comes

from business filing with the Department of Consumer Affairs (DCA), and sales tax data from the Department of Finance. Demographic data, from the census, provides insight into who lives in the neighborhood. Traffic data comes from a pilot partnership with Placemeter, a NYC startup that specializes in delivering real time traffic information.

Jointly with the Small Business Services (SBS), the tool was launched in December, 2013. This foundation will be used for an additional project with SBS, to analyze the performance of Business Improvement Districts (BIDs) in driving economic growth in BID zones across the City. By comparing these neighborhoods, the economic change, and the business investments and activities, the Mayor's Office will help SBS identify the most successful BIDs, and replicate their best practices in other BIDs in the City.

The NYC Business Atlas is designed to put neighborhood economic conditions directly in the hands of small business entrepreneurs, to help them make better decisions about their businesses.

Analytics-Driven Legislation

In the second half of 2013, MODA also began to develop its client services offerings to include quantitative analysis to inform legislative discussions. Traditionally, legislative deliberation has lacked granular understanding of potential impacts, running the risk that the legislation is ineffective, or even counter-productive. Leveraging the nuanced understanding of the City that analytics provides, however, is helping to eliminate that risk. NYC council members, agency heads, and the Mayor's Office are active in crafting local City law that affects the way that New Yorkers live and do business in the City. When considering the outcomes of specific policy decisions, it's helpful to have modeled the potential impacts.

MODA's familiarity with City data, outside data, and statistical techniques allow the team to quickly create tools that illustrate the varied outcomes of different policy decisions in New York. In several cases, MODA worked with agencies to determine how potential policy proposals would affect residents, businesses, and City personnel in New York.

For example, MODA worked with the Mayor's Office of Long-term Planning and Sustainability (OLTPS) to estimate the percentage of businesses that would be affected by various composting proposals, and to estimate the amount or organic matter that would be generated under those proposals.

- MODA started by using its data on businesses to create a list of all the waste generating firms in New York City, and to categorize them by type and size.

- Next, MODA relied on past research from the Department of Sanitation (DSNY) and the Business Integrity Commission (BIC) to find accurate estimates of waste by business type.

- MODA then conducted a sensitivity analysis on the inputs in the model to determine

which business characteristics were most reliable in predicting waste behavior.

- Once the model was tested, MODA fed in difference legislative scenarios that were being considered.

- Finally, MODA took the output of the model, and developed charts that communicated the estimated impact of different policy decisions, for OLTPS to use in its discussion with the City council is setting the specifics of the organic recycling bill.

Using a similar structure, MODA also worked with OLTPS on modeling charging stations in the City. Starting off with some basic assumption about electric vehicles, adoption rates, and using information about the density of car ownership, MODA was able to assist in the drafting of the a new law that makes over 10,000 electrical vehicle charging stations in New York City.

Using DataBridge and the skills of MODA to provide an objective, factual review of different legislative proposals, modeling likely outcomes is fertile research area for growth.

Increasing Transparency and Accountability through Open Data

The day-to-day operations of New York City generate an immense amount of data in agency systems. This data is the backbone of the DataBridge, supporting the analyses that MODA performs to improve the City. The 1's and 0's, the csv's, the databases that make up the City's digital footprint are fundamentally public infrastructure that belongs to the people of New York. The Bloomberg Administration was one of the first governments to take this position, creating NYC's Open Data Law.

MODA is responsible for implementing the New York City Open Data Law, Public Law 11 of 2012; NYC's Open Data Law is the most ambitious and comprehensive open data legislation in the country; agencies are held to high bars of data disclosure, and put on timetables to release the data to the public. MODA works with DoITT to facilitate a more transparent and open government to increase civic engagement, helping to determine the priority of releases (getting the most valuable data out quickly), and making the data available in formats, like APIs, that will encourage private innovation of public data. Through New York City's open data policy – a citywide set of standards and guidelines –the City is delivering information through raw data and ensuring that New York City government is increasingly

accountable and open for current and future generations.

Beyond presenting information to the public, these data sets serve as a rich resource for developers, civic groups, and anyone else to build applications on their own. The creation of new apps using City data fosters innovation and leverages talents beyond City government for create solutions to tough problems.

MODA worked with Open Data advocates and developers to determine the highest value unreleased datasets. Two that emerged from numerous conversations were the Automated City Register Information System (ACRIS) and the Primary Land Use Tax Lot Output (PLUTO). MODA worked closely with the Department of Finance, which is responsible for ACRIS, and the Department of City Planning, which is responsible for PLUTO, to release this important data. These are just a few of the "backbone" datasets recently released, whether through the Open Data portal or – in the event data does not meet the letter of the Open Data statute – on agency websites like Bytes of the Big Apple.[1]

Jointly by MODA and DoITT, the City released its inaugural Open Data Plan. The Plan details

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[1]http://www.nyc.gov/html/dcp/html/bytes/applbyte.shtml

440 datasets deemed by City agencies to qualify as public data and provide the planned date of release. By 2018 all of the City's public data will be available on the Open Data portal.

A recent partnership at a DataKind hackathon demonstrated the excitement of the public, and the value of public-government collaboration through open data. The way that City addresses are recorded in different databases poses a number of analytical hurdles: they can be similar to other addresses, and therefore, difficult to pin down; they can be misspelled, and therefore, hard to match; or, they may have a many to one relationship to a location. For these reasons, location data frequently needs to be standardized into a more robust format in order to support cross-agency analysis. This process of parsing addresses and outputting a standardized indicator of location is known as geocoding. Geocoding is of particular importance to MODA because location often serves as a viable denominator for merging multiple City datasets.

The city has long provided a geocoding application that converts addresses to a number of other location identifiers, including BIN (Building Identification Number) and BBL (Borough Block and Lot). However, the City's application does simple address matching to other data, without regard to potential sources of error in the original address input. Well aware of this problem, MODA programmers had developed "duct-tape" improvements on the geocoder; MODA's geocoder also accounted for potential errors in inputs, added flexibility to inputs, and applied simple logic to narrow down correct matches for fuzzy addresses. This in-house solution, while imperfect and not particularly accessible for agency clients who didn't have robust coding and programming skills, was a dramatic improvement in the City's ability to tie information to locations. The tool was immensely valuable, particularly during Hurricane Sandy, where it provided service in helping the City monitor and prioritize recovery efforts.

Through its work in the Community, and specifically, through MODA Advisor Drew Conway, MODA connected with DataKind an organization that galvanizes volunteers to support NGOs and other non-profits with analytical problems.

Eager to work with the talented volunteers at DataKind, MODA sought a revamp of the geocoder that would at once give it greater reach into difficult-to-geocode locations while making it more accessible for agency clients to use on their own. The MODA geocoder was given to DataKind volunteers in a weekend long effort to improve its address-parsing algorithm, add GUI (graphical user interface) functionality, and perform general optimizations. This effort led to significant improvements in the geocoding engine and also added a user-friendly GUI layer, enabling MODA to begin rollout of the improved geocoder to additional city agencies. This joint project between MODA and volunteers in the community will lead to increased optical insight into tens of thousands of difficult to identify locations. It is difficult to provide services to locations that do not properly map or match with other datasets. The MODA/DataKind geocoder significantly ameliorates this problem, enabling the City to see – and prioritize for assistance and services – tens of thousands of New Yorkers that had previously not been captured in geocoding efforts. The new geocoder is publicly available on GitHub, at https://github.com/datakind/MODA

As more and more Open Data becomes available to the public, MODA looks forward to further public-government partnerships that improve day-to-day operations, as well as the private innovation that will come from the Open Data sets.

The Open Data portal is available at www.NYC.gov/data

Epilogue for Analytics

As New York City enters a new Mayoral administration, the City will continue to face the classic day-to-day operational challenges that city administrators have always dealt with— how to keep city residents safe, how to efficiently manage traffic, how to deliver large quantities of clean water, how to dispose of refuse in a sanitary manner, how to encourage a vibrant local economy, the list goes on and on.

In New York City, that means allocating the City's roughly $70 billion dollar budget to care for more than eight million residents and several million more commuters and visitors.

The new leadership in City Hall and at the agencies will set the policy decisions. Analytics will continue to be a resource that helps those leaders make complex decisions and ultimately improve the quality of life for New Yorkers.

MODA projects in process, end-of-year 2013

As MODA wraps up 2013, and moves into Q1 of 2014, several projects remain open in the workflow of the team. A sampling of the active projects is included below.

- Business Improvement District (BID) best practices: work with SBS to analyze the economic growth of Business Improvement Districts, and study BID budgets to identify the common behaviors that most often lead to economic growth.

- Domain awareness pilot with OEM and Microsoft Research Asia: work with technology experts from Microsoft's smart cities platform, as well as subject matter experts at the Office of Emergency Management (OEM) to conduct a "proof-of-concept," of Microsoft's new city management dashboard in NYC.

- Map and verify the City's street directions: work with Rensselaer Polytechnic Institute (RPI) and DSNY to analyze GPS data from snowplows during NYC's last snow event. The data will be used to help verify digital street direction information in the City's City Street Center Line (CSCL) database.

- Top debtors for law: continue to work with the law department on identifying the City's top debtors, across several agencies. Work to develop a predictive "warning flag," that alerts the law department of organizations that are likely to incur large debt in unpaid fines, to improve the City's efficacy of collection and encouraging good behavior.

Projects in the pipeline for 2014

- 311 City Pulse: work with DoITT to build a pubsub (publication to subscribers) that allows users to receive a real-time feed of 311 activities in the City.

- Analytics in the cloud: develop a cloud-based testing area that allows MODA analysts to move their program processing off of local desktops, and into the cloud. The project is a proof of concept, intended to demonstrate the higher quality, lower cost opportunity of conducting MODA projects in the cloud.

- Building Assessment Automization: improve the building assessment master file by connecting it to automatically updating sources.

- Business Atlas, 2.0: improve the NYC Business Atlas to include a comparison feature of multiple locations, to include more traffic information, including daily subway rider information, and to include a "solver," tool that allows an entrepreneur to find a location based on their business inputs.

- Data Element Exchange Program (DEEP) Phase 3: Expand on the list of agencies connected through the City's DataShare platform, such as the Dep't of Consumer Affairs (DCA) and the Office of Management and Budget (OMB) to help streamline the exchange of data and aid agencies in increasing efficiency.

- DataBridge Warehouse Expansion: Increase the scope of information included in the data warehouse for City agencies to access for better resource allocation.

- Disaster recovery universal intake: build a single, streamlined approach for collecting information from residents affected by major disasters, integrating that data into DataBridge, and sharing that data with agencies that needs to provide response services.

- General contractor metrics: MODA will conduct an analysis of general contractor performance, including complaints and violations, for a scoring pilot of general contractors who work with the City.

- Healthy SNAP choices in Food Deserts: work with HRA's Center for Economic Opportunity (CEO) to analyze food availability in neighborhoods with high SNAP concentration.

- Residential Building Distress Indices: work with HPD to align metrics and improve targets for agency regulatory outreach and enforcement operations.

- Sandy Tracker 2.0: add additional information to the website for greater public transparency on the use of the federal disaster recovery and resilience funds.

- Targeted assistance to small businesses: conduct a predictive analytic project to find businesses "at risk," of failure, and target small business services to those firms, to improve their financial health.