Advanced Design & Construction Management Techniques- Building Information Modeling

جلسه نهم- اردیبهشت ماه 1398- مدیریت پروژه

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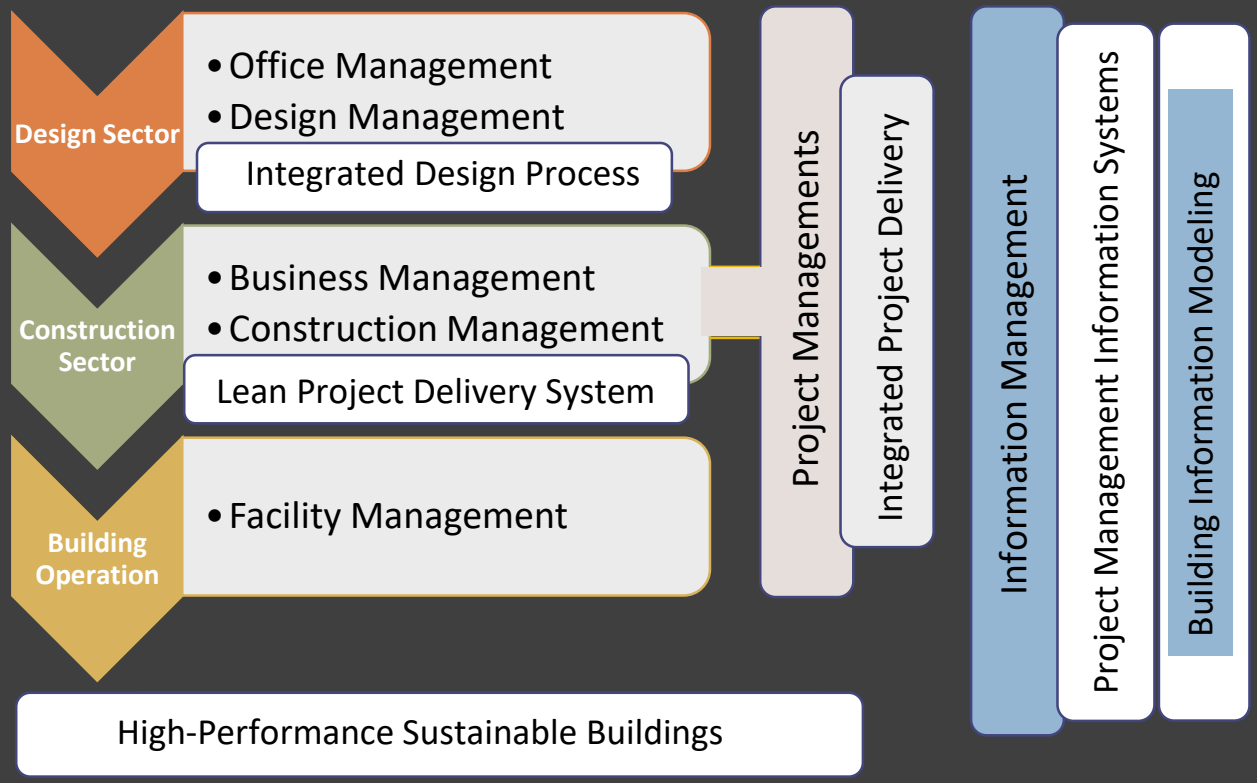
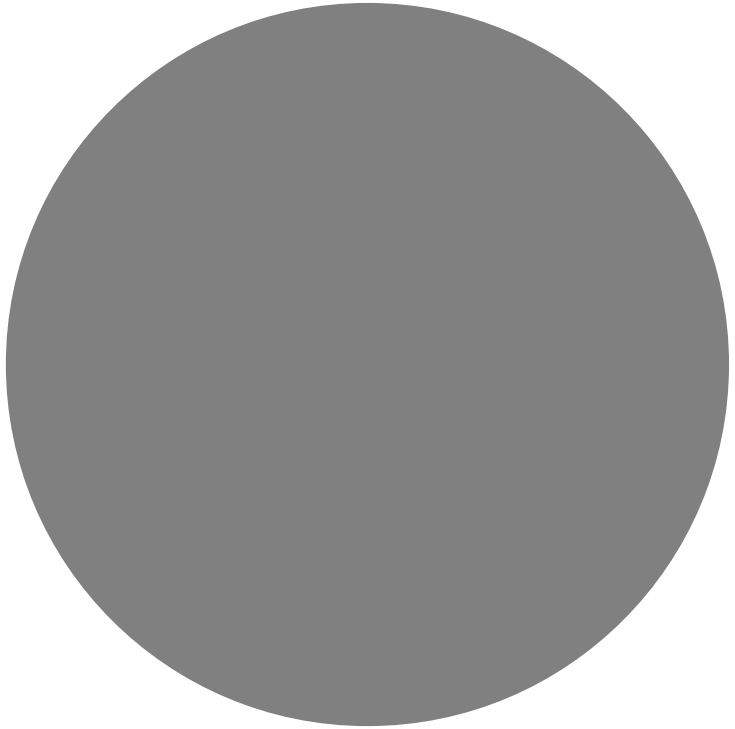
Introduction

- **BIM Challenges**
- **BIM Execution Planning**



- Collaboration & teaming
- Legal challenges to documentation ownership & production
- Changes in practice & use of information
- Implementation issues



Challenges

Collaboration & Teaming

- Permitting adequate sharing of model information
- Interoperability issues

=>Preparing a thorough BIM Execution Planning:

  - Specifying the level of detail needed for sharing information at each stage
  - Mechanism for model sharing (file based/model server)

- Security issue

=>Information security management (securing the servers, …)

Legal Challenges to Documentation Ownership & Production

- Who owns the multiple design, analysis, fabrication & construction datasets?
- Who pays for them?
- Who is responsible for their accuracy?

=> Can be addressed in contracts

Challenges in practice & use of information

- Integration of construction knowledge earlier in the design process.
- Intensive use of a shared building model during design phases;
- intensive use of a coordinated set of building models during construction and fabrication.

Implementation Issues

- Acquiring software
- Training
- Upgrading hardware
- Fundamental Change in business processes

⇒Plan for implementation before conversion can begin.

What does BIM Execution Planning do?

Reducing the unknowns

1. All parties will clearly understand the strategic goals for implementing BIM on the project
2. Organizations will understand their roles and responsibilities in the implementation
3. The team will be able to design an execution process which is well suited for each team member's business practices and typical organizational workflows
4. The plan will outline additional resources, training, or other competencies necessary to successfully implement BIM for the intended uses
5. The plan will provide a benchmark for describing the process to future participants who join the project
6. To define contract language to ensure that all project participants fulfill their obligations
7. The baseline plan will provide a goal for measuring progress throughout the project.

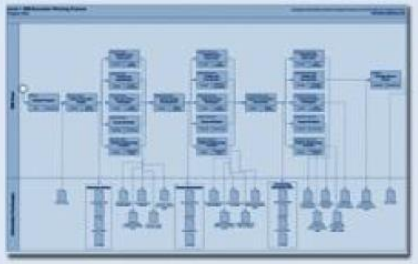
BIM Project Execution Planning Procedure

Identify BIM Goals and Uses

Define project and team value through the identification of BIM Goals and Uses.

Design BIM Project Execution Process

Develop a process which includes tasks supported by BIM along with information exchanges.



Develop Information Exchanges

Develop the information content, level of detail and responsible party for each exchange.

Define Supporting Infrastructure for BIM Implementation

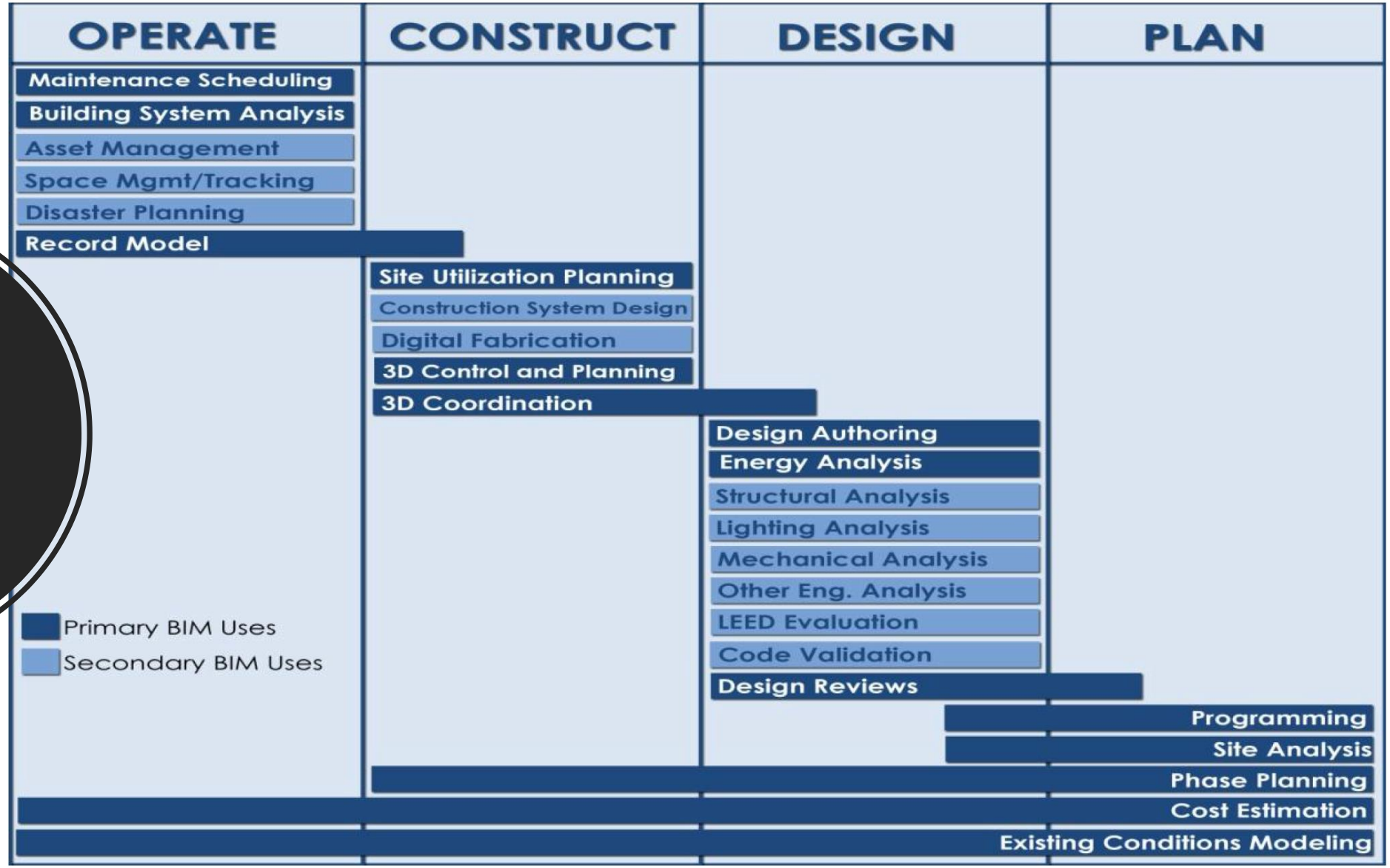
Define the project infrastructure required to support the developed BIM process.

- Delivery Strategy / Contract
- Communication Procedures
- Technology Infrastructure Needs
- Model Quality Control Procedure

Identifying BIM Goals & Uses

Priority (1-3)	Goal Description	Potential BIM Uses
1 - Most Important	**Value added objectives**	
2	Increase Field Productivity	Design Reviews, 3D Coordination
3	Increase effectiveness of Design	Design Authoring, Design Reviews, 3D Coordination
1	Accurate 3D Record Model for FM Team	Record Model, 3D Coordination
1	Increase effectiveness of Sustainable Goals	Engineering Analysis, LEED Evaluation
2	Track progress during construction	4D Modeling
3	Identify concerns accosiated with phasing on campus	4D Modeling
1	Review Design progress	Design Reviews
1	Quickly Asses cost associated with design changes	Cost Estimation
2	Eliminate field conflicts	3D Coordination

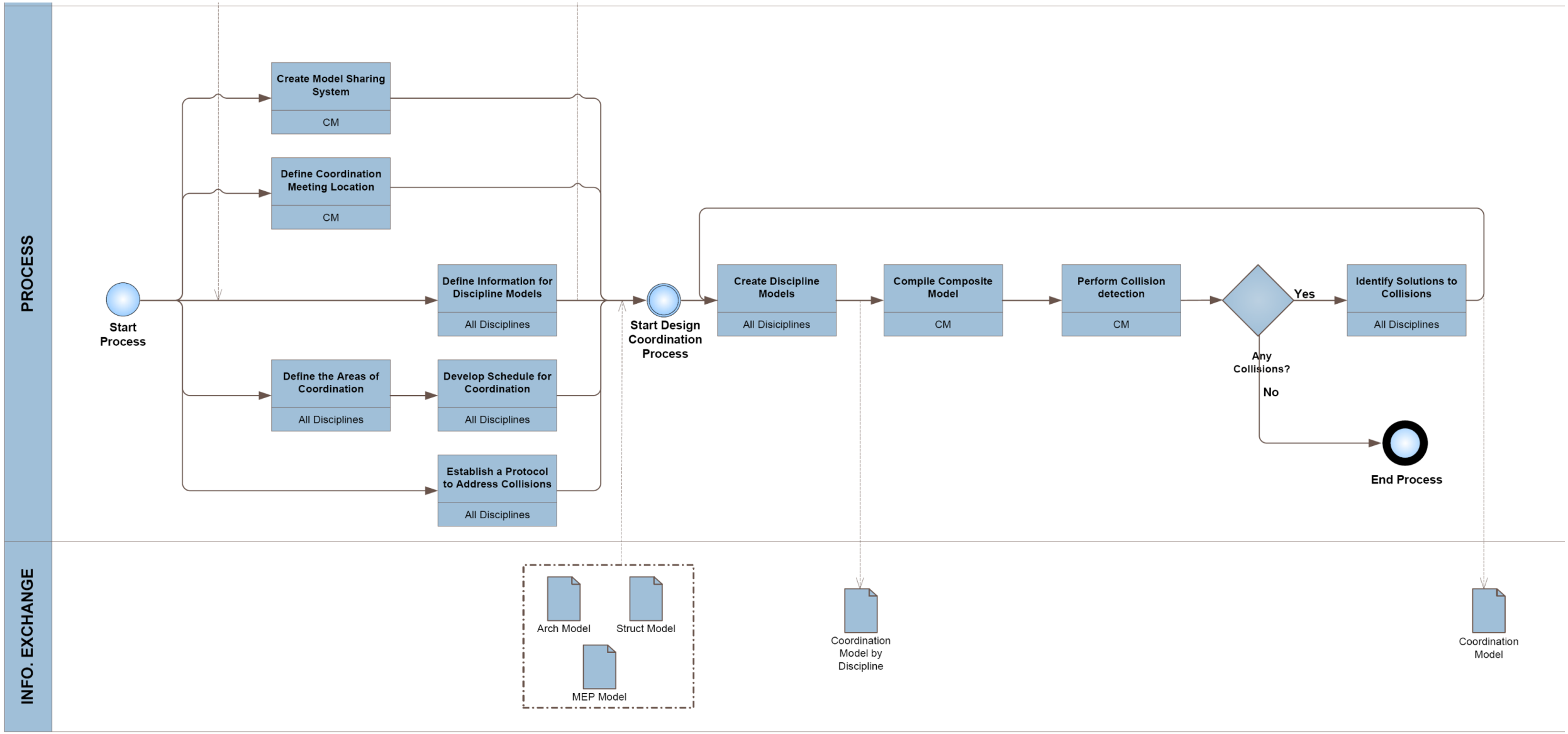
BIM Uses

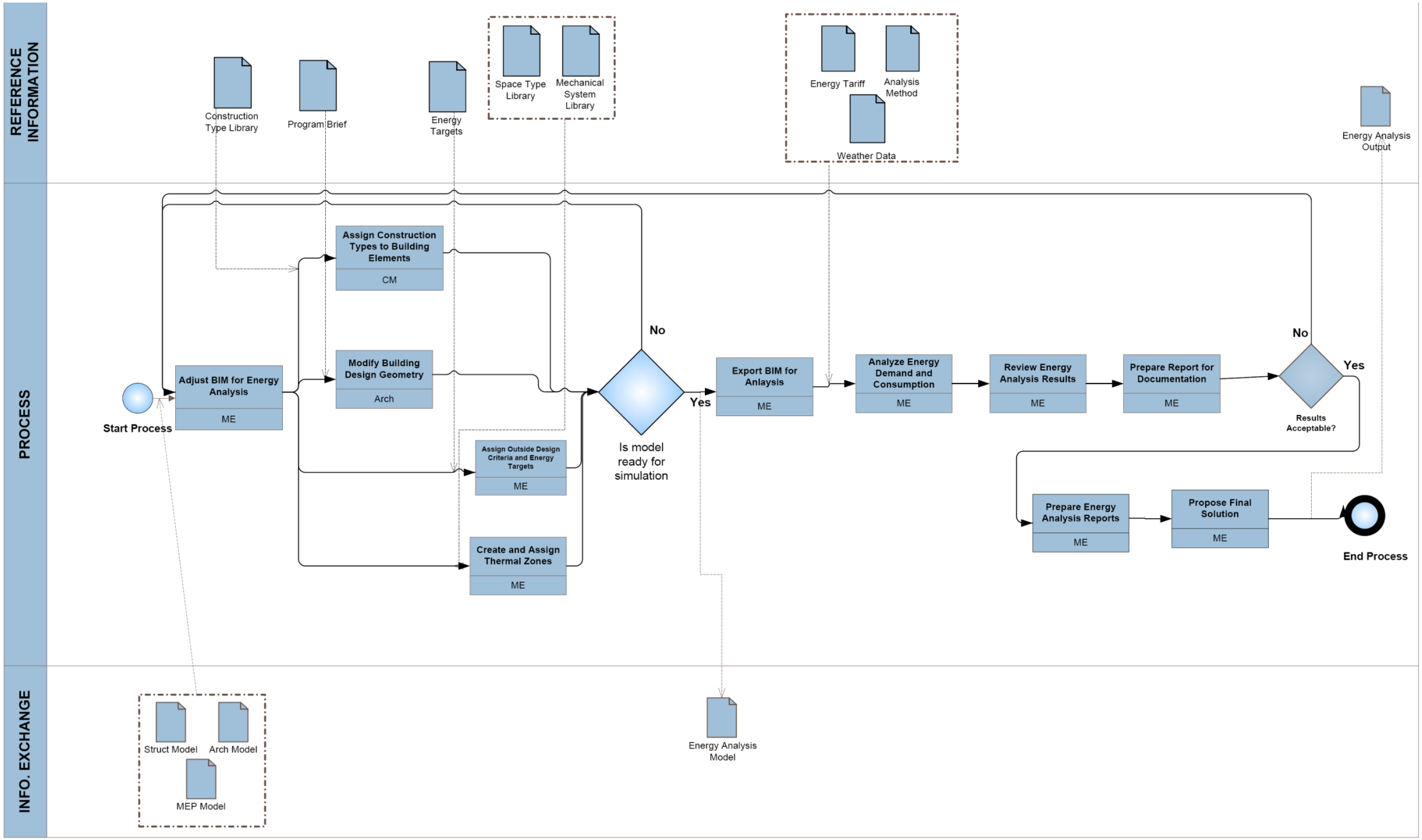

OPERATE
CONSTRUCT
DESIGN
PLAN
Maintenance Scheduling
Building System Analysis
Asset Management
Space Mgmt/Tracking
Disaster Planning
Record Model
Site Utilization Planning
Construction System Design
Digital Fabrication
3D Control and Planning
3D Coordination
Design Authoring
Energy Analysis
Structural Analysis
Lighting Analysis
Mechanical Analysis
Other Eng. Analysis
LEED Evaluation
Code Validation
Design Reviews
Programming
Site Analysis
Phase Planning
Cost Estimation
Existing Conditions Modeling
Primary BIM Uses
Secondary BIM Uses

BIM Use Selection Procedure

BIM Use*	Value to Project	Responsible Party	Value to Resp Party	Capability Rating			Additional Resources / Competencies Required to Implement	Notes	Proceed with Use
	High / Med / Low		High / Med / Low	Scale 1-3 (1 = Low)					YES / NO / MAYBE
				Resources	Competency	Experience			
Record Modeling	HIGH	Contractor	MED	2	2	2	Requires training and software		**YES**
		Facility Manager	HIGH	1	2	1	Requires training and software		
		Designer	MED	3	3	3			
Cost Estimation	MED	Contractor	HIGH	2	1	1			**NO**
4D Modeling	HIGH	Contractor	HIGH	3	2	2	Need training on latest software	High value to owner due to	**YES**
							Infrastructure needs	phasing complications	
								Use for Phasing & Construction	
3D Coordination (Construction)	HIGH	Contractor	HIGH	3	3	3			**YES**
		Subcontractors	HIGH	1	3	3	conversion to Digital Fab required	Modeling learning curve possible	
		Designer	MED	2	3	3			
Engineering Analysis	HIGH	MEP Engineer	HIGH	2	2	2			**MAYBE**
		Architect	MED	2	2	2			
Design Reviews	MED	Arch	LOW	1	2	1		Reviews to be from design model	**NO**
								no additioanl detail required	
3D Coordination (Design)	HIGH	Architect	HIGH	2	2	2	Coordination software required	Contractor to facilitate Coord.	**YES**
		MEP Engineer	MED	2	2	1			
		Structural Engine	HIGH	2	2	1			

Developing Information Exchange Roadmap




REFERENCE INFORMATION
PROCESS
INFO. EXCHANGE
Construction Type Library
Program Brief
Energy Targets
Space Type Library
Mechanical System Library
Energy Tariff
Analysis Method
Weather Data
Energy Analysis Output
Start Process
Adjust BIM for Energy Analysis
ME
Assign Construction Types to Building Elements
CM
Modify Building Design Geometry
Arch
Assign Outside Design Criteria and Energy Targets
ME
Create and Assign Thermal Zones
ME
No
Yes
Is model ready for simulation
Export BIM for Anlaysis
ME
Analyze Energy Demand and Consumption
ME
Review Energy Analysis Results
ME
Prepare Report for Documentation
ME
No
Yes
Results Acceptable?
Prepare Energy Analysis Reports
ME
Propose Final Solution
ME
End Process
Struct Model
Arch Model
MEP Model
Energy Analysis Model

The Detailed Information Exchange Worksheet

Information	
A	Accurate Size & Location, include materials and object parameters
B	General Size & Location, include parameter data
C	Schematic Size & Location

Responsible Party	
A	Architect
C	Contractor
CV	Civil Engineer
FM	Facility Manager
MEP	MEP Engineer
SE	Structural Engineer
TC	Trade Contractors

Information Exchange Title		Record Modeling			4D Modeling			3D Coordination			Design Authoring		
Time of Exchange (SD, DD, CD, Construction)		Construction			CD			CD			CD		
Model Reciever		FM			C			C, TC			ALL		
Reciever File Format													
Application & Version													
Model Element Breakdown		Info	Resp Party	Additional Information	Info	Resp Party	Notes	Info	Resp Party	Notes	Info	Resp Party	Notes
A	SUBSTRUCTURE												
	Foundations												
	Standard Foundations												
	Special Foundations												
	Slab on Grade												
	Basement Construction												
	Basement Excavation												
	Basement Walls												
B	SHELL												
	Superstructure												
	Floor Construction												
	Roof Construction												
	Exterior Enclosure												
	Exterior Walls												
	Exterior Windows												
	Exterior Doors												
	Roofing												
	Roof Coverings												
	Roof Openings												
C	INTERIORS												
	Interior Construction												
	Partitions												
	Interior Doors												
	Fittings												
	Stairs												
	Stair Construction												

Define Supporting Infrastructure for BIM Implementation

Including:

- The definition of the delivery structure and contract language;
- Defining the communication procedures;
- Defining the technology infrastructure;
- Identifying quality control procedures.

Questions to Consider for writing the Reflections:

EXPLORE THE DOCUMENTS PROVIDED REGARDING BIM EXECUTION PLANNING. WHAT ASPECTS OF THE DOCUMENT INTERESTS YOU THE MOST?

CHOOSE ONE OF THE CHALLENGES OF BIM IMPLEMENTATION AND EXPLAIN HOW ORGANIZATIONS MAY OVERCOME THIS CHALLENGE?

Preparation Reading for Next Class:

Subject:

Eco charrettes- The Goal Setting workshop