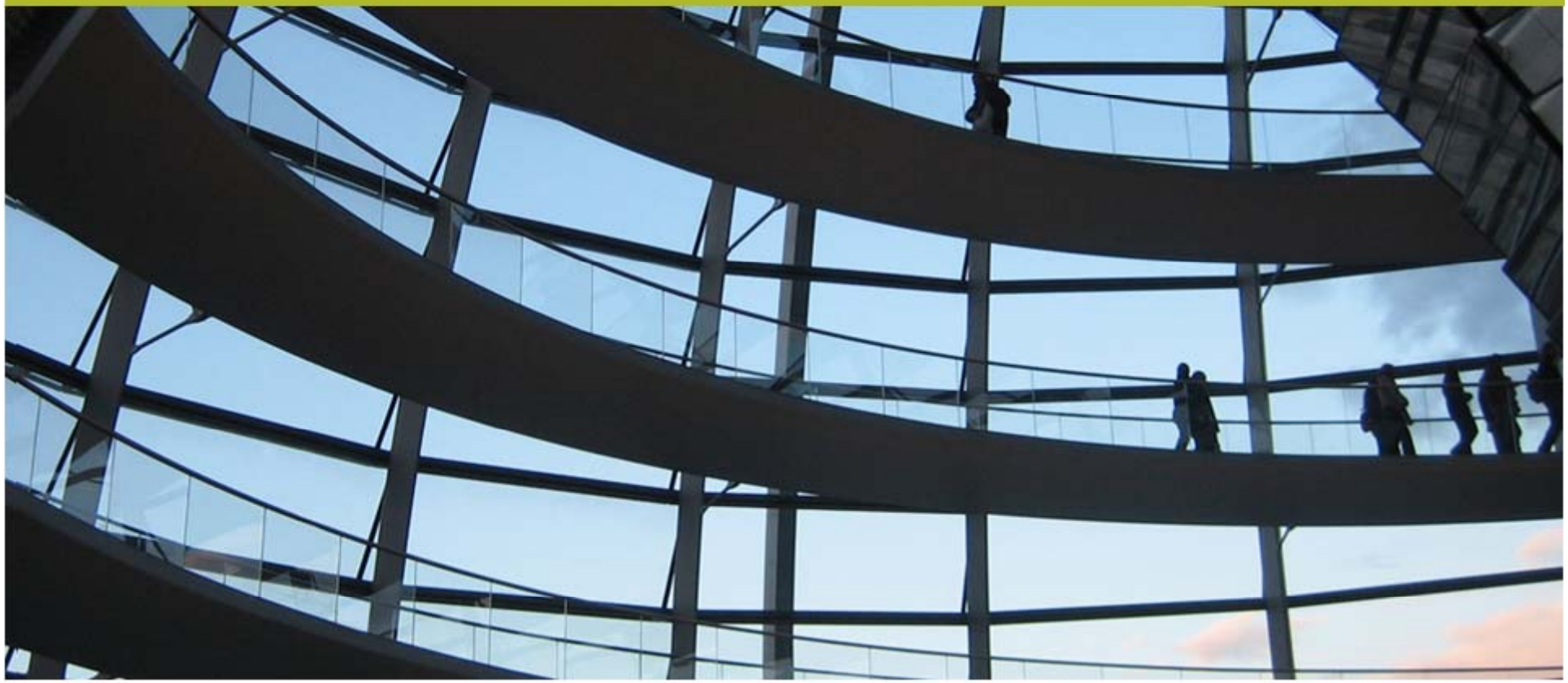
BIM for Facility Management

Managing for the Building Lifecycle



Michael Schley, IFMA Fellow, CEO and Founder, FM:Systems

FM:Systems

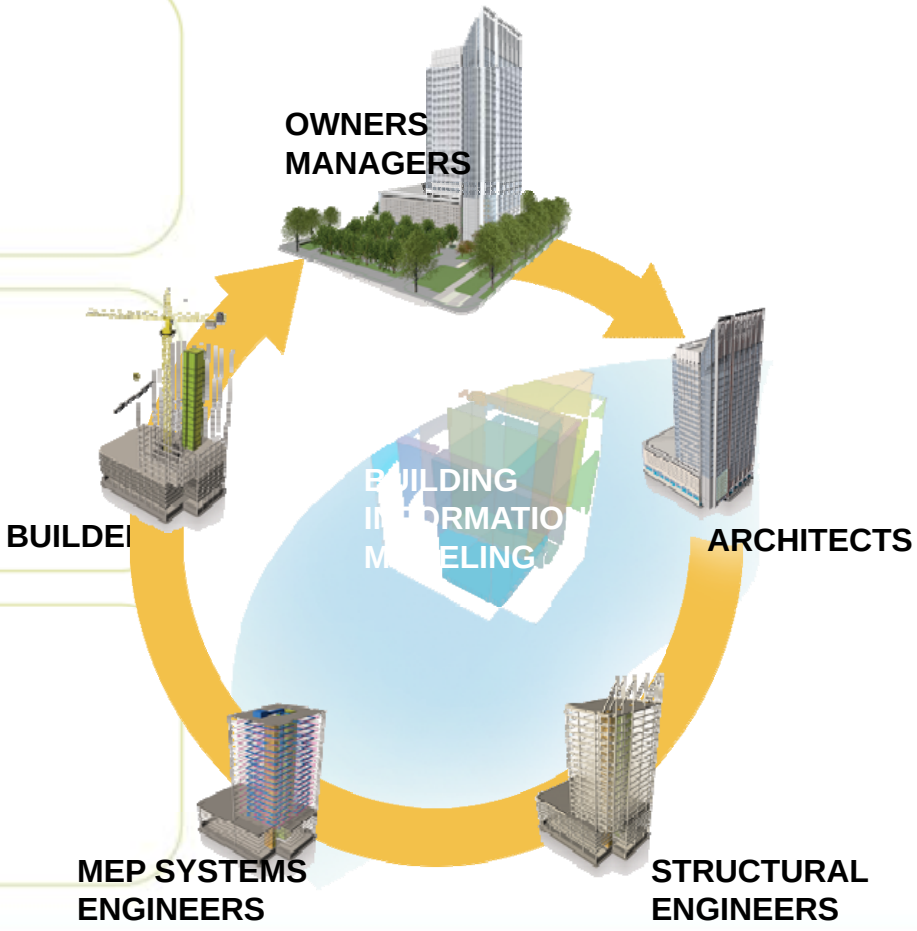
About Michael Schley

- Began career as an architect.
- Founded FM:Systems in 1984
- Serve as a Trustee on the IFMA Foundation
- Chair the IFMA Foundation's Knowledge Management Committee
- Named IFMA Fellow in 2008
- Serve on Cornell and Georgia Tech Advisory Councils

About FM:Systems

- Developer of Integrated Workplace Management (IWMS) Software
- Autodesk Preferred Industry Partner for BIM and FM

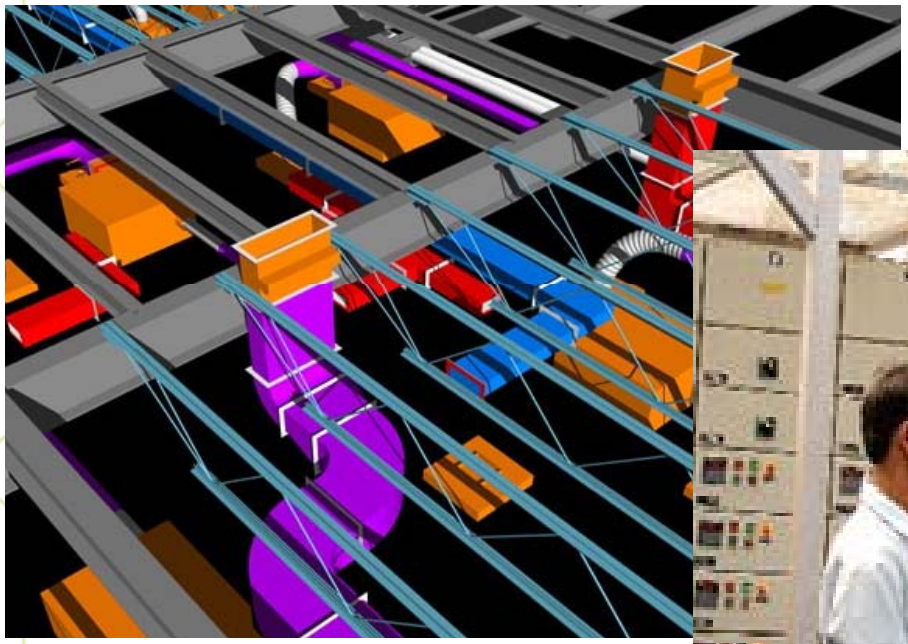
Information to Manage the Life Cycle of our Buildings



90% of the costs of a building occur after construction.

Facility Management Benefits

1. Integration with Maintenance Management



Facility Management Benefits

Building Commissioning

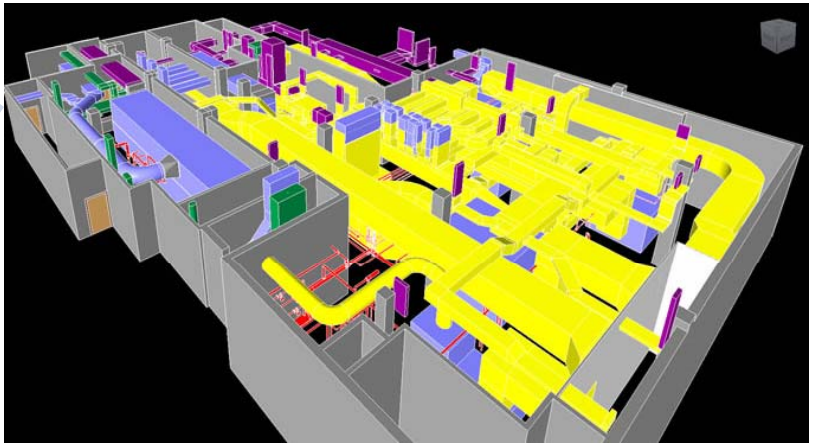
Classic Method

1. Difficult to Access
2. Impossible to Analyze
3. Hard to Update

Facility Management Benefits

The “Electronic Owner’s Manual”

Replacing 3-Ring Binders with a live information system



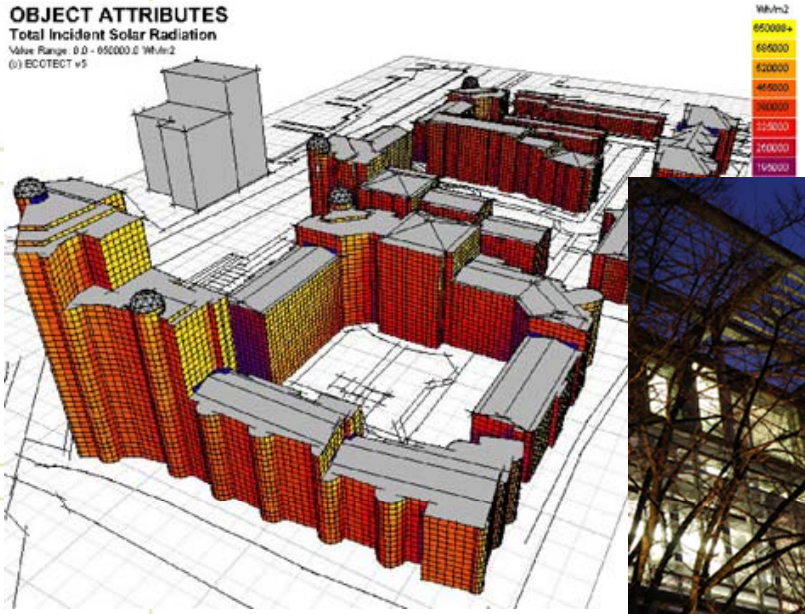
Facility Management Benefits

2. Improved Space Management

Room Status	count
Vacant	60
Moving Out	34
Moving In	89
Possible Conflict	1
total	183

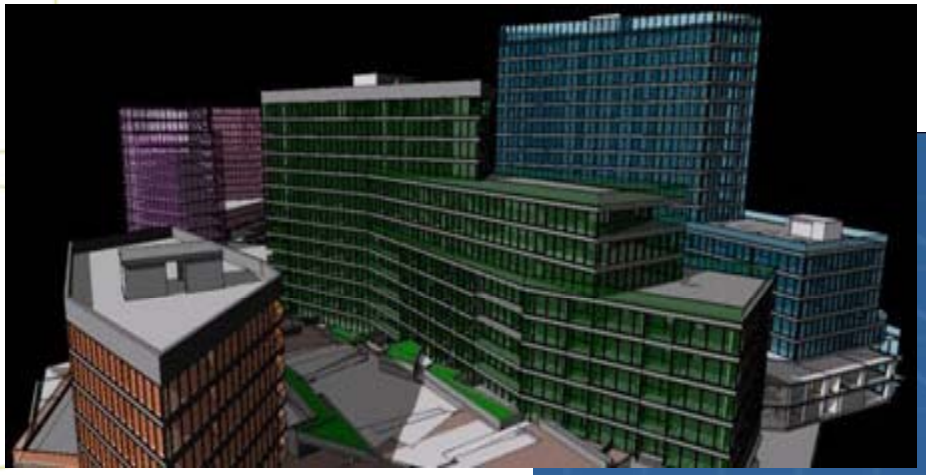
Facility Management Benefits

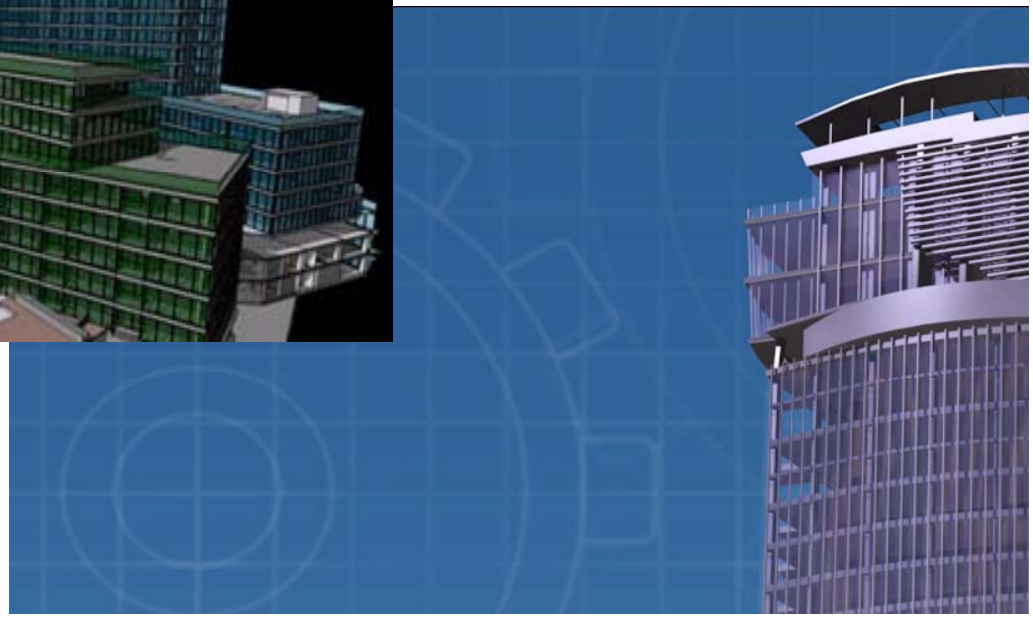
3. Building Analysis, Particularly Sustainability Initiatives



Facility Management Benefits

4. Change Management

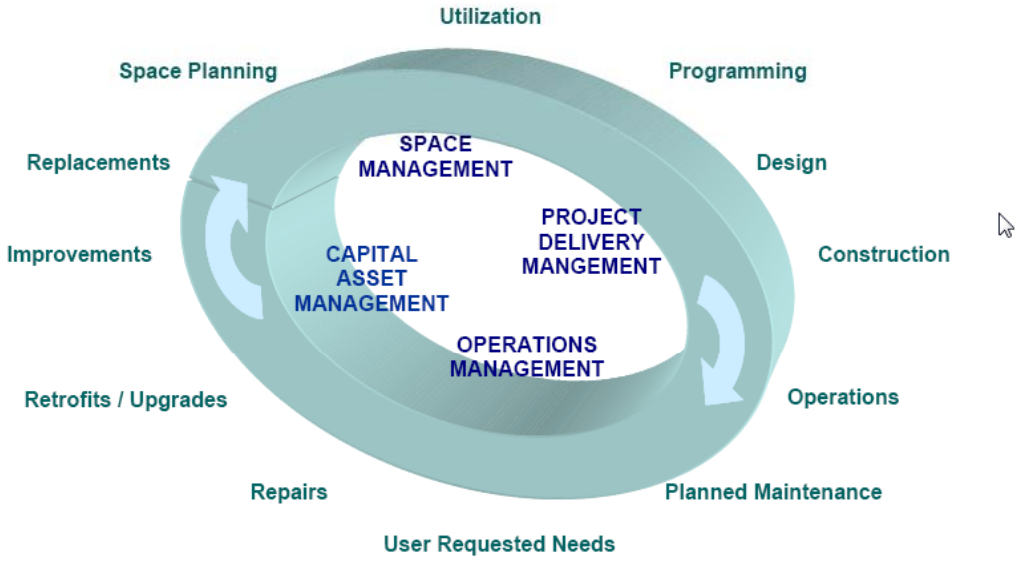




Facility Management Benefits

5. Lifecycle Management

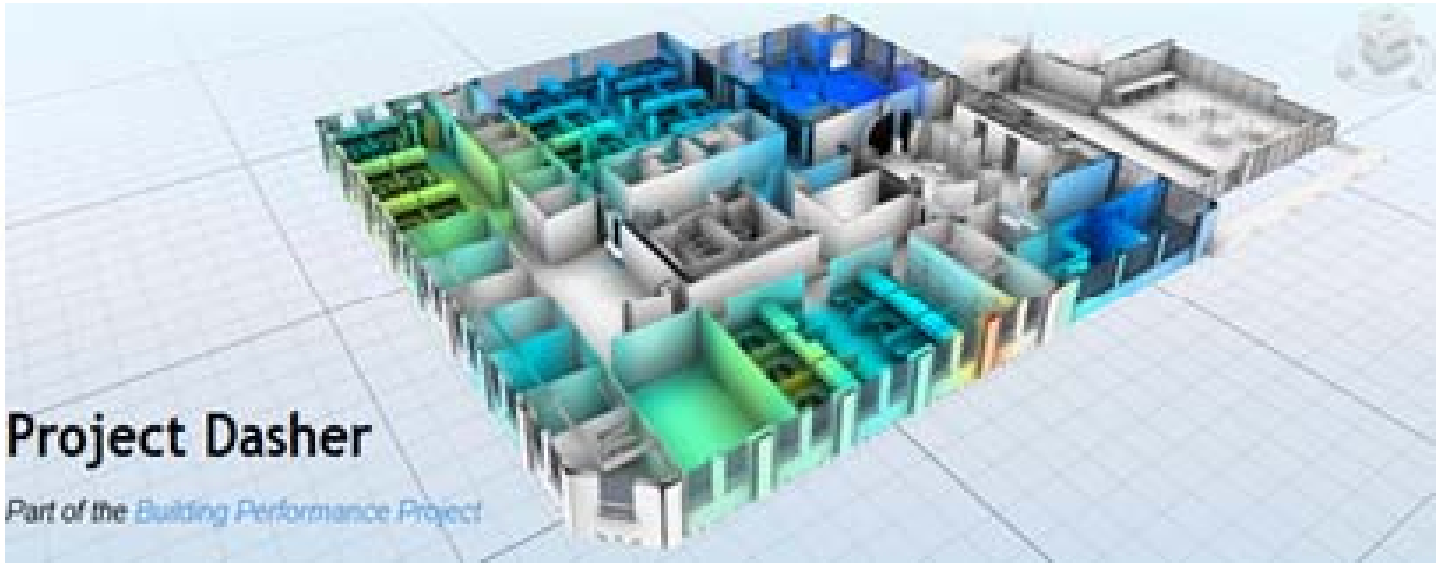
Figure 1: Asset Lifecycle Model
for
Total Cost of Ownership Management



Source: Whitepaper published in the USA by IFMA and authored by IFMA, APPA, US Federal Facilities Council, Holder Construction

Facility Management Benefits

- 6. BIM and Building Automation Systems



BIM and FM Possibilities

BIM and the FM Profession

- What does this all mean to Facility Management Professionals?

1. The Need for Information Management

- Information is not free
  - Cost to Collect
  - Cost to Verify
    - Nothing is more expensive than information you can't trust.
  - Cost to Maintain

1. The Need for Information Management

An Approach

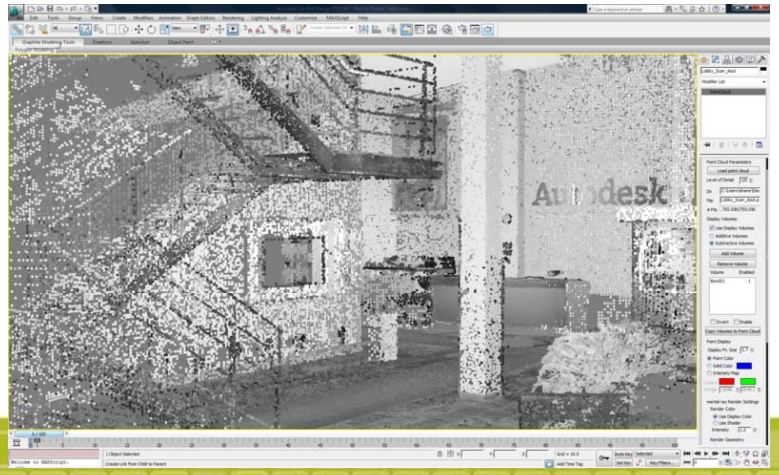
- Define the stakeholders, requirements and priorities
- Determine Criteria
  1. Health or Life Safety Requirements
  2. Regulatory Requirements
  3. Business Justification

2. Deciding Where to Begin
Prime Candidates for BIM

- Owners who Occupy
  - Education
  - Government
- Technical Buildings
  - Laboratories
  - Health Care
  - Airports
- New Buildings

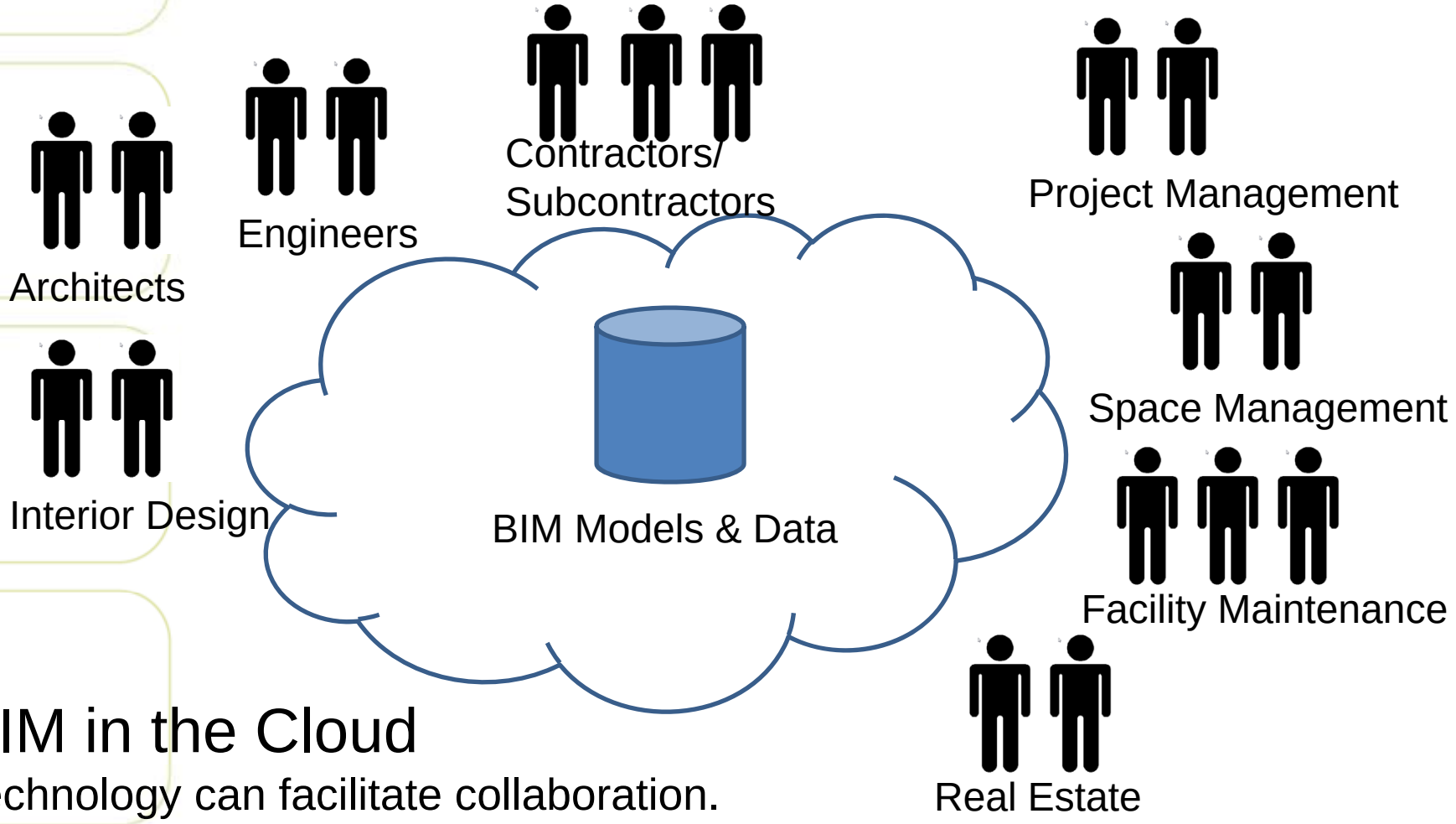
2. Deciding Where to Begin

- What about Older Buildings?
  - Lightweight BIM- At Minimum:
    - Accurate Walls and Doors
    - Method to Keep Updated
  - Special Purpose BIM
    - Created for Special Analysis
    - Possibly Maintained but not necessarily.
  - Point Clouds



3. Changes in Relationships

Technology Enabling Collaboration



BIM in the Cloud

Technology can facilitate collaboration.

4. Changes in FM Skills

- Information Management Skills
  - Writing specifications for information.
  - Managing changes.
  - Reviewing for completeness and accuracy.

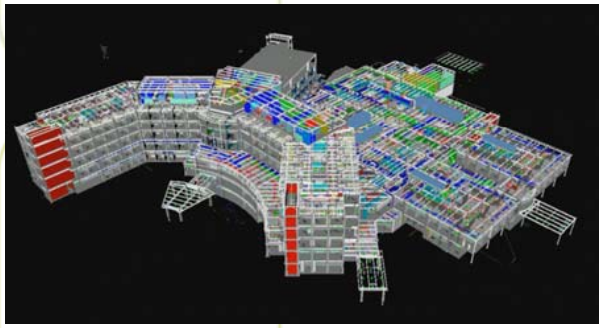
5. Changes in the FM Practices

- Building Commissioning
- Ongoing Lifecycle Management
  - Capital Improvement Budgeting
  - Ongoing Building Assessment

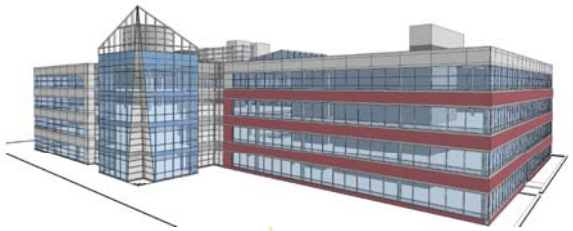
Integrating BIM with Facility Management Systems

BIM

CAFM / CMMS / IWMS



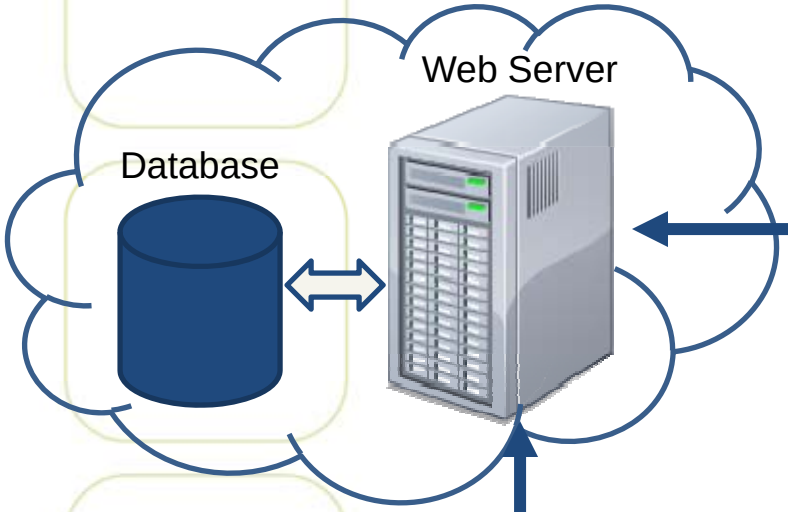
Middle-ware



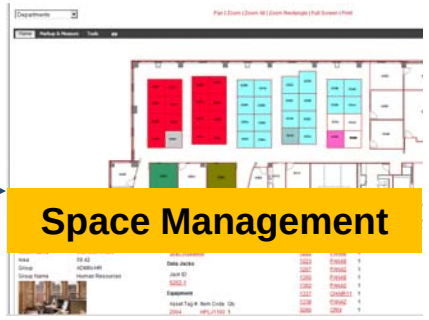
COBie

Direct BIM Integration

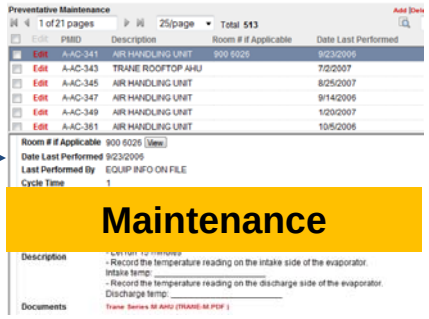
FM:Systems Direct BIM Integration



FM:Interact



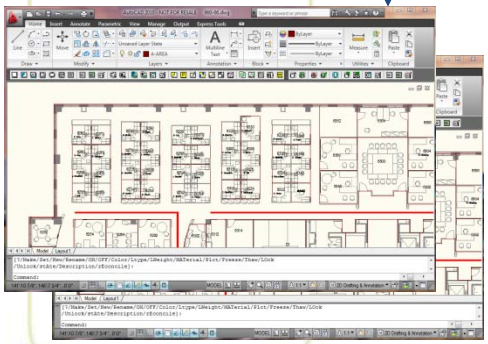
Space Management



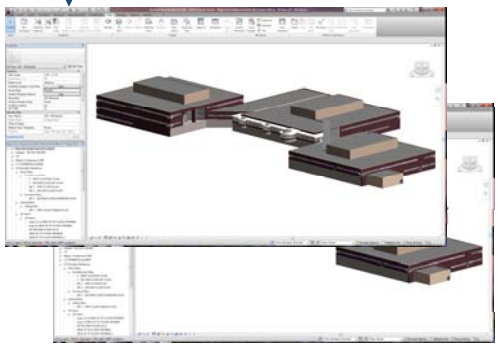
Maintenance

Real Estate

AutoCAD Drawings



Revit BIM Models

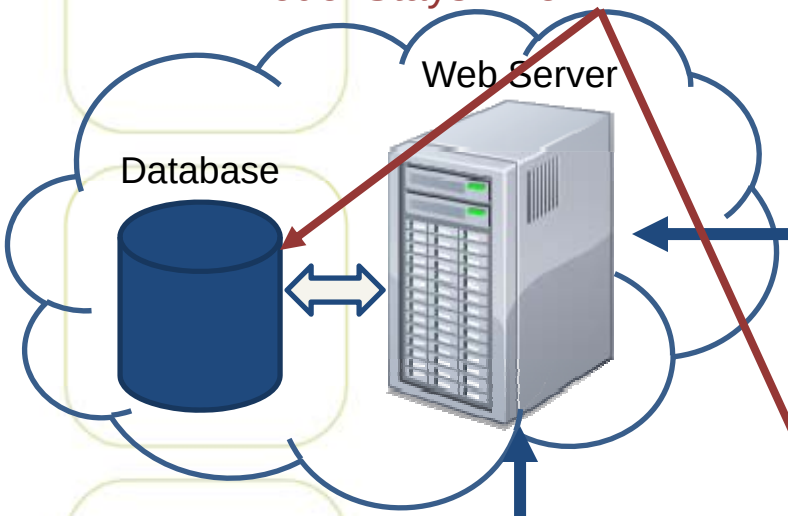


Architects/ Engineers/ Contractors

Owners/ Facility Managers

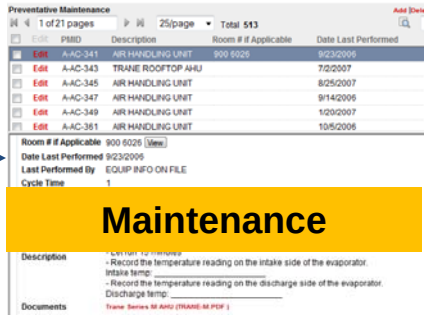
FM:Systems Direct BIM Integration

1. Bi-directional Flow of Information
   BIM Model Stays Live



FM:Interact

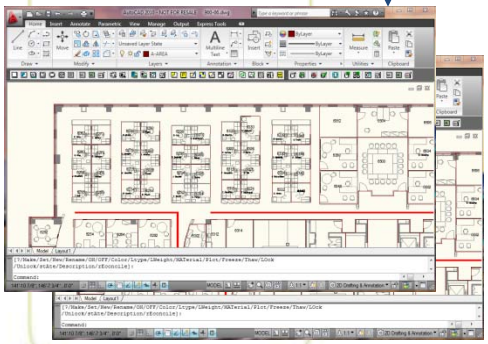
Space Management



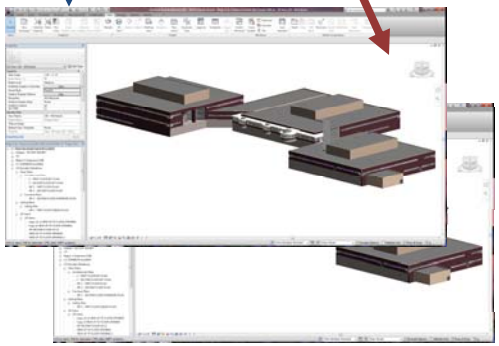
Maintenance

Real Estate

AutoCAD Drawings



Revit BIM Models

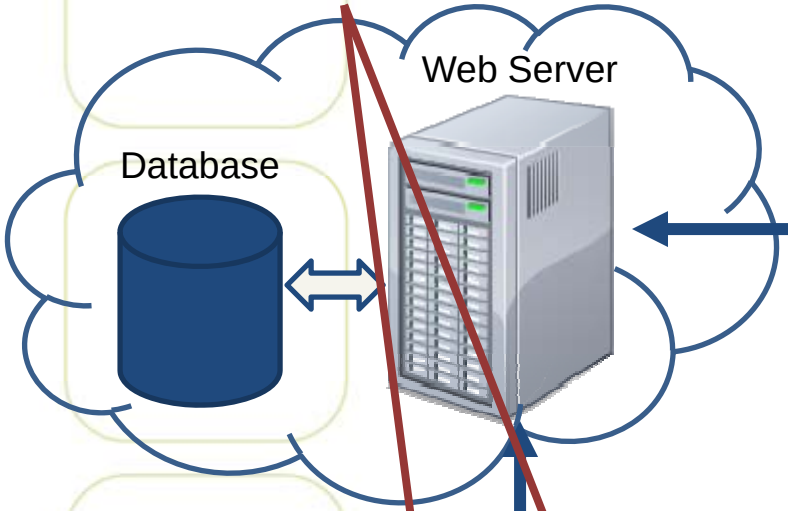


Architects/ Engineers/ Contractors

Owners/ Facility Managers

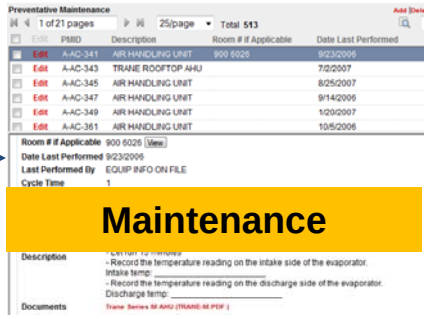
FM:Systems Direct BIM Integration

2. Support for both Revit and AutoCAD



FM:Interact

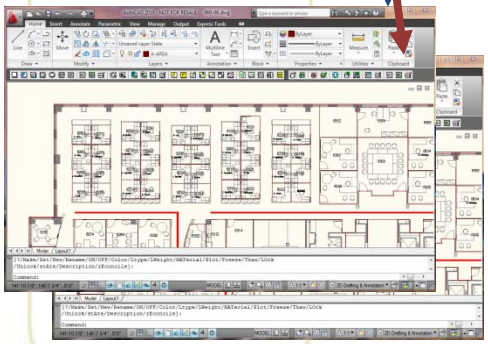
Space Management



Maintenance

Real Estate

AutoCAD Drawings



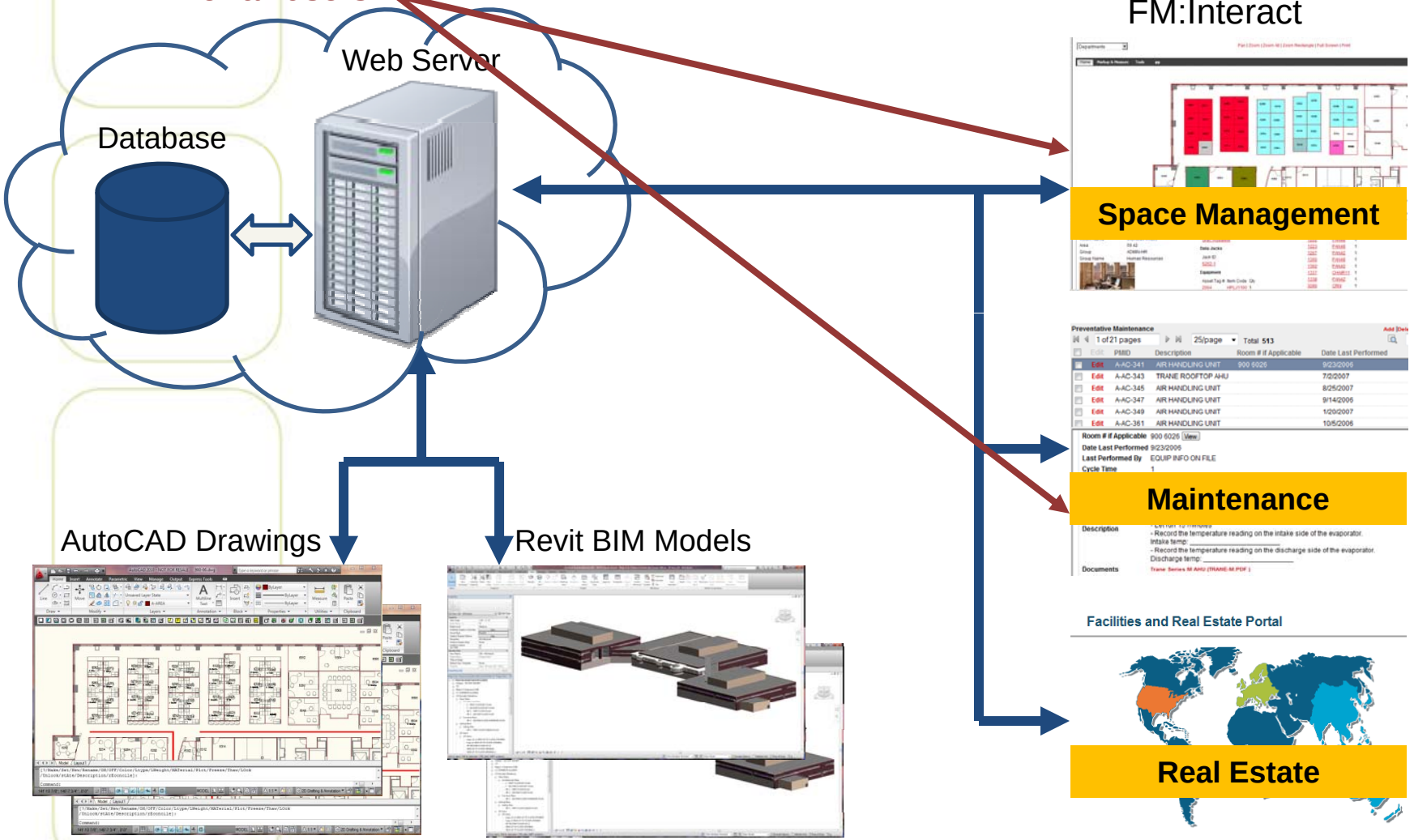
Revit BIM Models

Architects/ Engineers/ Contractors

Owners/ Facility Managers

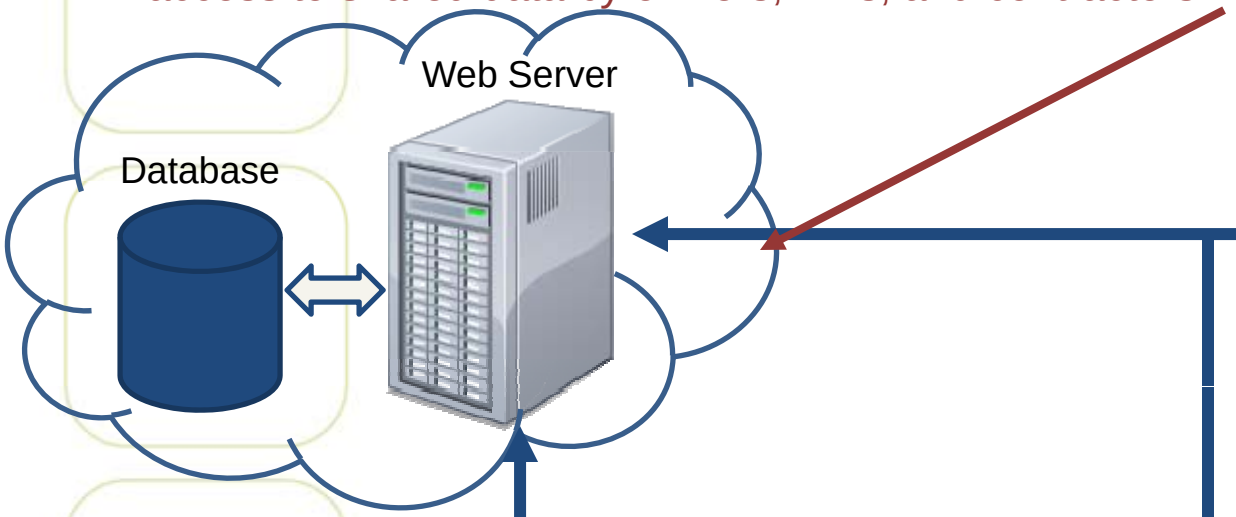
FM:Systems Direct BIM Integration

3. Web access provides access to BIM for all users.

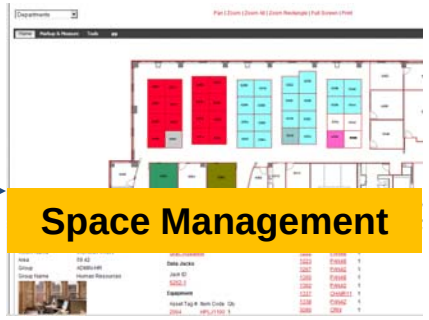


FM:Systems Direct BIM Integration

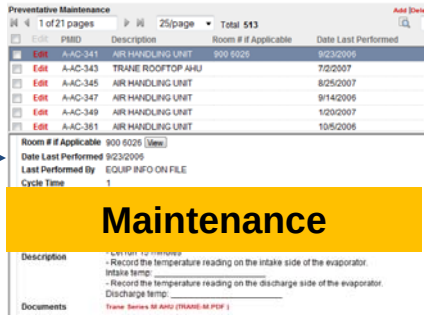
4. Use of web services and cloud-based hosting provides secure access to shared data by owners, AE's, and contractors



FM:Interact



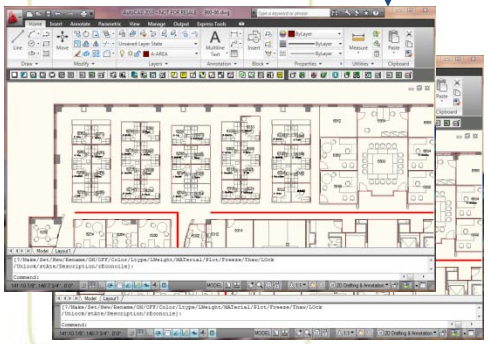
Space Management



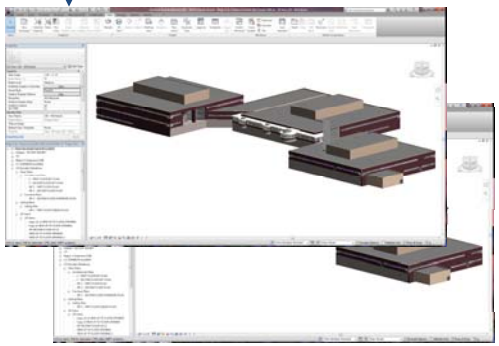
Maintenance

Real Estate

AutoCAD Drawings



Revit BIM Models



Architects/ Engineers/ Contractors

Owners/ Facility Managers

FM:Systems BIM Working Group

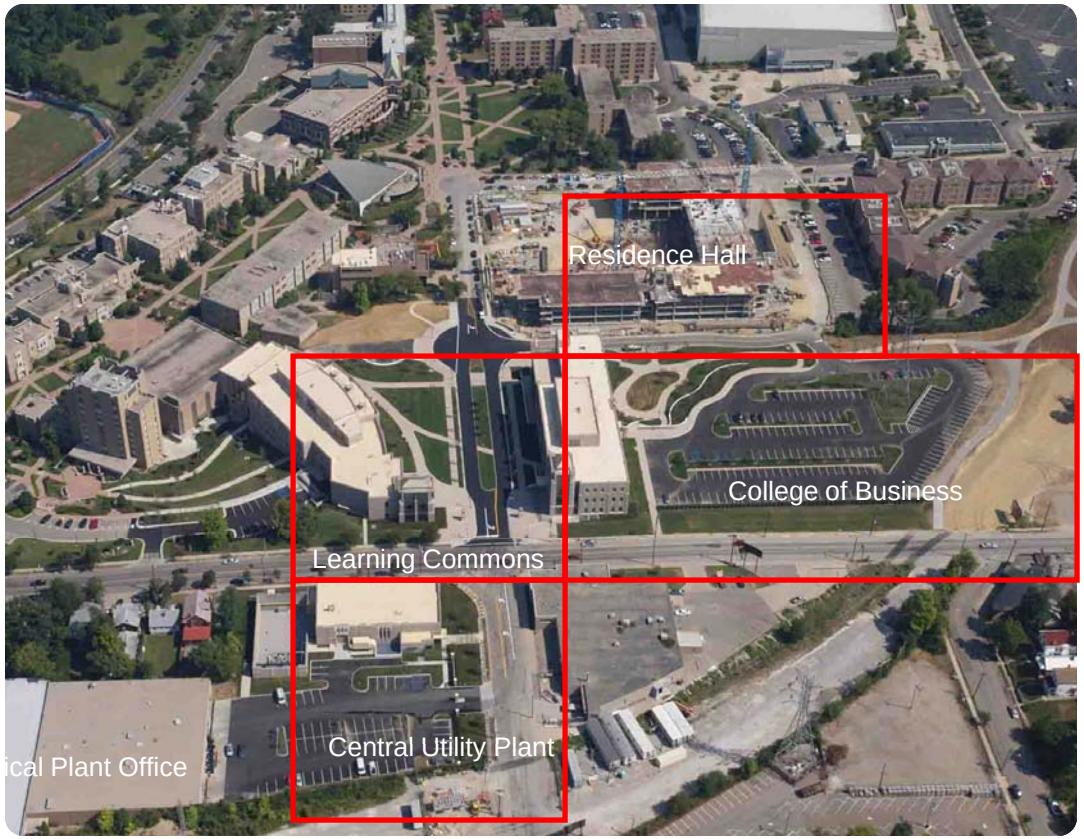
Case Study 1

Xavier University

- A Jesuit, Catholic university in Cincinnati
- Founded 1831
- 7,019 total students
- 70 buildings – over 2 million GSF

Xavier's Hoff Academic Quad and Residence Hall Project

- $117 M, Largest capital projects in schools history
- Added 25% to campus
- 4 new buildings
- BIM used to facilitate design and construction



Xavier's Challenges

- Facility information time-consuming or costly to gather
- Rapidly growing campus means even MORE information

"I collected the data for 1.5M SF on campus by walking and typing the information into the system, I don't want to do that again!"

Greg Meyer, Xavier Facilities

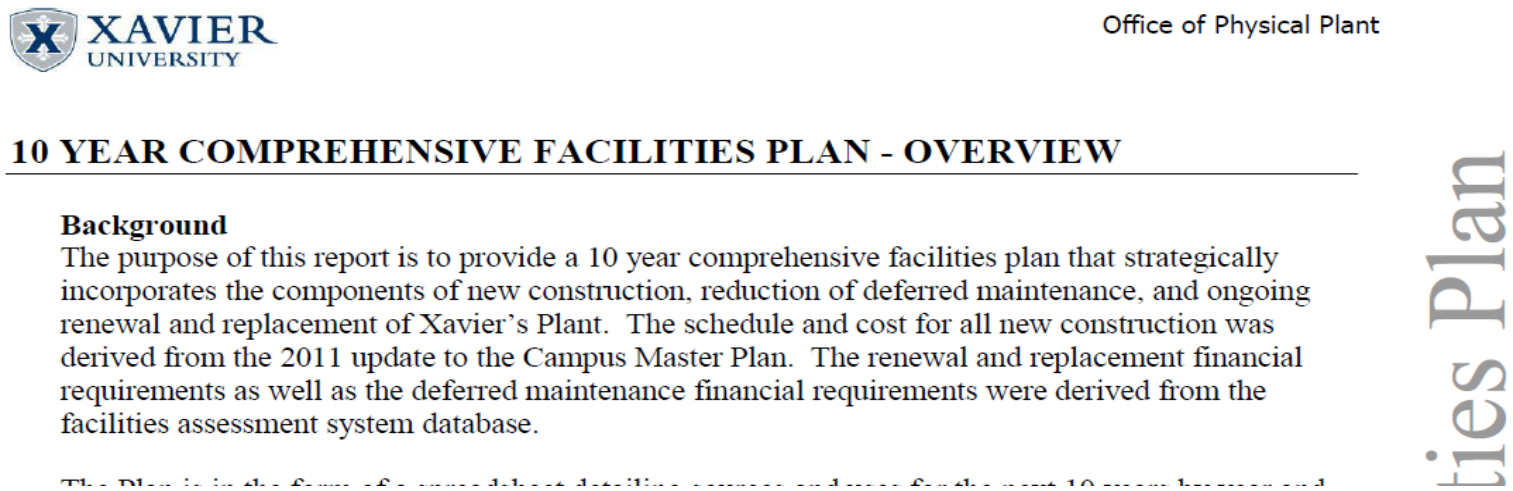
Xavier's BIM Vision

"The designers and the contractors already have the information that I need to maintain and manage the buildings why should I have to recreate what has already been accomplished?"

Greg Meyer,
Xavier
Facilities

Xavier's Results

- Modeled entire campus in BIM
- Producing 10 Year Comprehensive Facilities Plan
- Forecasts facilities capital costs using data derived manually and from BIM models



XAVIER UNIVERSITY

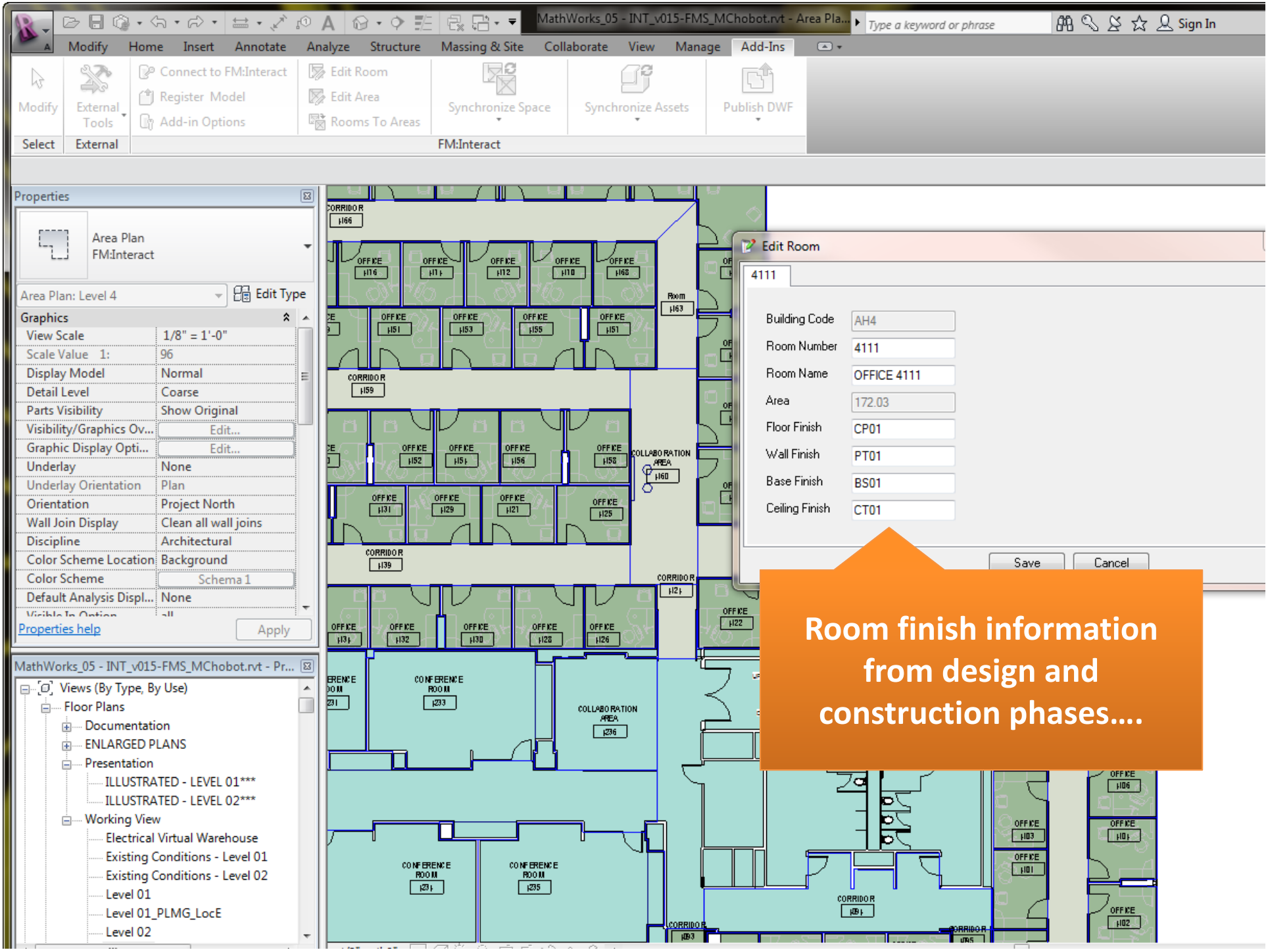
Office of Physical Plant

10 YEAR COMPREHENSIVE FACILITIES PLAN - OVERVIEW

Background

The purpose of this report is to provide a 10 year comprehensive facilities plan that strategically incorporates the components of new construction, reduction of deferred maintenance, and ongoing renewal and replacement of Xavier's Plant. The schedule and cost for all new construction was derived from the 2011 update to the Campus Master Plan. The renewal and replacement financial requirements as well as the deferred maintenance financial requirements were derived from the facilities assessment system database.

ties Plan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Type a keyword or phrase
Sign In
Modify
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Annotate
Analyze
Structure
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Collaborate
View
Manage
Add-Ins
Connect to FM:Interact
Register Model
Add-in Options
Edit Room
Edit Area
Rooms To Areas
Synchronize Space
Synchronize Assets
Publish DWF
Select
External
FM:Interact
Properties
Area Plan
FM:Interact
Area Plan: Level 4
Edit Type
Graphics
View Scale 1/8" = 1'-0"
Scale Value 1: 96
Display Model Normal
Detail Level Coarse
Parts Visibility Show Original
Visibility/Graphics Ov... Edit...
Graphic Display Opti... Edit...
Underlay None
Underlay Orientation Plan
Orientation Project North
Wall Join Display Clean all wall joins
Discipline Architectural
Color Scheme Location Background
Color Scheme Schema 1
Default Analysis Displ... None
Properties help
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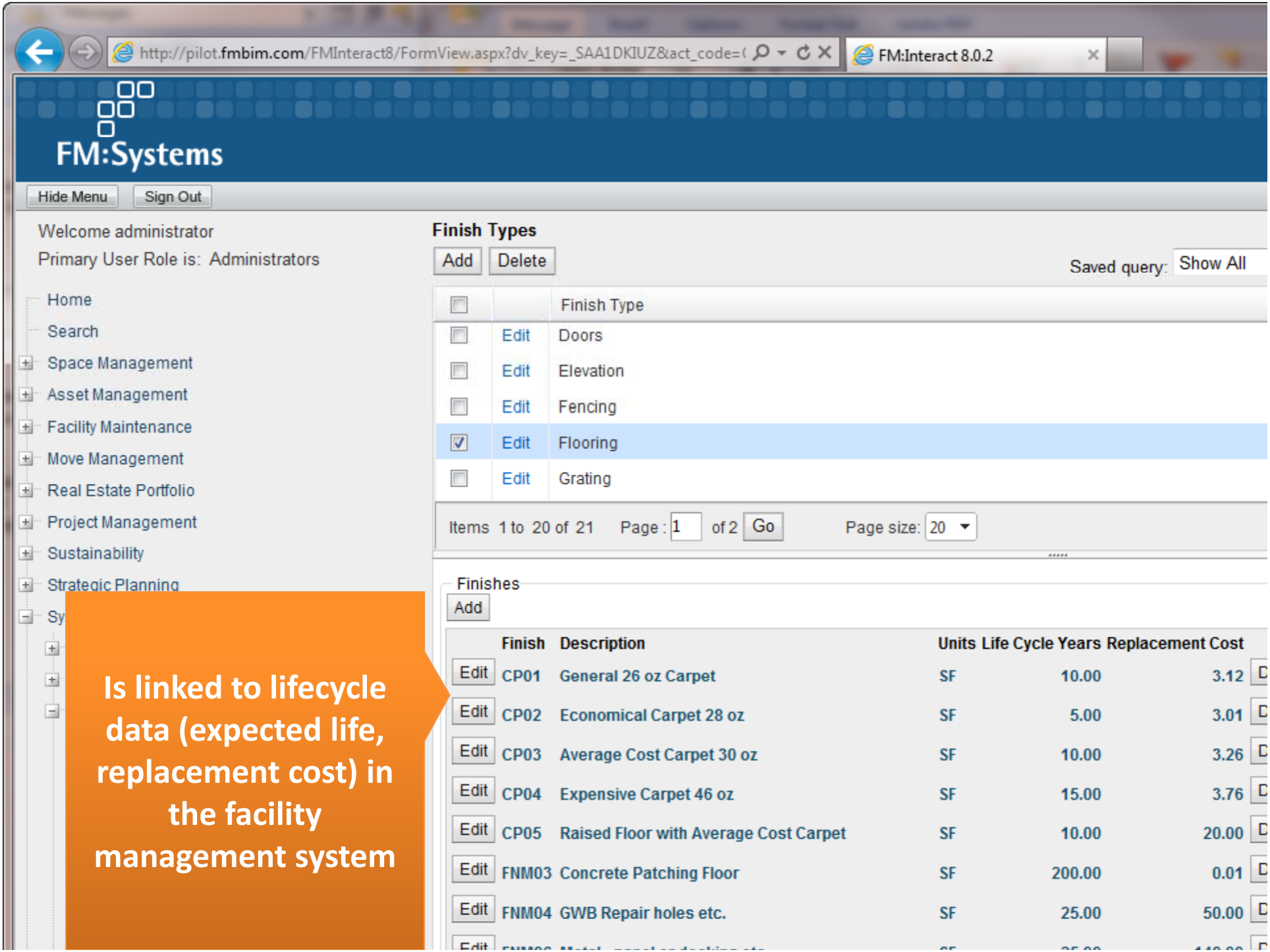
Views (By Type, By Use)
Floor Plans
Documentation
ENLARGED PLANS
Presentation
ILLUSTRATED - LEVEL 01***
ILLUSTRATED - LEVEL 02***
Working View
Electrical Virtual Warehouse
Existing Conditions - Level 01
Existing Conditions - Level 02
Level 01
Level 01_PLMG_LocE
Level 02
Edit Room
4111
Building Code AH4
Room Number 4111
Room Name OFFICE 4111
Area 172.03
Floor Finish CP01
Wall Finish PT01
Base Finish BS01
Ceiling Finish CT01
Save
Cancel
Room finish information from design and construction phases....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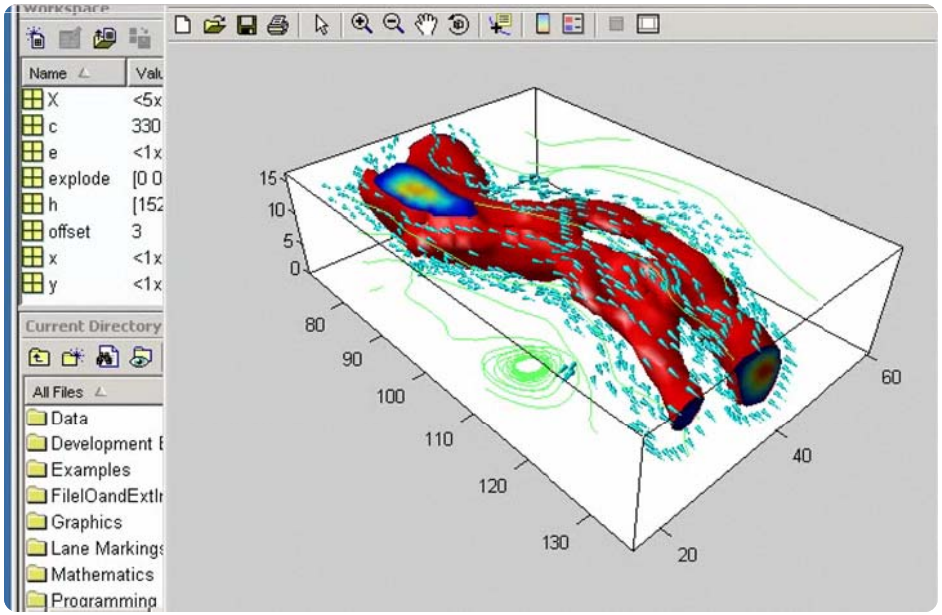
FM:Systems
Hide Menu
Sign Out
Welcome administrator
Primary User Role is: Administrators
Home
Search
Space Management
Asset Management
Facility Maintenance
Move Management
Real Estate Portfolio
Project Management
Sustainability
Strategic Planning
Finish Types
Add
Delete
Saved query: Show All
Finish Type
Edit Doors
Edit Elevation
Edit Fencing
Edit Flooring
Edit Grating
Items 1 to 20 of 21
Page : 1 of 2 Go
Page size: 20
Finishes
Add
Finish Description Units Life Cycle Years Replacement Cost
Edit CP01 General 26 oz Carpet SF 10.00 3.12
Edit CP02 Economical Carpet 28 oz SF 5.00 3.01
Edit CP03 Average Cost Carpet 30 oz SF 10.00 3.26
Edit CP04 Expensive Carpet 46 oz SF 15.00 3.76
Edit CP05 Raised Floor with Average Cost Carpet SF 10.00 20.00
Edit FNM03 Concrete Patching Floor SF 200.00 0.01
Edit FNM04 GWB Repair holes etc. SF 25.00 50.00
Is linked to lifecycle data (expected life, replacement cost) in the facility management system

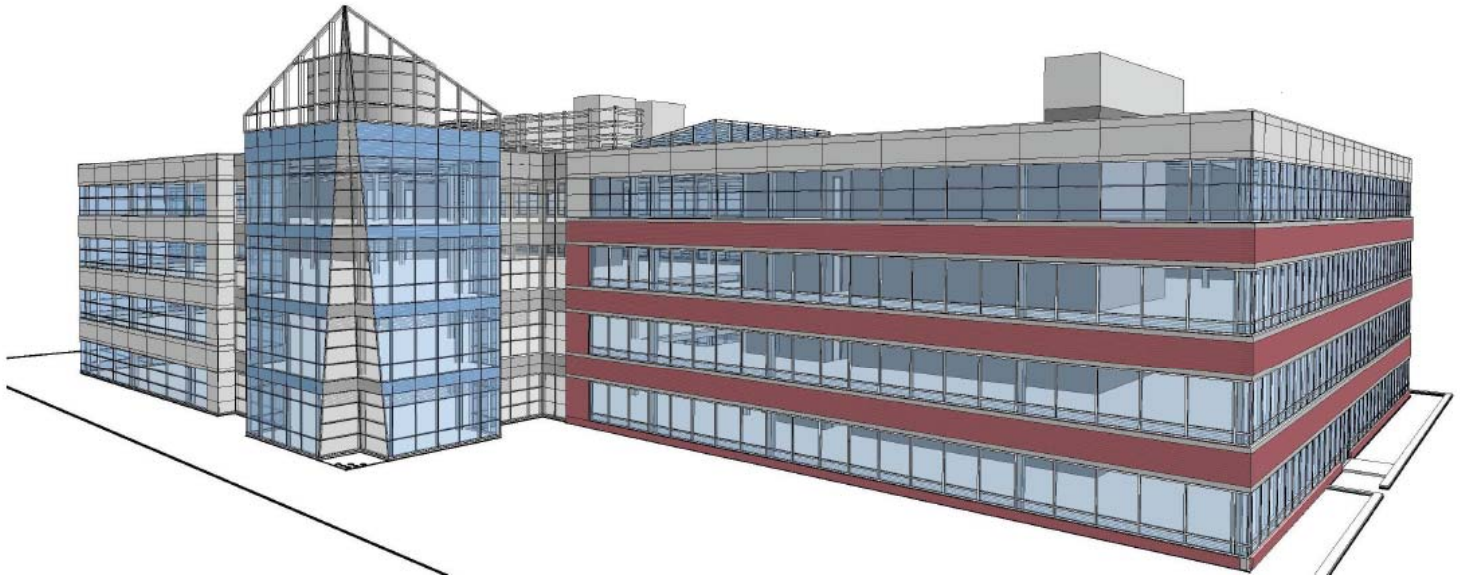
Case Study 2
MathWorks

- “Accelerating the pace of engineering and science”
- Global software company headquartered in Natick, MA
- Over 2,100 staff worldwide



MathWork's Apple Hill 4 Project

- 4 story 180,000 square foot corporate facility
- 460 offices, 300 person cafeteria, monumental stair atrium and various support spaces
- Anticipated Delivery date: December 2012

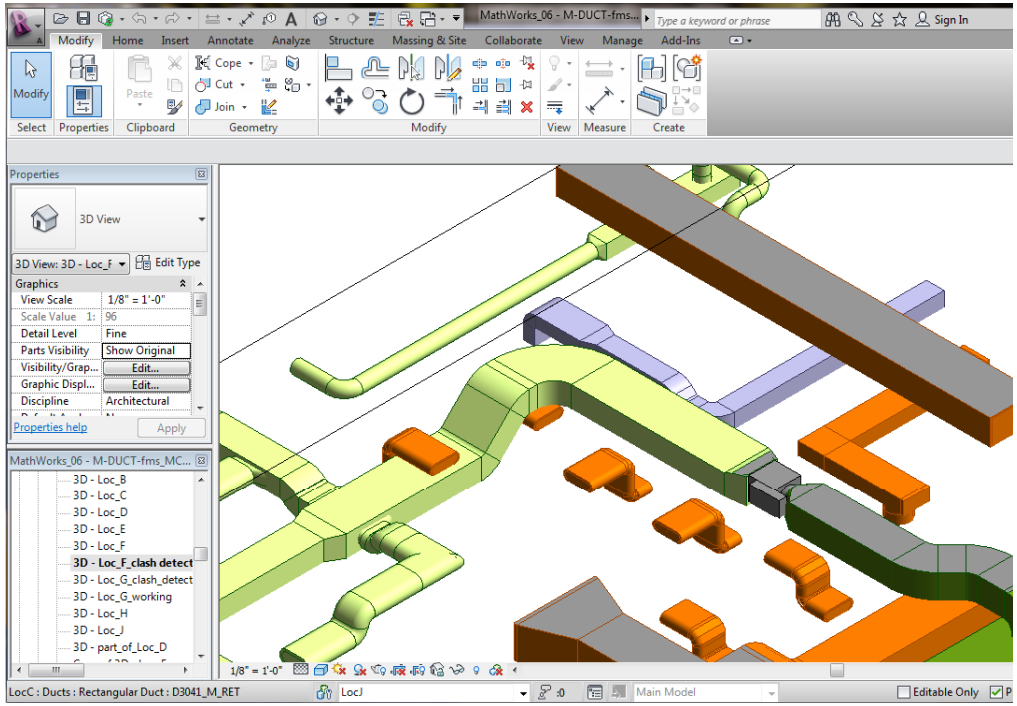


MathWork's Challenges

- Maintenance management system not fully implemented
- Difficult to properly catalog and inventory building assets
- Highly technical building comes with a lot of information

MathWork's BIM Vision

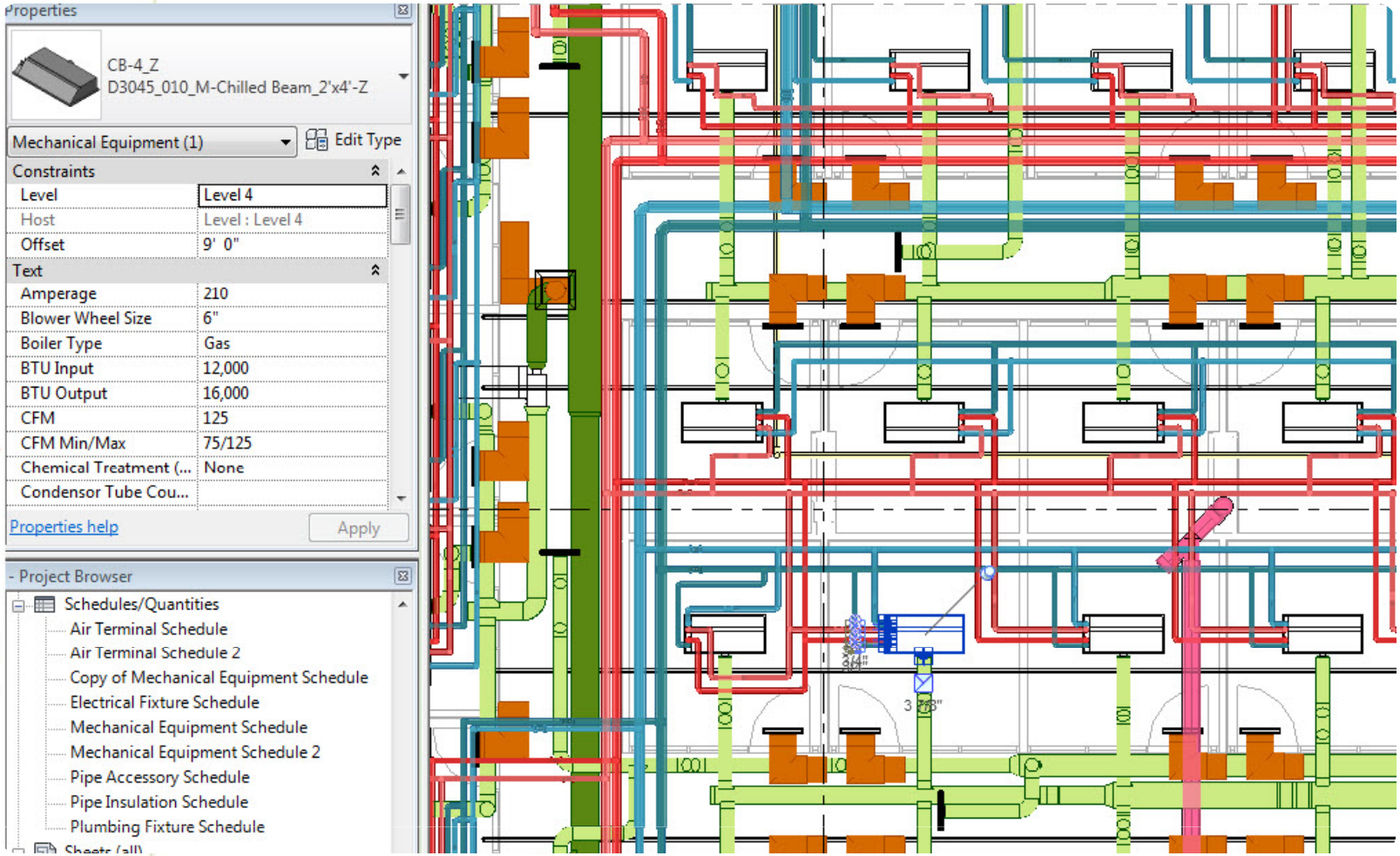
- Require BIM deliverables for project
- Leverage the data and information in the models to populate space and asset system



Mathworks Results
Detailed BIM Deliverable Requirements

Packaged RTU's			15500-15-1 Phoenix Mechanical	RTU-1
	Manufacturer	Type		AAON
	Model Number	Type		RL-095
	Serial Number			
	RTU Type			
	Fuel Source			
	Refridgerent Type			
	Size (Tonnage)	Instance		15.2
	Voltage	Type		460
	Amperage			
Condensor Boilers			15500-02 Phoenix Mechanical	FBN-2000
	Manufacturer	Type		Lochinvar Corporation
	Model Number	Type		FBN-2000
	Serial Number	Type		
	Boiler Type	Type		Crest Commercial Boiler
	Size (MBH)	Type		3.075
	BTU Input	Type		2.000 MBH
	BTU Output	Type		1.840 MBH
	Stack Size (dia)	Type		
	Modulator Motor Size (HP)	Type		
	Voltage	Type		120

Mathworks Results
Detailed BIM Data



Case Study 3
Western Michigan University

- Located in Kalamazoo, Michigan
- 25,000 Students
- 8 million square feet
- 115 Buildings

Western Michigan Challenges

- Energy Analysis
- Renovation and retrofit requirements.

- Decision in 2009 to model 2/3 of 8 million SF campus.

Western Michigan Results

- Leveraged existing CAD drawings.
- Used student interns, providing valuable real-life experience.
- Completed 80% of campus in 5 months.
- Helps WMU make smarter decisions.

ROI?

How do you justify the cost of modeling?

How do you justify the cost of not modeling? You assume that the status quo is free.

- Peter Strazdas, Associate Vice President of Facilities, Western Michigan University

BIM for Facility Managers

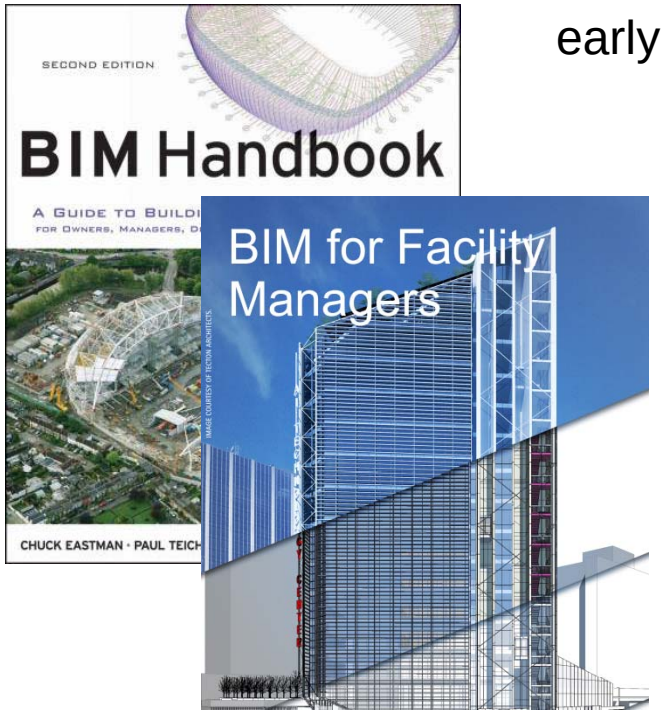
An upcoming publication by the IFMA Foundation and John Wiley & Sons

Paul Teicholz

Chuck Eastman

Eric Teicholz

Mike Schley



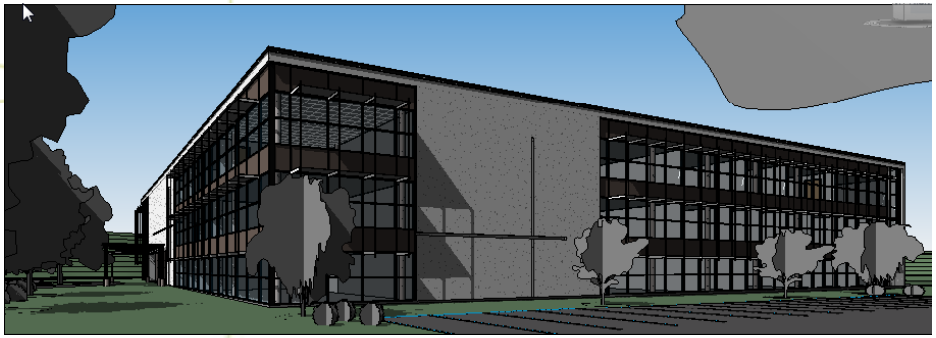
Scheduled for release in early 2013

CORNELL UNIVERSITY

BIM & FM Course- Class Project
Salamoun & Wu Team

hvac2	$107,327	+90	Underfloor Air Distribution
hvac1	$128,288	+90	Central VAV, Electric Resistance Heat, Chiller 5.96 COP

#	System Type	First Cost*	Operation & Maintenance	Replacement in 50 years	Energy cost**	Humidity Control
1	Package - Through-Wall	Low	Low	4	High	Poor
2	Package – Rooftop	Low/Med	low	3.3	High	Poor
3	Split System	Low/Med	Low	3.3	High	Poor
4	Heat Pump	Low/Med	Low	3.3	Medium	Poor
5	Heat Pump Water Loop	Low/Med	Medium	2.6	Medium	Poor
6	Decoupled Through-Wall	Low/med	Low	4/3.3	High	Good
7	Central – water cooled chiller with VAV	Medium	Medium	2	Low	Adequate
8	Central – air cooled chiller with VAV	Medium	Medium	2.5	Low	Adequate
9	Central – water cooled chiller with VAV and Ice Storage	High	Medium	2.5	Low***	Adequate



HVAC system:

1. Central VAV, Electric Resistance Heat,

Chiller <0.5kW/ton
= $128,288

2. Under floor Air Distribution
= $107,327

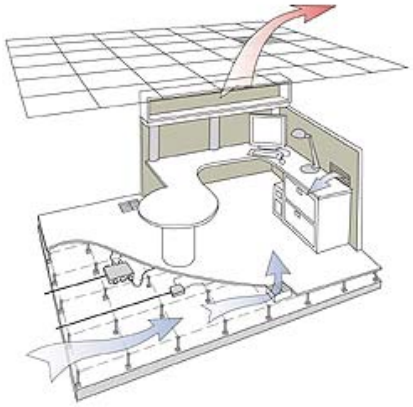
HVAC system:

Class Project
Cornell BIM & FM Class
Salamoun & Wu Team

Under floor Air Distribution:

Better alternative to conventional ceiling-based air distribution systems.

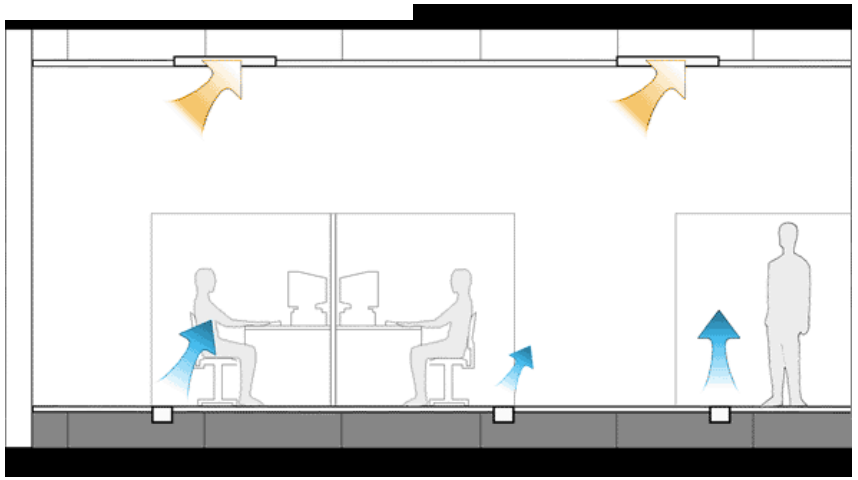
Why?
This technology uses the open space (under floor plenum) between the structural concrete slab and the underside of a raised access floor system to deliver conditioned air directly into the occupied zone of the building.



UFAD systems advantages
- Improved thermal comfort
- Improved indoor air quality,
- Reduced energy use.

By combining a building's heating, ventilating, and air-conditioning (HVAC) system with all major power, voice, and data cabling into one easily accessible service plenum under the raised floor, significant improvements can be realized in terms of increased flexibility and reduced costs associated with reconfiguring building services

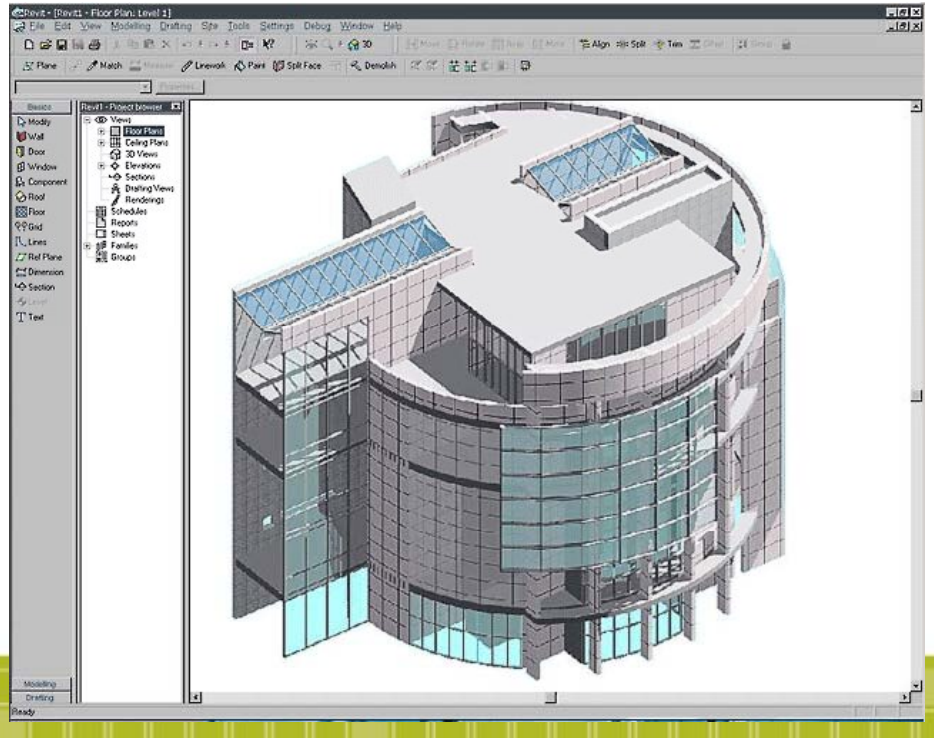
- Information technologies
- High churn rates.



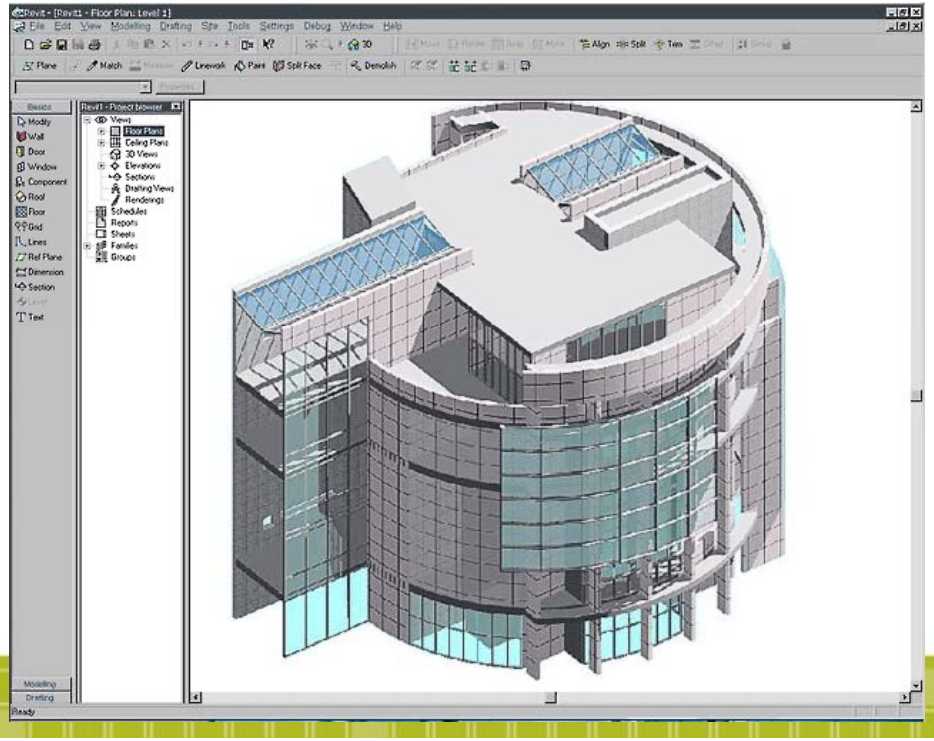
http://www.cbe.berkeley.edu/underfloorair/techoverview.htm

Closing Thoughts

- *BIM as a Practice*
- *Sharing Experience is Essential*
- *Manage for the LifeCycle*



Questions?



Thank You