BIM FOR FM

Utopia vs Reality

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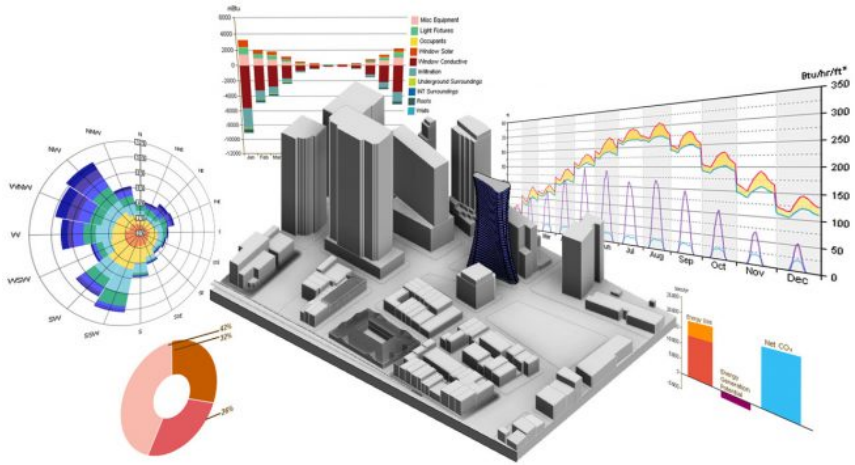
2019 Project Management Symposium

Agenda

- Building Information Modeling (BIM)
- Facilities Management (FM)
- FM Data Management: The Traditional Way
- FM Data Management: The BIM Way
  - ✓ What?
  - ✓ How?
- Challenges
- Recommendations

Building Information Modeling (BIM)

"**Building Information Modeling** is a digital representation of physical and functional characteristics of a facility. As such it serves as a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life cycle from inception onward."



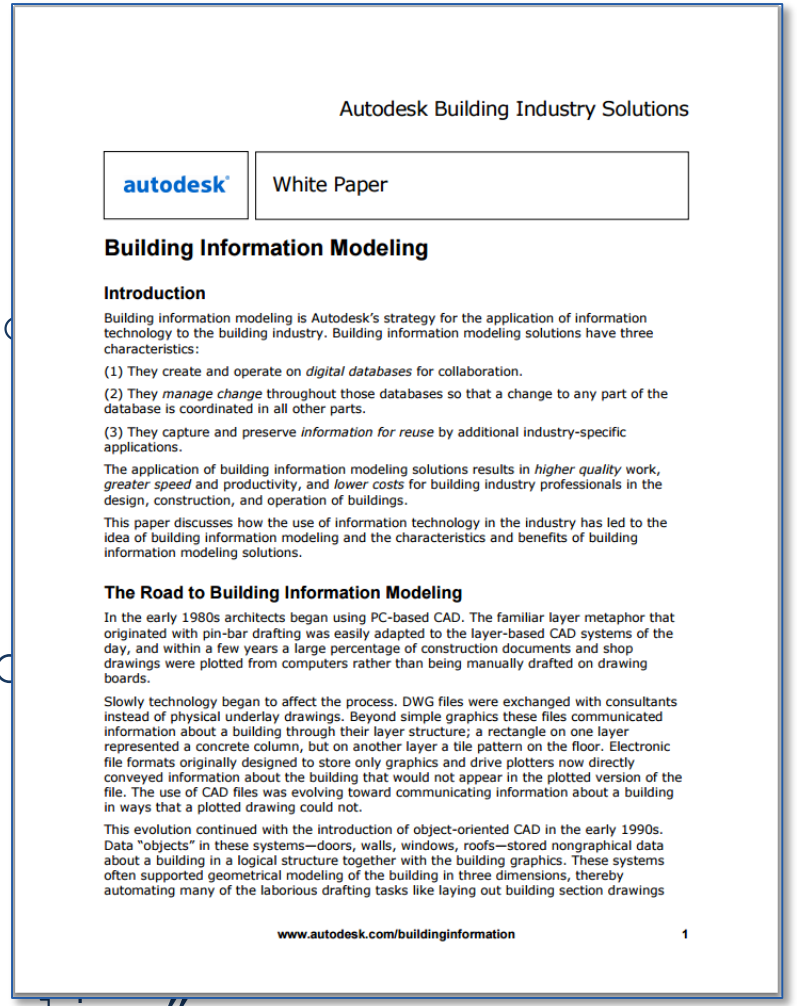
–National BIM Standards (NBIMS)

***BIM is used both as a noun (model) and verb**

Brief History of BIM

A Quick Timeline

- BIM was first wrote about in **1975**
  - ✓ Chuck Eastman, Professor at Georgia Tech Sch
    Architecture
  - ✓ "The Use of Computers Instead of Drawings in
    Design"
- "Building Information Model" term coined
  1992
  - ✓ Paper by Van Nederveen and Tolman
- Autodesk popularized "BIM" in **2002**
  - ✓ White paper titled "Building Information Modeling"



Autodesk Building Industry Solutions

autodesk | White Paper

Building Information Modeling

Introduction

Building information modeling is Autodesk's strategy for the application of information technology to the building industry. Building information modeling solutions have three characteristics:

(1) They create and operate on *digital databases* for collaboration.

(2) They *manage change* throughout those databases so that a change to any part of the database is coordinated in all other parts.

(3) They capture and preserve *information for reuse* by additional industry-specific applications.

The application of building information modeling solutions results in *higher quality* work, *greater speed* and productivity, and *lower costs* for building industry professionals in the design, construction, and operation of buildings.

This paper discusses how the use of information technology in the industry has led to the idea of building information modeling and the characteristics and benefits of building information modeling solutions.

The Road to Building Information Modeling

In the early 1980s architects began using PC-based CAD. The familiar layer metaphor that originated with pin-bar drafting was easily adapted to the layer-based CAD systems of the day, and within a few years a large percentage of construction documents and shop drawings were plotted from computers rather than being manually drafted on drawing boards.

Slowly technology began to affect the process. DWG files were exchanged with consultants instead of physical underlay drawings. Beyond simple graphics these files communicated information about a building through their layer structure; a rectangle on one layer represented a concrete column, but on another layer a tile pattern on the floor. Electronic file formats originally designed to store only graphics and drive plotters now directly conveyed information about the building that would not appear in the plotted version of the file. The use of CAD files was evolving toward communicating information about a building in ways that a plotted drawing could not.

This evolution continued with the introduction of object-oriented CAD in the early 1990s. Data "objects" in these systems—doors, walls, windows, roofs—stored nongraphical data about a building in a logical structure together with the building graphics. These systems often supported geometrical modeling of the building in three dimensions, thereby automating many of the laborious drafting tasks like laying out building section drawings

www.autodesk.com/buildinginformation 1

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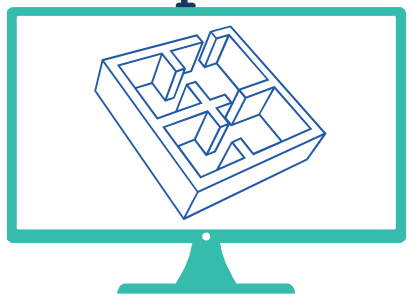
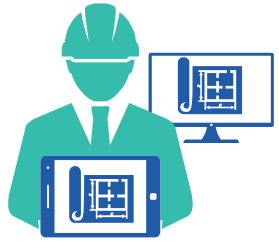
Why BIM?

A foundational, intelligent, model-based process



Uses 3D models to capture, explore, and maintain consistent and coordinated planning, design

Provides greater project insight for cost, schedule, and constructability



Uses and shares the same consistent data whether you're at your desk or in the field

Enables prompt response to change with processes that are smarter and faster

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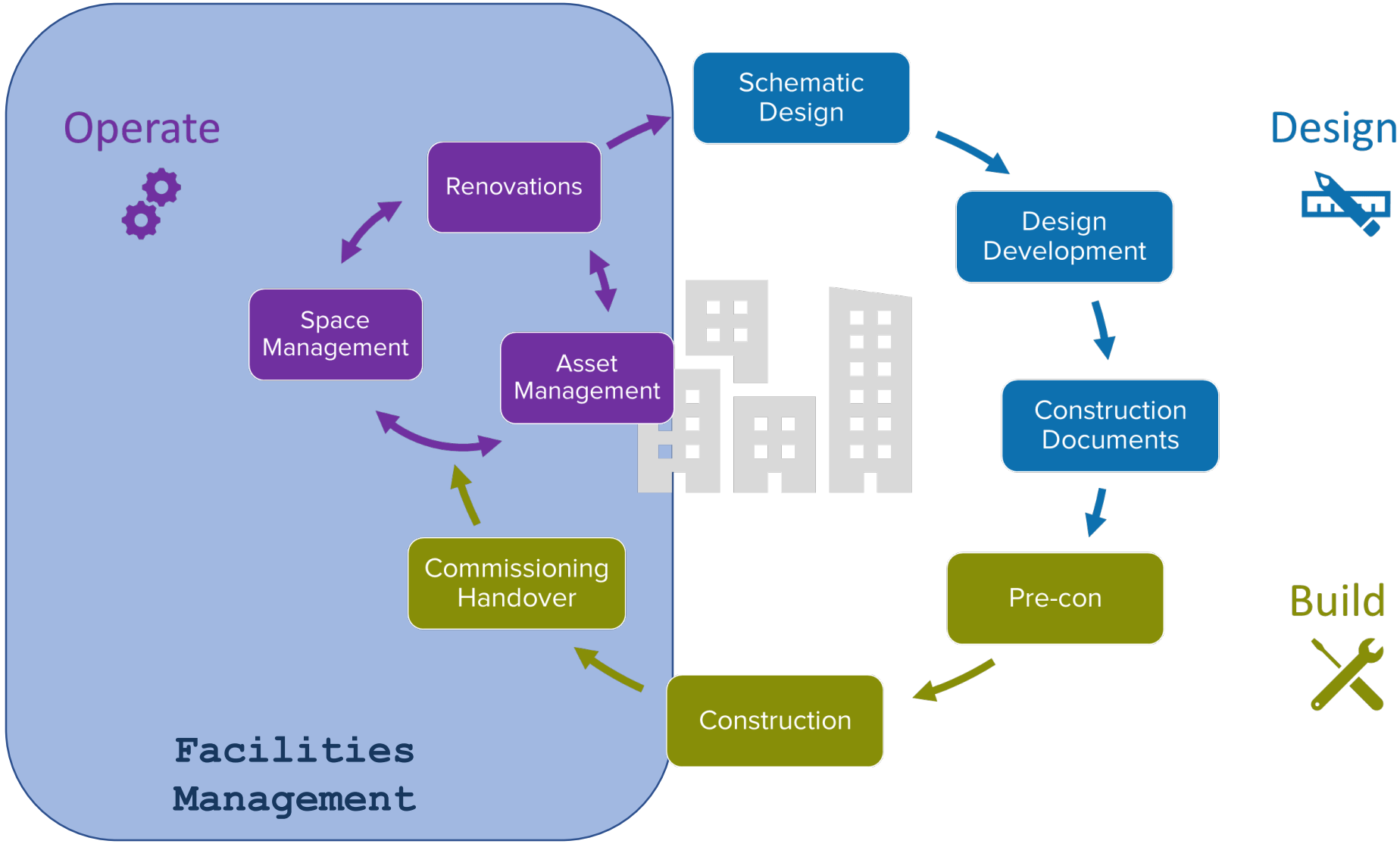
Building Lifecycle



Facilities Management (FM)

Operations and Maintenance

- Space Management
- Asset Management
  - ✓ Preventive Maintenance
  - ✓ Work Order Management
- Building Automation Systems
- Renovations

Quiz?

Q1. Which phase of building lifecycle costs the most ?

- ✓ **Operations**

Q2. What are two of the most important factors affecting this cost?

- ✓ **Accuracy** of FM data
- ✓ Ease of **access** to FM data

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FM Data Collection: The Traditional Way

Project Closeout Deliverables

- 2D As Built Drawings
  - ✓ Hard prints
  - ✓ PDFs
  - ✓ CAD
- O&M Manuals
  - ✓ Hard copy binders
  - ✓ PDFs

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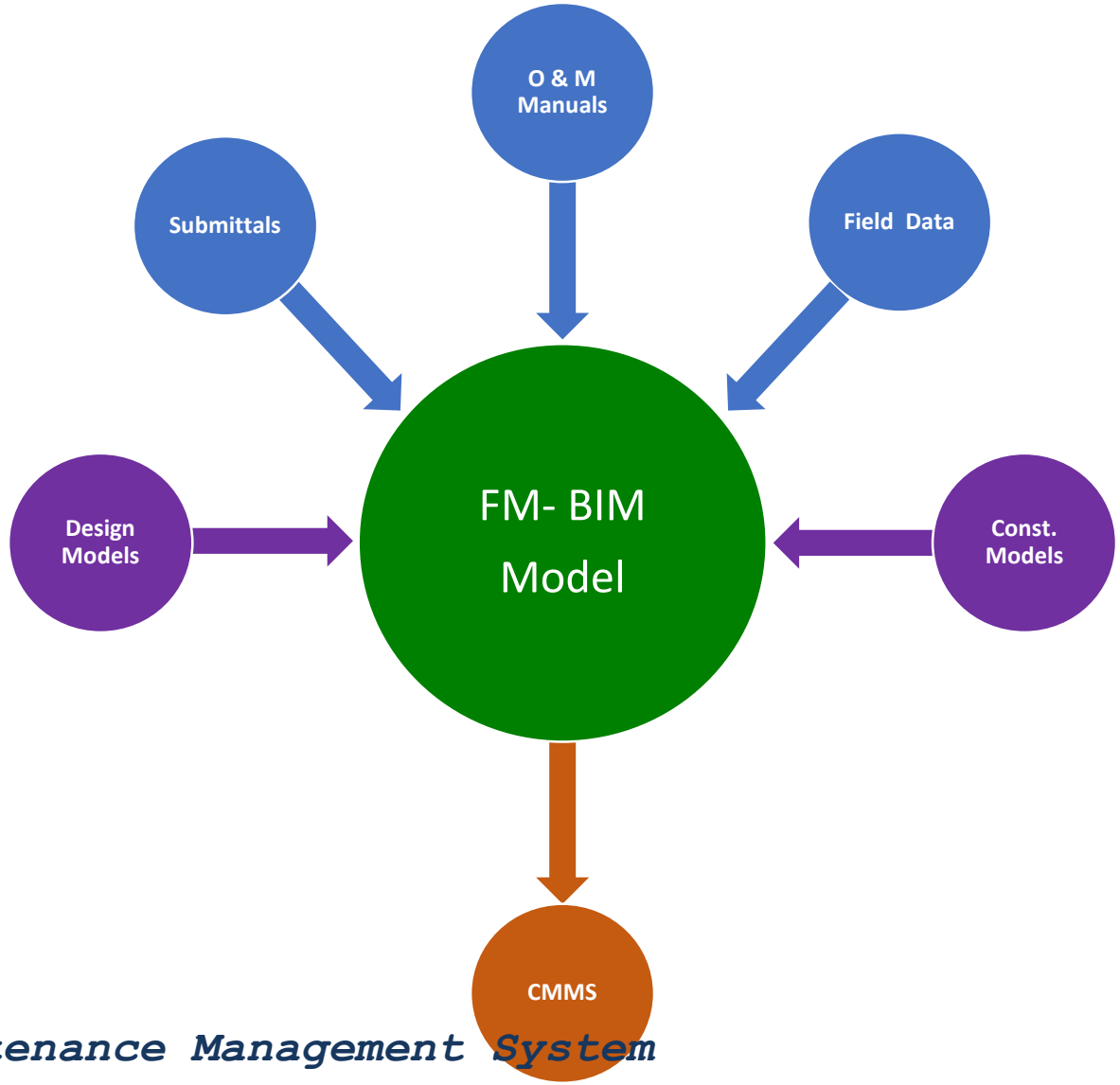
FM Data Collection: The BIM Way



*CMMS: Computerized Maintenance Management System

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But Sometimes…

Life before the digital era

Life after the digital era

What is the way forward?

Answer the two key questions

- What FM data do we collect?
- How do we collect FM data?

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What FM data do we collect?

- **Geometry**
  - ✓ 2D (.pdf or .dwg or hard prints)
  - ✓ 3D (.rvt or .dwg or .nwd)
- **Parametric Data**
  - ✓ Physical Attributes (properties)
  - ✓ Location
- **Field Data**
  - ✓ Commissioning Data
  - ✓ Barcoding/ Asset Tagging
- **O&M Submittal Data**
  - ✓ Preventive Maintenance
  - ✓ Safety Plans
  - ✓ Warranty

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How do we collect FM data?

- **BIM Authoring Software**
- **Excel**
- **COBie**
- **FM Cloud Software**

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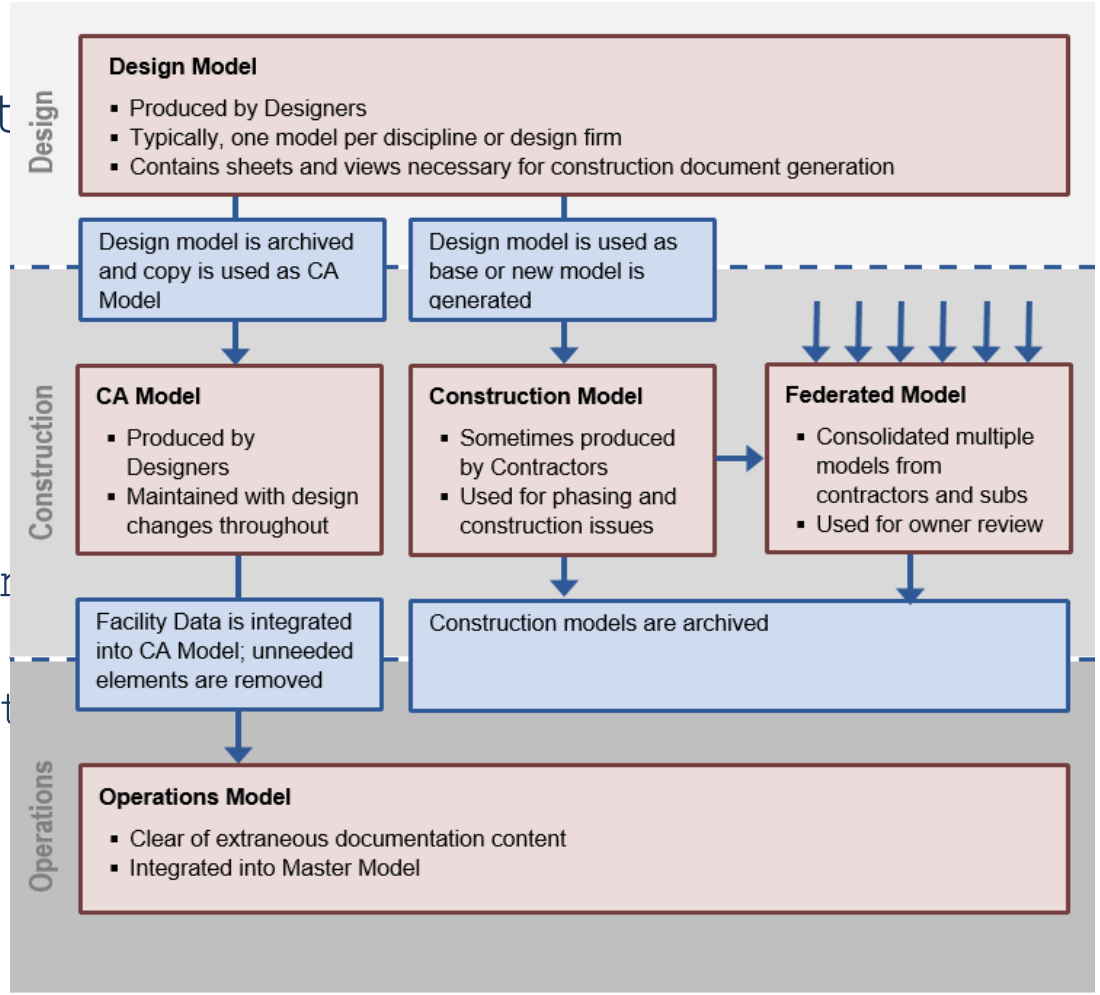
FM data collection: BIM authoring software

- Management of different data t
  - ✓ Great for geometric data
  - ✓ Good for parametric data
  - ✓ Ok for field data
  - ✓ Not good for submittal data
- Other Considerations
  - ✓ Design Models versus Constructior
  - ✓ Final deliverable format (.rvt,
  - ✓ Level of Development for As Built



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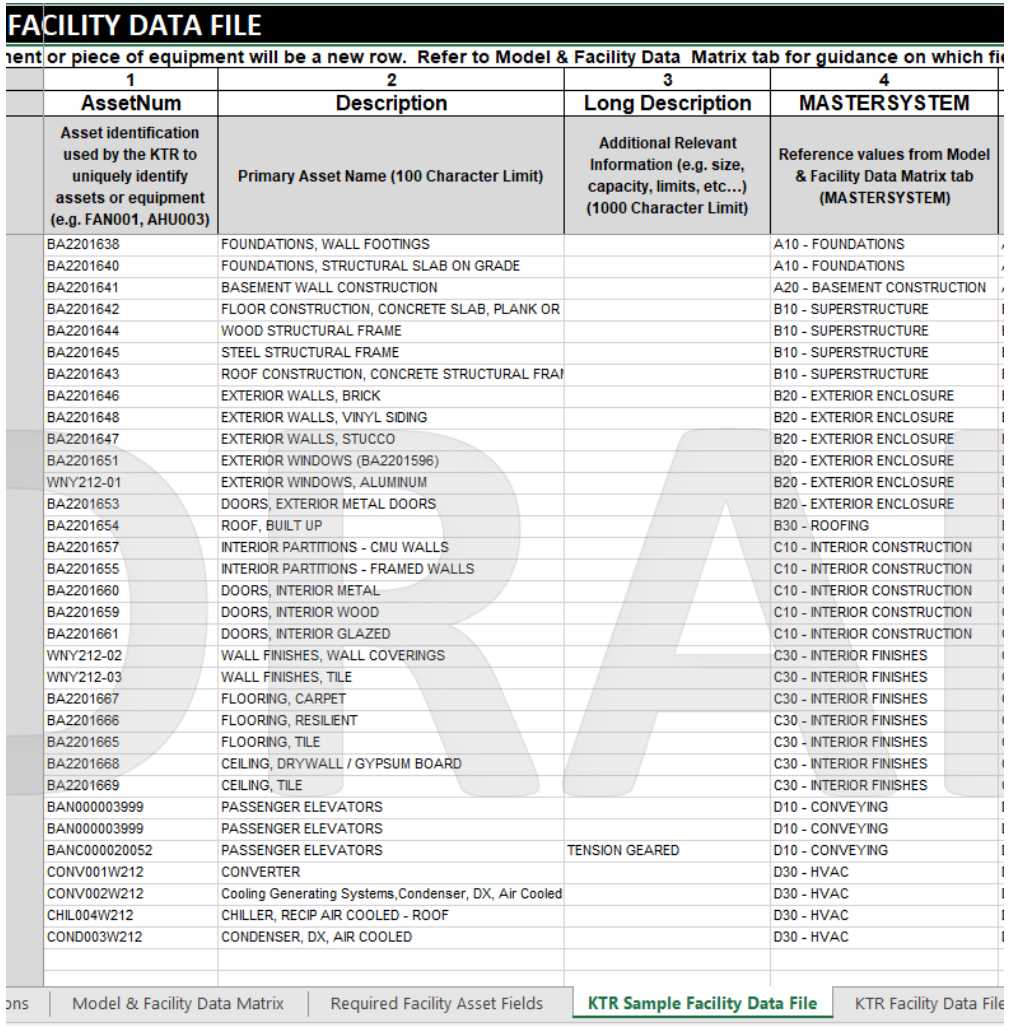
FM data collection: Excel

- Management of different data types
  - ✓ Not good for geometric data
  - ✓ Great for parametric data
  - ✓ Good for Field Data
  - ✓ Ok for submittal data
- Other Considerations
  - ✓ Customization versus standardization
  - ✓ Responsibilities and data integrity
  - ✓ Example: eOMSI workbook from NAVFAC



FACILITY DATA FILE

ient or piece of equipment will be a new row. Refer to Model & Facility Data Matrix tab for guidance on which fi

	1	2	3	4
	AssetNum	Description	Long Description	MASTERSYSTEM
	Asset identification used by the KTR to uniquely identify assets or equipment (e.g. FAN001, AHU003)	Primary Asset Name (100 Character Limit)	Additional Relevant Information (e.g. size, capacity, limits, etc…) (1000 Character Limit)	Reference values from Model & Facility Data Matrix tab (MASTERSYSTEM)
	BA2201638	FOUNDATIONS, WALL FOOTINGS		A10 - FOUNDATIONS
	BA2201640	FOUNDATIONS, STRUCTURAL SLAB ON GRADE		A10 - FOUNDATIONS
	BA2201641	BASEMENT WALL CONSTRUCTION		A20 - BASEMENT CONSTRUCTION
	BA2201642	FLOOR CONSTRUCTION, CONCRETE SLAB, PLANK OR		B10 - SUPERSTRUCTURE
	BA2201644	WOOD STRUCTURAL FRAME		B10 - SUPERSTRUCTURE
	BA2201645	STEEL STRUCTURAL FRAME		B10 - SUPERSTRUCTURE
	BA2201643	ROOF CONSTRUCTION, CONCRETE STRUCTURAL FRAI		B10 - SUPERSTRUCTURE
	BA2201646	EXTERIOR WALLS, BRICK		B20 - EXTERIOR ENCLOSURE
	BA2201648	EXTERIOR WALLS, VINYL SIDING		B20 - EXTERIOR ENCLOSURE
	BA2201647	EXTERIOR WALLS, STUCCO		B20 - EXTERIOR ENCLOSURE
	BA2201651	EXTERIOR WINDOWS (BA2201596)		B20 - EXTERIOR ENCLOSURE
	WNY212-01	EXTERIOR WINDOWS, ALUMINUM		B20 - EXTERIOR ENCLOSURE
	BA2201653	DOORS, EXTERIOR METAL DOORS		B20 - EXTERIOR ENCLOSURE
	BA2201654	ROOF, BUILT UP		B30 - ROOFING
	BA2201657	INTERIOR PARTITIONS - CMU WALLS		C10 - INTERIOR CONSTRUCTION
	BA2201655	INTERIOR PARTITIONS - FRAMED WALLS		C10 - INTERIOR CONSTRUCTION
	BA2201660	DOORS, INTERIOR METAL		C10 - INTERIOR CONSTRUCTION
	BA2201659	DOORS, INTERIOR WOOD		C10 - INTERIOR CONSTRUCTION
	BA2201661	DOORS, INTERIOR GLAZED		C10 - INTERIOR CONSTRUCTION
	WNY212-02	WALL FINISHES, WALL COVERINGS		C30 - INTERIOR FINISHES
	WNY212-03	WALL FINISHES, TILE		C30 - INTERIOR FINISHES
	BA2201667	FLOORING, CARPET		C30 - INTERIOR FINISHES
	BA2201666	FLOORING, RESILIENT		C30 - INTERIOR FINISHES
	BA2201665	FLOORING, TILE		C30 - INTERIOR FINISHES
	BA2201668	CEILING, DRYWALL / GYPSUM BOARD		C30 - INTERIOR FINISHES
	BA2201669	CEILING, TILE		C30 - INTERIOR FINISHES
	BAN000003999	PASSENGER ELEVATORS		D10 - CONVEYING
	BAN000003999	PASSENGER ELEVATORS		D10 - CONVEYING
	BANC000020052	PASSENGER ELEVATORS	TENSION GEARED	D10 - CONVEYING
	CONV001W212	CONVERTER		D30 - HVAC
	CONV002W212	Cooling Generating Systems,Condenser, DX, Air Cooled		D30 - HVAC
	CHIL004W212	CHILLER, RECIP AIR COOLED - ROOF		D30 - HVAC
	COND003W212	CONDENSER, DX, AIR COOLED		D30 - HVAC

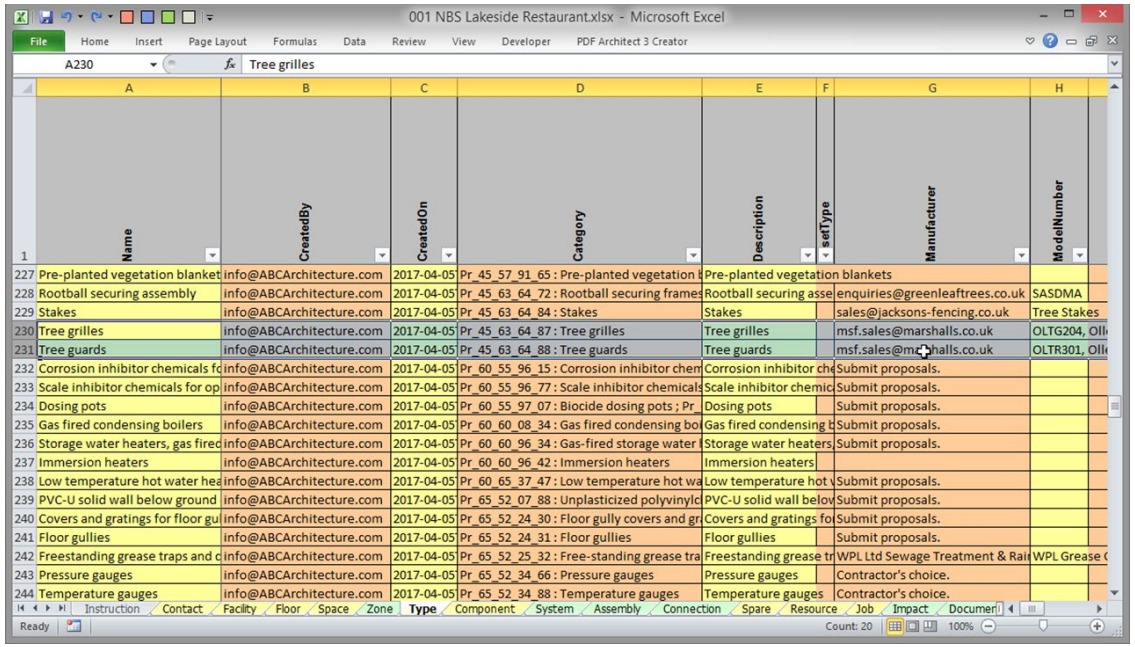
ons | Model & Facility Data Matrix | Required Facility Asset Fields | KTR Sample Facility Data File | KTR Facility Data File

FM data collection: COBie

Construction (to) Operations Building Information Exchange

- Management of different data types
  - ✓ Not good for geometric data
  - ✓ Great for parametric data
  - ✓ Good for Field Data
  - ✓ Ok for submittal data

- Other Considerations
  - ✓ COBie becoming the norm for data exchange at construction completion
  - ✓ COBie format is strict and not specific to any one BIM application
  - ✓ Many O&M solutions directly import COBie data
  - ✓ Industry standard so not much



	Name	CreatedBy	CreatedOn	Category	Description	setType	Manufacturer	ModelNumber
227	Pre-planted vegetation blanket	info@ABCArchitecture.com	2017-04-05	Pr_45_57_91_65 : Pre-planted vegetation b	Pre-planted vegetation blankets			
228	Rootball securing assembly	info@ABCArchitecture.com	2017-04-05	Pr_45_63_64_72 : Rootball securing frames	Rootball securing asse		enquiries@greenleaftrees.co.uk	SASDMA
229	Stakes	info@ABCArchitecture.com	2017-04-05	Pr_45_63_64_84 : Stakes	Stakes		sales@jacksons-fencing.co.uk	Tree Stakes
230	Tree grilles	info@ABCArchitecture.com	2017-04-05	Pr_45_63_64_87 : Tree grilles	Tree grilles		msf.sales@marshalls.co.uk	OLTG204, Oll
231	Tree guards	info@ABCArchitecture.com	2017-04-05	Pr_45_63_64_88 : Tree guards	Tree guards		msf.sales@marshalls.co.uk	OLTR301, Oll
232	Corrosion inhibitor chemicals fo	info@ABCArchitecture.com	2017-04-05	Pr_60_55_96_15 : Corrosion inhibitor chem	Corrosion inhibitor che		Submit proposals.	
233	Scale inhibitor chemicals for op	info@ABCArchitecture.com	2017-04-05	Pr_60_55_96_77 : Scale inhibitor chemicals	Scale inhibitor chemic		Submit proposals.	
234	Dosing pots	info@ABCArchitecture.com	2017-04-05	Pr_60_55_97_07 : Biocide dosing pots ; Pr_	Dosing pots		Submit proposals.	
235	Gas fired condensing boilers	info@ABCArchitecture.com	2017-04-05	Pr_60_60_08_34 : Gas fired condensing boi	Gas fired condensing b		Submit proposals.	
236	Storage water heaters, gas fired	info@ABCArchitecture.com	2017-04-05	Pr_60_60_96_34 : Gas-fired storage water h	Storage water heaters,		Submit proposals.	
237	Immersion heaters	info@ABCArchitecture.com	2017-04-05	Pr_60_60_96_42 : Immersion heaters	Immersion heaters			
238	Low temperature hot water hea	info@ABCArchitecture.com	2017-04-05	Pr_60_65_37_47 : Low temperature hot wa	Low temperature hot v		Submit proposals.	
239	PVC-U solid wall below ground	info@ABCArchitecture.com	2017-04-05	Pr_65_52_07_88 : Unplasticized polyvinylc	PVC-U solid wall below		Submit proposals.	
240	Covers and gratings for floor gu	info@ABCArchitecture.com	2017-04-05	Pr_65_52_24_30 : Floor gully covers and gr	Covers and gratings for		Submit proposals.	
241	Floor gullies	info@ABCArchitecture.com	2017-04-05	Pr_65_52_24_31 : Floor gullies	Floor gullies		Submit proposals.	
242	Freestanding grease traps and c	info@ABCArchitecture.com	2017-04-05	Pr_65_52_25_32 : Free-standing grease tra	Freestanding grease tr		WPL Ltd Sewage Treatment & Rai	WPL Grease
243	Pressure gauges	info@ABCArchitecture.com	2017-04-05	Pr_65_52_34_66 : Pressure gauges	Pressure gauges		Contractor's choice.	
244	Temperature gauges	info@ABCArchitecture.com	2017-04-05	Pr_65_52_34_88 : Temperature gauges	Temperature gauges		Contractor's choice.	

FREE TOOL Autodesk COBie Extension for Revit

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FM data collection: FM Cloud Software

- Management of different data types
  - ✓ Ok for geometric data
  - ✓ Good for parametric data
  - ✓ Great for Field Data
  - ✓ Ok for submittal data
- Other Considerations
  - ✓ Software cost
  - ✓ Software interoperability
  - ✓ Data encryption
  - ✓ Overlapping functionality with other project management software (like punch lists, markups etc.)

ecodomus

KTrack

AUTODESK® BIM 360™

ONUMA SYSTEM

dRofus
A NEMETSCHEK COMPANY

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FM data collection: comparison

	Geometric Data	Parametric Data	Field Data	Submittal Data
BIM Authoring Software	★★★	★★	★	X
Excel	X	★★★	★★	★
COBie	X	★★★	★★	★
FM Cloud Software	★	★★	★★★	★

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Challenges

- Clarity of deliverable – What is really desir useful?
- Timing of definition of deliverable
- Authoring ability of software and cross platf… capabilities
- Owner, Designer, General Contractor, Subcontractor understanding
- Data population and integrity process
- As-builts, field conditions, and change order incorporations

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Recommendations

- Clearly define deliverables early
- Clearly define assets and attributes early
- Different deliverable types have different leve of effort
- Delivery type will dictate a workflow
- Defining how a deliverable will be used in the end should be discussed in the beginning
- Think about how a deliverable will be used by end users
- Understand how to control the quality of the

Thank You!

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