Project Goal Statement
HVAC Data
Gowen Systems
Problem
Mechanical heating
Three air handling units
No mechanical cooling
Electric Meters
Hot Water System
Deliverables include:
- company's built environment data.
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- 100 Unique Sensors help to efficiently heat and cool the building as well as report values to McKinstry’s Database
HVAC Data
- 6.5 million row csv

Background
McKinstry Construction Engineering Co. serves building owners, occupants, and operators by providing well-designed, easy-to-maintain buildings that work at peak levels of performance and economy for their clients.

Design | Construction | Operation | Maintenance

Problem
- The UW consumes 295 million kWh electricity per year at a cost of $15M
- McKinstry has access to the HVAC performance data from the UW, though it goes largely unused... How can we unlock this data?

Project Goal Statement
To support McKinstry’s Cycle of Services by providing accessible visualizations of HVAC systems using the company’s built environment data.

Deliverables include:
- A dashboard that produces visualizations of HVAC sensors within Gowen Hall
- Recommendations to improve energy usage on dashboard visualizations

Recommendations
- Three air handling units
  - Mechanical heating
  - No mechanical cooling
- Hot Water System
- Electric Meters

Gowen Systems

Dashboard Creation
All development was done using R Shiny and MySQL. The open source packages provide an elegant and powerful framework for web apps

Requirements
- Our dashboard shall...
  - Be intuitively designed
  - Process data quickly
  - Add value to McKinstry’s existing services
  - Be scalable
  - Consider holistic system

Feedback
How can we improve upon what we have designed?
What additional needs can be identified?
Test & Evaluation
Do functionalities work as expected?
Do they work efficiently?
Design & Development
What is the duration of design sprint?
How can we support holistic dashboard experience?

Identifying Requirements
What functions best serve the needs of McKinstry?
Building Operators, and Project Sponsors?

Ideation & Benefit Analysis
What functions must be prioritized?
What are our constraints?
Planning & Scheduling
What are roles of each team-member?
What are our next scheduled milestones?

Each cycle represents an iteration to the dashboard whose requirements and solutions have evolved through the collaborative effort of our cross-functional team and our end user.

Dashboard
- Figure 1: McKinstry’s Cycle of Services
- Figure 2: AHU with Economizer
- Figure 3: Agile Product Development Cycle

Findings
Gowen is being heated over the winter holiday...
- From the relational plots created using our dashboard, we can see that heat is being supplied to the building throughout December.
- The CO2 levels confirm our findings since CO2 gives us an approximation of the occupancy in the auditorium space.
- Therefore, variable set-points must be enabled in savings
- Lighting and heating account for 50% of energy consumption
- Therefore, variable set-points must be enabled based on the building’s expected occupancy
  - Avoid heating costs when building is not occupied

Impact
- Smallest amount of filtered data returned to R
- Improve speed with keys and indices
- Manage number of connections with pool object

Backend Development
- Figure 5: System of filtering data

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