Best Practice: Electronic Buildings Inspection Scheduling System

CITY: NEW YORK CITY   **POLICY AREAS: TECHNOLOGY; BUILDINGS ADMINISTRATION**

BEST PRACTICE

The **Plumbing Inspection Portable Entry System (PIPES)** was developed by the Department of Buildings to support the process of scheduling and performing plumbing inspections. PIPES provides automated support for scheduling, geographic routing, field inspections, results tracking and job sign-off. It is integrated with the Department's Building Information System (BIS). The system uses a web-based interface in the office and a handheld-based application for field inspections.

ISSUES

At the time of implementation, PIPES' intent was to address issues resulting from increased inspection volume with decreasing operational efficiencies due to manual paper-based processes along with inadequate customer service that was decentralized among the five boroughs.

Specific issues included:
- Significant increases in inspection requests for all inspection types
- Manual inspection scheduling, routing, disposition and tracking methods that were inefficient and non-standard across the boroughs
- Appointment details not available on BISWeb, resulting in multiple call-backs and often results in "no-access" to inspection sites
- Paper-based processes that were an ineffective use of inspectorial resources
- Non-transparent processes that opened the door to corruption
- Administrative burden for staff performing redundant functions across disciplines and boroughs
- Calling hours were limited and resulted in calls going to voice mail in borough offices

GOALS AND OBJECTIVES

The goal of PIPES was to standardize and streamline the plumbing inspection process, making the process transparent to citizens and industry representatives through leveraging state-of-the-art technology. Specific goals included:

- Reduced wait time for scheduling appointments through the centralized call center
- Increased productivity and reduced costs through optimization of workload assignment and routing
- Increased time in the field for inspections and responding to complaints
- Standardized inspection methods among the boroughs with quality assurance checks and controls
- Established uniform understanding and enforcement of building codes and objections
- Facilitated training of new inspectors and support staff
- Reduced corruption and protection of the inspector by having an objective record of activities
- Creation of a better relationship with the industry and improved Department image
- Validated BIS information prior to appointment scheduling
- Enhanced data integrity through structured data collection using handheld technology
- Integrated code references in handheld technology
- Standardized forms and elimination of work order paperwork
- Standardized routing protocols, yet allowances for chiefs to generate final route
- Confirmed appointments electronically (email and BISWeb)
- Uploaded inspection results to BIS and BISWeb in a timely manner

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IMPLEMENTATION

Launched in 2004, PIPES transformed an inefficient manual paper-based process for plumbing inspections into a state-of-the-art technology-based system that automated support for scheduling, geographic routing, field inspections, results tracking and job sign-off that has been integrated with the Department's Building Information System (BIS). PIPES uses a web-based interface in the office and a handheld-based application for field inspections.

The following system features resulted in a standardization of the plumbing inspection process among the five boroughs.

System features include:
- Single intranet application used by the call center, plumbing support staff and inspectors to schedule, route, conduct and record results of plumbing inspections
- BISWeb interface for posting inspection appointments and results
- Structured and standardized inspections
- "Blind assignment" of work orders to inspectors
- Handheld computers and printers for use in the field
- Inspector and route optimization Multiple hardware and software platforms: IIS, ASP custom GUI, Forte application server, Windows CE, Bluetooth, handheld custom interface code, Metrix 4.6.5, PointServe GIS/Optimization, Oracle, SQL Server, GeoSupport, BIS (EntireX, ADABAS/Natural, XML), BISWeb (Tomcat)

Standardized Plumbing Inspection Workflow Framework:
- Inspection Appointment Requested – Plumber call centralized call center
- Work Order Created – Operator gathers information about the job site, the work being performed and what needs inspecting
- Schedules Date – Determines the date of the inspection
- Adds "special" or "complaint" Inspections - Borough may add additional work orders to inspector's schedule
- Optimizes Route – Computes best-case route assignments and sequencing per inspector to generate time of appointment
- Notifies Plumber of Appointment Time - Plumber is notified by email/fax
- Prepares for Inspection – Inspector downloads the daily route and work orders to the handheld computer
- Conducts Inspection and Enters Results - Conducts each inspection and enters results into the handheld computer
- Posts Results – Inspector uploads recorded results at end of day to PIPES and BISWeb

COST

Initial costs for PIPES software and consulting services totaled approximately $1,000,000 USD, resulting from a mix of in-house staff and retained consultant services for necessary software configuration and customization under the direction of in-house management.

A team of consultants was acquired through a contract established with Hill International for the development of PIPES. Hill International obtained additional consultants from Metrix and LinksPoint. Metrix consultants were responsible for the customization and configuration of the Metrix desktop software application utilized for the scheduling component. Linkspoint consultants were responsible for the development of the custom code needed for the handheld technology component of the system that interfaces with the Metrix software.

While consultants worked on PIPES system design and development, in-house staff worked on parallel paths focusing on web development, Adabase development and Systems Testing.

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RESULTS AND EVALUATION

The launch of PIPES revolutionized a manual paper-based process that varied among the five borough offices by developing a software application that centralized, automated and standardized processes for plumbing inspectors to perform their job with increased efficiency.

As a result of the PIPES system, the following targets were achieved:
- Enabled online access to inspection schedules, results and objections thus eliminating the need to hire "expediters" or to visit a borough office for information queries. After the implementation of PIPES, utilization of BISWeb was 230% greater than utilization in the prior year for the same period
- Reduced time and errors with the elimination of manual data entry of field inspection results
- Provided for same day inspections results instead of 2-3 days turnaround
- Improved transparency and open access to the public thus improving accountability of inspectors

TIMELINE

February 2, 2004	PIPES launched
April 2004	Department released revised Operations Policy and Procedure Notice, addressing Inspection Scheduling and Notifications

LEGISLATION

There is no legislation specifically applicable with this program.

LESSONS LEARNED

As a result of challenges encountered during implementation, the Department of Buildings' realized the following "lessons learned" that need to be addressed for future extension of the PIPES framework to other inspection disciplines. These will be crucial to the success of the Buildings Field Inspection Recording and Scheduling Technologies (B-FIRST) project which will consolidate all inspection trades and inspection types into a single system.

- Too much technology and business change at one time leads to confusion and slower adoption of changes
- Hardware/software model complexity can result in multiple points of failure that need close monitoring
- Unstable network exacerbates problems
- Major investment in PIPES "care and feeding" and data integrity cleanup are needed
- Staff and site readiness must be objectively assessed before deployment
- Thorough up-front and end-to-end business analysis must be done
- It is important to work out scheduling parameters clearly
- Routing parameters are complex and the process is imperfect
- Project scope clarity, change control, and governance are key

TRANSFERABILITY

As a result of the successful implementation of PIPES, the B-FIRST strategic initiative has been initiated to automate and streamline the inspection process for the remaining DOB inspection units based on the framework previously developed for PIPES. The project will consolidate all inspection trades and inspection types into a single system that will provide consistency, transparency, accessibility and accountability to Department management and to the citizens of NYC.

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The B-FIRST model will accommodate all inspection types within the various inspection units, organized by an over-arching four stage business model that applies to all types of inspections:

(1) Inspection scheduling (request and work order creation, task list generation, scheduling)
(2) Inspection dispatch (resource allocation, routing, inspection packets, dispatch)
(3) Conducting Inspection & recording results in the field via structured task lists (inspect, record, print, issue violations, upload data)
(4) Inspection review and confirmation (review and approve data fields)

Through B-FIRST, the Department (and the City if the B-FIRST model is used by other agencies) can maximize inspector utilization, individual inspector productivity, improve the quality and timeliness of inspections and improve customer service. At the back-end, it reduces the review time required by supervisors. In the field, it automates the generation of violations. B-FIRST supports significant improvements in inspection performance management reporting.

CONTACTS

Department of Buildings
280 Broadway
New York, NY 10007
(212) 566-5000
pipesquestions@buildings.nyc.gov

http://NYC.gov/buildings