Preventive Maintenance KPI Dashboard for NS Public Housing

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Background

- The Department of Municipal Affairs and housing provide services and guidance to municipalities, towns, and villages in many areas as well as coordinating service contracts, performing work verifications, providing equipment data, and performing monthly building inspections.
- The main problem is there is no evaluation system for the preventive maintenance program, leading to issues with performance improvement. Moreover, developing KPIs also helps to expand their PVM program.
- Equipment covered by current PVM program : fire alarms, sprinklers, fire extinguishers, generators (emergency and standby), heating systems (oil/gas), and elevators.

Project Scope

- **Perform** data mining/data analysis to develop a set of key performance indicators.
- **Develop** and **implement** a KPI dashboard.
- **Make recommendations** for improvement of the data collection capability for the future.

Design Process

Met with the client, learned about the department, the current needs

Clarify the current problem and obtained three major datasets

Worked with the client to define the project scope and expectations of potential solution

Investigated into the datasets and explored the relations between datasets

Researched and developed three short-term KPIs to use in our analysis tool

Developed three long-term KPIs to use in the future should they wish to add more data to support them

Brainstormed and developed potential solution alternatives. Worked with client to choose one of alternatives

Created Data processing tool in Excel and reviewed the tool concept with the client

Revised data processing tool and developed the prototype of dashboard

KPIs Developing

Research: obtained three KPIs from two sources: peer reviewed paper and Maintenance Textbook.

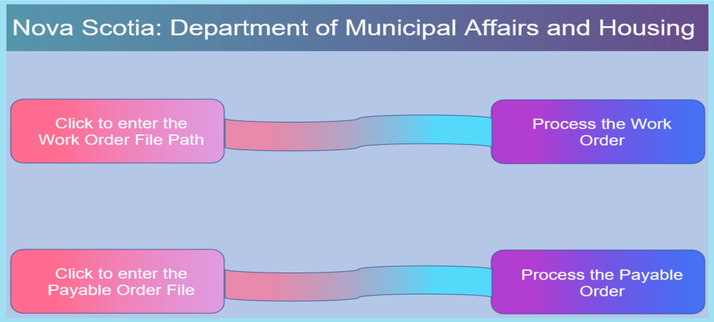
Short Term KPIs:

- Cost of Asset Maintenance
- Unplanned/Planned Maintenance Percentage
- Preventive Maintenance Compliance

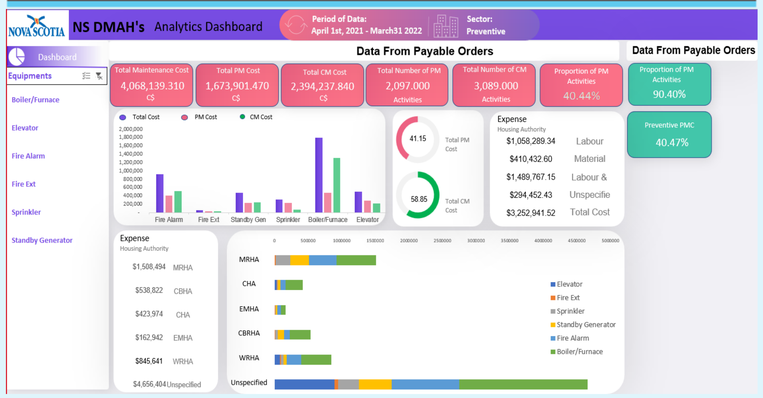
Long Term KPIs:

- Mean-Time Between Failures
- Mean-Time to Repair
- Percentage of Tenants Satisfied with Repairs

Data Processing User Interface



Dashboard User Interface



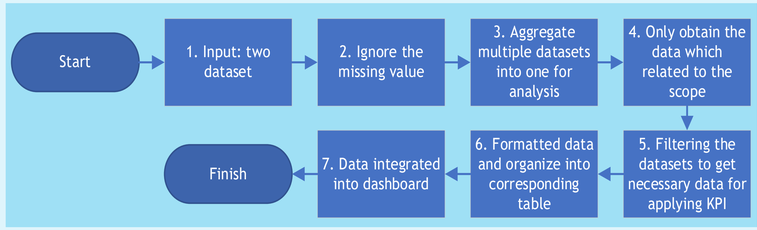
Conclusion & Recommendation

Conclusion: DMAH has a lot of room for improvement in preventive maintenance by improving the data collection system. Our tool has proven itself to be effective, so long as the following recommendations are made in order to improve the maintenance data quality:

Recommendations:

- Establish requirements for each KPI
- Standardize data collection/data entry
- Improve responsiveness to maintenance requests
- Implement personnel training
- Expand the scope of the data collections to include long-term KPIs
- Train contractors to properly complete project reports

Developing Process tool Development Process



Data Output

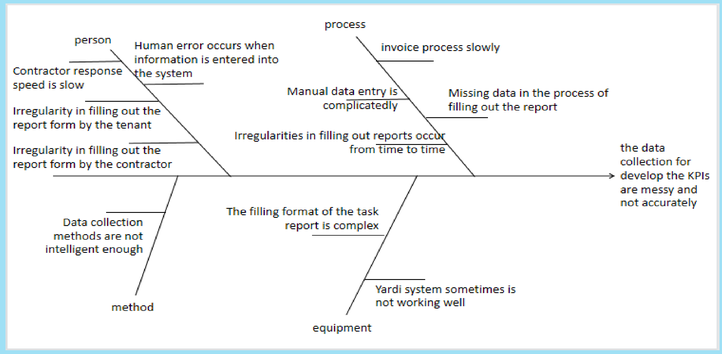
Mtce Fire Alarm		Mtce Fire Ext		Mtce Standby Generator		Mtce Sprinkler		Mtce Boilers/Furnace		Mtce Elevators	
Total Number of CM	1,126	Total Number of CM	126	Total Number of CM	245	Total Number of CM	86	Total Number of CM	1,236	Total Number of CM	270
Total Cost of CM	511,444	Total Cost of CM	26,283	Total Cost of CM	251,560	Total Cost of CM	74,643	Total Cost of CM	1,314,077	Total Cost of CM	214,230
Labour Cost	155,380	Labour Cost	11,200	Labour Cost	49,756	Labour Cost	23,228	Labour Cost	201,916	Labour Cost	36,568
Material Cost	72,453	Material Cost	3,628	Material Cost	37,676	Material Cost	8,805	Material Cost	241,373	Material Cost	2,798
Labour & Material Cost	118,692	Labour & Material Cost	5,004	Labour & Material Cost	91,854	Labour & Material Cost	23,682	Labour & Material Cost	539,645	Labour & Material Cost	141,852
Blank cell cost	33,643	Blank cell cost	406	Blank cell cost	28,204	Blank cell cost	8,477	Blank cell cost	56,590	Blank cell cost	11,315
Cost/CM	454	Cost/CM	224	Cost/CM	1,027	Cost/CM	868	Cost/CM	1,063	Cost/CM	793
MRHA	246,814	MRHA	10391.9	MRHA	88408.05	MRHA	57158.44	MRHA	428400.05	MRHA	1279.38
CHA	47,583	CHA	5773.17	CHA	23133.85	CHA	2865.01	CHA	229221.27	CHA	7808.66
EMHA	25,614	EMHA	1847.25	EMHA	21478.93	EMHA	1322.5	EMHA	60980.67	EMHA	2932.56
CBIHA	10,872	CBIHA	460.67	CBIHA	71563.6	CBIHA	7279.13	CBIHA	182023.78	CBIHA	813.93
AV-WRHA	26,965	AV-WRHA	7181.18	AV-WRHA	43523.02	AV-WRHA	6018.09	AV-WRHA	280621.78	AV-WRHA	34268.89
Unspecified	55,666	Unspecified	956.8	Unspecified	2319.54	Unspecified	0	Unspecified	87885.74	Unspecified	167127
TC-WRHA	97,930	TC-WRHA	1672.1	TC-WRHA	1132.96	TC-WRHA	0	TC-WRHA	44943.56	TC-WRHA	0
Prev Mtce Fire Alarm		Prev Mtce Fire Ext		Prev Mtce Standby Generator		Prev Mtce Sprinkler		Prev Mtce Boilers/Furnace		Prev Mtce Elevators	
Total Number of PM	350	Total Number of PM	134	Total Number of PM	458	Total Number of PM	69	Total Number of PM	1,020	Total Number of CM	66
Total Cost of PM	410,057	Total Cost of PM	25,774	Total Cost of PM	229,887	Total Cost of PM	239,270	Total Cost of PM	477,924	Total Cost of CM	290,989
Labour Cost	256,826	Labour Cost	6,119	Labour Cost	159,764	Labour Cost	13,048	Labour Cost	80,131	Labour Cost	64,353
Material Cost	1,220	Material Cost	978	Material Cost	1,342	Material Cost	900	Material Cost	38,964	Material Cost	294
Labour & Material Cost	22,248	Labour & Material Cost	6,376	Labour & Material Cost	29,845	Labour & Material Cost	143,624	Labour & Material Cost	240,083	Labour & Material Cost	126,861
Blank cell cost	50,962	Blank cell cost	6,124	Blank cell cost	6,410	Blank cell cost	23,853	Blank cell cost	50,648	Blank cell cost	17,820
Cost/CM	1171.592	Cost/CM	192.345	Cost/CM	502	Cost/CM	3467.674	Cost/CM	468.552853	Cost/CM	4408.927
MRHA	159678.8	MRHA	6651.24	MRHA	188212.3	MRHA	162706.85	MRHA	158792.92	MRHA	0
CHA	28506.91	CHA	3236.97	CHA	18269.09	CHA	3046.93	CHA	31215.16	CHA	23313.95
EMHA	25444.36	EMHA	7030.89	EMHA	2024	EMHA	853.88	EMHA	2736.6	EMHA	676.2
CBIHA	74543.78	CBIHA	5786.13	CBIHA	18049.25	CBIHA	37032.61	CBIHA	130397.73	CBIHA	0
AV-WRHA	83906.3	AV-WRHA	347.01	AV-WRHA	3332.69	AV-WRHA	35629.28	AV-WRHA	114918.01	AV-WRHA	48543.8
Unspecified	27689.57	Unspecified	0	Unspecified	0	Unspecified	0	Unspecified	28165.12	Unspecified	218455.3
TC-WRHA	287.5	TC-WRHA	2722.05	TC-WRHA	0	TC-WRHA	0	TC-WRHA	11698.27	TC-WRHA	0

Boiler / Furnace					
	Total			Preventive	
Status	Percentage	Count number	Status	Percentage	ount numb
Work Completed	0.799528	339	Complt	0.612903226	114
Call	0.176887	75	Call	0.38172043	71
Canceled	0.007075	3	Canceled	0.005376344	1
In Progress	0.011792	5	In Progres	0	0
Scheduled	0.004717	2	Schedulec	0	0
Total KPI PMC	0.805226	Preventive KPI		0.616216216	

Elevator					
	Total			Preventive	
Status	Percentage	Count number	Status	Percentage	ount numb
Work Completed	0.91001125	809	Complet	0.9893233843	278
Call	0.032602092	29	Call	0.003558719	1
Canceled	0.04049494	36	Canceled	0	0
In Progress	0.00674916	6	In Progress	0	0
Scheduled	0.01012373	9	Scheduled	0.007117438	2
Total KPI PMC	0.94841735	Preventive KPI P		0.9893233843	

Analysis

After the data mining of the three datasets, the team found that the datasets included various data which are valuable in performing the analysis. However, considering that the network between different housing authorities is not standardized, and that there is no synchronized data collection method, the dataset is not consistent as it should be. Consequently, there are a few risks that could not be addressed during this project due to these limitations.



Causes of data clutter:

- Inaccurate data entry
- Inability to standardize contractor's project report format
- Long processing time for maintenance requests
- Non-standard format for filling maintenance requests
- No standardized format for filling out project reports