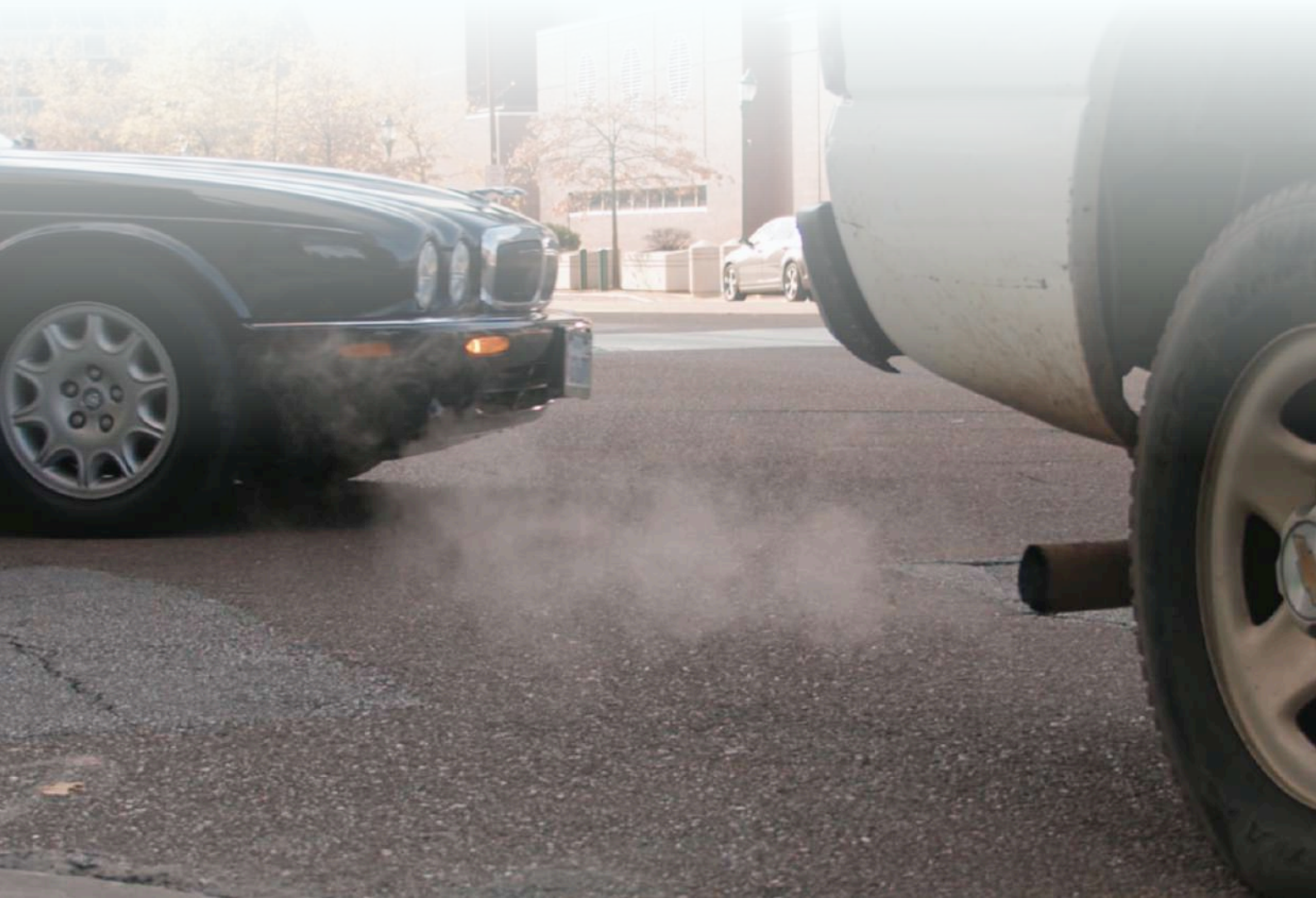
Ringknot Consulting

Less Noise Pollution, More Revenue for A Global Metropolis With RingKnot Smart City Infrastructure & Sustainability Solutions

About the Client

A government department of a cosmopolitan metropolis that works to reduce air, noise, and hazardous materials pollution. The mission of the department is to enrich the environment and ensure good living conditions for its citizens. Sustainability and safety form core components of the department's work ethic – and RingKnot has empowered the department to deliver on this mission with the Smart City Infrastructure and Sustainability Solutions.



Controlling Air and Noise Pollution with Holistic AI, ML and IoT Intervention

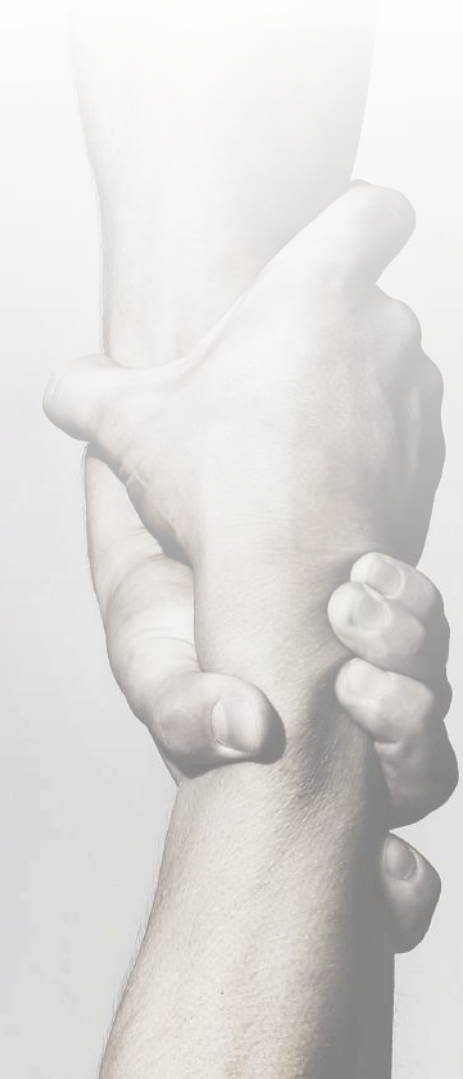
The department actively keeps a check on the level of air and noise pollution in the city. In this process, it identified some key challenges.

Noise pollution rectification was a completely manual process, but that changed with RingKnot

Vehicle owners in the city had been illegally modifying their vehicle mufflers, creating noise over 76 dbs, which is considered a violation of the city's laws.

With this context, the department embarked on digitalization journey for identifying vehicles with modified mufflers using AI. The department installed a camera with a microphone in specific locations and has been able to identify 200 incidents per week. Nearly 15% of these incidents have turned to be violations.

Before RingKnot intervention, the department's inspectors had to go through a tedious manual process of verifying the incidents to identify the vehicle number and type that was violating muffler rules. When these inspectors presented their case in the court of law, they needed to show the appropriate video of the violation as proof. At this juncture, each inspector had to manually search for the recorded video and manually link it to a license plate.



How RingKnot Holistic AI solution made rectification of noise pollution more seamless and efficient

- RingKnot built a Machine Learning model. We used the existing muffler violation videos as a training data set to identify other similar violating vehicles
- The solution is able to identify the type of vehicle and license plate using the ML model.
- The solution provides an intuitive admin interface that helps with metrics on the vehicle types, accuracy, errors. This interface helps

- **Identify the type of vehicles**
- **Display vehicle number plate information with confidence score**
- **Correct or verify the captured information**
- **View quick statistics on verified and captured incidents**
- **Intuitively search the portal for videos based on number plate information**

Technologies at work

- Azure ML Studio
- Azure Video Analyzer Media
- Azure Custom Vision
- Azure Cognitive Search
- App Service
- Azure Docker Container
- Event Hub
- SQL DB
- Azure Synapse Analytics
- Azure Function App
- Key Vault
- Azure Active Directory for user authentication
- Power BI Pro License
- Azure DevOps

Less pollution, more revenue for the metropolis

Besides enormous time-saving, the department is now able to penalize people who resort to illegal modification of vehicle mufflers, thereby causing noise pollution. Moreover, with the citations issued regularly to violators, the department has witnessed a significant increase in its fine-based revenue.

Complete elimination of manual efforts on the part of inspectors to zoom in and identify the license plate

Overall saving of 400 person days per year of effort on video review

Boosted fine revenues for the department

Rectifying air and noise pollution from idling vehicles

A large number of commercial vehicles are frequently found idling in the city. The motor ignition of these resting vehicles is continuously turned on for more than the allowed three minutes limit. This was causing excessive air and noise pollution in the city.

For every such case, a fine of $100-$2000 is imposed on the violator, and the reporting citizen is rewarded with an amount equivalent to 30% of this fine. In case any ordinary citizen spots a commercial vehicle idling for more than three minutes, they can record the information on their phone. This information is then uploaded on the department's website, where the inspectors review it. However, with too many violating videos floating in, viewing and verifying each video to detect and confirm the exact violations became a complex challenge for the inspectors.

How RingKnot Holistic AI and IoT solution infused efficiency in rectification of the idling vehicle problem

RingKnot developed an innovative solution that automatically captures the vibration in idling vehicles in each video to instantly detect violation. The solution also immediately captures the licence plate information from the video, which aids the inspectors in issuing a quick citation. Moreover, it also efficiently furnishes a voice-to-text conversion of the information, which can be attached along with the citation.

RingKnot delivered an AI-powered initiative that integrates with existing video storage and extracts videos for processing. AI enabled solution validates the type of vehicle as commercial or otherwise, using ML-based FFT to isolate the noise of the vehicle and examines for three minutes to validate the violation.

An ML solution was created which uses existing videos as training data sets to identify commercial vehicles

The solution isolates idling noise using ML-based FFT model.

The solution provides an intuitive admin interface that helps with metrics on the vehicle types, accuracy, errors among several other insights.

Technologies at work

- App Service
- Event Hub
- Azure ML Studio
- Azure Video Analyzer Media
- SQL DB
- Azure Synapse Analytics
- Azure Function App
- Key Vault
- Azure Active Directory for user authentication
- Power BI Pro License
- Azure DevOps

A greener and cleaner metropolis with RingKnot

Besides fast-tracking the verification process, the use of the solution has promoted enormous time-saving for the client. It has also allowed the department to monitor air and noise pollution in the city efficiently, thereby contributing to a greener and safer environment for citizens.

Elimination of effort required by each inspector to view three minute long videos of each complaint

Overall saving of ~20,800 person days per year of effort on video review, saving $12.5M/year.

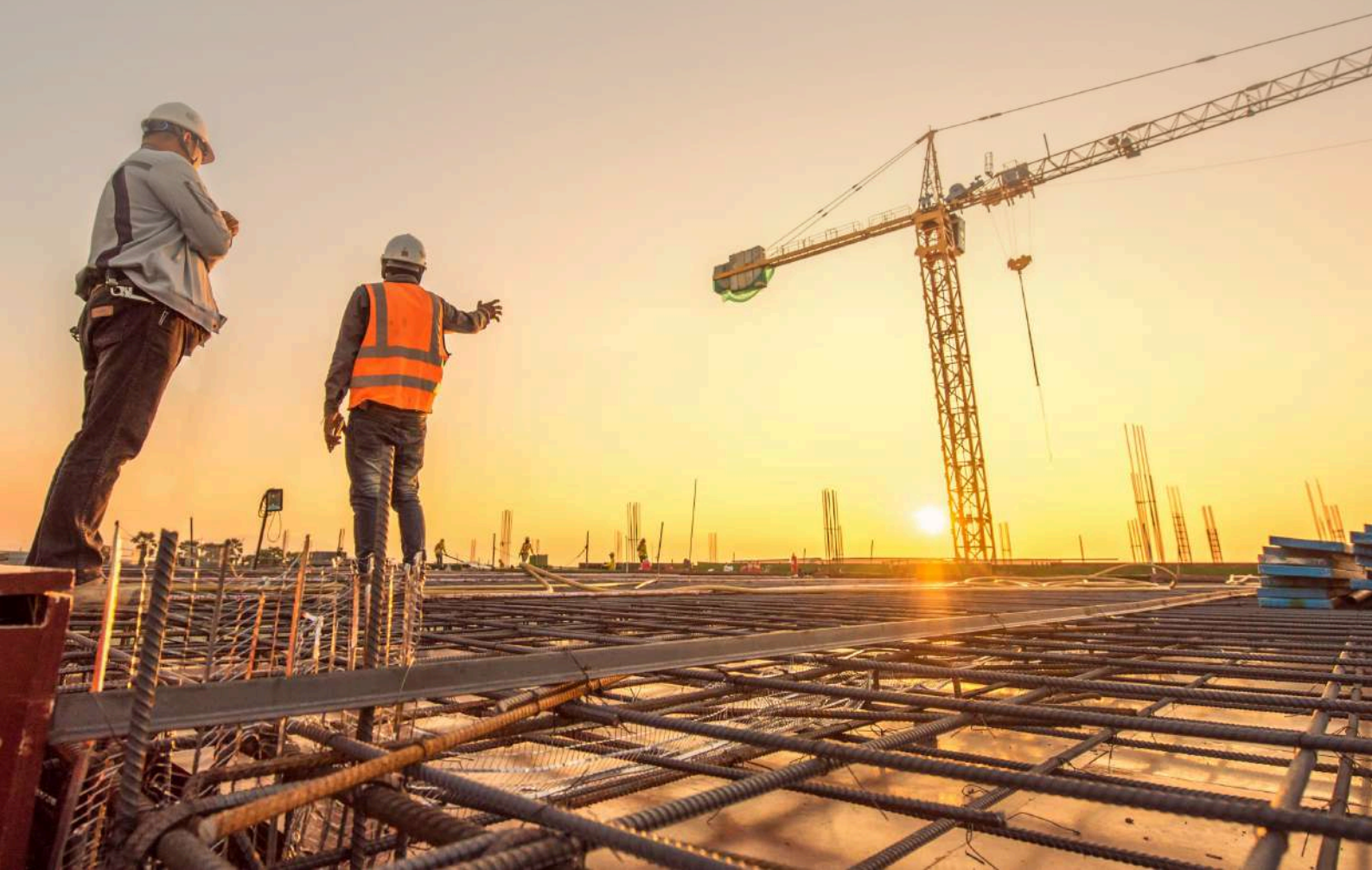
Quicker resolution of complaints raised by citizens

Boosted fine revenues for the department

Regulating the Use of Asbestos in the Construction Industry for a Safer Metropolis

The city's building owners are responsible for having an asbestos survey performed by a department-certified asbestos investigator to determine if asbestos-containing materials (ACM) may be disturbed as the work progresses on their building. The size and scope of the abatement activity, with reference to the total amount of ACM that will be disturbed, determines the reporting or filing requirements.

The city department certifies the Handlers, Restricted Handlers, Supervisors, and Investigators who can do the abatement and support activities after they meet the necessary training and exam passing requirements. The application and certification process are currently manual and there have been instances of fake certificates resulting in non-authorized persons being on job which affects the quality of work, impersonation, and loss of revenues.



The certification process was not as easy as it sounds

01

Duplication of certificates

Applying for a certificate through the department was expensive. Therefore, many people attempted to duplicate the certificates in order to avoid the hefty payment. Duplication of certificates is considered a severe violation of the city's laws.

02

Manual application process

The entire process was conducted manually and was paper-based, wherein an applicant was required to physically collect the form from the department, fill in the details, attach credentials and submit the form along with the fee to the department.

03

Manual verification process

The city department followed an extensive, 3-tier verification process, which was being conducted manually, consuming large amounts of time and resources.

With RingKnot Data and Blockchain capability, the city's officials streamlined the certification process

The department deployed the new-age data and blockchain-enabled solution by RingKnot, which effectively digitizes and automates the entire certification handling process. By providing centralized verifiable credentials, it ensures top-notch safety and security.

- **Workflow for review and approval of applications are based on criteria set forth by the city department after the background verification check process**
- **For applicants who clear the certification process, the workflow for online issuance of exam ticket is triggered and ticket is sent through email.**
- **For applicants who don't clear background verification, the workflow for rejection along with clarifications - if any - is sent through email.**
- **Exams are conducted on the premises of the department using handheld devices and results are captured on the web application and stored in databases.**
- **For those applicants who clear the exam successfully, a verifiable credential (VC) is generated and shared with the applicant with a QR code. Applicants can download the VC using this QR code and store it in a mobile wallet such as Microsoft Authenticator.**
- **For applicants who do not clear the examination, the results are declared through email. Applicants can then schedule the next exam online through the web application.**

For building owners who want to verify the certification, the following options are implemented.

- Access to Verifiable Credentials through one time OTP authentication
- Access to web application with a list of certified individuals with relevant registration and qualifications

The department audits data capture, integration, record keeping and violation reporting through the Verifiable Credential interface.

The RingKnot solution integrates the web application, verifiable credential interface, and mobile interface, thus making the certification and authentication process extremely efficient and seamless.

Technologies at work

UI/UX Azure web-based application built in React.JS	**Backend Workflow** Power Automate and/ or Azure function app	**Storage** Azure Datalake	**Database** Azure SQL Database
Decentralized Identity Azure active directory verifiable credentials	**Credential store** Azure Key Vault	**ID issuer** Azure Open ID	**API** Azure SendGrid

The city's construction sites are safer with RingKnot

Besides controlling incidents of certification fraud, impersonation and safety threats, the department now enjoys minimal dependency on other organizations to complete the certification process. The department also saves significant time on completing each asbestos handling certification. The renowned public entity is now able to generate substantial revenue from asbestos handling certifications.

The manual, paper-based process moving online has led to tremendous paper-saving, thus helping the city department further its sustainability goals.

Significant time-cost saving with transcription and automation of the previously manual process.

Verifiable secure digital credentials build transparency in the entire certification process. No more fake certificates mean no revenue loss for the department.

Significantly reduced dependency on other agencies and stronger collaboration yielding data-informed operational decisions.