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Rome Wasn't Built in a Day.. Neither Should a CMMS!

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January 24, 2018

AGENDA

- LRWWU Overview
- Overall Needs for a CMMS
- Our Approach
- Findings
  - Final Rankings
  - Vendor Demos
- Next Steps and Lessons Learned

LRWWU OVERVIEW

- Five member communities: Chelmsford, Dracut, Lowell, Tewksbury, and Tyngsboro
  - Serving over 180,000 citizens
- 25 Remote Facilities (Pump and Diversion Stations)
- Over 250 miles of sewer and drain
  - 200+ miles of sewer
  - 50+ miles of drain

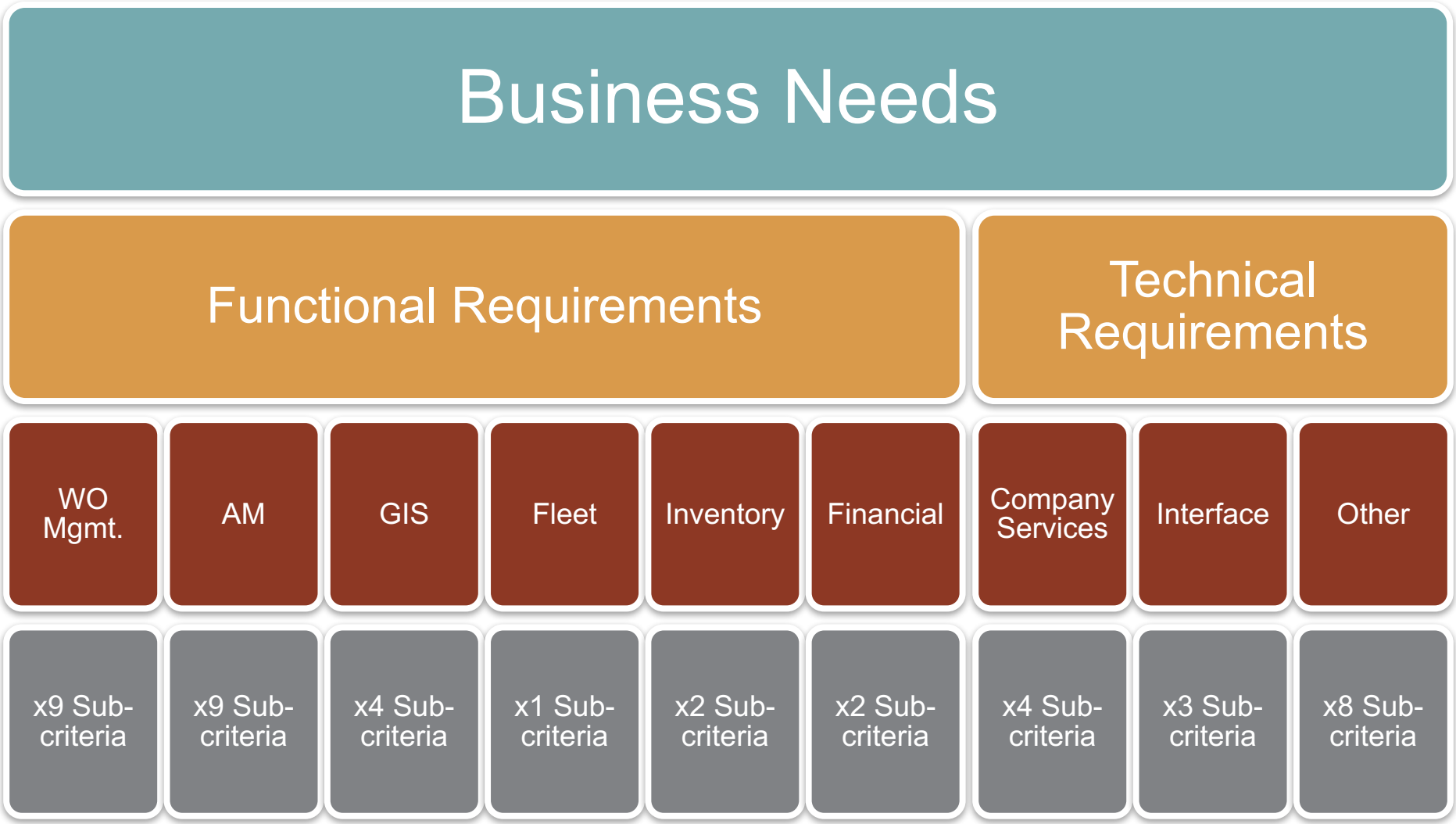
OVERALL NEEDS FOR A CMMS

- Current system is MP2 (Only ~450 Assets in system)
- Identify asset ID naming convention
  - i.e. Asset ID: SP-0111 -- Common Name: Screw Pump No. 1
- What asset information needs to be collected?
- Adopt a proactive approach to Maintenance Management
- Current system supported by vendor
- Horizontal (Collection system) vs Vertical (Buildings)
- Potential future build out to other departments

Our Approach

Hazen

OVERVIEW


Business Needs
Functional Requirements
Technical Requirements
WO Mgmt.
AM
GIS
Fleet
Inventory
Financial
Company Services
Interface
Other
x9 Sub-criteria
x9 Sub-criteria
x4 Sub-criteria
x1 Sub-criteria
x2 Sub-criteria
x2 Sub-criteria
x4 Sub-criteria
x3 Sub-criteria
x8 Sub-criteria

BUSINESS NEEDS

Ranking

B1: Reporting of historical and real time maintenance and operation data for improved decision making

B2: Integration with GIS, MUNIS

B3: Operational Use

B4: Work order management system (entry, lookup, modification, approval, notification, updating, and closing)

B5: Centralized repository for maintenance data

B6: Reduced maintenance costs through better scheduling

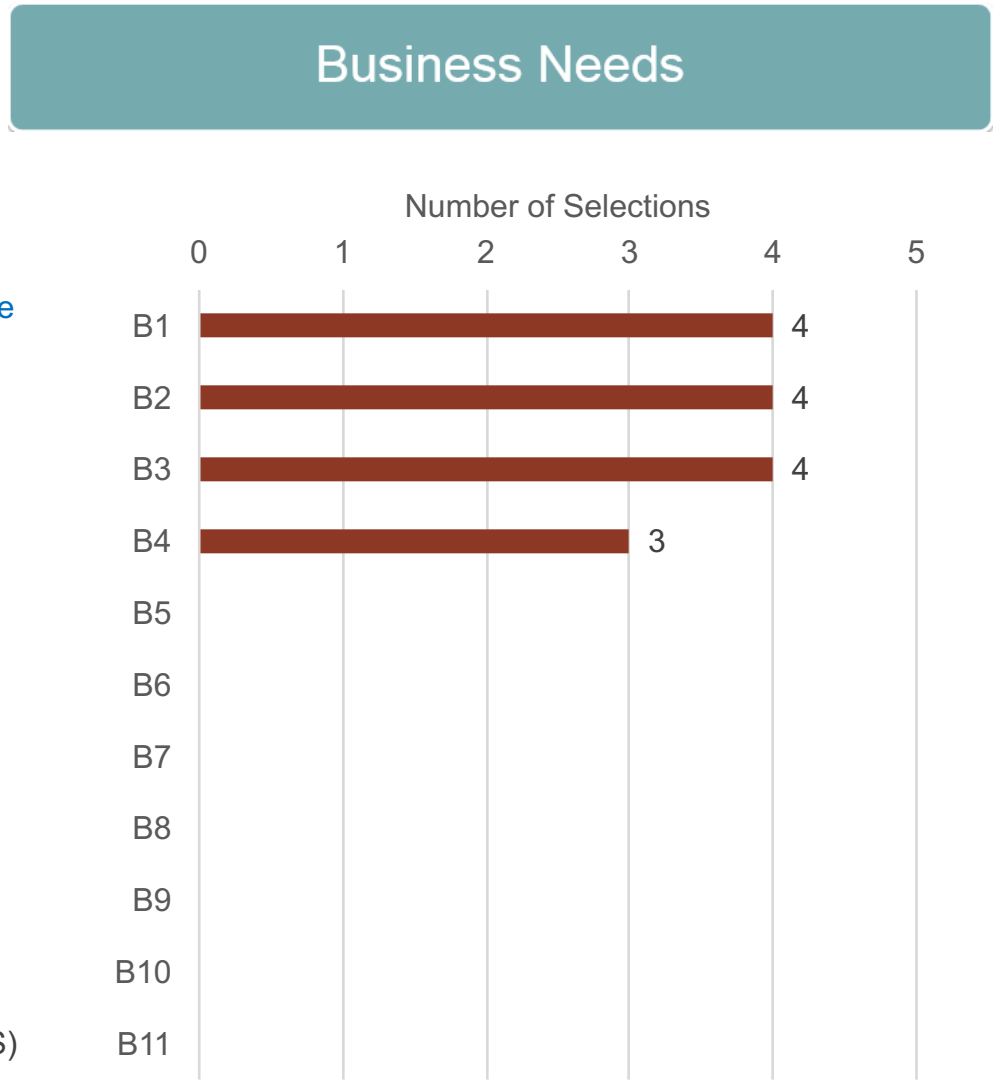
B7: Managing assets to extend asset life-cycles

B8: Track KPIs (e.g., scheduled vs. unplanned maintenance)

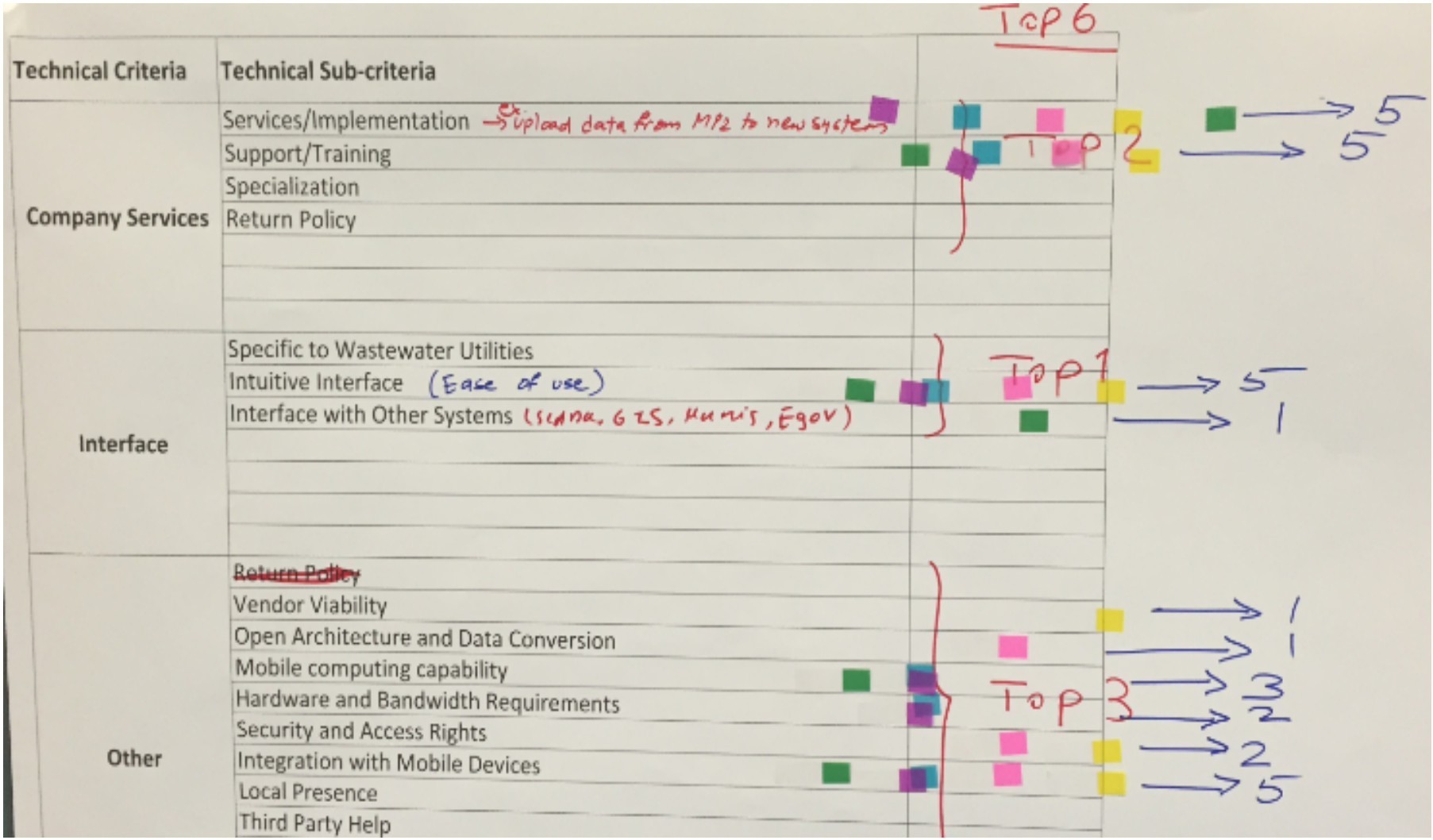
B9: Improved compliance and standards tracking

B10: Integrated fleet management system

B11: Mobile applications (integration with CCTV, GIS)



WORKSHOPS WITH LRWWU



WORKSHOPS WITH LRWWU

Criteria Weightings

	Name:	LRWWU 1	LRWWU 2	LRWWU 3	LRWWU 4	LRWWU 5	Results			
Requirements	**Criteria**	**Score #1**	**Score #2**	**Score #3**	**Score #4**	**Score #5**	**Maximum Score**	**Minimum Score**	**Average Score**	**Weighting (%)**
Functional	Work Order Management	50	50	25	20	20	50	20	33	**28%**
	Asset Management	10	10	15	20	15	20	10	14	**12%**
	GIS	20	5	10	20	10	20	5	13	**11%**
	Fleet Management			5	5	5	5	5	5	**4%**
	Inventory Management			5	5	5	5	5	5	**4%**
	Financial Planning					10	10	10	10	**9%**
Technical	Company Services	20	20	5	3	10	20	3	12	**10%**
	Interface		10	25	15	20	25	10	18	**15%**
	Other		5	10	12	5	12	5	8	**7%**
	Total	**100**	**100**	**100**	**100**	**100**				

FUNCTIONAL AND TECHNICAL CRITERIA

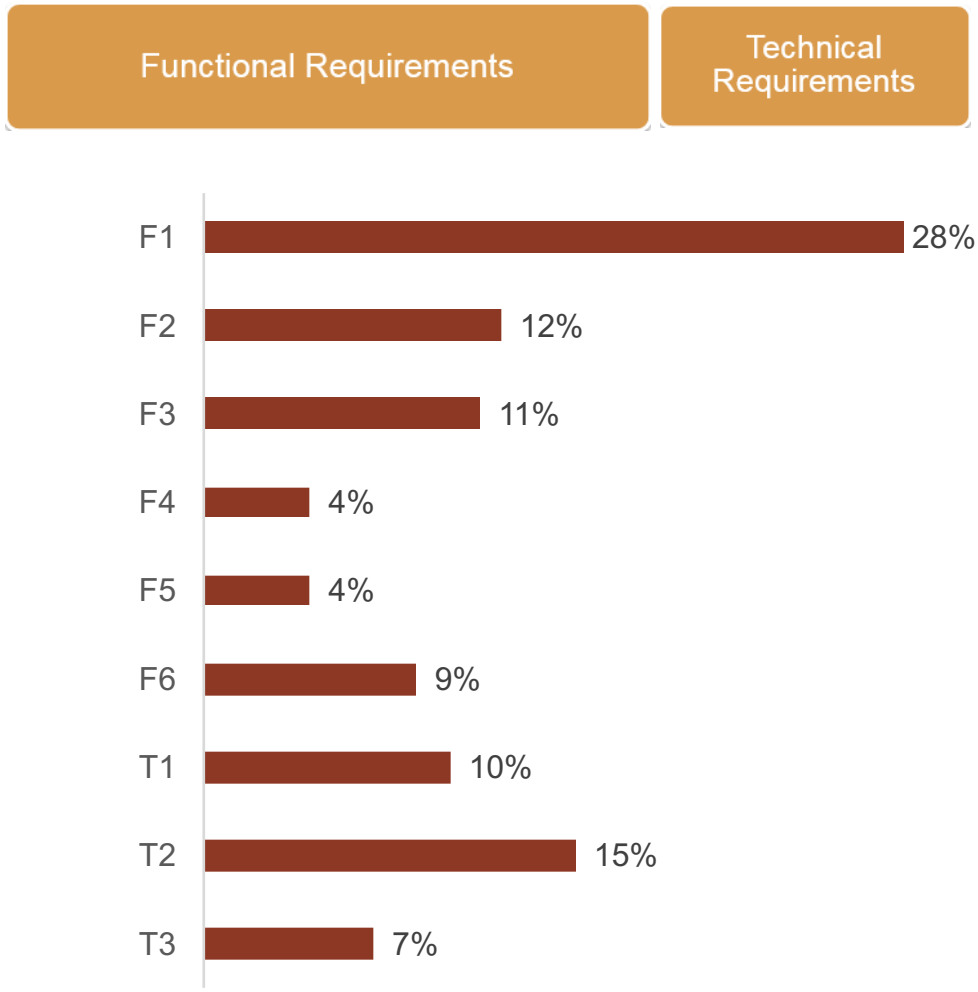
Weightings

Functional Criteria:

- F1: Work Order Management
- F2: Asset Management
- F3: GIS
- F4: Fleet Management
- F5: Inventory Management
- F6: Financial Planning

Technical Criteria:

- T1: Company Services
- T2: Interface
- T3: Other



Industry Research

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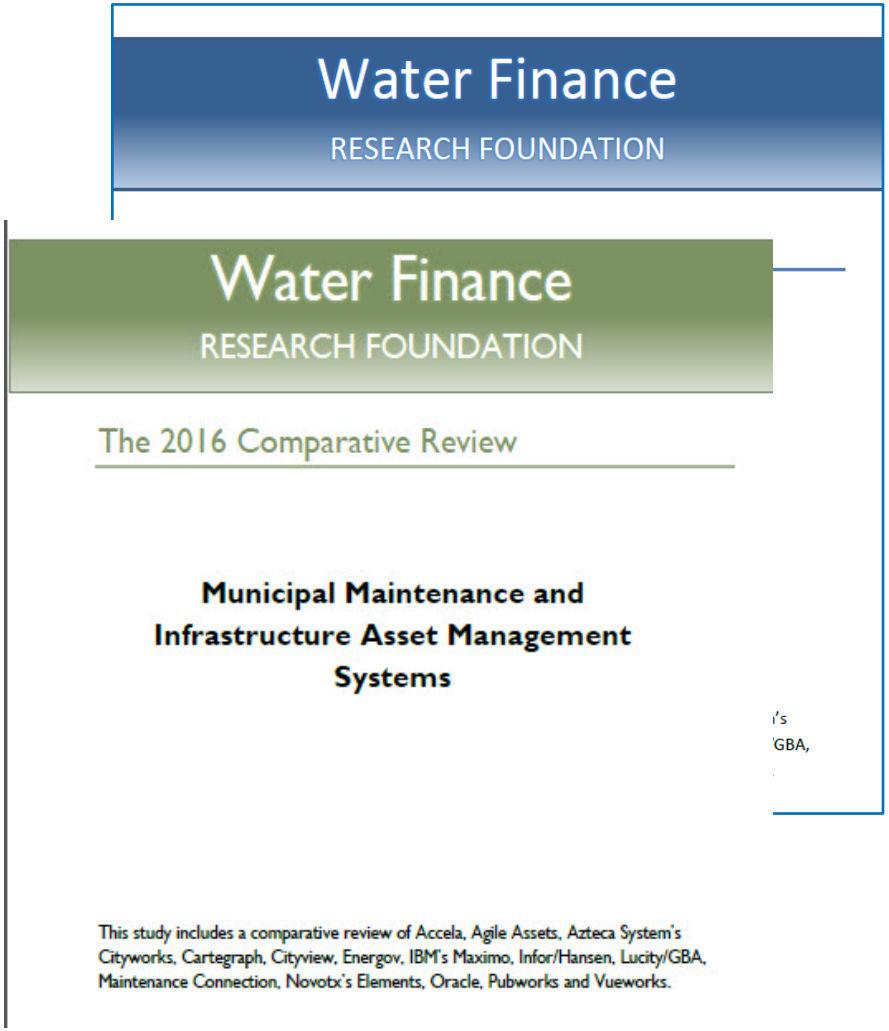
CMMS SOLUTIONS

EAM

Public Sector

INDUSTRY REFERENCES

- Industry research
- Internal knowledge of different systems at Hazen
- Vendors websites
- Existing users feedback



CAPABILITIES ASSESSMENT

		F1-1: Work Orders and Work Flows	3-Good
		F1-2: Corrective/Preventive/Predictive Maintenance	3-Good
Req		F1-3: Report Generation	4-Excellent
		F1-4: Scheduling Capability	3-Good
Functional	F1: Work Order Management	F1-3: Report Generation	4-Excellent
		F1-4: Scheduling Capability	3-Good
	F2: Asset Management	F2-1: Document Integration	3-Good
		F2-2: Risk Management	1-Poor
		F2-3: Customizable Attributes	
		F2-4: Barcode Compatibility	2-Fair
		F2-5: Asset Hierarchy	0
		F2-6: Asset Management Reports/Dashboards/Business Analytics	3-Good
		F2-7: Condition Assessment (Support Balanced Scorecard Methodology)	0
	F3: GIS	F3-1: 311 System/ Egov	4-Excellent
		F3-2: GIS Mapping	4-Excellent
		F3-3: Mobile Devices	3-Good
		F3-4: Esri GIS Integration	3-Good
	F5: Inventory Management	F5-1: Parts Inventory	0
	F6: Financial Planning	F6-1: Financial planning - with Munis	5-Exceptional
Technical	T1: Company Services	T1-1: Services/Implementation --> Upload data from MP2 to New System	4-Excellent
		T1-2: Support/Training	4-Excellent
	T2: Interface	T2-1: Intuitive Interface (Ease of Use)	2-Fair
		T2-2: Interface with Other Systems (Scada, GIS, Munis, Egov)	4-Excellent
	T3: Other	T3-1: Integration with Mobile Devices	3-Good
		T3-2: Cloud deployment capability	5-Exceptional
		T3-3: Hardware and Bandwidth Requirements	4-Excellent
		T3-4: Security and Access Rights	3-Good
		T3-5: Vendor Viability	3-Good
		T3-6: Open Architecture and Data Conversion	3-Good

SCORING GUIDE

Scoring protocol for each sub-criteria

Functional Requirement
Criteria F1: Work Order Management
Sub-Criteria F1-2: Corrective/Preventive/Predictive Maintenance

Score	Description
5	Exceptional corrective, preventive, and predictive maintenance capabilities including the following features: • Ability to distinguish between corrective, preventive, and predictive maintenance work orders • PM can be set based on flexible time interval • PM can be set based on target set dates • PM can be set based on usage • PM can be adjusted based on extended dates • PM can be set against a single asset, an asset class, or the entire system • Condition-based work order generation
4	Excellent corrective, preventive, and predictive maintenance capabilities including the following features: • Ability to distinguish between corrective, preventive, and predictive maintenance work orders • PM can be set based on flexible time interval • PM can be set based on target set dates • PM can be adjusted based on extended dates • PM can be set based on usage
3	Good corrective, preventive, and predictive maintenance capabilities including the following features: • Ability to distinguish between corrective, preventive, and predictive maintenance work orders • PM can be set based on flexible time interval • PM can be set based on target set dates
2	Fair corrective, preventive, and predictive maintenance capabilities including the following features: • Ability to distinguish between corrective, preventive, and predictive maintenance work orders • PM can be set based on flexible time interval
1	Poor corrective, preventive, and predictive maintenance capabilities including the following features: • Ability to distinguish between corrective, preventive, and predictive maintenance work orders
0	No corrective, preventive, and predictive maintenance capabilities.

SCORING GUIDE

Scoring protocol for each sub-criteria

Requireme	Criteria	Sub-Criteria	No	Weighting (%)	CMMS 1	CMMS 2	CMMS 3	CMMS 4	CMMS 5	CMMS 6
Functional	Asset Management	Risk Management	11	1.7%	4-Excellent	2-Fair	3-Good	4-Excellent	4-Excellent	4-Excellent
		Customizable Attributes	12	1.7%	4-Excellent	4-Excellent		4-Excellent		5-Exceptional
		Barcode Compatibility	13	1.7%	1-Poor	3-Good	4-Excellent	2-Fair	0	4-Excellent
		Asset Hierarchy	14	0.9%	2-Fair	3-Good	5-Exceptional	3-Good	2-Fair	5-Exceptional
		Asset Management Reports/Dashboards/Business Analytics	15	0.9%	3-Good	1-Poor	3-Good	4-Excellent	3-Good	5-Exceptional
		Condition Assessment (Support Balanced Scorecard Methodolo	16	0.9%	4-Excellent	0	5-Exceptional	5-Exceptional	3-Good	3-Good
	GIS	311 System/ Egov	19	3.7%	4-Excellent	1-Poor	4-Excellent	2-Fair	4-Excellent	4-Excellent
		GIS Mapping	20	3.7%	5-Exceptional	4-Excellent	5-Exceptional	5-Exceptional	5-Exceptional	5-Exceptional
		Mobile Devices	21	3.7%	4-Excellent	3-Good	4-Excellent	2-Fair	3-Good	5-Exceptional
		Esri GIS Integration	22	3.7%	4-Excellent	3-Good	4-Excellent	5-Exceptional	4-Excellent	4-Excellent
	Inventory Management	Parts Inventory	24	4.3%	4-Excellent	2-Fair	5-Exceptional	5-Exceptional	4-Excellent	5-Exceptional
	Financial Planning	Financial planning - with Munis	26	8.5%	0	0	3-Good	3-Good	4-Excellent	3-Good
Technical	Company Services	Services/Implementation --> Upload data from MP2 to New Syst	28	5.0%	4-Excellent	2-Fair	5-Exceptional	5-Exceptional	4-Excellent	5-Exceptional
		Support/Training	29	5.0%	4-Excellent	1-Poor	5-Exceptional	5-Exceptional	4-Excellent	5-Exceptional
	Interface	Intuitive Interface (Ease of Use)	32	12.5%	3-Good	3-Good	4-Excellent	4-Excellent	3-Good	5-Exceptional
		Interface with Other Systems (Scada, GIS, Munis, Egov)	33	2.5%	2-Fair	2-Fair	4-Excellent	4-Excellent	3-Good	5-Exceptional
	Other	Integration with Mobile Devices	35	2.4%	4-Excellent	3-Good	4-Excellent	2-Fair	3-Good	5-Exceptional
		Cloud deployment capability	36	1.5%	5-Exceptional	4-Excellent	4-Excellent	3-Good	5-Exceptional	5-Exceptional
		Hardware and Bandwidth Requirements	37	1.0%	4-Excellent	4-Excellent	4-Excellent	3-Good	4-Excellent	3-Good
		Security and Access Rights	38	1.0%	4-Excellent	2-Fair	3-Good	4-Excellent	3-Good	5-Exceptional
		Vendor Viability	39	0.5%	3-Good	5-Exceptional	3-Good	5-Exceptional	2-Fair	4-Excellent
		Open Architecture and Data Conversion	40	0.5%	4-Excellent	2-Fair	5-Exceptional	4-Excellent	3-Good	4-Excellent

Findings

FINAL RESULTS AND RANKINGS

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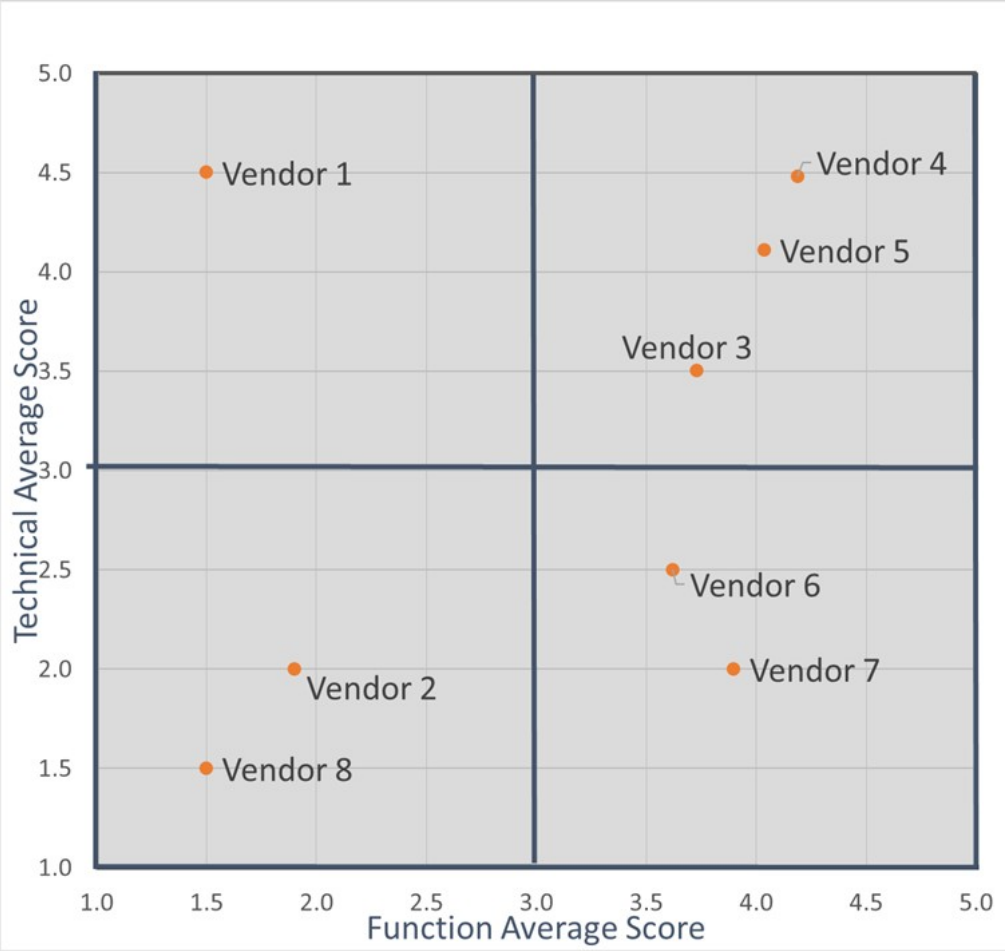
LOWELL REGIONAL WASTEWATER UTILITY

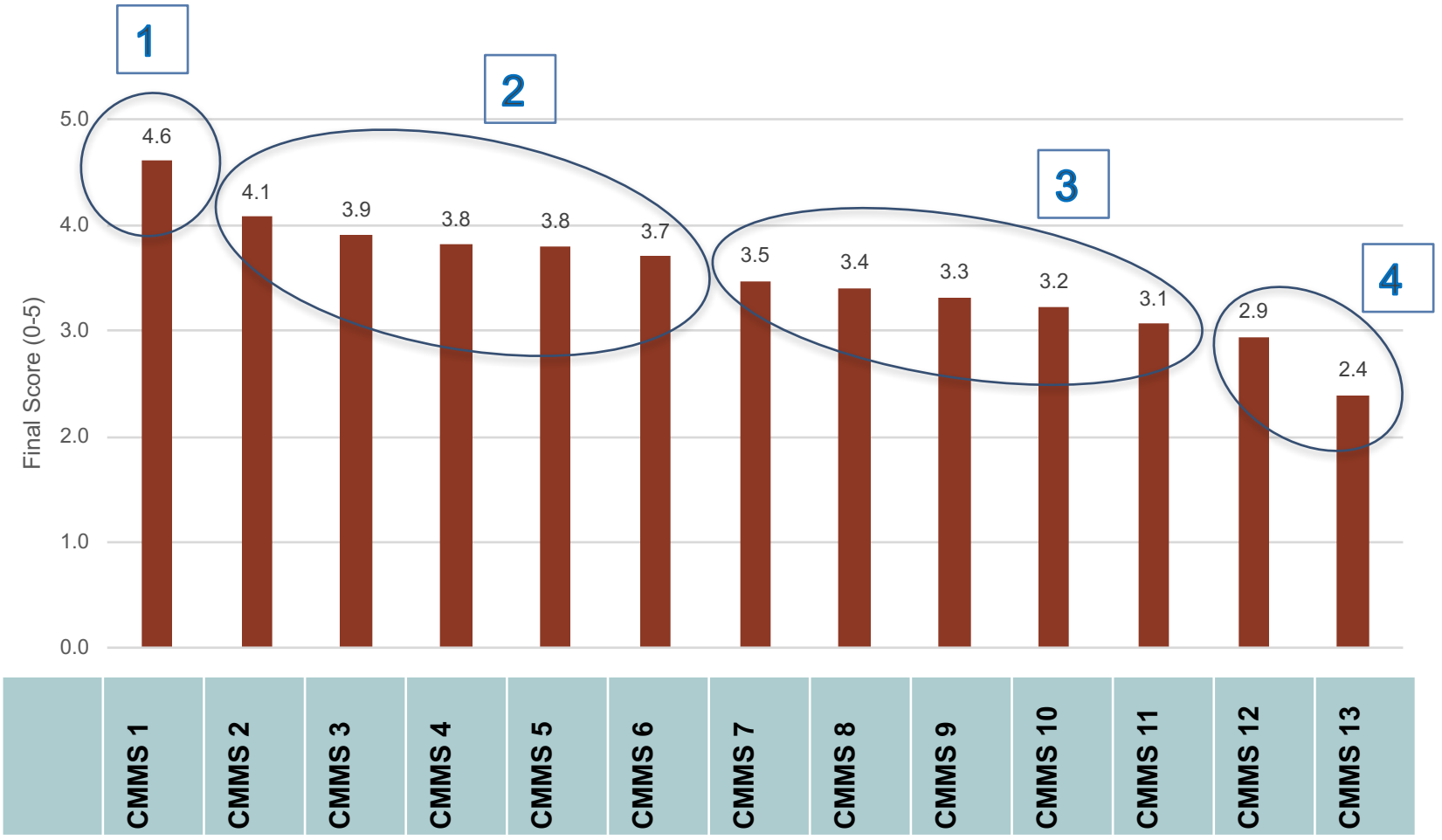
FINAL RANKINGS

Criteria	CMMS 1	CMMS 2	CMMS 3	CMMS 4	CMMS 5	CMMS 6	CMMS 7	CMMS 8	CMMS 9	CMMS 10	CMMS 11	CMMS 12	CMMS 13
Ranking	8	13	6	4	9	1	5	2	3	11	10	12	7
F1: Work Order Management	4	3	3	4	3	5	4	4	4	3	3	4	4
F2: Asset Management	3	3	3	3	2	4	4	4	4	2	4	2	4
F3: GIS	4	3	4	4	4	5	3	5	4	4	4	4	2
F5: Inventory Management	4	2	5	5	4	5	4	5	5	0	4	5	1
F6: Financial Planning	0	0	3	3	4	3	3	3	3	5	3	0	3
T1: Company Services	4	2	5	5	4	5	5	5	5	4	3	3	4
T2: Interface	3	3	4	4	3	5	4	4	4	2	2	3	4
T3: Other	4	3	4	3	4	5	5	4	3	4	4	3	5

PRODUCT EVALUATION MATRIX



CMMS RANKING RESULTS



Vendor Demos & Discussions

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CMMS VENDOR DEMONSTRATIONS

- Invited Vendors to come and demo their product capabilities.

Scenario 1: Preventive Maintenance

LRWWU has built a new influent pumping facility at the Wastewater Treatment Plant and would like to establish cyclical maintenance in order to decrease operating costs and lengthen the lifespan of the assets. Each PM WO should include tasks and instructions on the steps for maintenance according to warranty specifications. Demonstrate how the influent pumping facility and equipment will be maintained using your solution.

No.	Function
1	Show how to create new attribute fields, new tabs etc.
2	Demonstrate how the new influent pump is added to the asset register and assigned to a specific location, hierarchy and asset ID.
3	Show how the next scheduled PM for the pump is generated and assigned.
4	Show what information is included in the paper-based work order to help the crew find the asset.
5	Show how condition data is used to trigger PMs.
6	Show how history of work orders can be retrieved for the pump.
7	Show the system's ability to upload asset specific files (i.e. photos, as-builts etc. and link to one or more work orders
8	Show how inventory is assigned to each Work Order, tracked and reported.
9	Demonstrate the inventory management capabilities, show how to identify when to replenish the inventory stock, and how items are reordered.
10	Show how multiple (similar) assets can be written to the same work order

CMMS VENDOR DEMONSTRATIONS

- Invited Vendors to come and demo their product capabilities.
- Developed demo scripts to facilitate conversations
  - Based on current issues and showed the full gamut of software capabilities
- Hands On Experience
  - Allowed LRWWU users to be in command

Next Steps & Lessons Learned

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OAKELL REGIONAL WASTEWATER UTILITY

NEXT STEPS

- Presented outcomes to Leadership
- Currently in the selection process
- Finalize P&ID and Asset tables

Legend:

Needs label
Needs no label
Removed from drawing

Piping and Instrumentation
P-300s Aeration Trains No. 1-4, Aeration Blowers No. 1-4, Primary Effluent & Low-Pressure Air Distribution

Location	Page Number	Location Description	Process Line	Size (diameter-in)	Pipe Material	Asset ID	Common Name	Date Tagged	Editing Changes from Original Drawing	Grommet
Aeration Influent Channel	P-307	TSS Probe in PE Channel	Aeration			AE-0300	TSS Probe		ADDED 10/2016	
Aeration Train 1	P-301	DO Probe in Cell 1	Aeration			AE-0308A	DO Probe		ADDED 10/2016	
Aeration Train 1	P-301	DO Probe in Cell 2	Aeration			AE-0308B	DO Probe		ADDED 10/2016	
Aeration Train 1	P-301	DO Probe in Cell 3	Aeration			AE-0308C	DO Probe		ADDED 10/2016	
Aeration Train 1	P-301	ORP Probe in Cell 3	Aeration			AE-0308D	ORP Probe		ADDED 10/2016	
Aeration Train 2	P-302	DO Probe in Cell 1	Aeration			AE-0314A	DO Probe		ADDED 10/2016	
Aeration Train 2	P-302	DO Probe in Cell 2	Aeration			AE-0314B	DO Probe		ADDED 10/2016	
Aeration Train 2	P-302	DO Probe in Cell 3	Aeration			AE-0314C	DO Probe		ADDED 10/2016	
Aeration Train 2	P-302	ORP Probe in Cell 3	Aeration			AE-0314D	ORP Probe		ADDED 10/2016	
Aeration Train 3	P-303	DO Probe in Cell 1	Aeration			AE-0320A	DO Probe		ADDED 10/2016	
Aeration Train 3	P-303	DO Probe in Cell 2	Aeration			AE-0320B	DO Probe		ADDED 10/2016	
Aeration Train 3	P-303	DO Probe in Cell 3	Aeration			AE-0320C	DO Probe		ADDED 10/2016	
Aeration Train 3	P-303	ORP Probe in Cell 3	Aeration			AE-0320D	ORP Probe		ADDED 10/2016	
Aeration Train 4	P-304	DO Probe in Cell 1	Aeration			AE-0326A	DO Probe		ADDED 10/2016	
Aeration Train 4	P-304	DO Probe in Cell 2	Aeration			AE-0326B	DO Probe		ADDED 10/2016	
Aeration Train 4	P-304	DO Probe in Cell 3	Aeration			AE-0326C	DO Probe		ADDED 10/2016	
Aeration Train 4	P-304	ORP Probe in Cell 3	Aeration			AE-0326D	ORP Probe		ADDED 10/2016	
	P-305	Aeration Blowers 1&2						Y	Y	Y	Y	IP	N	N	N

LESSONS LEARNED

- Buy-in from staff/end users – Extremely crucial
  - User friendly software
- Identify Facility Needs - Have the software fit into your desired framework
- Resource/Manpower needs – Getting the right team is key!
- Needs to be a Phased Approach – Takes time and effort to get it done, right!

THANK YOU !!

QUESTIONS ??

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