Four Voices Framework
for Operational Excellence

Be Boulder.

University of Colorado **Boulder**
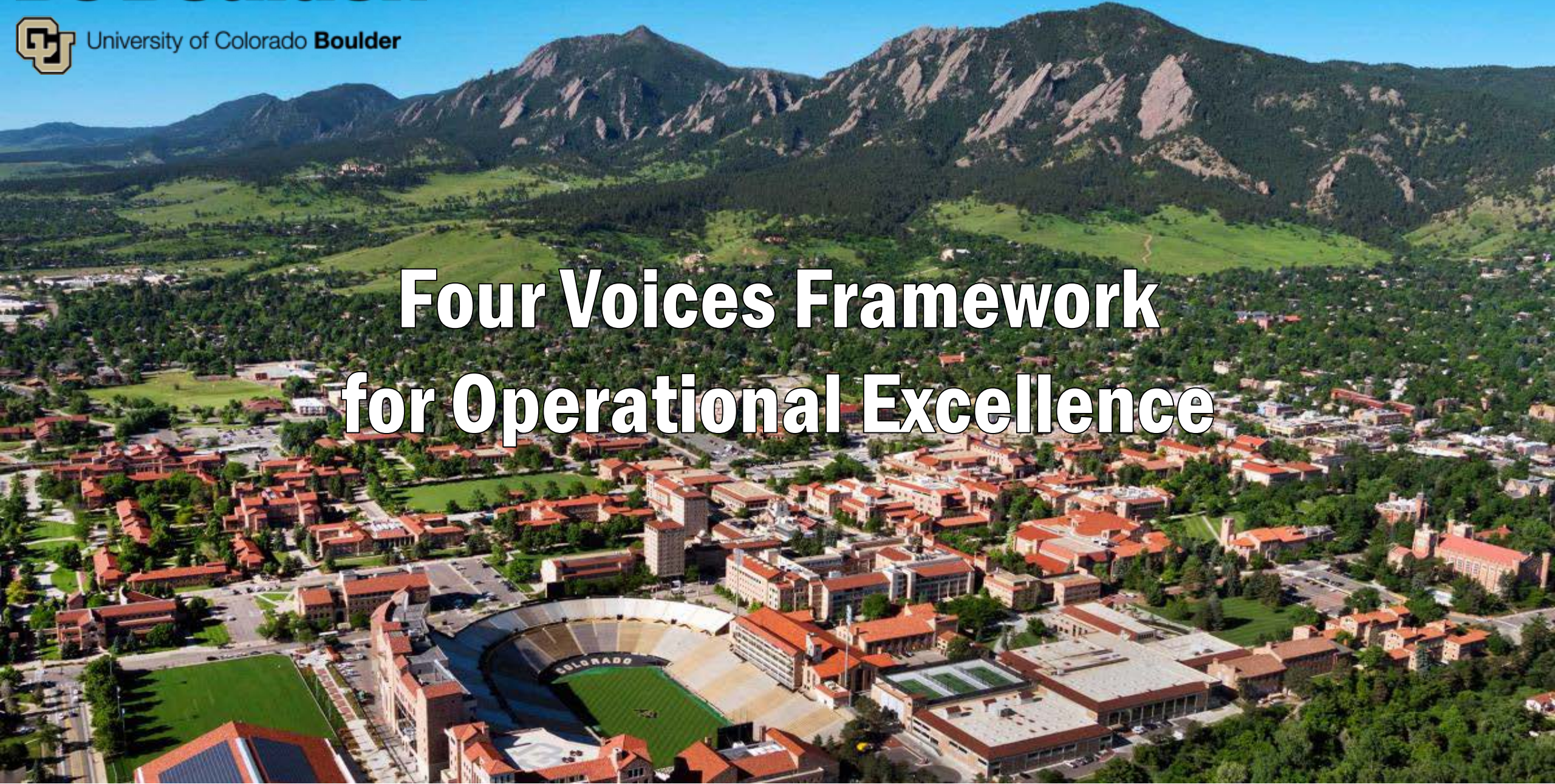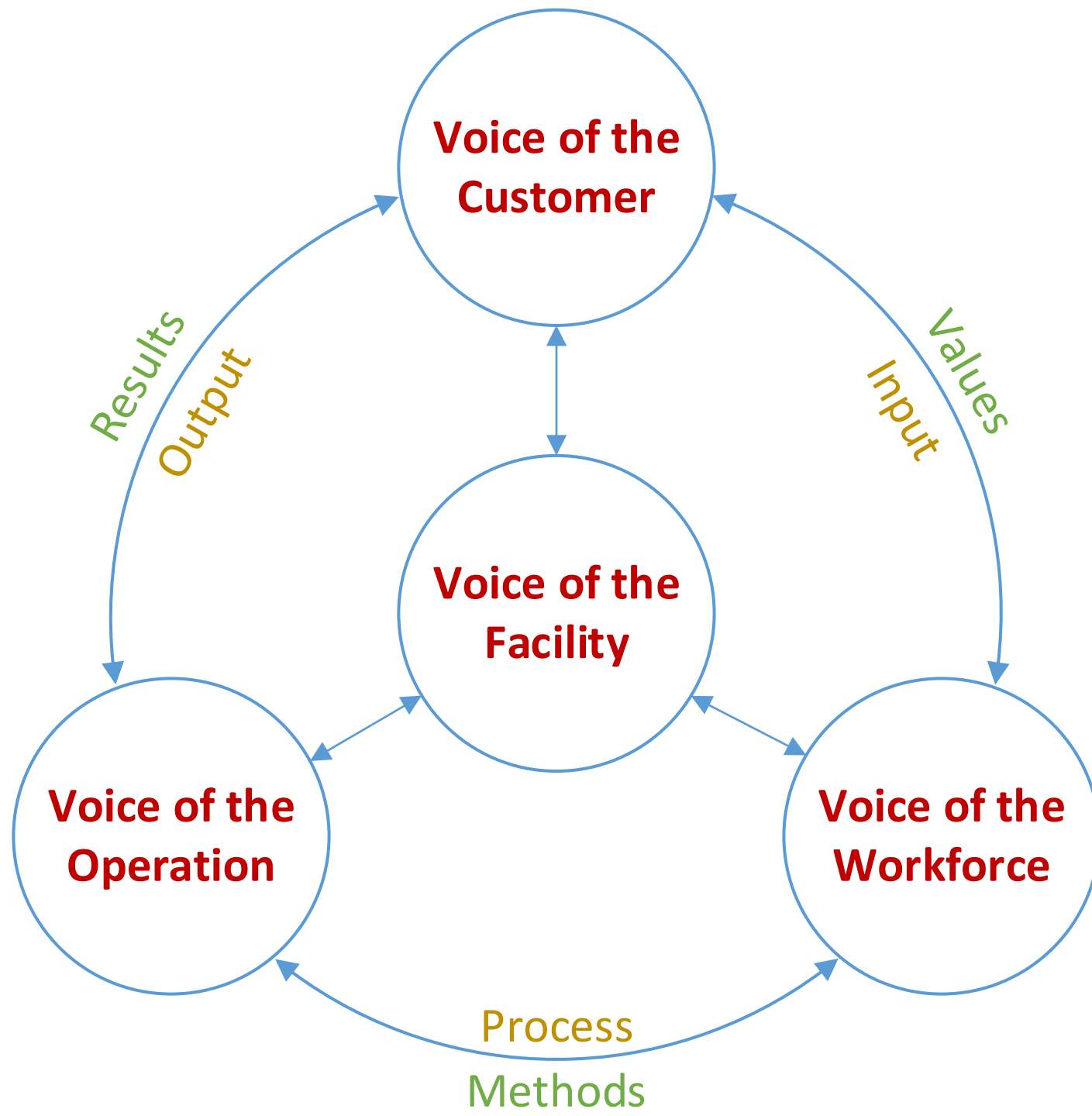
Voice of the Customer - Insights

- Who are your customers?
- Do all your customers require the same type of service?
- What do your customers value? What do they expect from you?
- What kind relationships do your customers expect to have with you?
- How do your customers prefer to communicate with you?
- Why do your customers use your services/products? Do you have to compete?
- How do your customers reimburse you? How does this impact your relationship with them?
- What do your customers complain about?

Voice of the Customer - Tools

- Customer segment analysis
- MOUs, SLAs, contracts, invoices
- Customer feedback (solicited and unsolicited)
- Work order analysis
- (Customer satisfaction vs. service quality)
- Critical to Quality diagrams
- Customer experience maps
- Website analytics
- Social media and online reviews
- Information from other voices

Customer Experience Map - Residents of CU Residence Halls – Getting Help From Housing Facilities Services

Phase	DISCOVER	DECIDE	CONTACT	ENGAGE	RESPOND
Customer Wants	Learn how to get help with a problem	Understand my options Compare options and pick the best one Keep it simple	Contact HFS for help Clearly communicate my problem Understand next steps	Work with HFS staff to solve the problem Understand the problem, the cause, and the solution	Follow-up with survey or other action
Customer Thinking	This is inconvenient, and it's CU's fault. I hope the solution is quick and easy.	Which option gets my problem solved fastest? Which requires the least effort?	Do they understand my problem? Is my problem taken seriously? When will someone come to help? Will it be inconvenient for me?	Can you tell me when you're coming? What if I'm not around when you arrive? I hope they fix it right the first time.	Was my problem solved? Was the technician courteous? Professional? Who can I talk to about this?

I need some help

Research Options

Call 5-5555 → Helpful / Re-directed

FixIt → Now what?

Hall office → No follow-up

Generic email

Now what?

Problem solved

More generic email

Take our survey!

Touchpoints
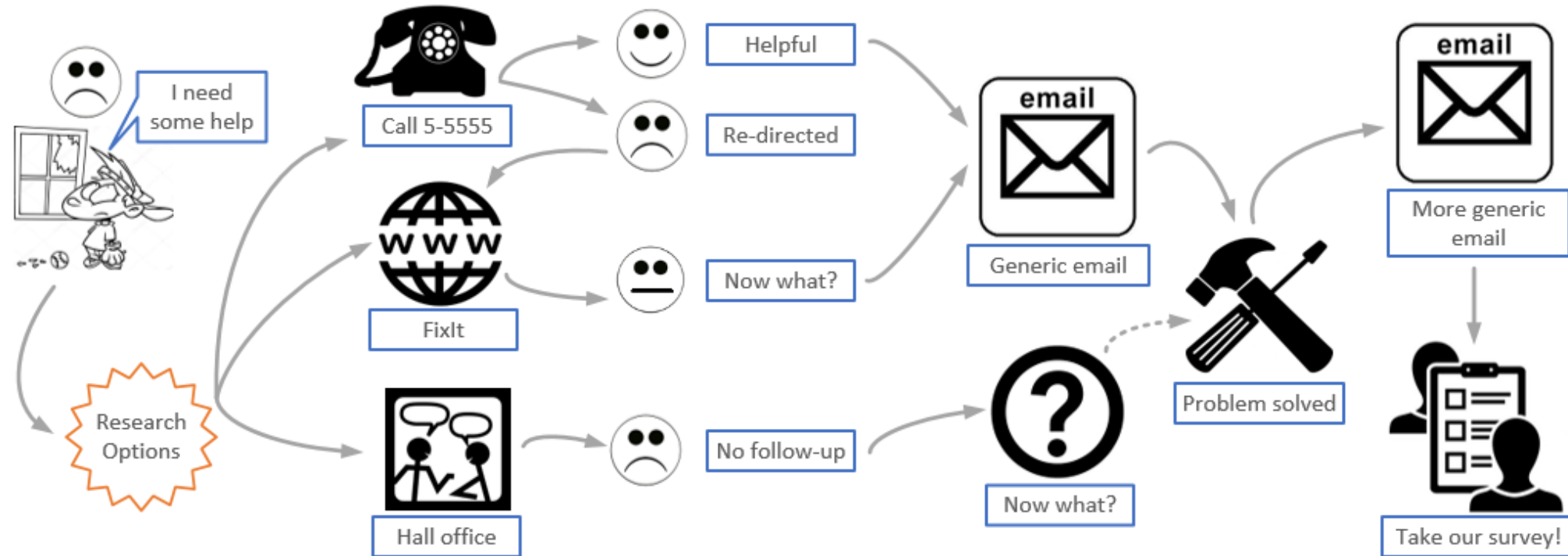
- Educate customer about available options
- Speak with customer on the telephone
- Receive a customer request through the online FixIt portal
- Provide information via email
- Speak with customer in person (hall office staff)
- Speak with customer in person (maybe)
- Follow-up after negative survey

Report a problem
Know Your Issue?

Access	Bed Lofting	Cleanliness	Dining Services
Doors & Windows	Elevator	Fire Safety	Furniture
Grounds	Heating & Cooling	Internet - A/V - Computers	Laundry
Light & Power	Other	Pest Control	Plumbing
Residential Appliances	Restroom Supplies & Dispensers	Walls, Floors & Ceilings	
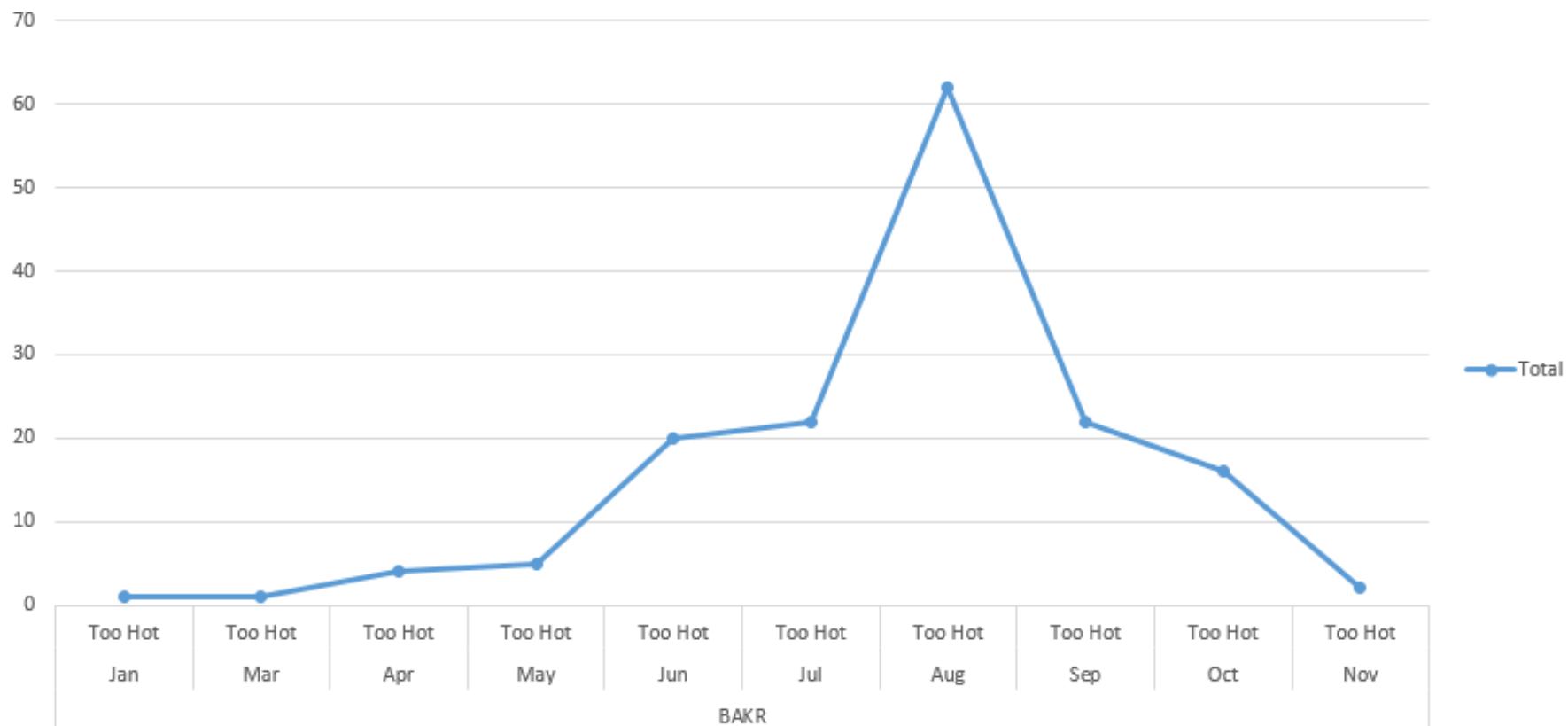
Voice of the Workforce - Insights

- What human resources do you need to deliver value to your customers?
- Do your employees possess the right tools, skills, knowledge, and support?
- Do they understand your mission and vision? Do they agree with it?
- Do they understand how their daily work relates to your mission and vision?
- Do they have ideas about how to work better, faster, or safer?
- Do they feel valued? Listened to? Are they engaged?
- Does information flow across boundaries between functional groups?
- Are the words "not my job" ever spoken? Do your customers ever hear?
- What is your organizational culture?

Voice of the Workforce - Tools

- All-hands meetings, cross-functional team meetings, one-on-one meetings
- Coaching and performance management sessions
- Surveys
- Suggestion boxes
- Focus groups
- Problem solving challenges
- SWOT analysis
- Stop-Start-Continue exercises
- Knowledge base, SOPs, work instructions
- Exit interviews

Equipment

Consider the following machines. What is good about them? What is not so good about them? Where do they work well? Where do they not work well? Do you recommend any changes?

- **Backpack Vacuum**
  - Easy to use and get around
  - Straps tend to get worn out
  - Lower back pains, hard to wear for long periods of time
  - Good in stairs, cord can be a problem, but some stairs don't get much use
    - Start in the middle, go up and down from there
  - Not very powerful but comfortable and works well
  - Good for small offices and areas with lots of furniture, they get into the corners
  - Good in laundry rooms for vents and things
  - If using an upright, you have to stop when you get to stairs and go get another tool
  - Use feet to collect hair, then pick it up. BP vac doesn't work so good
    - Or use just the hose, it picks it up
    - Lint rollers can be helpful
  - Better than broom because it picks up everything
    - Broom is easier and safer

8:00 – 8:10	**Introductions**
8:10 – 8:20	**Brief overview of Lean Action Work Outs**
8:20 – 8:35	**Critical-To-Quality for Bear Creek** CTQ Tree
8:35 – 9:45	**Create current process map for Bear Creek** Value Stream Mapping
9:45 – 10:00	**Break**
10:00 – 10:30	**Break-out session #1** Cause and Effect Diagram (Fishbone), SWOT Analysis, Quality Element Prioritization
10:30 – 11:45	**Quality Function Deployment (QFD)** House of Quality
11:45 – 12:30	**Lunch in C4C**
12:30 – 12:45	**Create ppt slides as a group reflecting the morning's accomplishments** Brief review

Relative Priority		Classroom	Elevators	Entrances	Hallways	Kitchen	Laundry	Lobby	Lounge	Office	Stairs	Restrooms	Closet	Outside entrance	Snow removal				Relative Priority	
8	Classroom	X	1	0	1	1	1	1	1	1	1	-1	1	1	-1				13	Snow removal
-7	Elevators	-1	X	-1	-1	0	0	-1	-1	-1	0	-1	1	0	-1				11	Restrooms
1	Entrances	-1	0	X	1	0	0	0	0	1	1	-1	1	0	-1				8	Classroom
-4	Hallways	-1	0	0	X	0	0	-1	0	-1	0	-1	1	0	-1				6	Lobby
0	Kitchen	-1	0	0	0	X	0	-1	0	1	1	-1	1	1	-1				1	Entrances
-5	Laundry	-1	0	-1	0	-1	X	-1	-1	0	1	-1	1	0	-1				0	Kitchen
6	Lobby	0	1	0	1	1	1	X	1	1	1	-1	1	0	-1				0	Lounge
0	Lounge	-1	1	-1	0	0	1	-1	X	1	0	-1	1	1	-1				-4	Hallways
-4	Office	-1	0	-1	0	-1	0	-1	-1	X	1	-1	1	1	-1				-4	Office
-7	Stairs	-1	0	-1	0	-1	-1	-1	0	-1	X	-1	1	0	-1				-5	Laundry
11	Restrooms	1	1	1	1	1	1	1	1	1	1	X	1	1	-1				-7	Elevators
-13	Closet	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	X	-1	-1				-7	Stairs
-8	Outside entrance	-1	0	-1	-1	-1	0	-1	-1	-1	0	-1	1	X	-1				-8	Outside entrance
13	Snow removal	1	1	1	1	1	1	1	1	1	1	1	1	1	X				-13	Closet

Voice of the Operation - Insights

- What are the key processes your operation uses to deliver value to your customers?
- Are your processes performing efficiently? Effectively? Within specifications?
- What defects do your processes produce, and why? Are they preventable?
- Do your processes flow? If not, what breaks the flow?
- What financial resources and physical assets do you need to support your operation?
- Are those financial resources and physical assets being effectively managed?
- What is your ratio of preventative work to reactive work?
- What deferred costs have accumulated across your operation, and why?

Voice of the Operation - Tools

- Make your problems obvious
- Measure to improve
- Data → Information → Call to Action

- Improve efficiency by removing waste to streamline processes
  - The Seven Wastes
  - Value stream maps + theory of constraints

- Improve effectiveness by preventing defects to guarantee quality
  - SIPOC and process maps
  - Root cause analysis with corrective & preventative action planning (RCA/CAPA)

HFS Maintenance Work Management System – Acquiring Parts From HFS Stores During Normal Business Hours

Technician

START → Part needed for work order

Shop stock[1]? — YES → Enough on hand? — YES → END

Shop stock[1]? — NO → Request part from HFS Stores

Enough on hand? — NO → Request part from HFS Stores

Visit local vendor to purchase part → SPO with vendor?

SPO with vendor? — YES → Purchase part → Deliver receipt to HFS Stores

SPO with vendor? — NO → Call HFS Stores for for credit card payment over the phone → Purchase part

Notify HFS Stores to make sure someone is around to help pay → Visit local vendor to purchase part

Complete "Housing Maintenance Tool/ Material Request" form and obtain supervisor signature → Change status of work order to reflect delay

Stores

Stock part[2]? — NO → Can part be purchased locally?

Can part be purchased locally? — YES → Notify HFS Stores to make sure someone is around to help pay

Can part be purchased locally? — NO → Complete "Housing Maintenance Tool/ Material Request" form and obtain supervisor signature

Stock part[2]? — YES → In stock?

Receive "Housing Maintenance Tool/ Material Request" → Order part

Order part → When part arrives, notify technician to pick up → Part purchased with credit card?

Part purchased with credit card? — YES → Complete "Housing Maintenace A-Card Receiving Report"

Part purchased with credit card? — NO → Complete "Housing Maintenance Receiving Report" → Give top sheet to Finance with original receipt; file bottom sheet (with copy of receipt for credit card purchases)

Complete "Housing Maintenace A-Card Receiving Report" → Give top sheet to Finance with original receipt; file bottom sheet (with copy of receipt for credit card purchases)

In stock? — NO → Order part

In stock? — YES → Give part to technician → Complete line item on "Inventory Charge Outs" form → Work Order number?

Give top sheet to Finance... → Work Order number?

Work Order number? — YES → Charge to work order → Post data to CMMS[3] → END

Work Order number? — NO → Charge to building or zone via sales order → Post data to CMMS[3]

Definitions

[1]**Shop stock**: Low dollar value parts that are stored in several places across campus. These parts are not recorded on work orders – they are generally charged to building speedtypes. There is currently no official list of what parts can be considered "shop stock", and there is minimal tracking of what parts are kept where.

[2]**Stock parts**: Parts that HFS Stores regularly keeps in stock.

[3]**CMMS**: Computerized maintenance management system. Currently, HFS uses TMA.

Enviropure EPW-3000 Biodigester - Village Center Dining - CU Boulder

Input	Process	Output

System

- PHIX XIV High pH Solution
- Bio Energizer Enzyme Solution
- Water
- Food Waste
- Water

- Trough Feed Grinder (Main Dish Room)
- Bowl Feed Grinder (Catering Kitchen)
- Slurry Pump
- Slurry Pump
- Bypass Valve
- Centrifugal Separator
- Tank 1 (1,000 Gallons)
- Tank 2 (1,000 Gallons)
- Tank 3 (1,000 Gallons)
- pH Sensor
- Tank 3 pH Readout
- Tank 3 Output Filter

- TIMER
- SWITCH
- SHUT
- FOOD WASTE
- WASTE WATER
- OPEN

- Purified Waste
- Waste Water
- Untreated Waste

HFS PM Tasks (twice weekly)

- Ensure the *Bio Energizer Enzyme Solution* tank is not empty or near empty, or the system will not break down food waste properly.
- Ensure the PHIX XIV High pH Solution tank is not empty or near empty, or the pH of the Purified Waste output will be below acceptable levels (<5.5)

- Ensure the timer on the Trough Feed Grinder is enabled and set to 5 Minutes. If water is allowed to run continuously, the system will not function properly.

- Ensure the Bypass Valve below the sink in the catering kitchen remains shut, otherwise waste will not be sent into the Biodigester system.

- Ensure the Centrifugal Separator unit is functioning properly, or too much water will enter Tank 1, causing the Biodigester system to not function properly.

- Clean the pH Sensor weekly to ensure proper functioning, or the pH Readout may not show the correct pH.
- Calibrate the pH Sensor monthly per manufacturer recommendations with three buffer solutions to ensure accuracy.

- Check the pH levels on the Tank 3 pH Readout Screen. Levels should be between 6 and 10.
- Clean the Tank 3 Output Filter, or the output flow from Tank 3 may become blocked, causing partially-treated waste to leave the system.

Dining Services Responsibilities

- Only allow food waste and water to enter the Feed Grinders. Other items can cause damage to system components.
- Only allow water to enter system in moderation. Too much water can cause the system to function improperly.

- Never open the Bypass Valve below the sink in the catering kitchen. This prevents waste from entering the Biodigester system.

- Report malfunctioning system components, unusual noises, or leaks to Housing Facilities Services immediately.

Broken equipment

Working equipment

Supervisor Approval
Buffer: $200
Extractor: $200
Scrubber: $300
Wide Area Vac: $350
Kaivac: $400
Clipper: $400
Backpack Vac: $200

Report — Custodian reports broken equipment to supervisor

Verify — Supervisor verifies problem

Request — Supervisor submits request to Waxie

Examine — Waxie examines equipment and provides quote

Approval — Supervisor or manager approves quote

Repair — Waxie repairs equipment

Report	Verify	Request	Examine	Approval	Repair
Verbal report		Date	Every Wednesday	Supervisor	
Undocumented		Requestor	How prioritize?	Manager	
		Location			
		Type			
		Serial #			
		Problem			

1 minute	15-30 minutes	5 minutes	15 minutes	5 minutes	5-210	46-266 minutes
1-3 days	1-2 days	7-14 days	0-10 days	0-150 days		9-179 days

	2015-05-16	2015-05-23	2015-05-30	2015-06-06	2015-06-13	2015-06-20	2015-06-27	2015-07-04	2015-07-11	2015-07-18	2015-07-25
Sheets	0	40	692	736	82	1592	750	920	1878	1000	190
Pillow Cases	0	140	351	506	196	1107	375	1340	1539	1090	95
Towels	84	940	3682	780	298	7544	750	4370	10546	7200	444
Wash Cloths	42	470	1841	390	149	3772	375	2185	5273	3600	222
Bed Spreads	0	20	86	368	17	100	375	160	334	120	75
Blankets	42	20	86	390	29	105	375	160	334	120	102
New Bed Spreads	0	0	65	0	24	682	0	75	605	30	20
BC Sheets	84	300	0	44	24	36	0	0	512	400	54
BC Pillow Cases	42	150	0	22	12	18	0	0	228	200	27
BC Bed Spreads	42	150	0	22	12	18	0	0	228	200	27

Voice of the Facility - Insights

- What assets make up our facilities?

- What condition are those assets in?

- Are those assets suitable for their intended purpose?

- When do those assets need to be replaced, and how much will it cost?

- Are our facilities up to code? Are they accessible? What can we do about it?

- What goes wrong in our facilities? How often, and why?

- How are our facilities being used? How has that changed over time?

- Does our current infrastructure meet the needs of our users?

Voice of the Facility - Tools

- Drawings and facility inventories

- Space utilization studies

- Work order analysis

- Building inspections (visual, infrared, thermal, endoscope, UV, drone)

- Utility consumption

- Building automation systems

- Facility condition assessment and forecasting (FCI)

- Facility performance assessment

Willard/Cheyenne Arapaho Generator

- **Willard Hall**
  - **Willard ATS South - Mech. Room**
    - **Willar South Gear - Main Electrical Room**
      - South Gear -
      - Panel Vending
      - AHU Heaters Mech Room
      - Fan Mech Room
      - Panel PAG-PA1
      - Panel PA2-PA3
      - Space
      - Panel PBG - PB1
      - Panel PB2 - PB3
      - Space
      - AHU-1 Control
      - Andover Control
      - Attic Panel
      - Security - 1st Fl Door
      - Lighting Control/Security
      - Security Cabinet
    - **Willard ATS North - Mech. Room**
      - North Gear -
      - Panel PEG - PE1
      - Panel PCG-PC1
      - Panel PC2 - PC3
      - Elevator - Attic
      - Panel PDG - PD1
      - Panel PD2 - PD3
      - Fire Alarm Panel (Main Office)
      - KACB Radio Outlet (This Room)
      - Gate and Control Power (This Room)
      - Outside Lights (This Room)
      - Outside E. Pole Lights
      - Outside Lights COntrol
      - IT Room UPS
      - Spare
      - Spare
      - Spare
      - Electric Room Recpt
  - **Willard North Gear - Main Electrical Room**
- **Cheyenne Arapaho Hall**
  - **Cheyenne ATS - Main Electrical Room**
  - **Cheyenne EMDC Panel - Main Electrical Room**
    - **Panel EM - Room 002 Main Electrical Room**
    - **Panel PEG - Room 002 Main Electrical Room**
    - **Panel PE1 - Room 191**
      - **Panel PF2 - 2nd Floor W. Dining Room**
    - **Pump Controller - Room 002 Mechanical Room**

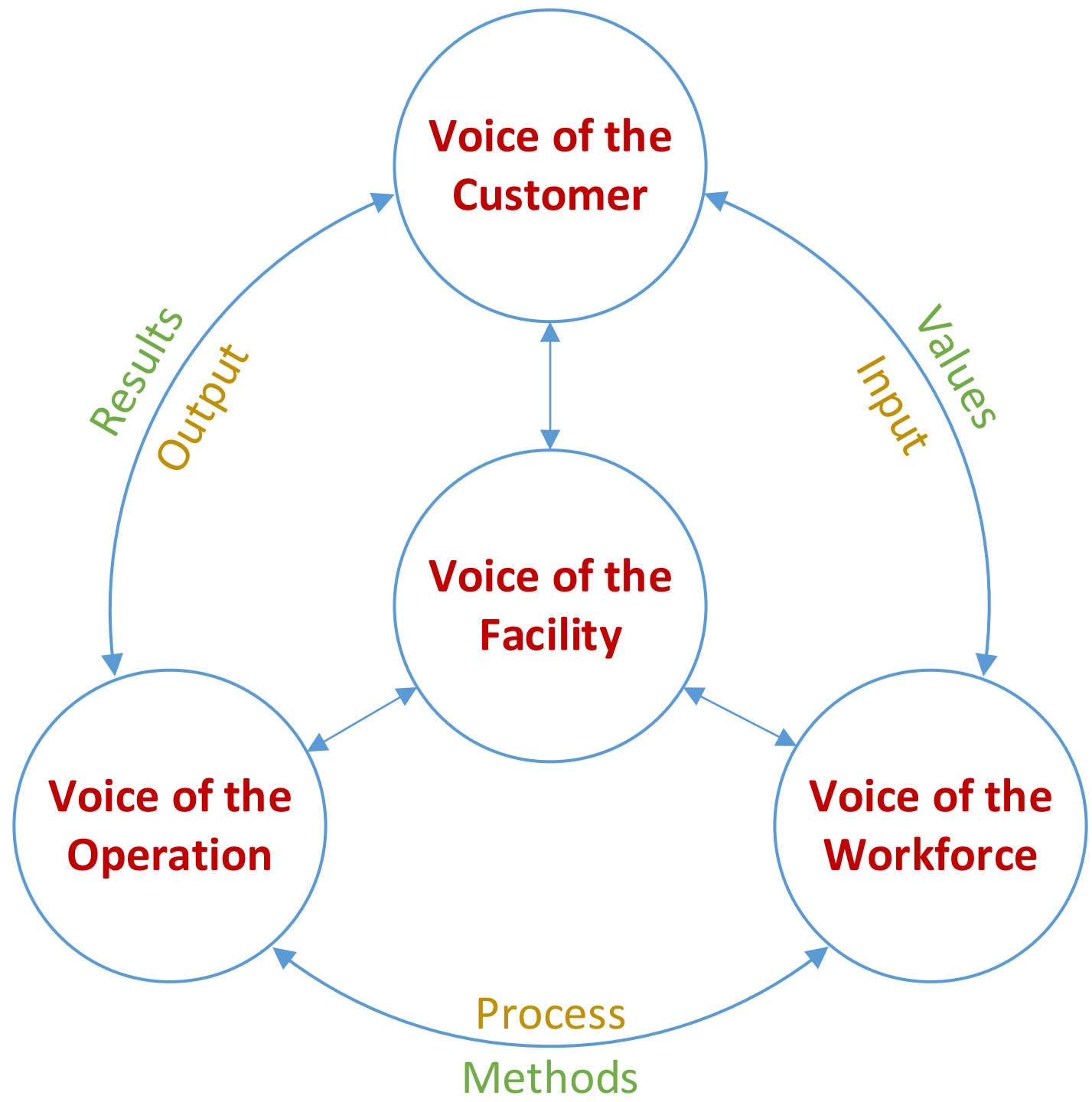| Count of Work Order #	Column Labels										
Row Labels	Aden Hall	Andrews Hall	Arnett Hall	Baker Hall	Brackett Hall	Buckingham Hall	Chey/Arap Hall	Cockerell Hall	Crosman Hall	Darley North Hall	Darley South Hall
Carpentry	**198**	**266**	**496**	**670**	**127**	**329**	**998**	**186**	**216**	**387**	**268**
Door/Viewer	54	64	100	147	16	62	187	52	53	77	45
Carpentry - General	34	52	92	118	18	69	137	26	17	96	57
Window	40	14	18	61	48	9	156	42	59	20	32
Dispenser Repair	31	43	88	45	8	47	157	22	15	31	22
Blinds	7	22	16	45	1	7	107	15	28	20	14
Wall/Ceiling		21	42	46	11	16	23	3	5	26	28
Signage	4	11	21	32		25	38	10	4	15	10
Loft Take-down	4	1	9	30	5	23	46	5	6	31	18
Bulletin/White Board	4	18	18	68	6	19	33	3	4	14	8
R/R/I White Board		1	45	26	2	18	13	1	1	13	16
Loft Set-up	7	2	2	14	4	8	18	2	6	14	4
Screen related work	3	3	15	7		7	26	3	3	2	1
Loft Repair	3	1	4	3		7	8		3	10	4
Door	1	6	1	7	2	2	13		3	6	1
Flooring	2	1	6	7	1	4	7		1	1	1
Bathroom partition related work		1	3	1	1	1	2	1		3	2
Door viewer		3	2			2	4	1		1	1
Bathroom/Kitchen - General		1	2	4		1			2		1
Bunk beds	1			1	2		16		2	2	
Roofing				1	4	2		1		1	
Towel rack related work				5			2		3	1	1
Countertops				1				2			1
Sliding Closet Door			1		1			1	1		
Wall Tile related work	1			3							
Mirror related work	2				1		2			1	2
Un-bunk beds								1			
Insulation related work				2							1
Gutters											
Roof Inspection - Monthly				1							
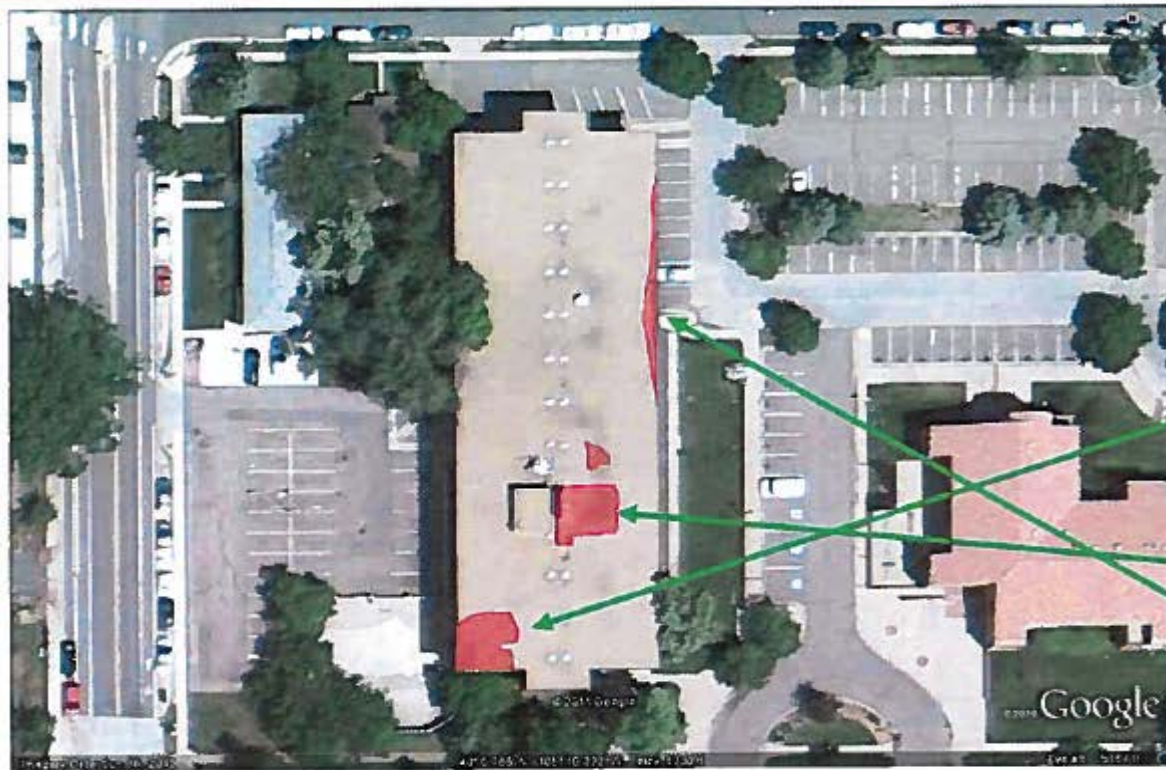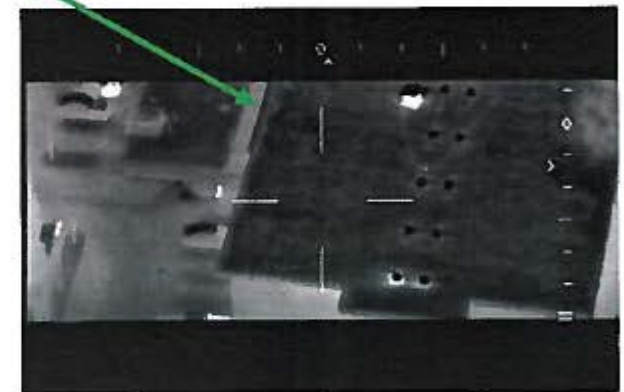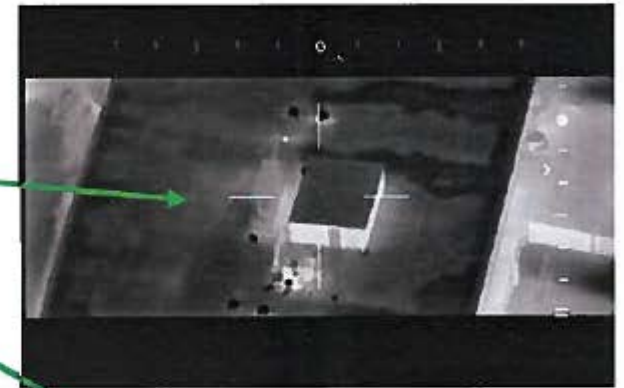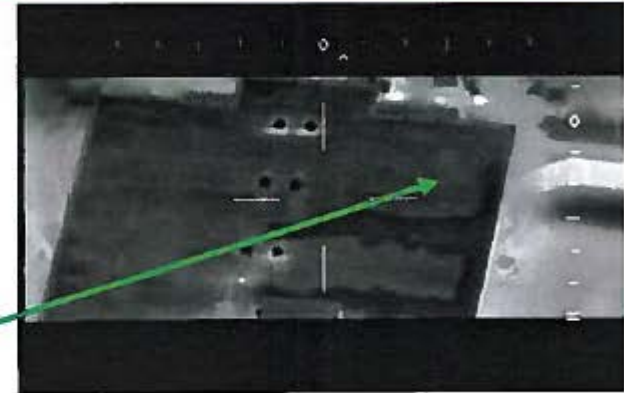
Legend:

Red Areas	Investigate for Entrapped Moisture
Green Arrows	Reference Locations

Cod	Category	Asset Description	Priority	Risk	Criticality	Performance	API	Notes
A	**Substructure**		**3**	**3.8**	**3.2**	**2.6**	**2.7**	
A10	**Foundations**		**4**	**4.5**	**4.1**	**3.2**	**3.4**	
A1010	Standard Foundations	Poured in place concrete exterior walls, grade beams, footers, poured in place concrete columns	5	5	5	2.5	⚑ 3	Water damage south side
		Sub-surface water-proofing and drainage	5	5	5	5	⚑ 5	South side failed, water seeping through foundation
A1020	Special Foundations							
A1030	Slab on Grade	Slab on grade	2	3.5	2.3	2	2.1	Localized sub-surface erosion and a hole in dining food storage area
A20	**Basement Construction**		**2**	**3**	**2.2**	**2**	**2**	
A2010	Basement Excavation							
A2020	Basement Walls	Terracotta block and brick	2	3	2.2	2	2	
B	**Shell**		**2.8**	**3.5**	**2.9**	**2.5**	**2.6**	
B10	**Superstructure**		**3**	**4**	**3.2**	**1.8**	**2**	
B1010	Floor Construction	Poured in place slab on beams with rebar	3	4	3.2	1.5	1.8	
B1020	Roof Construction	Timber structure with timber sheathing	3	4	3.2	2	2.2	
B20	**Exterior Enclosure**		**2.8**	**3.1**	**2.8**	**2.9**	**2.9**	
B2010	Exterior Walls	Poured in place concerete walls	3	4.5	3.3	3.5	⚑ 3.5	Localized structural cracks indicate foundation issues, letting water in
		Sandstone and limestone façade	2	3	2.2	3	2.8	Localized structural cracks indicate foundation issues
B2020	Exterior Windows	Steel frame single pane casement windows	3	2.5	2.9	3	⚑ 3	
B2030	Exterior Doors	Steel or wood painted exterior doors	3	2.5	2.9	2	2.2	
B30	**Roofing**		**2.7**	**3.3**	**2.8**	**2.8**	**2.8**	
B3010	Roof Coverings	Clay tile roof	3	2	2.8	2	2.2	
		Single-ply EPDM membrane roof	3	4	3.2	2.5	2.6	Grease starting to comprimise
		Galvanized or copper gutter, downspouts & fittings	2	4	2.4	4	⚑ 3.7	In process of replacing with copper, west side done
B3020	Roof Openings							
C	**Interiors**		**3**	**3.2**	**3**	**2.2**	**2.4**	
C10	**Interior Construction**		**3**	**2**	**2.8**	**2**	**2.2**	
C1010	Partitions & ceilings	Interior walls, metal lath and plaster on steel channel	3	2	2.8	2	2.2	
C1020	Interior Doors	Stained solid wood construction	3	2	2.8	2	2.2	
C1030	Fittings							
C20	**Stairs**		**3**	**4.5**	**3.3**	**2**	**2.3**	
C2010	Stair Construction	Concrete	3	4.5	3.3	2	2.3	
C2020	Stair Finishes							
C30	**Interior Finishes**		**3**	**3**	**3**	**2.5**	**2.6**	
C3010	Wall Finishes, Restrooms							
C3020	Floor Finishes, Restrooms	Tile	3	3	3	2.5	2.6	
		Omni-coat	3	3	3	2.5	2.6	
C3030	Ceiling Finishes							
D	**Services**		**3.2**	**3**	**3.2**	**2.3**	**2.5**	
D10	**Conveying**		**3**	**4**	**3.2**	**3**	**3**	
D1010	Elevators & Lifts	Elevator (3)	3	4	3.2	3	⚑ 3	
D20	**Plumbing**		**3.6**	**2.9**	**3.5**	**2.2**	**2.4**	
D2010	Plumbing Fixtures	Toilets	2	2	2	2	2	
		Sinks	2	2	2	2	2	~70% old style, overflow train tubes break off. If they break a certain way, sink is shot.
		Showers	2	3	2.2	2	2	
		Drinking Fountains	2	2	2	2	2	
D2020	Domestic Water Distribution	PRV Station	5	3	4.6	1.5	2.1	
		Copper distribution piping, Main	5	4	4.8	3	⚑ 3.4	
		Copper distribution piping, Lateral	3	3	3	3	⚑ 3	
		Heat exchanger	5	2	4.4	1.5	2.1	Redundancy

Dim_Facility
- 🔑 Facility_Id
- Facility_Code
- Facility_Name
- Facility_Type
- Facility_Build_Year
- Facility_Remodel_Year
- Facility_Zone

Fact_API_Session
- 🔑 API_Session_ID
- API_Session_Facility
- API_Session_Walk_Date
- API_Session_Score_Date
- API_Session_Notes

Fact_API_Detail
- 🔑 API_Detail_Id
- API_Detail_Session
- API_Detail_Asset
- API_Detail_Priority
- API_Detail_Risk
- API_Detail_Performance
- API_Detail_Notes

Dim_Asset
- 🔑 Asset_Id
- Asset_Class
- Asset_Facility
- Asset_Make
- Asset_Model
- Asset_Quantity
- Asset_Description
- Asset_Install_Year
- Asset_TMA_Link

Dim_Asset_Class
- 🔑 Asset_Class_ID
- Asset_Class_Uniformat
- Asset_Class_Name
- Asset_Class_Performance_Standard

Dim_Uniformat
- 🔑 Uniformat_Id
- Uniformat_Code
- Uniformat_Level_1
- Uniformat_Level_2
- Uniformat_Level_3
- Uniformat_Level_4
- Uniformat_UOM
- Uniformat_Definitions

- Identify
- Design
- Improve
- Monitor
- Explore