UCHealth’s BIM-Centric Approach to Operating and Managing Its Facilities

It All Starts With the Models
Biography

- BIM Management for over $2B in Construction
- CPM Project Scheduling ($10M-$150M Projects)
- Database Development and Administration (MS-Access)
- Healthcare Facilities, Laboratories, Data Centers, and Telecom
- Mobile Applications Implementation
- AGC CM-BIM instructor
- Major: B.S., Information Systems Management. Graduated summa cum laude (GPA 4.0)

Ft. Belvoir Community Hospital - AGC Washington Contractor Award for BIM Projects
New Construction – Contractors Over $150 Million (2007-2011). Congressionally mandated end date and final cost was $960 Million.

Laser Scan – Hospital to Lab Conversion (Mech Room)
About UCHealth

More than:

- **5,000** affiliated or employed providers
- **22k** employees
- **132k** inpatient admissions and observation visits
- **1,900** beds
- **72.5k** surgeries
- **3.9** MILLION Outpatient, urgent care and emergency room visits
- **8.4** MILLION SF
UCHealth Footprint – Rocky Mountain Region
Why BIM?

INFORMATION

INFORMATION
Data is Paramount for Owners

- How many **fill in the blank** do we have:
  - ORs
  - PATIENT ROOMS
  - INFUSION SPACES
  - UNIVERSITY OF COLORADO – DENVER SPACES
  - AIR TERMINALS, FIRE DAMPERS

- I need information on **fill in the blank**:
Data is Paramount for Owners

- Most unusual request - How many paper towel dispensers do we have?

Needed to know if it was less expensive to buy or lease....
Data is Paramount for Owners

“I receive all these models and I don’t know what to do with them.”
- UCHealth VP Facilities, Design + Construction
Facilities Maintenance (FM) BIM (MEP Assets)

Mobile CMMS

Enterprise CMMS

Computerized Maintenance and Management System (CMMS)

BIM Authoring Software

IWMS BIM (Spaces, Departments, Employees, Gov’t Reporting)

Integrated Workspace Management System (IWMS)

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FM-BIM to COMPUTERIZED MAINTENANCE AND MANAGEMENT SYSTEM (CMMS)
Begin with the End in Mind

- Interview End-users for Requirements
  - Research CMMS systems
  - Download Trials
  - Attend Local BIM/VDC user groups
  - Select a CMMS
  - Develop specifications from End-Users’ needs
FM-BIM Development Process (Three Options)

OPTION 1
Are the Trade Contractors’ BIMs Compatible with CMMS?
YES
Use TC’s BIMs
NO
Remove non-FM Assets (Pull Boxes, Clearances, Etc.)

OPTION 2
Are the Design BIMs Compatible with CMMS?
YES
Conform Engineer’s BIMs to TCs BIMs
NO
Export BIMs to Mobile CMMS

OPTION 3
Procure CMMS Compatible FM-BIM

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Mobile CMMS Process

Once the FM-BIM has been completed the Mobile CMMS process can start.

1. Export MEP BIMs to Mobile CMMS
2. Affix QR Codes to MEP Assets and Scan and assign in Mobile CMMS
3. Export Text File (.csv)
4. Add Additional Fields to the Text File
5. Enter Asset Data into the Text File
6. Import the Text File into the Mobile CMMS
CMMS QR Coding

- Obtain ceiling close in dates
- FM-BIM must be delivered prior to these dates – recommend two weeks prior to ceiling grid install
CMMS – Collecting Data

- The QR code is now assigned to the appropriate asset
- Export to a .CSV file and enter data (where it is more productive – i.e. copy, paste, autofill)
- Add columns specific for each asset
- These columns will be read as fields by the CMMS
- If a column is empty for a particular asset it will not be imported
- For example, a fan may have CFM data but a boiler will not. Therefore, the CMMS will not import the empty CFM field for the boiler but it will if the field contains data for the fan
- The advantage of this method is the data can be added later

<table>
<thead>
<tr>
<th>Asset ID</th>
<th>Asset Description</th>
<th>Manufacturer</th>
<th>Model</th>
<th>Serial Number</th>
<th>CFM</th>
<th>MBTU</th>
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<tr>
<td>GMC-AT-1.830</td>
<td>A-Single Duct AT 5-16 - With Reheat Coil: 12&quot;</td>
<td>PRICE</td>
<td>SDV5-005</td>
<td>1344668-003-001</td>
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<td>900</td>
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<td>CUP-HW-3</td>
<td>Condensing Boilers RTC-6000: Condensing Boilers RTC-6000</td>
<td>SUPERIOR</td>
<td>IROQUIOS</td>
<td>3520-658-000386-7738003489</td>
<td>25,000</td>
<td></td>
</tr>
</tbody>
</table>

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CMMS – Mobile Application

- Mobile application image showing data from a VAV Unit-Single Duct
- Photos
- PDFs
CMMS – Mobile Application

- Custom fields added for the VAV (note the MBTU field is not shown!)

<table>
<thead>
<tr>
<th>Details</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>manufacturer</td>
<td>model</td>
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<tr>
<td>PRICE</td>
<td>SDV6-004</td>
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<tr>
<td>installed by</td>
<td>installation date</td>
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<tr>
<td>Add installed by</td>
<td>Add installation date</td>
</tr>
<tr>
<td>Add warranty expiration</td>
<td>Add expiration date</td>
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<tr>
<td>air flow</td>
<td>air pd heating</td>
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<tr>
<td>0.00 in-wg</td>
<td>cfm</td>
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<tr>
<td>inlet pressure drop</td>
<td>inlet size</td>
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<tr>
<td>0.01 in-wg</td>
<td>max air flow</td>
</tr>
<tr>
<td>max unoccupied air flow</td>
<td>min air flow</td>
</tr>
<tr>
<td>0</td>
<td>min unoccupied air flow</td>
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<tr>
<td>reheat airflow</td>
<td>sad air pd</td>
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<tr>
<td>0.00 in-wg</td>
<td>sound attenuating device</td>
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<td>system classification</td>
<td>system name</td>
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<tr>
<td>Power,Supply Air</td>
<td>type</td>
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<tr>
<td>wtr max</td>
<td>AT-Cooling Only</td>
</tr>
<tr>
<td>Test</td>
<td></td>
</tr>
</tbody>
</table>
CMMS – Asset Plan PDFs

- Equipment Plan PDFs Aid Technicians in finding Assets
- Upload Plans to the Mobile CMMS
- Asset Plans are derived from the FM-BIM
FM-BIM to CMMS Lessons Learned

• Do not start QR codes with zeroes! If the QR code is exported to a .CSV the leading zeroes disappear due the export treating the field as “number” and not “text”:

QR Code **00005** becomes **5**

• If the FM-BIM has already been exported to the CMMS copying and pasting revisions and re-exporting to the CMMS may cause the underlying element ID to change and the CMMS will read the pasted element ID as a new asset resulting in duplicates in the mobile CMMS:

![Element IDs of Selection](image1.png)  
AT-1000 Original Element ID (241358)  

![Element IDs of Selection](image2.png)  
AT-1000 Element ID After Copying and Pasting (311459)
FM-BIM to CMMS Lessons Learned

- MEP Assets – area served vs. where asset is located

AT 1.316 and AT 1.314 are located in corridor 1.C315. They are identified by the spaces they are serving. However, the technicians prefer identifying them by their physical location.

Add a location field to the CMMS.
FM-BIM to CMMS Lessons Learned

- Make sure WiFi is installed in mechanical spaces and rooftops (often overlooked!) or there will be dead zones.
FM-BIM to CMMS Lessons Learned

- Make sure QR codes are UV and weather resistant
IWMS-BIM to INTEGRATED WORKSPACE MANAGEMENT SYSTEM
BIM to IWMS

- Bring order to data chaos!
  - Developed building naming standard
  - Identified system to categorize and type rooms
  - Developed method for Centers for Medicaid/Medicare Services reporting
  - Developed asset identity standard
  - Consolidate data from models
  - Inventory and enter all facilities into one system!

- Scalable
  - Add modules as needs expand

Where's Harmony Cancer Center?

Northern Colorado

Metro Denver

Southern Colorado
BIM to IWMS

- BIM Integrates well with IWMS
  - Bi-directional data sharing
  - Add-ins written to access some IWMS features within BIM
  - Retire legacy “dumb” CAD files
BIM to IWMS

- Room Unique ID is derived from the Building Code + the Floor Code + the Room Number

Room Unique ID = CAN00AIP-02-3024
BIM to IWMS

- Web based
  - Anyone can access the BIM data via the IWMS
  - Reporting features
  - Tailorable
  - Consistent data
  - Searches and queries
  - Mobile
**IWMS Custom Fields**

- **Wing** – Requests are made for specific areas of buildings so these areas can be assigned to a wing to filter the data.

- **Wayfinding Code** – what the public and staff see on signs (may differ from the designer’s room number used on the drawings).

- **Identify leased spaces within Owned facilities**.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
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<tbody>
<tr>
<td>Building Code</td>
<td>CAN00AIP</td>
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<tr>
<td>Floor Code</td>
<td>02</td>
</tr>
<tr>
<td>Room Code</td>
<td>2G.0212</td>
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<tr>
<td>Room Name</td>
<td>ANESTH IN CHARGE</td>
</tr>
<tr>
<td>Wing</td>
<td>CCW</td>
</tr>
<tr>
<td>Wayfinding Code</td>
<td>2.2312.8</td>
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<tr>
<td>Employee Capacity</td>
<td>1</td>
</tr>
<tr>
<td>Lease Code</td>
<td></td>
</tr>
<tr>
<td>Room Area (ft²)</td>
<td>194.35</td>
</tr>
</tbody>
</table>
**IWMS Custom Fields**

- **Designed Room Category and Designed Room Type** – Allows recording a space’s original design use where the room type has changed such as from storage to an enclosed office.

- **Prorate** – Identifies spaces such as common areas where the space’s area will be proportionally shared among reimbursable spaces (for CMS reporting).

- **Non-UCHealth Emp** – Allows people not listed in the UCHealth system to be added.

- **UCHealth Effective Date** – The date a space’s Category or Room Type changed.

[Image of IWMS Custom Fields interface with highlighted fields: Division Code, Department Code, Room Category, Room Type, Designed Room Category, Designed Room Type, Prorate, non-UCHealth Emp, UCHealth Effective Date.]
UCHealth and University of Colorado – Denver (UCD) Share Facilities

- UCHealth uses the Facilities Guidelines Institute (FGI) manual for coding spaces
- UCD Uses the Facilities Inventory and Classification Manual (FICM) standard
- Select a FGI code and the corresponding FICM code is selected as well.
IWMS CMS Reporting New BIM vs. Obsolete CAD Polyline Methods

IWMS is data driven from the models

CAD Polyline Tracing is labor intensive and subject to errors
Automating Centers for Medicare & Medicaid Services Reporting (CMS)

- Use face of wall for area measurements so the area could be used for other uses besides CMS
- Need to account for dead space
- Finance desires monthly reports
- Use Prorate fields for common area
- Develop equations to resolve the issue
IWMS CMS Reporting 3

CMS Reporting Calculations

- Calculations were developed in Excel first and tested
- Once the calculations were verified a spec was developed
- The vendor input the calculations in the backend of the IWMS
- The output was verified in the IWMS development database and accepted
- The revisions were the moved to the production database
Screen Capture of Mobile IWMS Application
Employee List and after Importing into IWMS

The employee badging list is sent to the IWMS vendor every Monday. Last name, first three letters of first name, and employee ID are concatenated by the IWMS vendor and uploaded into the IWMS.
LOCATE EMPLOYEE
**IWMS Bar Coding and Enterprise Move Management**

**Bar Code Major Clinical Furnishings**
- Director of Operations, Patient Services requested a means to track clinical furnishings
- Attach bar codes to major clinical furnishings
- Record location and department information

**Enterprise Move Management**
- Seven buildings at main campus
- Several moves and renovations
- Purchased IWMS’ Enterprise Move Management application
- Allows what-ifs
- Does not require drawings
BIM to IWMS Lessons Learned

- If the database is hosted externally then IT must open a port in the firewall.
- If a guest Wi-Fi is used and the mobile app uses the guess WiFi then IT must open a port for the guest WiFi.
- Each facilities’ IP address must be white-listed.
- Must develop a building coding system.
- Must develop a room category and type convention.
- Decide if employees will be tracked.
Contact Information

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