AUTODESK. UNIVERSITY

Digital Project Management:
Lean Integrated Project Delivery Process

Ravi Wood

BIM Manager Gresham Smith I@RavClarenceWood

Rina Sahay

Architectural BIM Manager Fishbeck| @rinasahay

About the speaker

Ravi Wood

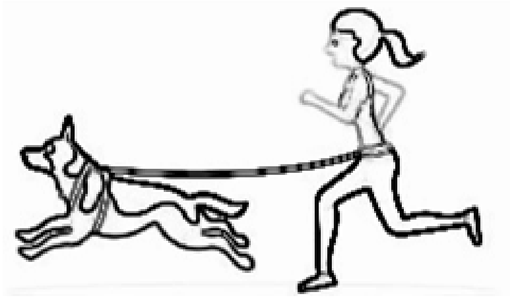
- Collaborator and Innovator.
- BIM Manager, Gresham Smith
- Top Rated class for BIM Management: AU 2019.
- Speaker at RICS IFMA Sweden 2016.
- Top Rated Speaker at Hong Kong BIM HKIBIM 2016.
- Speaker at AEC Next, NY Design Expo.

I guess i am a Geek...

VOLUNTEER AND GIVE BACK TO SOCIETY

- HABITAT FOR HUMANITY
- KNIGHTS OF COLUMBUS
- CHURCH
- UNITED WAY
- NIH
- ST JUDE CHILDREN'S

K-STATE



About the speaker

Rina Sahay

- Architectural BIM Manager, Fishbeck
- Autodesk Expert Elite, Revit Certified Professional, Revit Subject Matter Expert.
- Mentor - Autodesk Revit Forum and Directly.com
- AKA The Destructor and The Ice Queen

fishbeck
Engineers | Architects | Scientists | Constructors

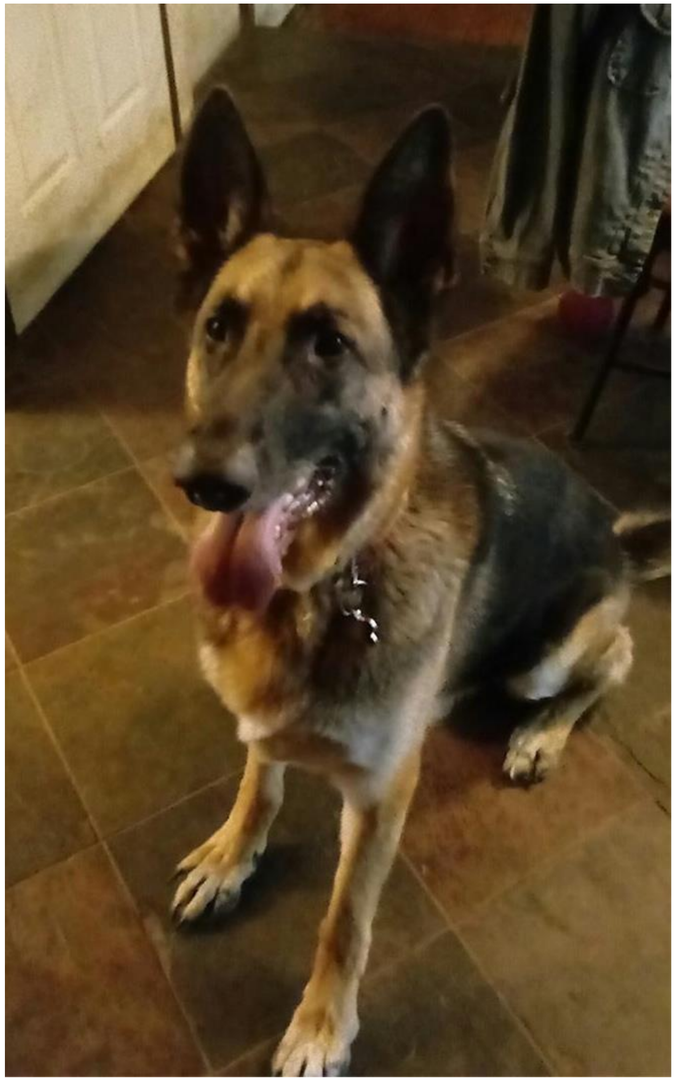
I am also known as

Grandma

Mom

They gave us The Bark Of Approval!!

JUGNU the “Firefly”



ROSCOE

ALTERNATIVES TO HANDSHAKES, HUGS, HIGH FIVES AND HONGI

THE WAVE

THE HAND ON HEART

NAMASTE

NZSL: HOW ARE YOU?

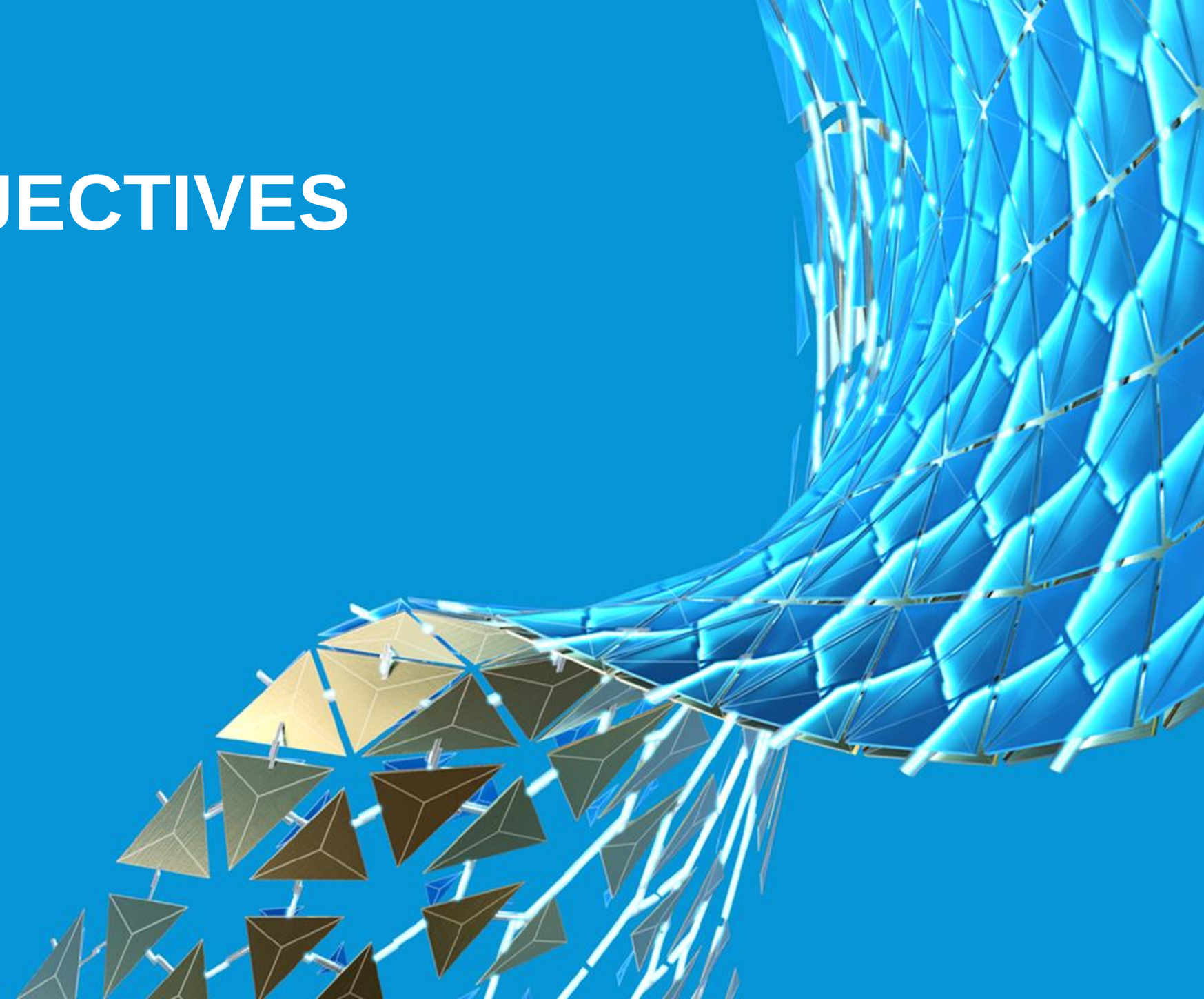
THE 'HI-BROWS'

THE 'ALL GOOD' NOD

THE 'EAST COAST WAVE'

THE 'WHAT A WORLD EH?'

CLASS OBJECTIVES



DIGITAL PROJECT MANAGEMENT 4 PHASES

INITIATE

Development of Digital Execution Plan based on AIA & UK Level 2.

PLAN

Strategic planning during design development or concept design phase.

EXECUTE

Implementation of BEP during CD and CA phase of project.

CLOSE

Guidelines for LOD 500 Level BIM data at project handover.

LEAN INTEGRATED PROJECT DELIVERY

STAY TUNED!

We will then relate these objectives to two real life Case Studies from our experience

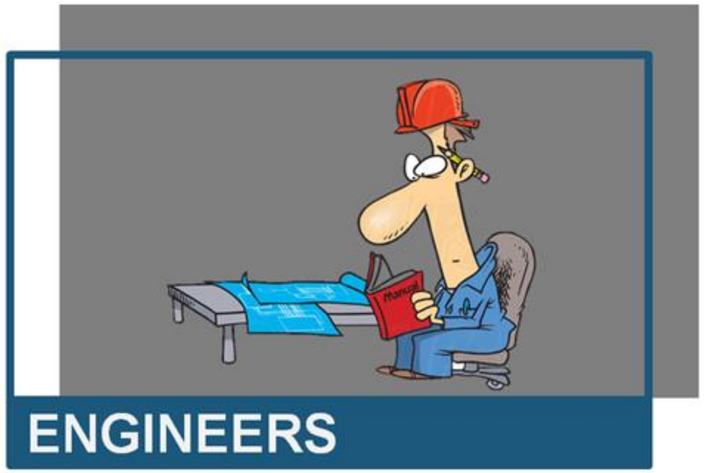
PROJECT “ROSCOE THE GERMAN SHEPHERD”

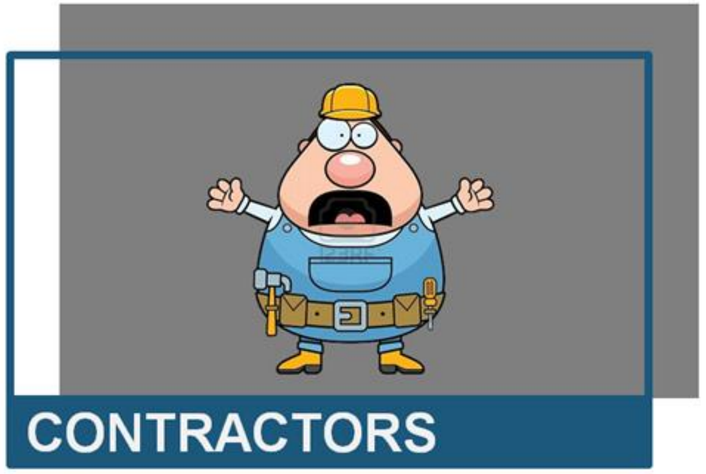
PROJECT “JUGNU THE FIREFLY”

Objective 1: Initiate

Development of Digital Execution Plan based on AIA & UK Level 2

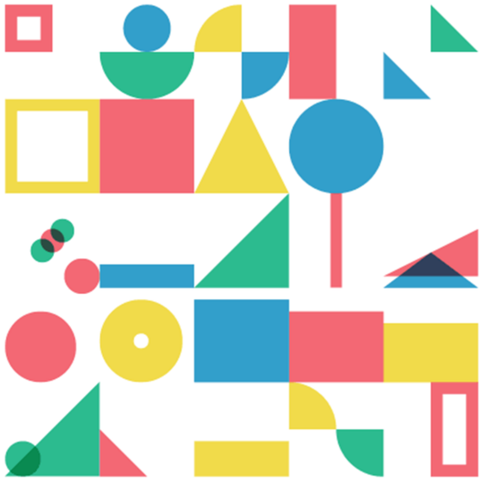

WHO





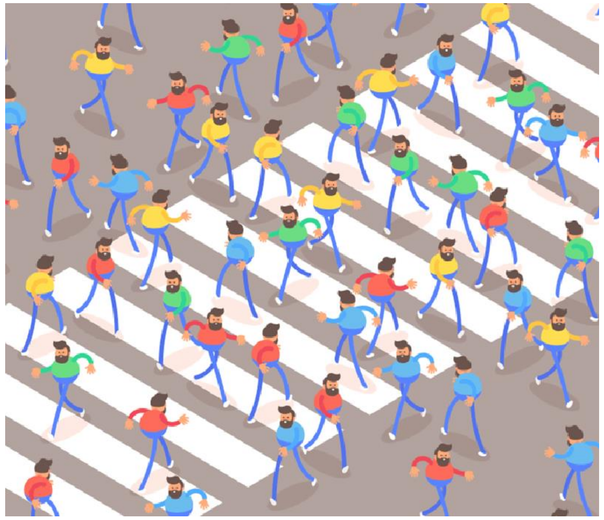
PROJECT STAKEHOLDERS


WHY



DISORGANIZED

CONFUSED

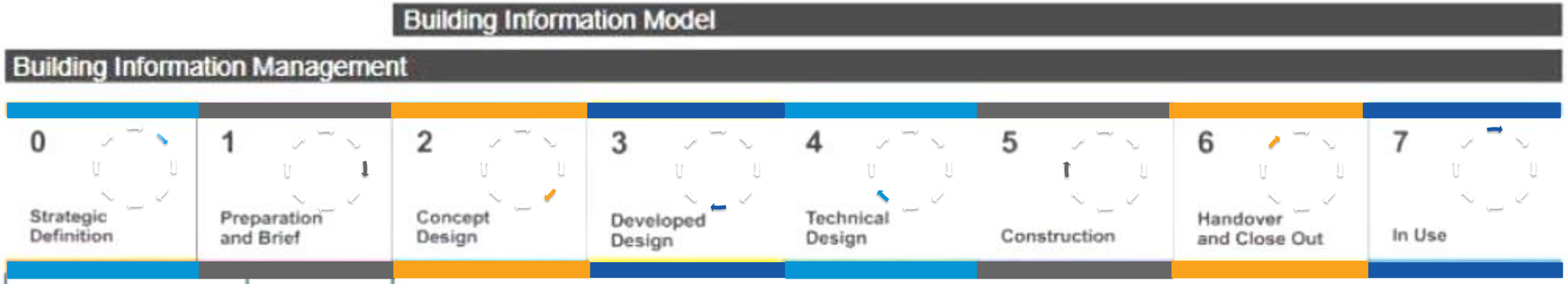


CHAOTIC

A BIM EXECUTION PLAN SAVES THE DAY!


WHEN

START THE BEP WITH THE END RESULT IN MIND



CLIENT'S REQUIREMENTS

EMPLOYER'S INFORMATION REQUESTS

BIM EXECUTION PLAN (BEP)

START THE BEP WITH THE END RESULT IN MIND

THE PATHWAY TOWARDS THE END RESULT

P

R

O

S

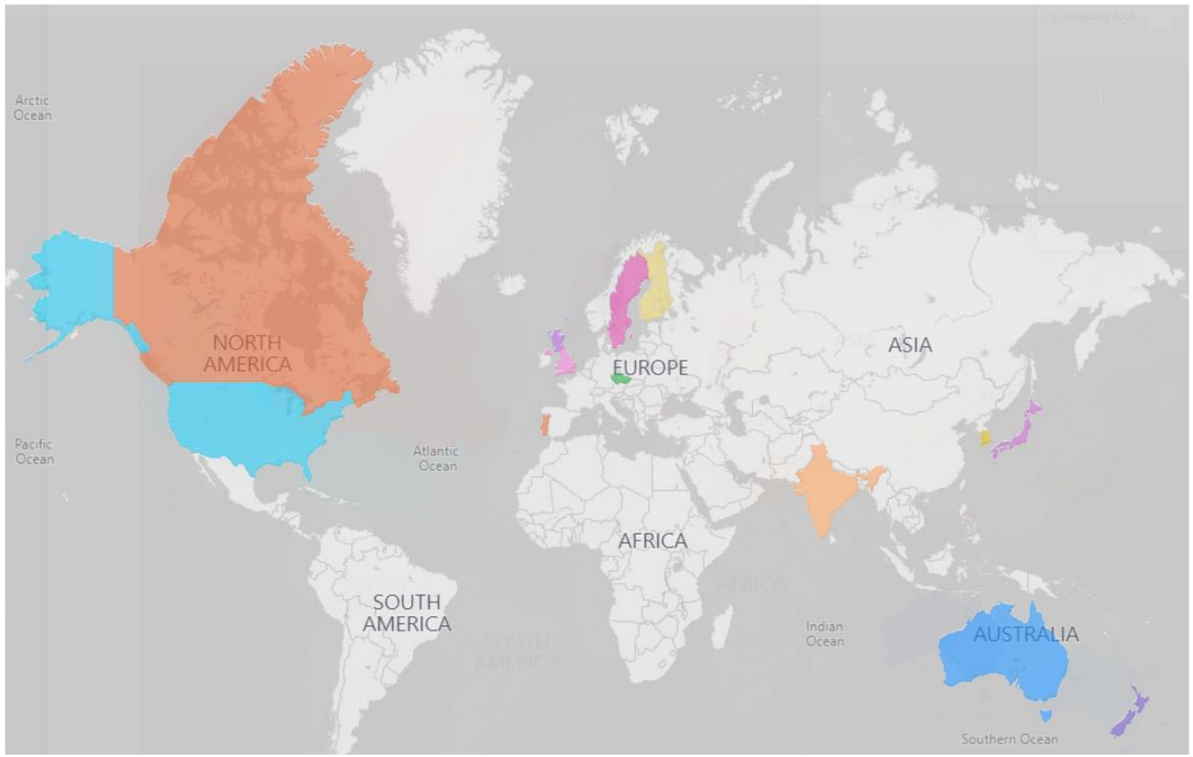
P

E

R

SOURCE: https://econsultancy.com/how-to-plan-your-digital-strategy-with-the-prosper-framework/

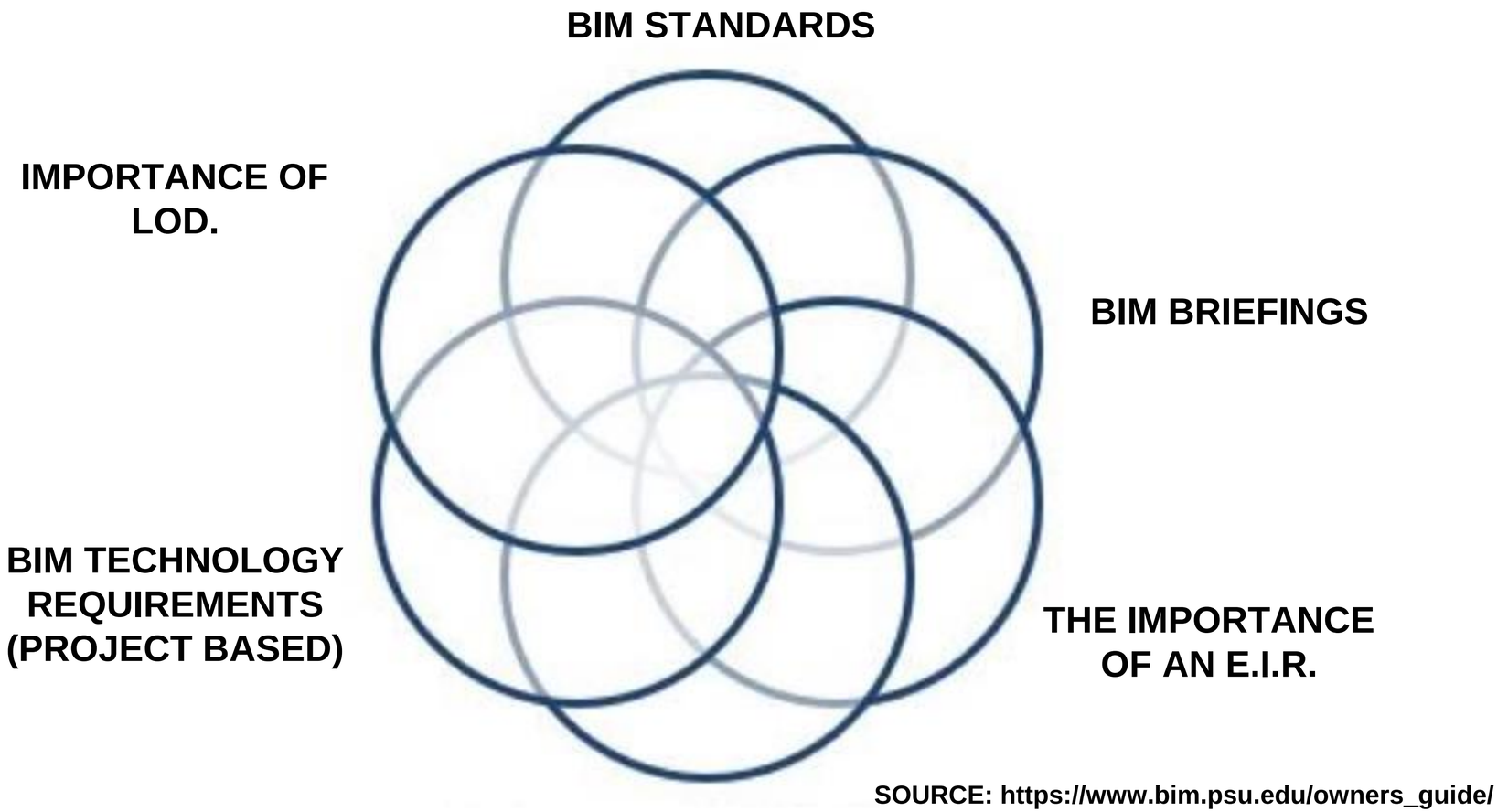

WHERE



1	Canada	https://www.canbim.com/
2	USA	https://www.gsa.gov/real-estate/design-construction/3d4d-building-information-modeling/bim-guides
3	Scotland	https://bimportal.scottishfuturestrust.org.uk/
4	UK	https://www.thenbs.com/knowledge/what-is-building-information-modelling-bim
5	Portugal	http://www.ptbim.org/
6	Czech Republic	https://www.czbim.org/
7	Sweden	https://www.bimalliance.se/om-oss/in-english/
8	Finland	https://buildingsmart.fi/en/tag/bim-en/
9	Korea	https://www.building-smart.or.jp/old/download/files/20121018_Open%20BIM%20in%20Korea.pdf
10	Japan	https://www.jsce-int.org/node/398
11	India	https://www.ibima.co.in/
12	Hong Kong	https://www.hkibim.org/
13	Australia	https://bim.natspec.org/
14	New Zealand	https://www.building.govt.nz/projects-and-consents/planning-a-successful-build/scope-and-design/bim-in-nz/
15	Singapore	https://www.corenet.gov.sg/general/bim-guides/singapore-bim-guide-version-20.aspx

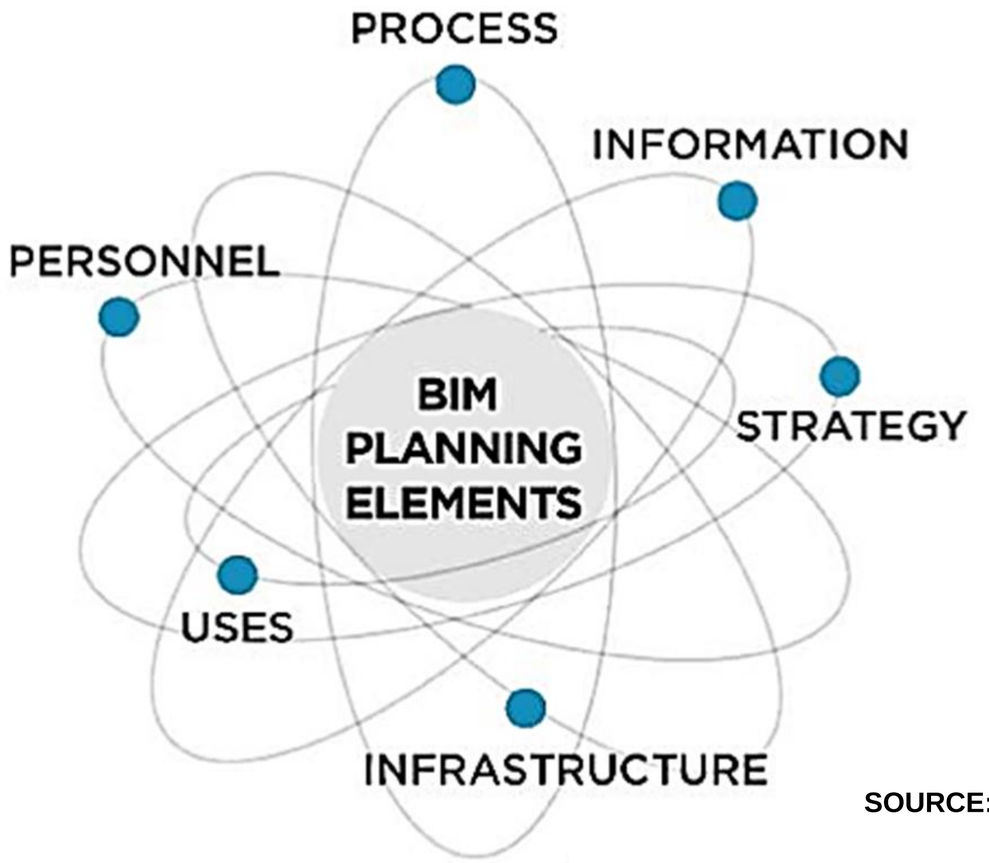
BEP RESOURCES BY COUNTRY


WHAT



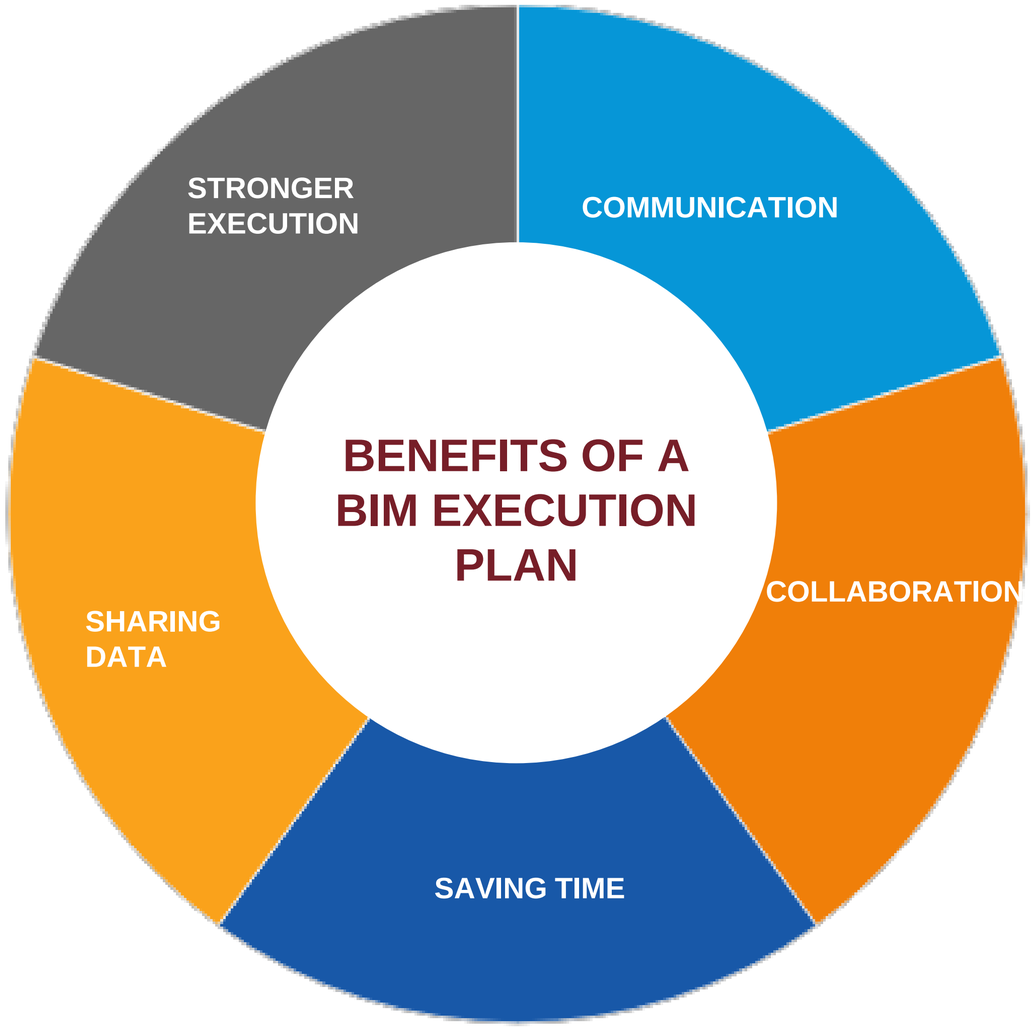
SOURCE: https://www.bim.psu.edu/owners_guide/

RELEVANCE OF DIGITAL EXECUTION PLAN



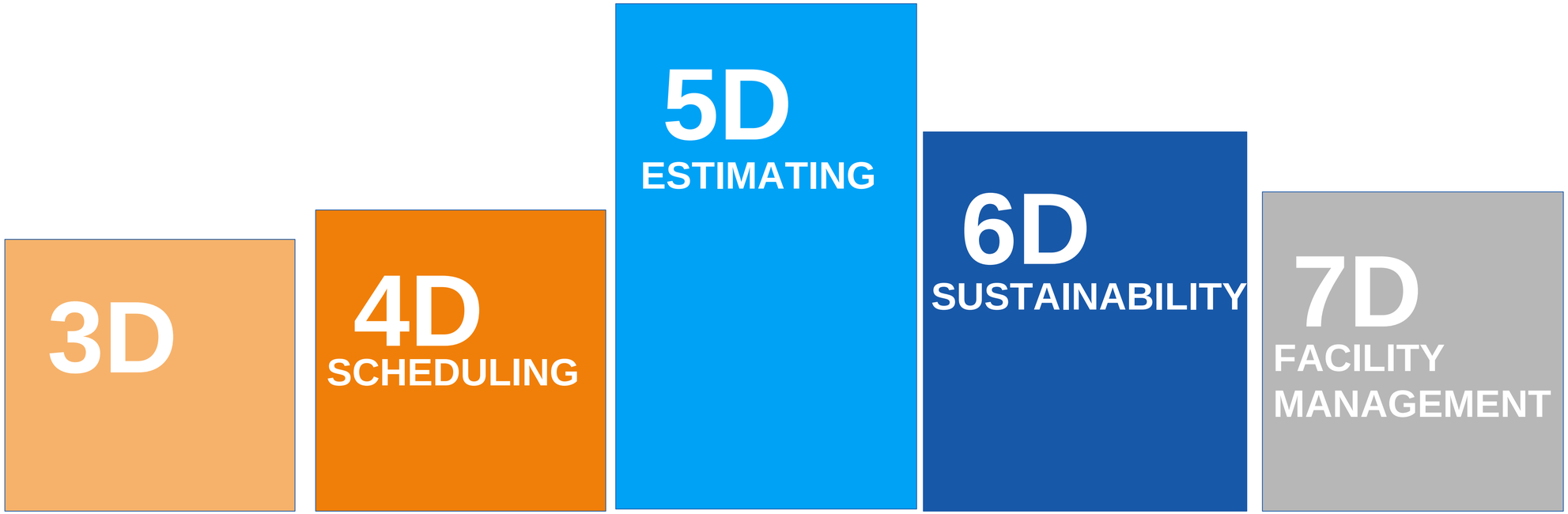
SOURCE: https://www.bim.psu.edu/owners_guide/

COMPONENTS OF BIM EXECUTION PLAN



BENEFITS OF BIM EXECUTION PLAN

Source: https://lupiter.co.in/contact-us

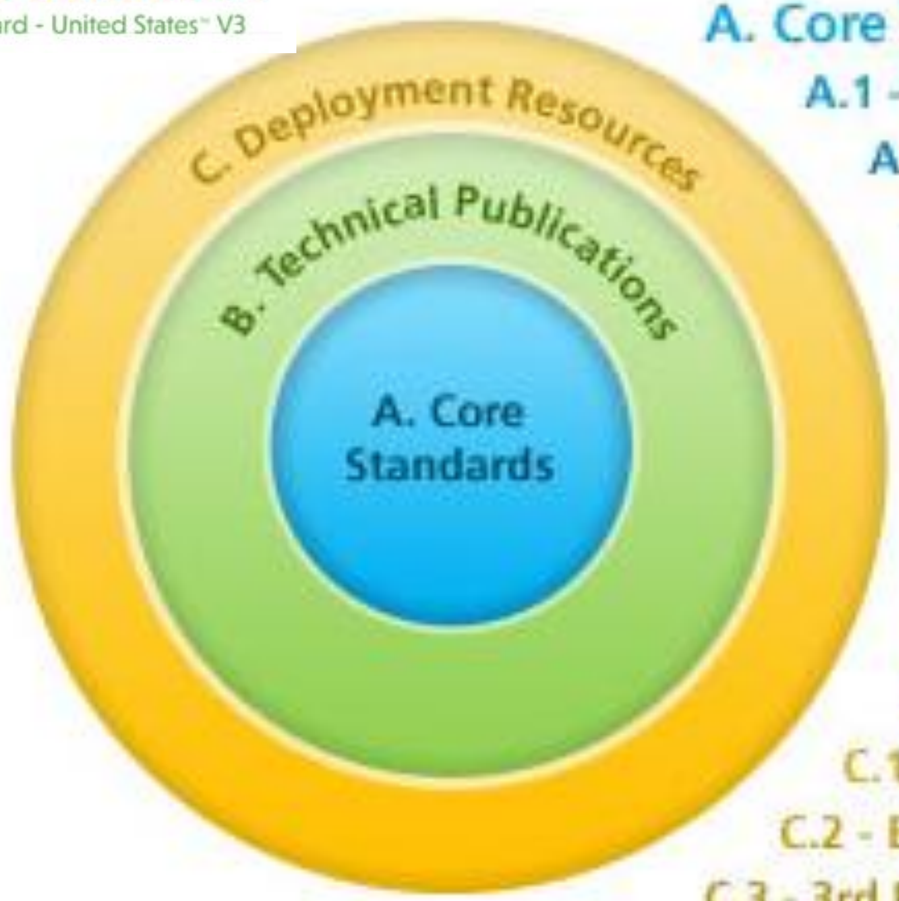


7 DIMENSIONS OF BIM EXECUTION PLAN


HOW

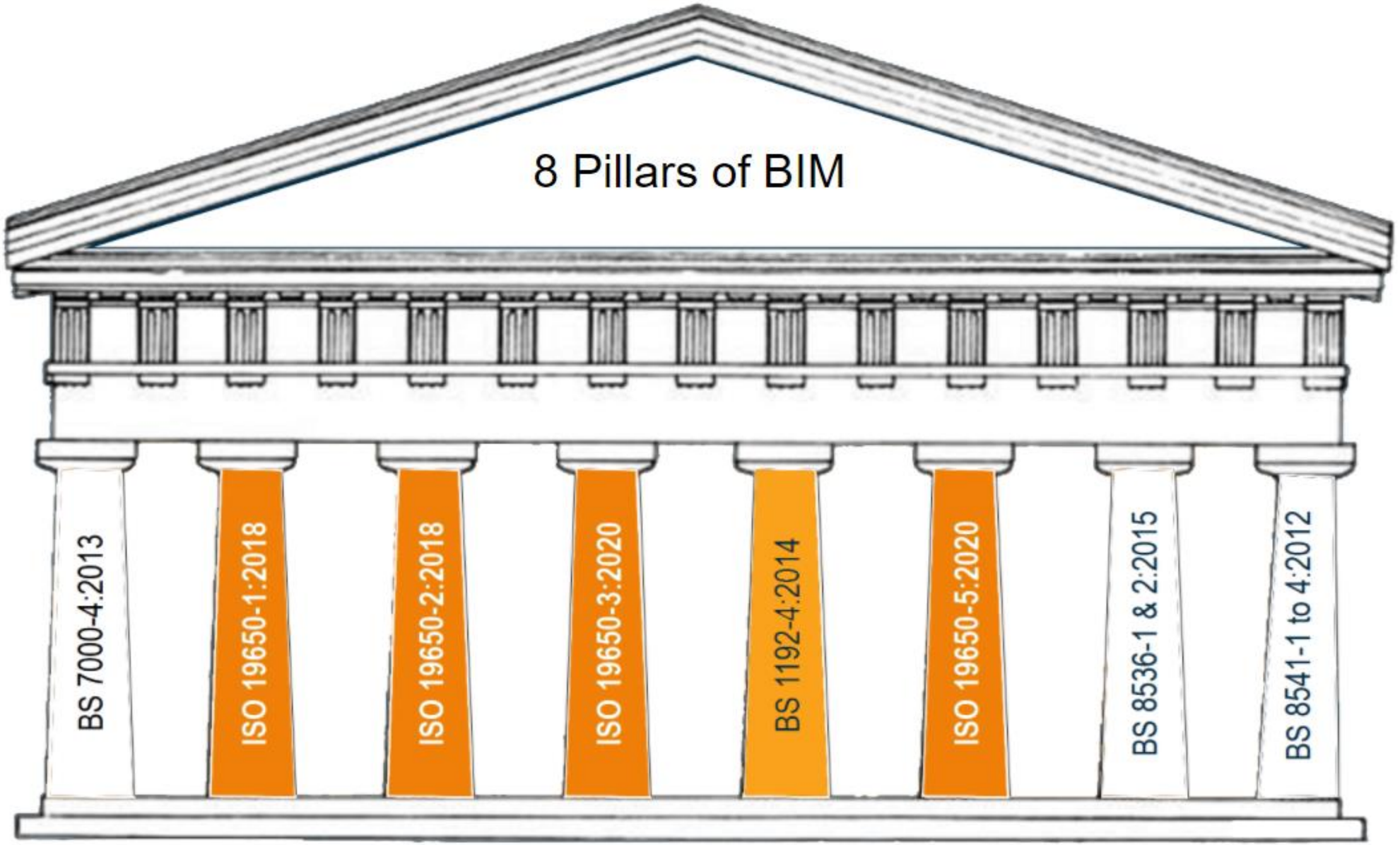
SOURCE: https://www.nibs.org/page/nbgo

National Institute of BUILDING SCIENCES™
National BIM Standard - United States™ V3



A. Core Standards
A.1 - ISO Standards
A.2 - Normative Standards
A.3 - Information Exchanges
A.4 - Conformance Specificatio
A.5 - Test Suite
B. Technical Publications
B.1 - Reference Processes
B.2 - Reference Specifications
B.3 - Reference Examples
C. Deployment Resources
C.1 - Contract Specifications
C.2 - Best Practice Guides
C.3 - 3rd Party Support Services

SCOPE NATIONAL BIM STANDARD-UNITED STATES



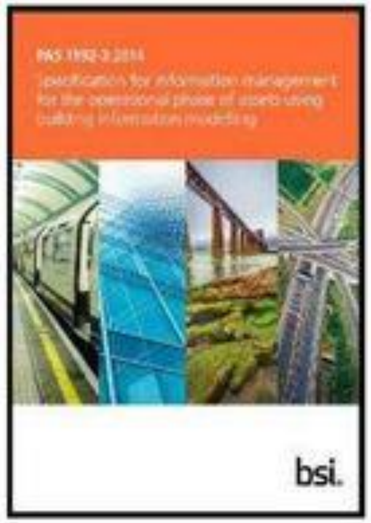
SOURCE: https://www.nibs.org/page/nbgo

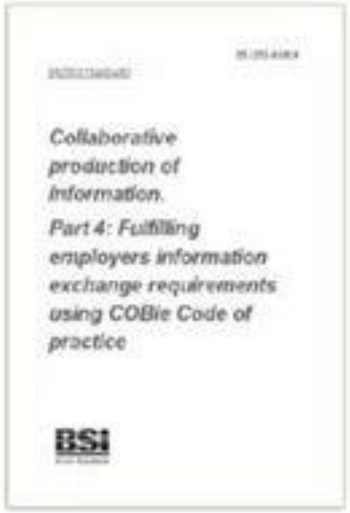
UK PILLARS FOR BIM

UK Standards for BIM

Source: https://geospatial.blogs.com/.a/6a00d83476d35153ef01b8d08ebfa5970c-popup

BS1192:2007 | PAS1192-2:2013 | PAS1192-3:2014 | BS1192-4:2014 (COBie) | BS 8541 Series

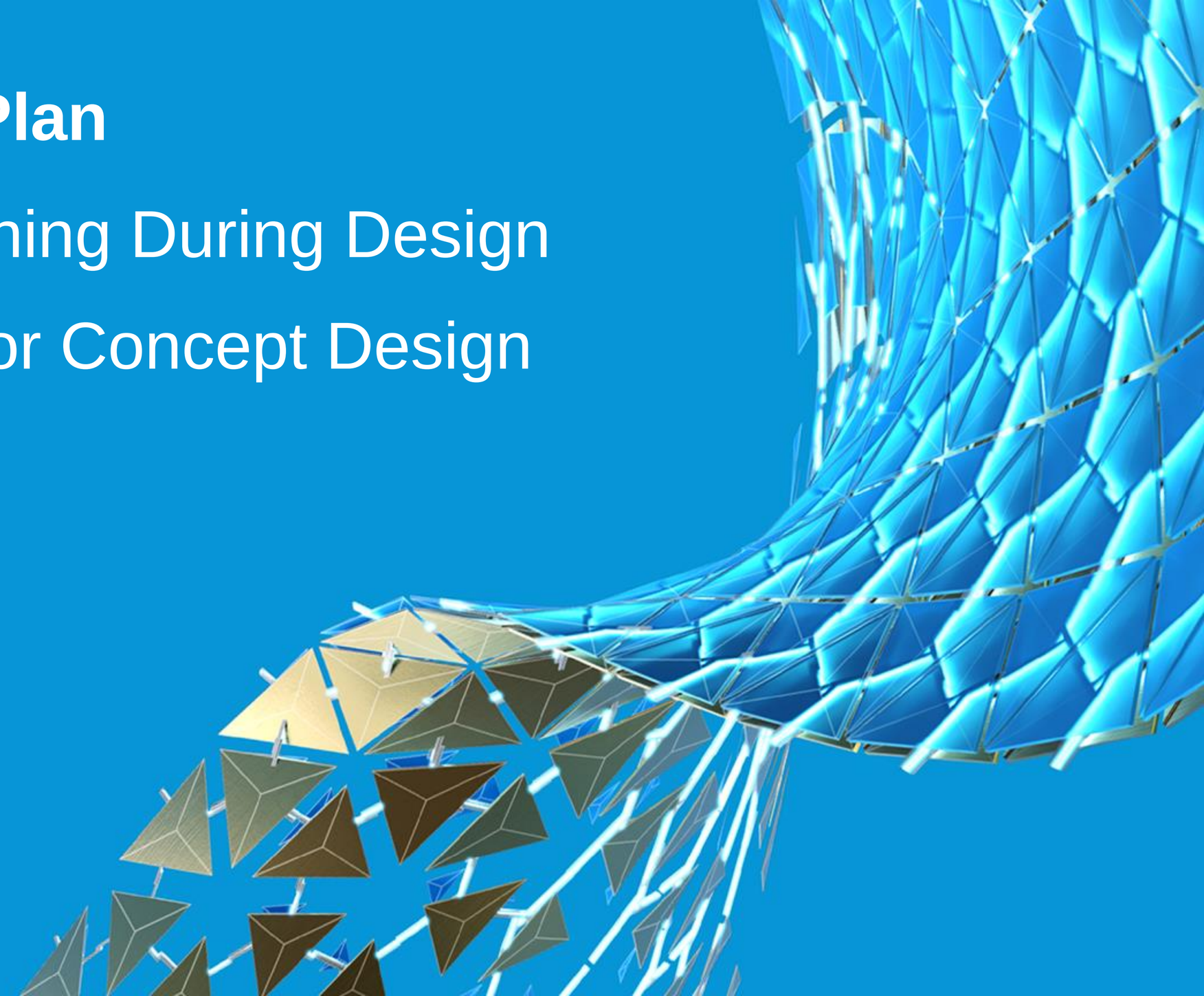




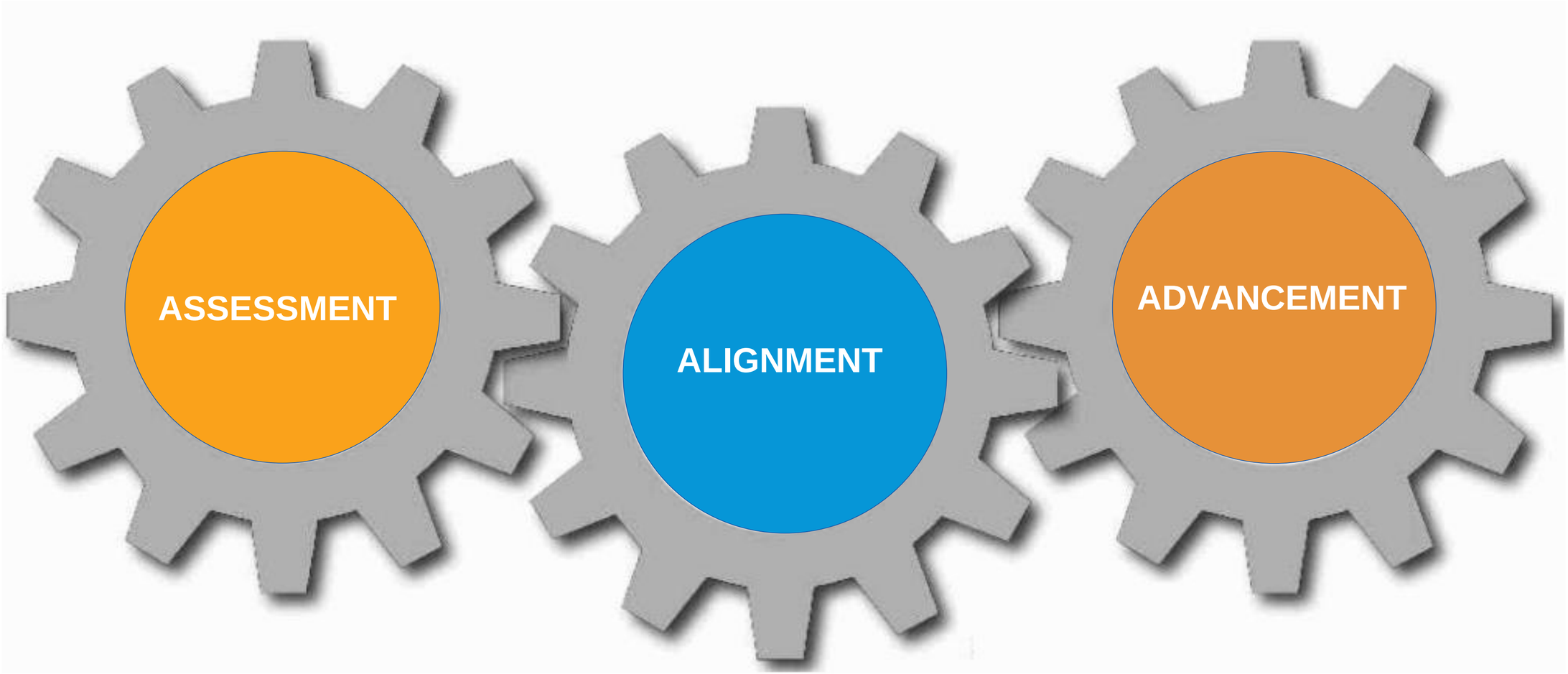
UK LEVEL 2 OVERVIEW

Objective 2: Plan

Strategic Planning During Design Development or Concept Design Phase

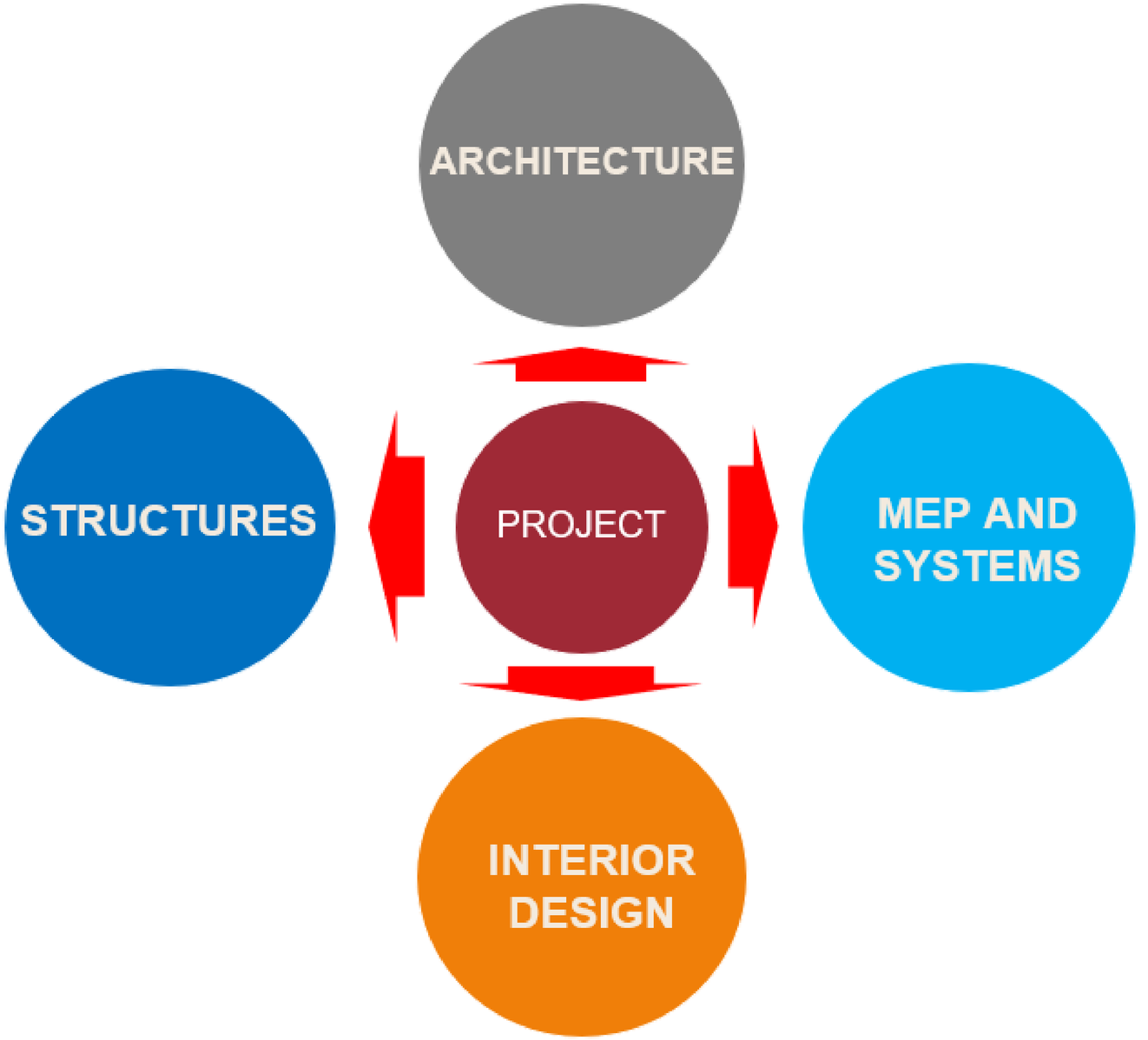


EFFECTIVE COMMUNICATION

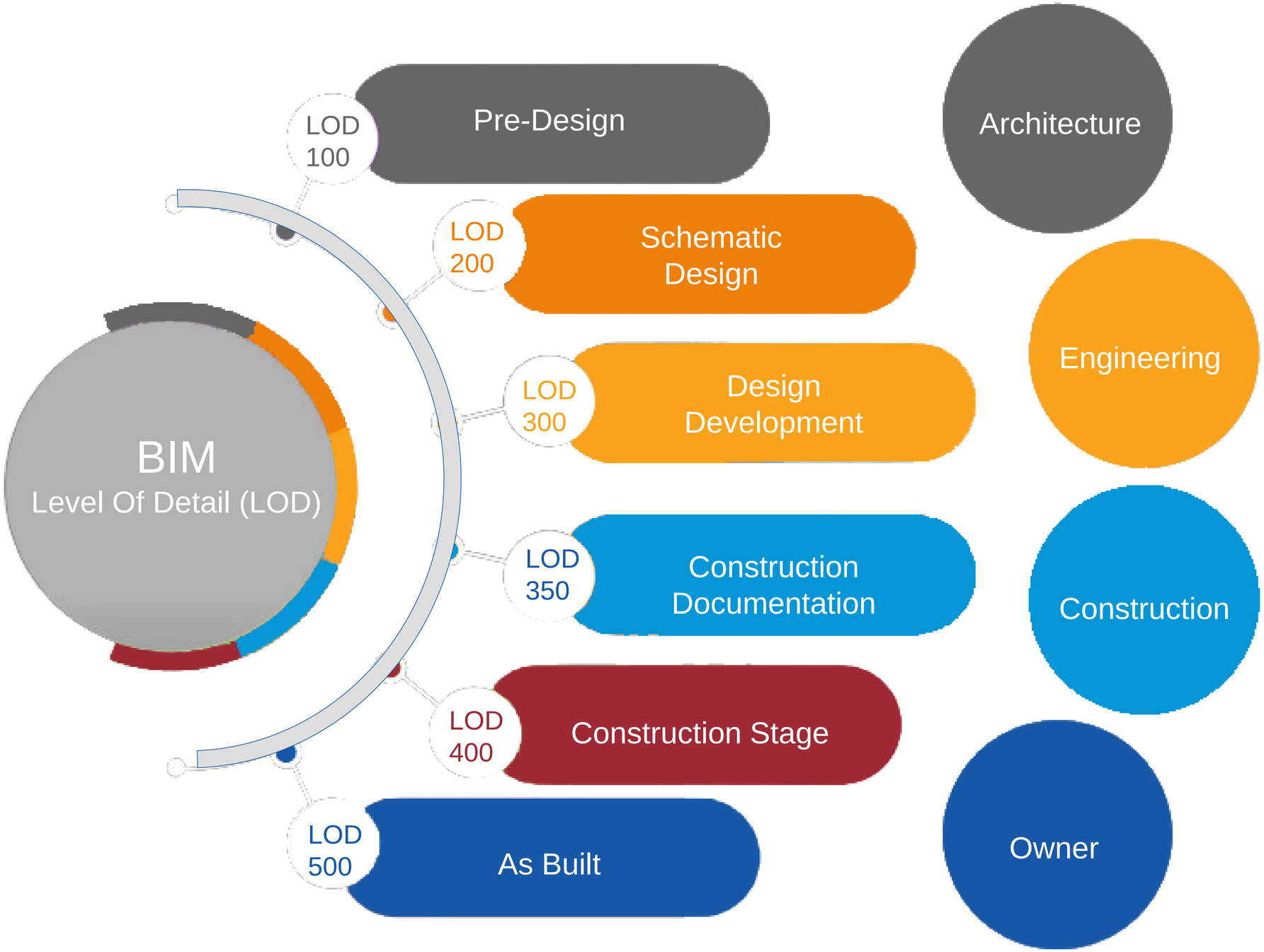


BIM ORGANIZATION PLANNING PROCEDURE

SOURCE: https://www.bim.psu.edu/owners_guide/



FILE PLANNING: SPLITTING OF FILES


BIM
Level Of Detail (LOD)
LOD 100
Pre-Design
LOD 200
Schematic Design
LOD 300
Design Development
LOD 350
Construction Documentation
LOD 400
Construction Stage
LOD 500
As Built
Architecture
Engineering
Construction
Owner

	Level Of Accuracy				
Upper Range (Imperial)		2"	5/8"	1/4"	1/16"
Lower Range (Imperial)	2"	5/8"	1/4"	1/16"	0
Upper Range (Metric)	-	5cm	15mm	5mm	1mm
Lower Range (Metric)	5cm	15mm	5mm	1mm	0
	LOA10	LOA20	LOA30	LOA40	LOA50

SOURCE: https://cdn.ymaws.com/www.nysapls.org/resource/resmgr/2019_conference/handouts/hale-g_bim_loa_guide_c120_v2.pdf

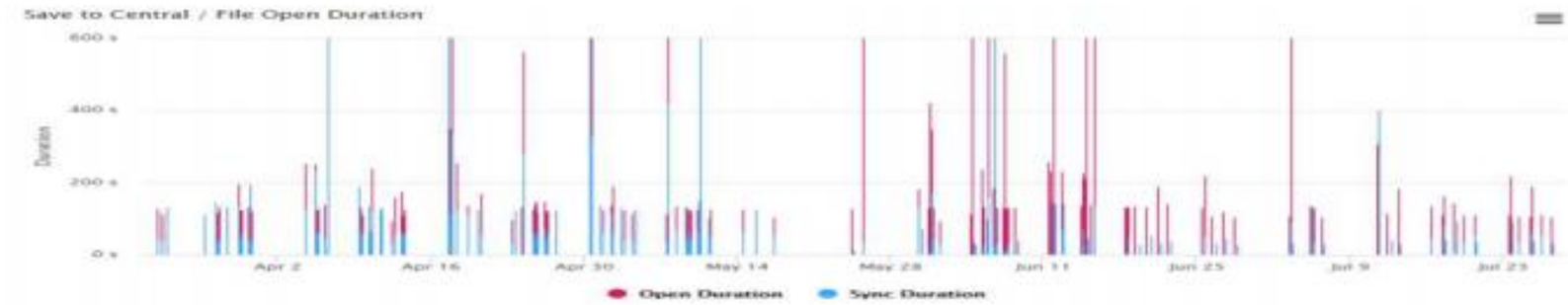
LEVEL OF ACCURACY

SOURCE: Autodesk A 360

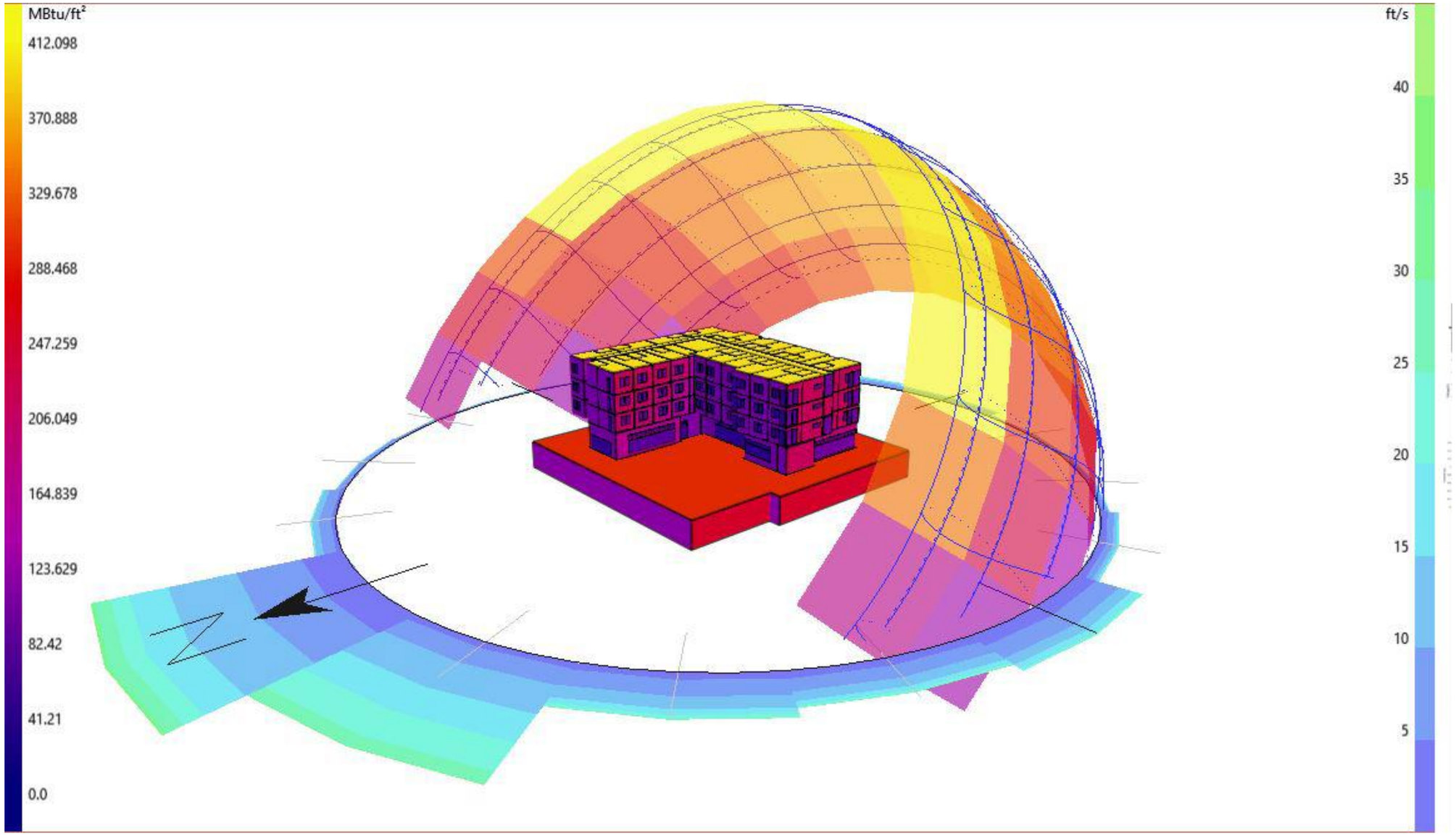
TEAM TASKS ACCOUNTABILITY ASSIGNMENT

Property	Value
Design Options	6
Families	1,277
Groups	18
In-place Families	501
Family Instances	55,172
Levels	42
Materials	340
Phases	17
Placed Rooms	2,127
Placed Spaces	0
Unenclosed Rooms	71
Unenclosed Spaces	0
Unplaced Families	134
Unplaced Rooms	127
Unplaced Spaces	0
Views	2,606
View Filters	17
Worksets	20

Property	Value
Hard Disk Drive	Disk drive; 223.57 GB
Video	Intel(R) HD Graphics Family; RAM:1 GB; Driver:10.18.10.3871
Motherboard	Hewlett-Packard
Operating System	Microsoft Windows 7 Enterprise N, 64-bit, 6.1.7601
CPU	GenuineIntel, GHz:2.7
Machine Name	WK_TELDNA
BIOS	Hewlett-Packard
Memory	16
Memory Slots	2
IP Address	10.112.1.101



ACCOUNTABILITY TRACKING AND MONITORING



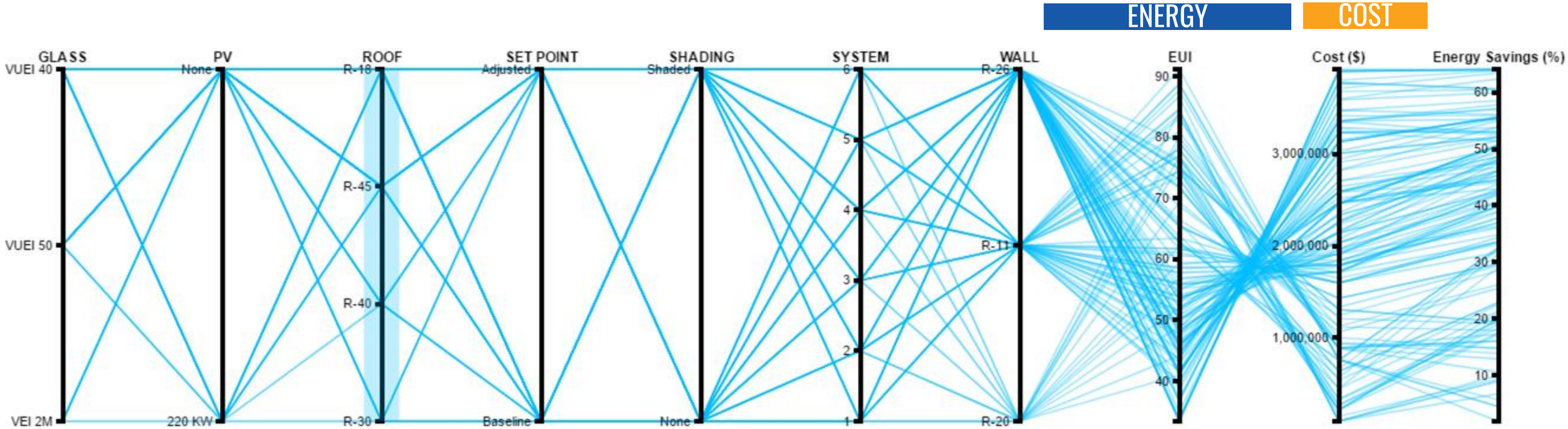
SUSTAINABILITY

SOURCE: Autodesk. https://www.autodesk.com/sustainability/overview

COST VS ENERGY OPTIMIZATION: COVETOOL

Selecting Cheapest Option for Energy Code Compliance

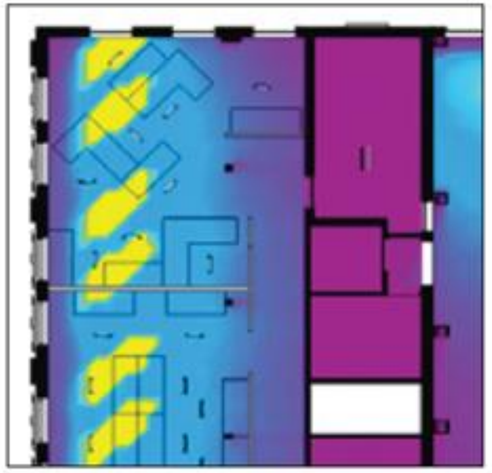
SOURCE: https://www.cove.tools/



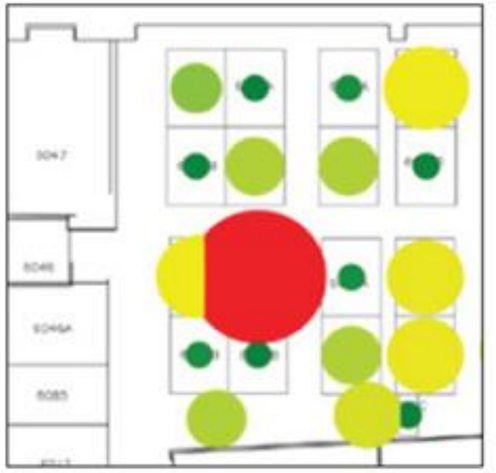
COST PREMIUM **$91,875.00**

ENERGY SAVINGS **10%**

DAYLIGHT	GLASS	PV	ROOF	SET POINT	SHADING	SOLAR HOT WATER	SYSTEM	WALL
None	VUEI 50	None	R-18	Baseline	None	None	1	R-11
None	VUEI 50	None	R-18	Baseline	None	None	1	R-11



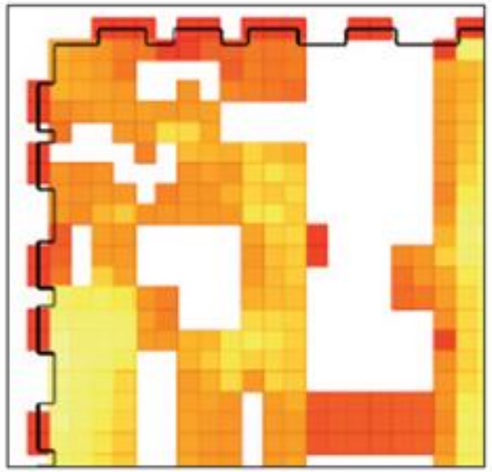
1. Daylight



2. Low Visual Distraction

3. Views to Outside

4. Adjacency Preference



5. Circulation

6. Work Styles

7. Low Acoustic Distraction

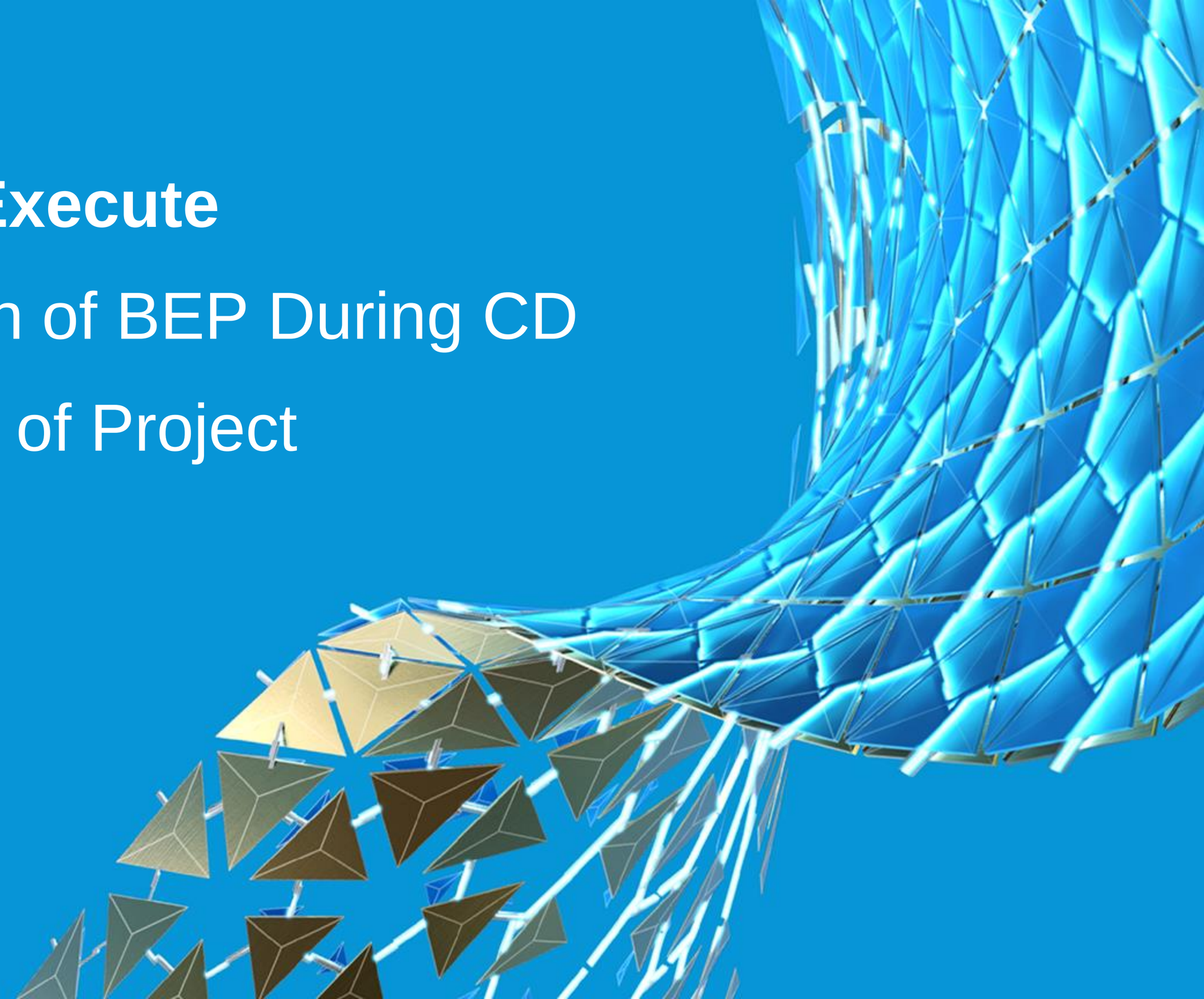
8. Low Density

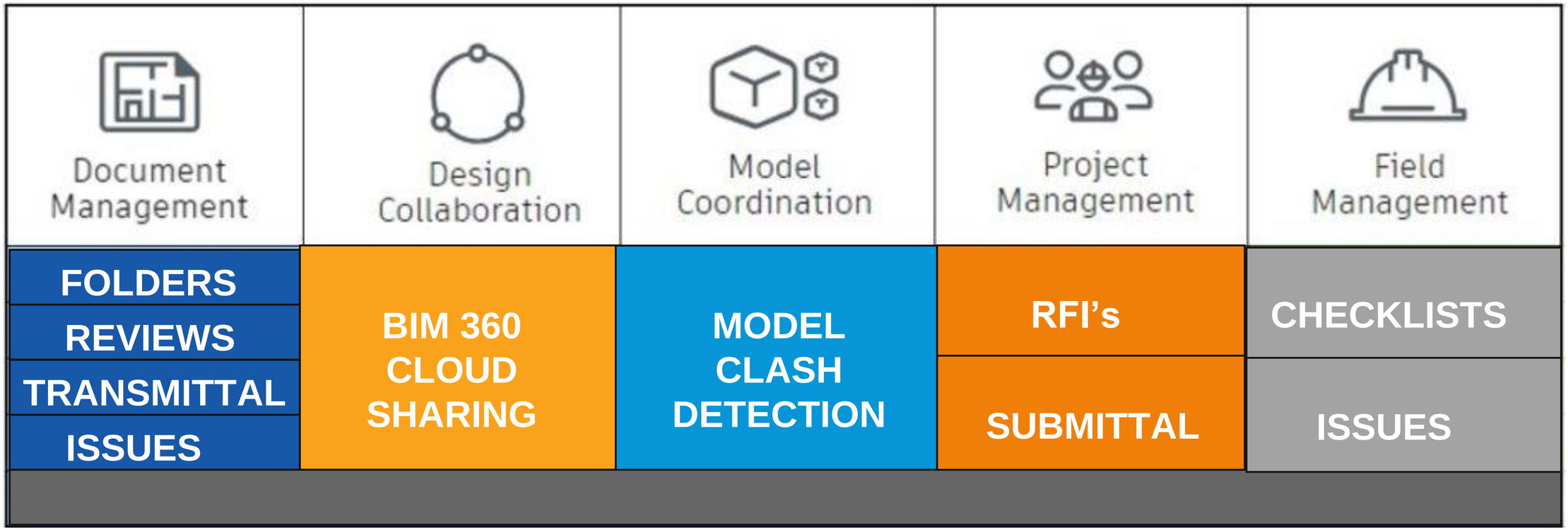
GENERATIVE DESIGN

Source: Autodesk https://www.autodesk.com/solutions/generative-design/architecture-engineering-construction

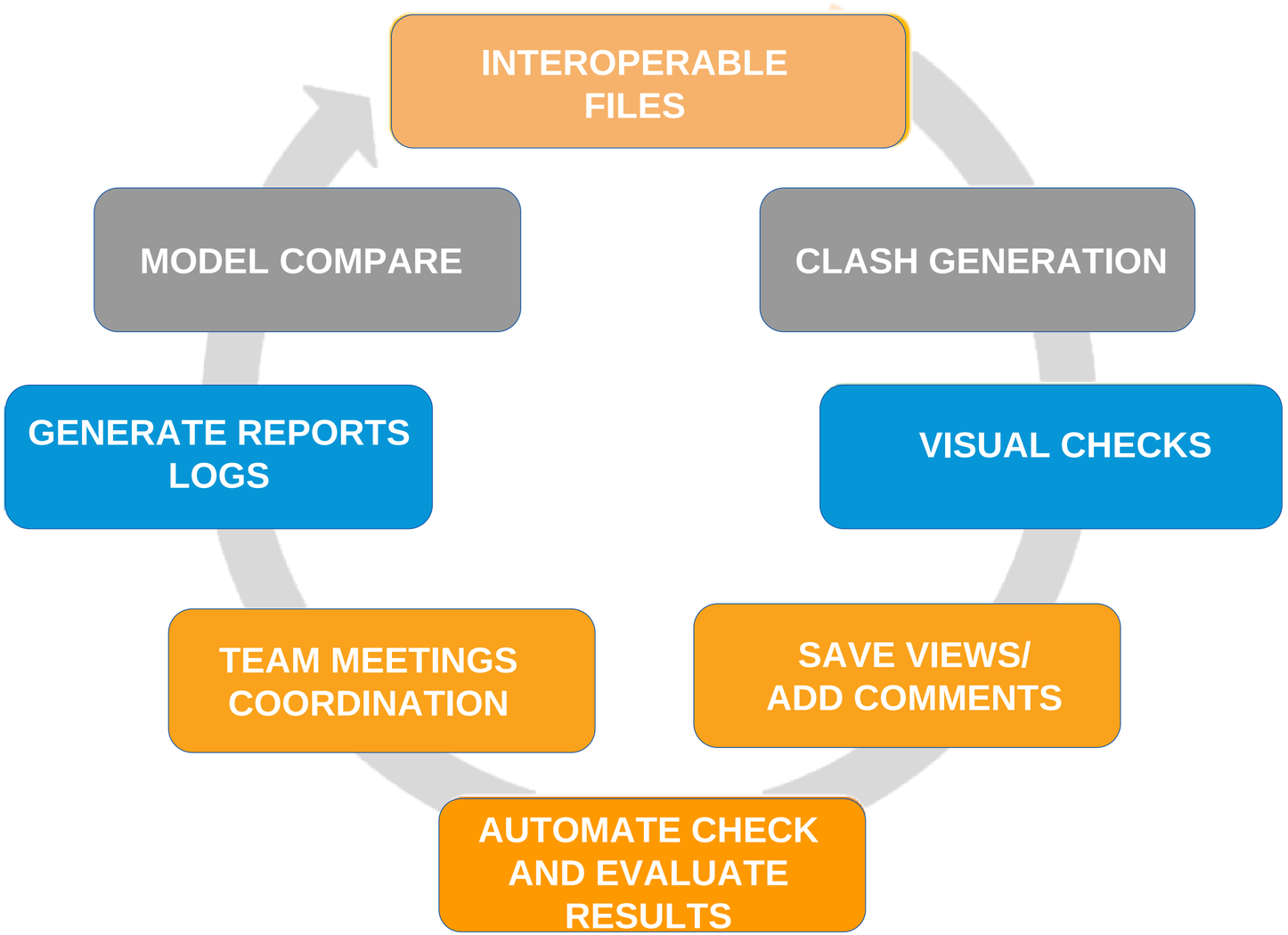
Objective 3: Execute

Implementation of BEP During CD and CA Phase of Project





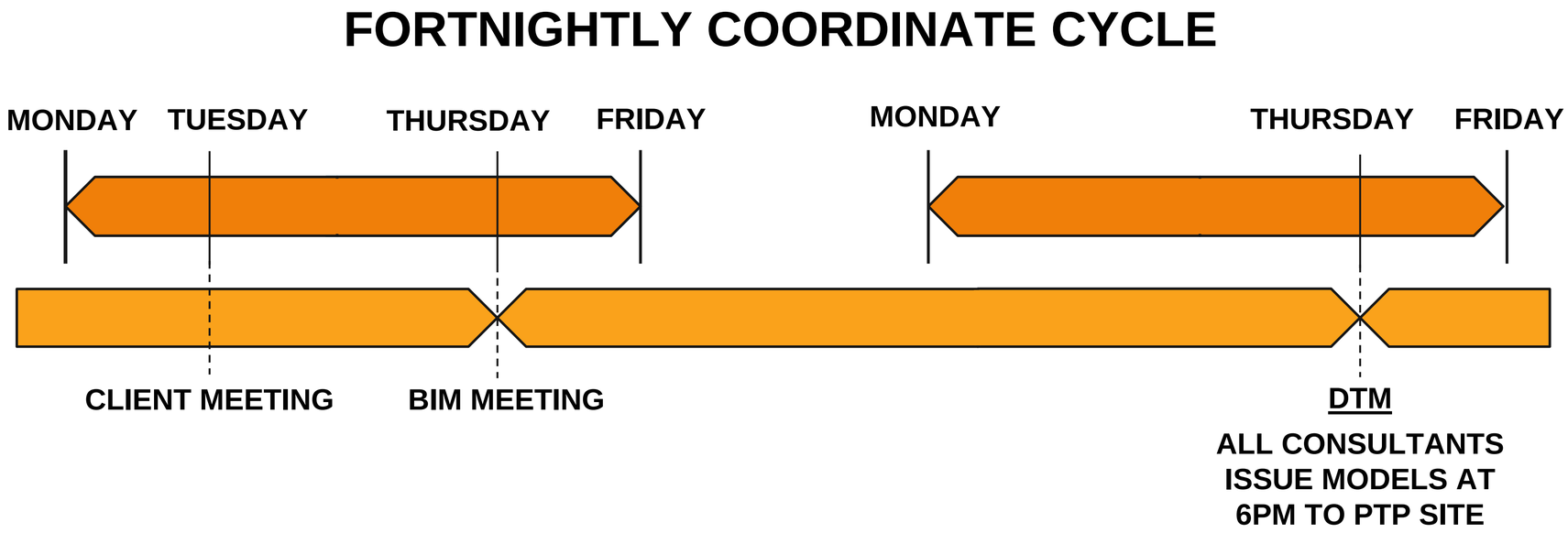
BIM CLASH COORDINATION



BIM CLASH CHECKS

Planning & Documentation

Collaboration Strategy

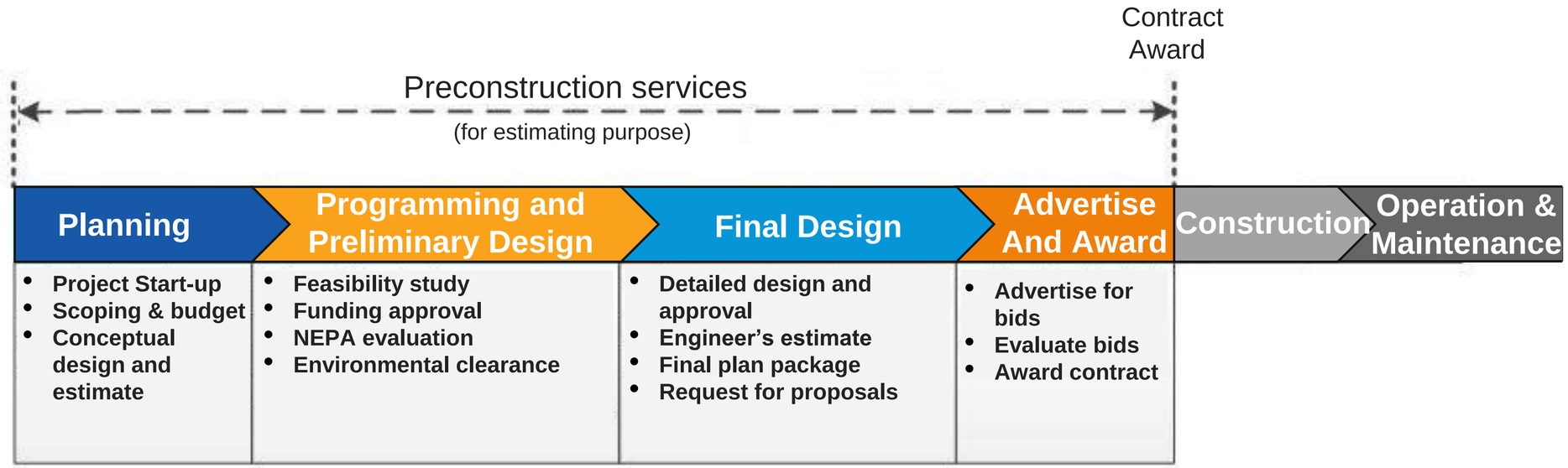


COLLABORATION TIMELINE

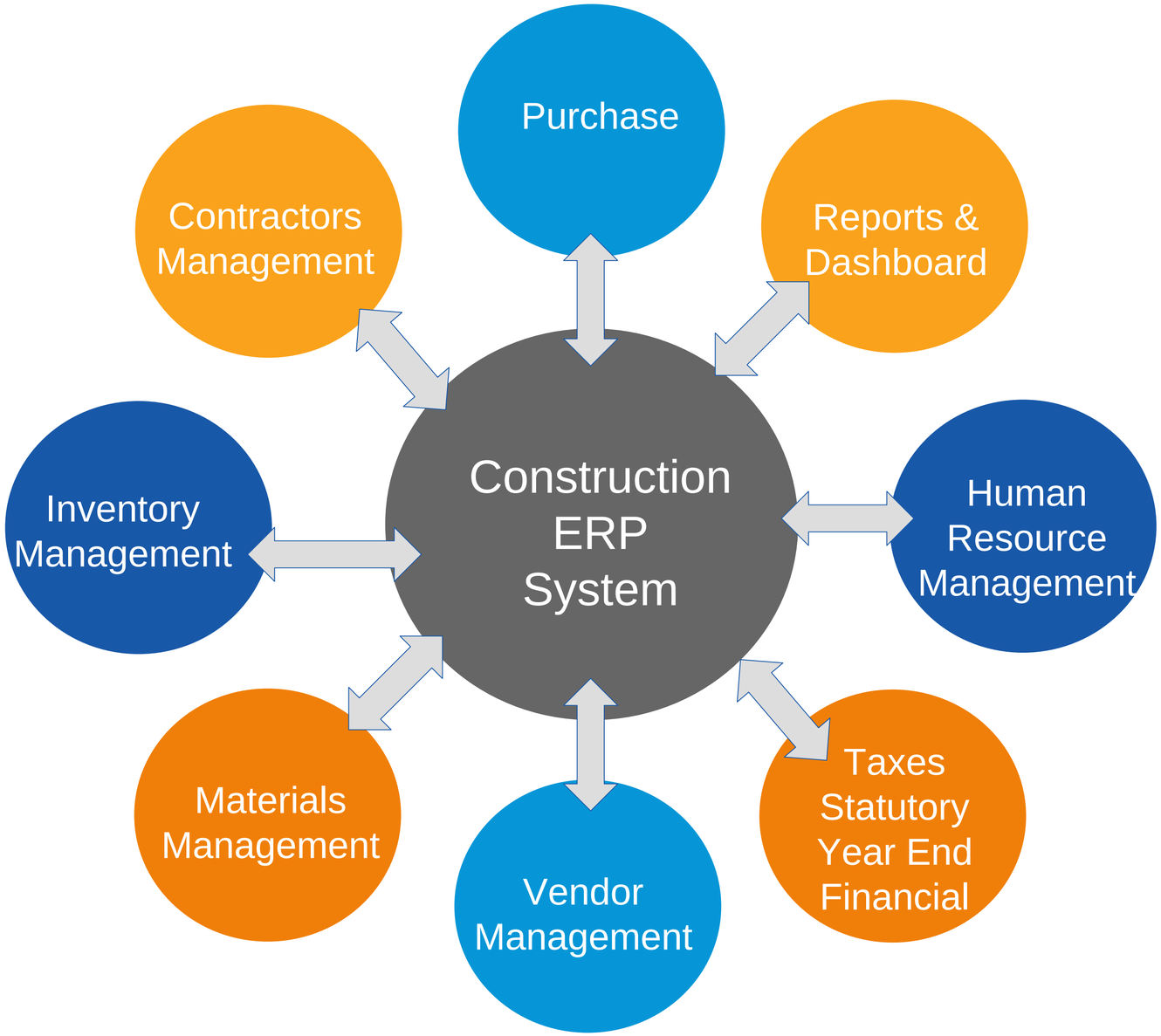
	EQ Submittal		Content Modelling				BIM Coordinator				Shop Drawing Pro	
Level / Location	Submit Equipment Submittal	Days	Start	Finish	Days	Model Upload	Coordination Start	Coordination Finish	Days	Model Sign-off	Shop Dwg Start	Shop Dwg Finish
Building 1												
Basement	12/31/2017	1	1/1/2018	1/1/2018	0	1/2/2018	1/3/2018	1/3/2018	0	1/4/2018	1/5/2018	1/5/2018
Level 01	1/28/2018	1	1/29/2018	1/29/2018	0	1/30/2018	1/31/2018	1/31/2018	0	2/1/2018	2/2/2018	2/2/2018
Level 02	2/25/2018	1	2/26/2018	2/26/2018	0	2/27/2018	2/28/2018	2/28/2018	0	3/1/2018	3/2/2018	3/2/2018
Level 03	4/1/2018	1	4/2/2018	4/2/2018	0	4/3/2018	4/4/2018	4/4/2018	0	4/5/2018	4/6/2018	4/6/2018
Level 04	4/29/2018	1	4/30/2018	4/30/2018	0	5/1/2018	5/2/2018	5/2/2018	0	5/3/2018	5/4/2018	5/4/2018
Level 05	5/27/2018	1	5/28/2018	5/28/2018	0	5/29/2018	5/30/2018	5/30/2018	0	5/31/2018	6/1/2018	6/1/2018
Penthouse	7/1/2018	1	7/2/2018	7/2/2018	0	7/3/2018	7/4/2018	7/4/2018	0	7/5/2018	7/6/2018	7/6/2018

TIMELINE MANAGEMENT

Preconstruction services timeline



PRECONSTRUCTION DIGITAL MANAGEMENT



BIM ERP MANAGEMENT

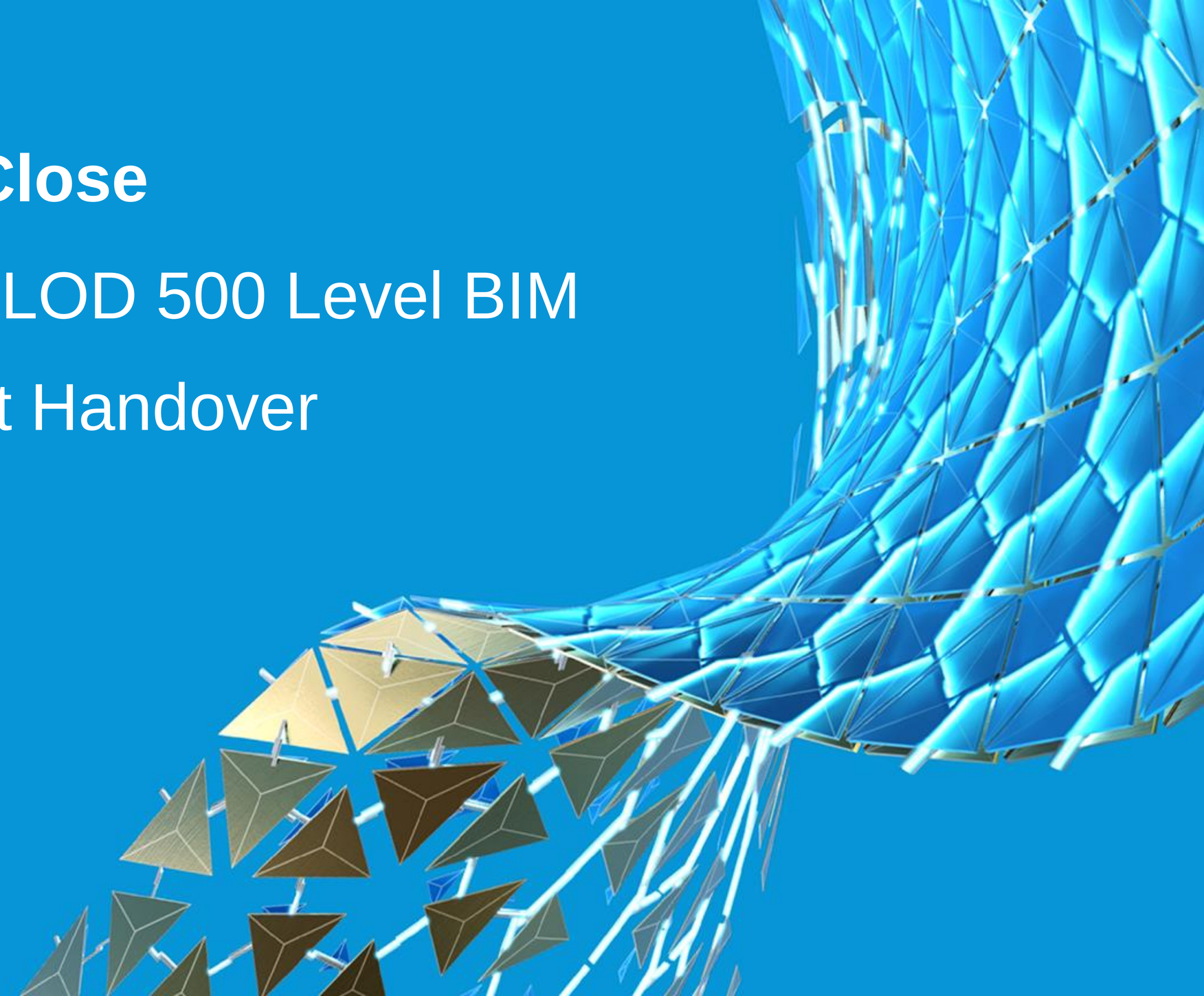
SOURCE: https://blog.capterra.com/comparison-of-5-construction-erp-software-options/

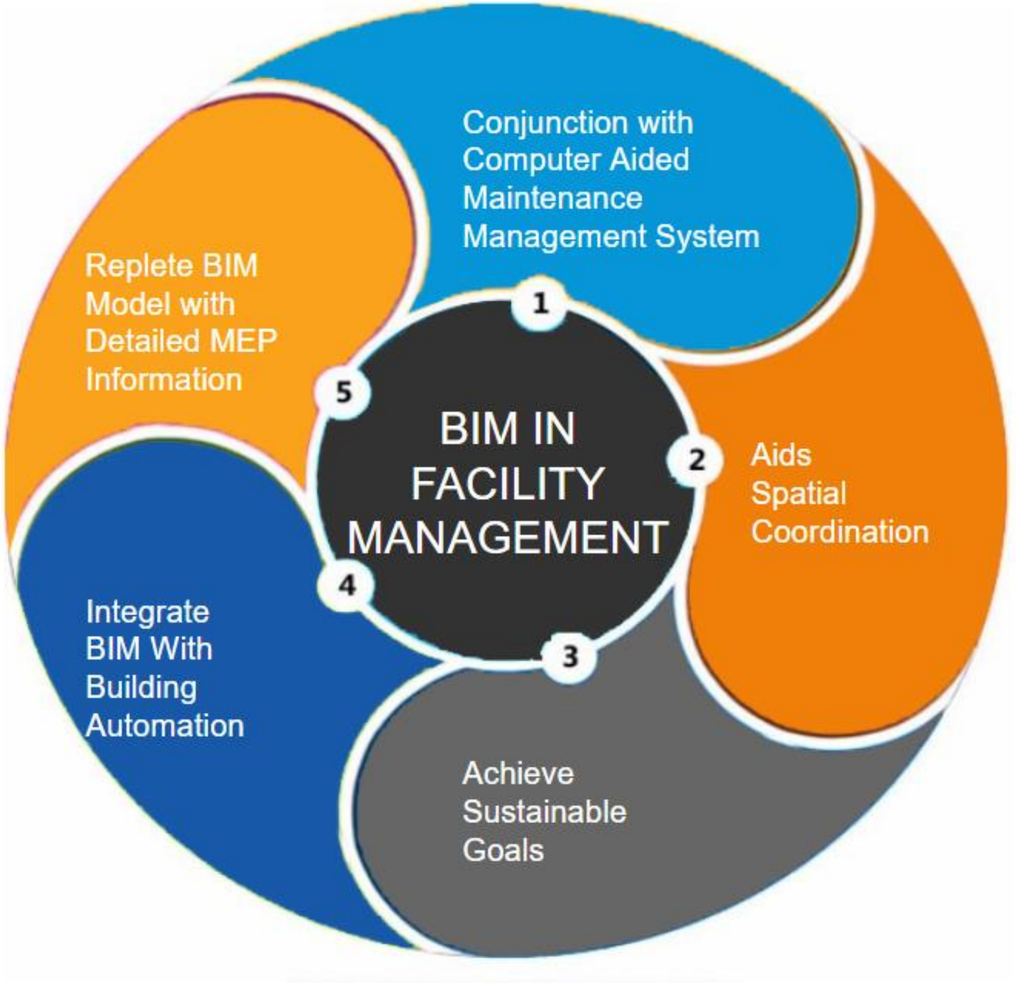
BIM LOGISTICS MANAGEMENT

Source: https://www.jansen.com/en/building-systems-profile-systems-steel/services-steel-systems/planning-bim-steel-systems.html

Objective 4: Close

Guidelines for LOD 500 Level BIM Data at Project Handover





BIM IN FACILITY MANAGEMENT

SOURCE: https://www.cadoutsourcingservices.com/blog/how-to-use-bim-in-facilities-management.php

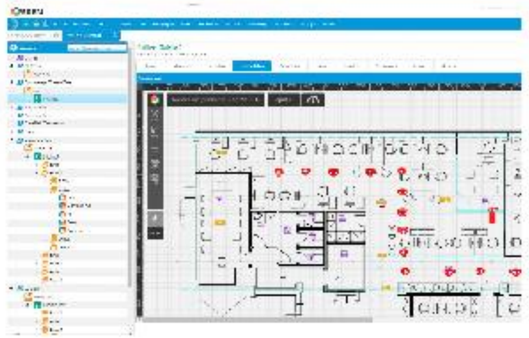
BIM MODELS

FLOOR PLANS

SQL DATABASE

SPACE MANAGEMENT

ASSET MANAGEMENT



WEB LINKAGE TO FACILITY MANAGEMENT FMMS SOFTWARE

ASSET INFORMATION MANAGEMENT

Documentation and Record Keeping

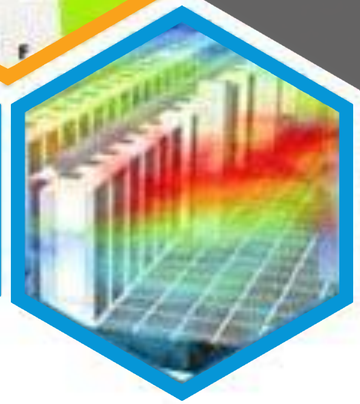
Management of Spatial Requirements

Preventive Maintenance Modelling

How Should Facility Managers use Revit BIM?

Asset Management

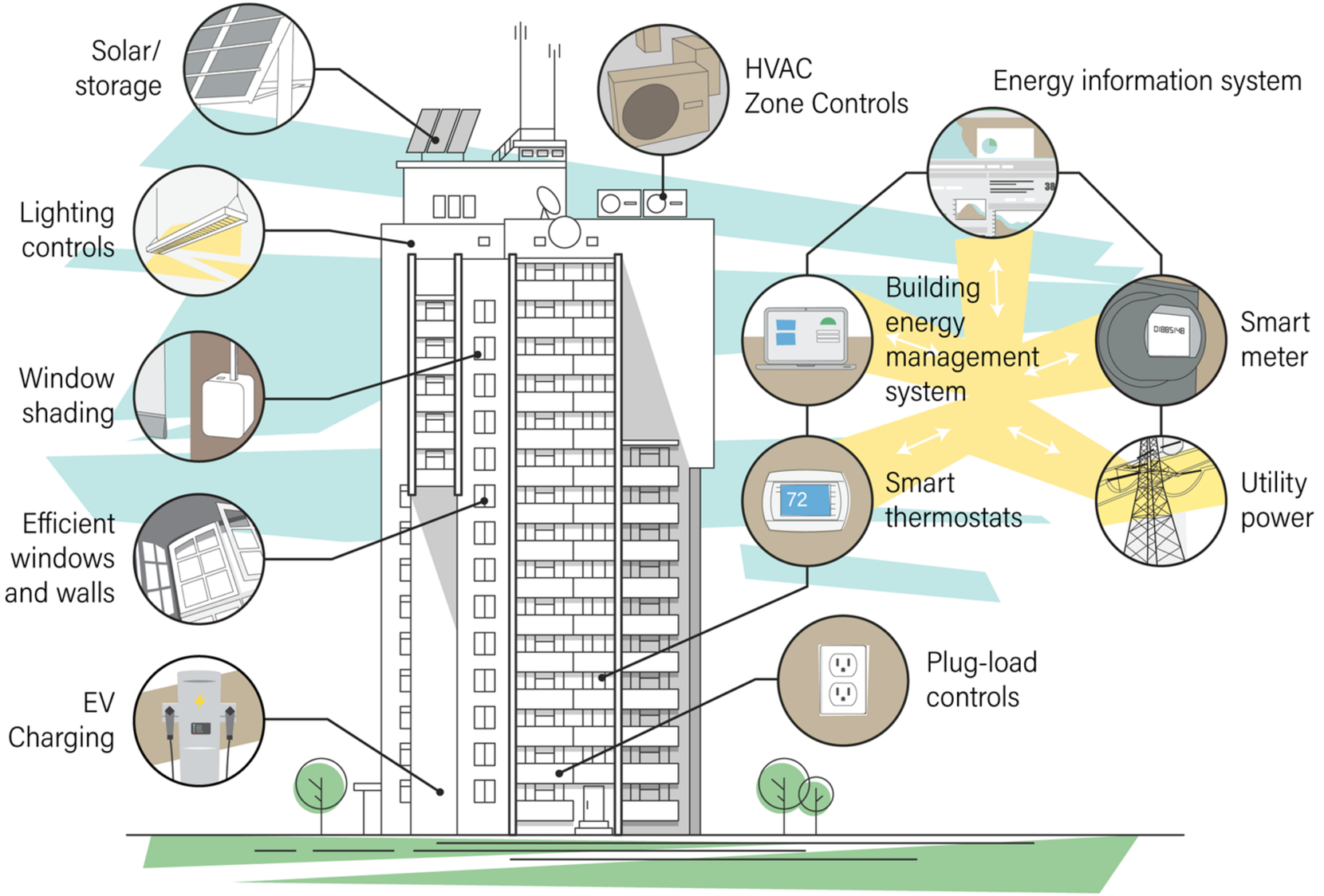
Energy Efficiency Analysis



Disaster Planning And Management

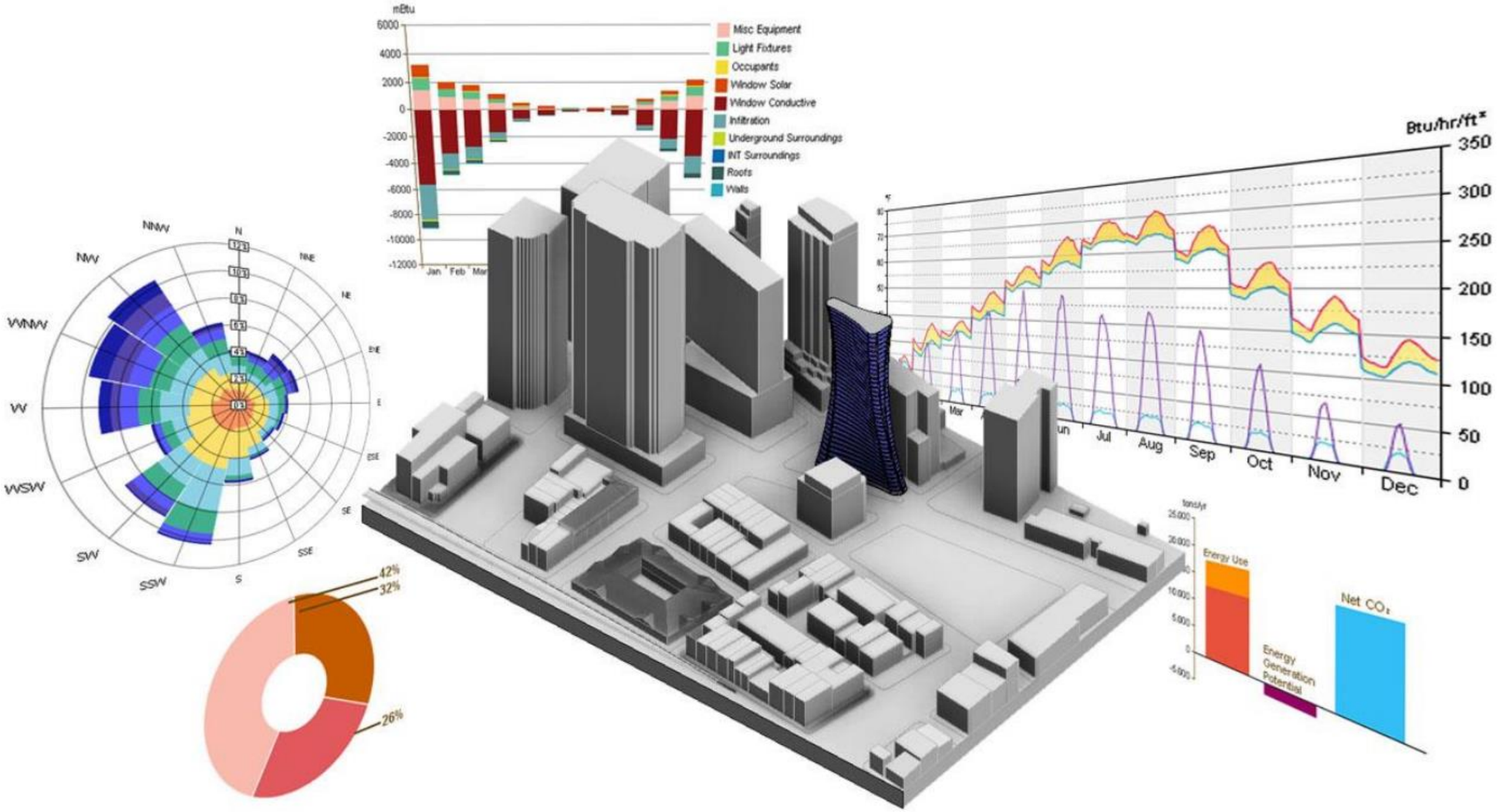
IMPROVED SPACE MANAGEMENT

STREAMLINED MAINTENANCE



SUSTAINABLE BUILDINGS

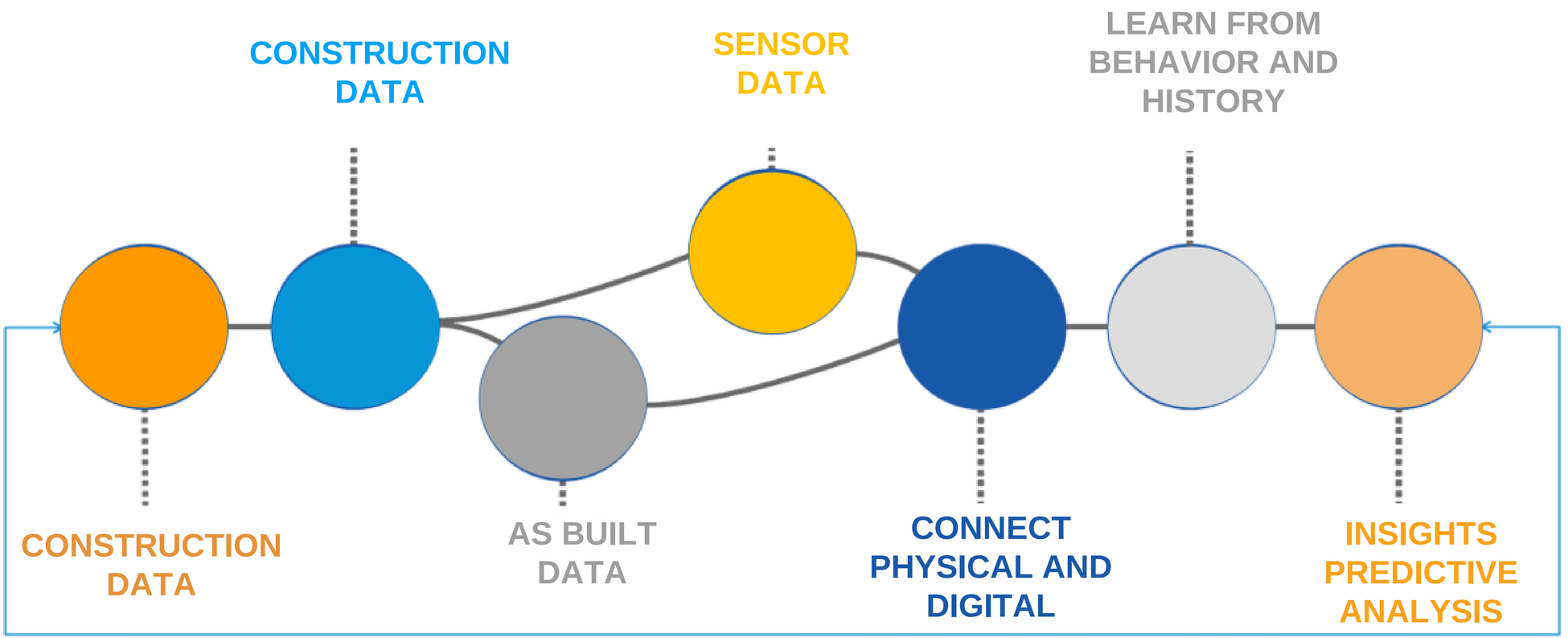
Source: https://www.aceee.org/grid-interactive-efficient-buildings-gebs



ENERGY EFFICIENCY

Source: https://www.aceee.org/grid-interactive-efficient-buildings-gebs

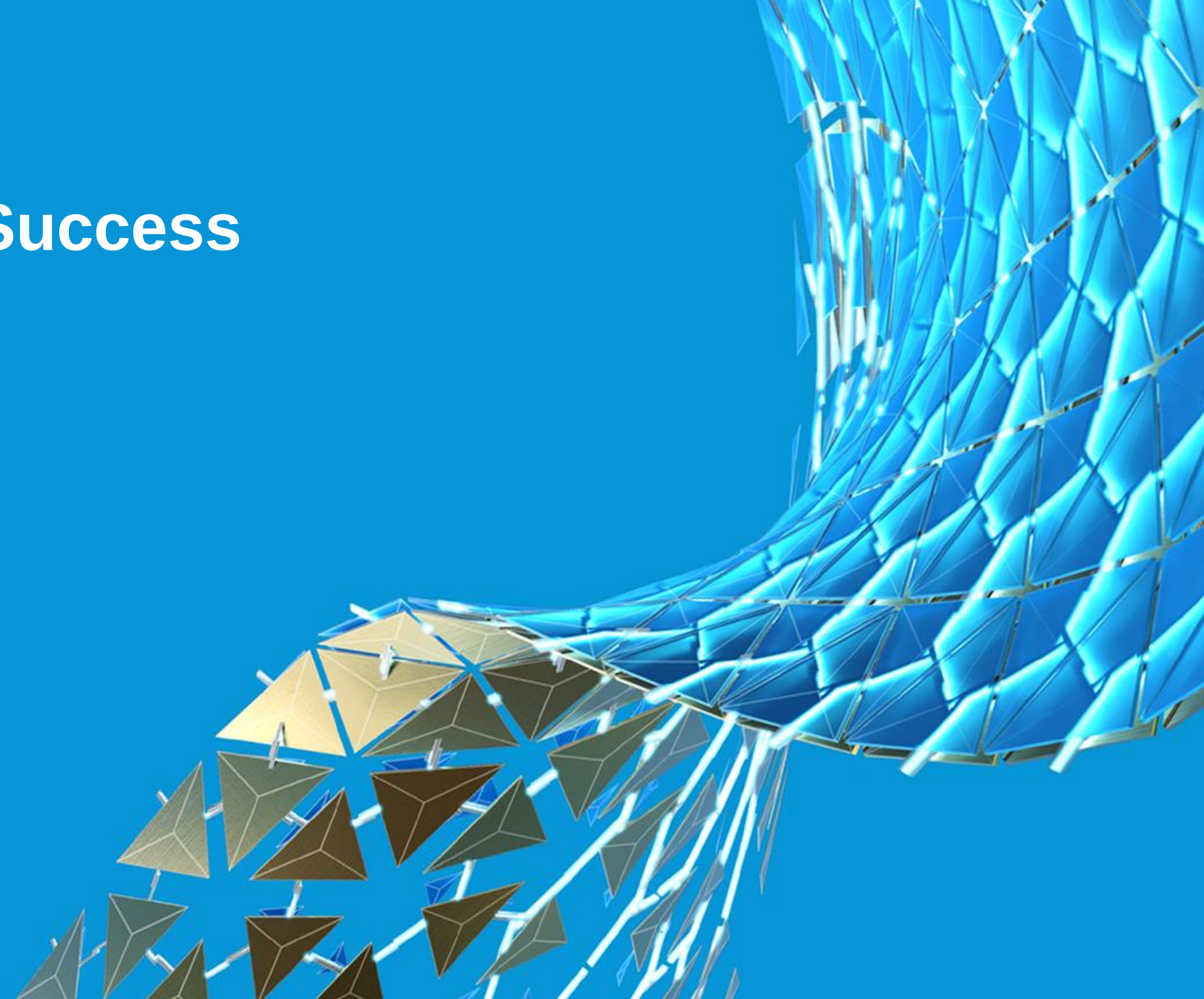
ECONOMIC RETROFIT



DIGITAL TWIN

SOURCE: https://www.autodesk.com/autodesk-university/article/Forge-BIM-360-Docs-IoT-Hub-2019

Toolbox For Success



- Model Authoring

- Coordination and Clash Resolution

- Communication

- Model Review

- Cloud Based Collaboration

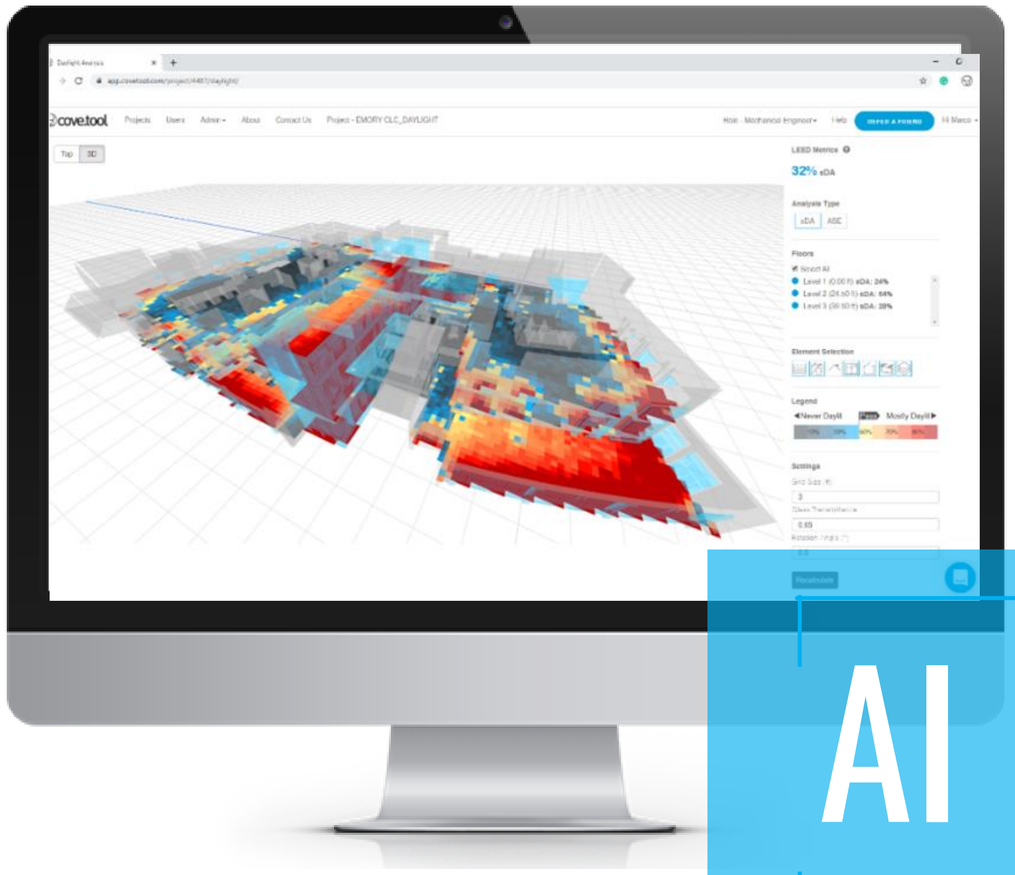
- Model Data Exchange

TOOLS FOR COLLABORATION AND COORDINATION


Warnings Data Color coded bY Level
File Size Referenced from Baseline
Warning Major causes Model Maintenance Prioritization
Intersecting walls
Redundant families
Tag not on room
Not enclosed room
Unjoined elements
Duplicate elements
Duplicate Mark Values
Rooms and Spaces Data
Rooms
Spaces
Reduntant Spaces and Room removal Progression
100% CD
75% CD
50% CD
DD
Location of Project
Seismic Zone - Weather Data- Energy Analysis Benchmark
Warnings
BY DATE
Time to open a file
27.7 seconds
Current Model Stats
File Size (MB)
307
Time to Open (sec)
15.7
Warnings
227
Number of Families
729
Number of Links
27
Number of Groups
31
Number of Schedules
23

DASHBOARDS

Cove.tool helps achieve higher productivity and reduces construction cost



AI

01 Automation

Reduces errors and dramatically increases the number of professionals able to use the software.

02 Speed

Most design decisions need to happen concurrently and in real time. Consultants take weeks to answer questions.

03 Data Driven Design

Data collection increases predictive and generative abilities of the platform.

04 Cost Optimization

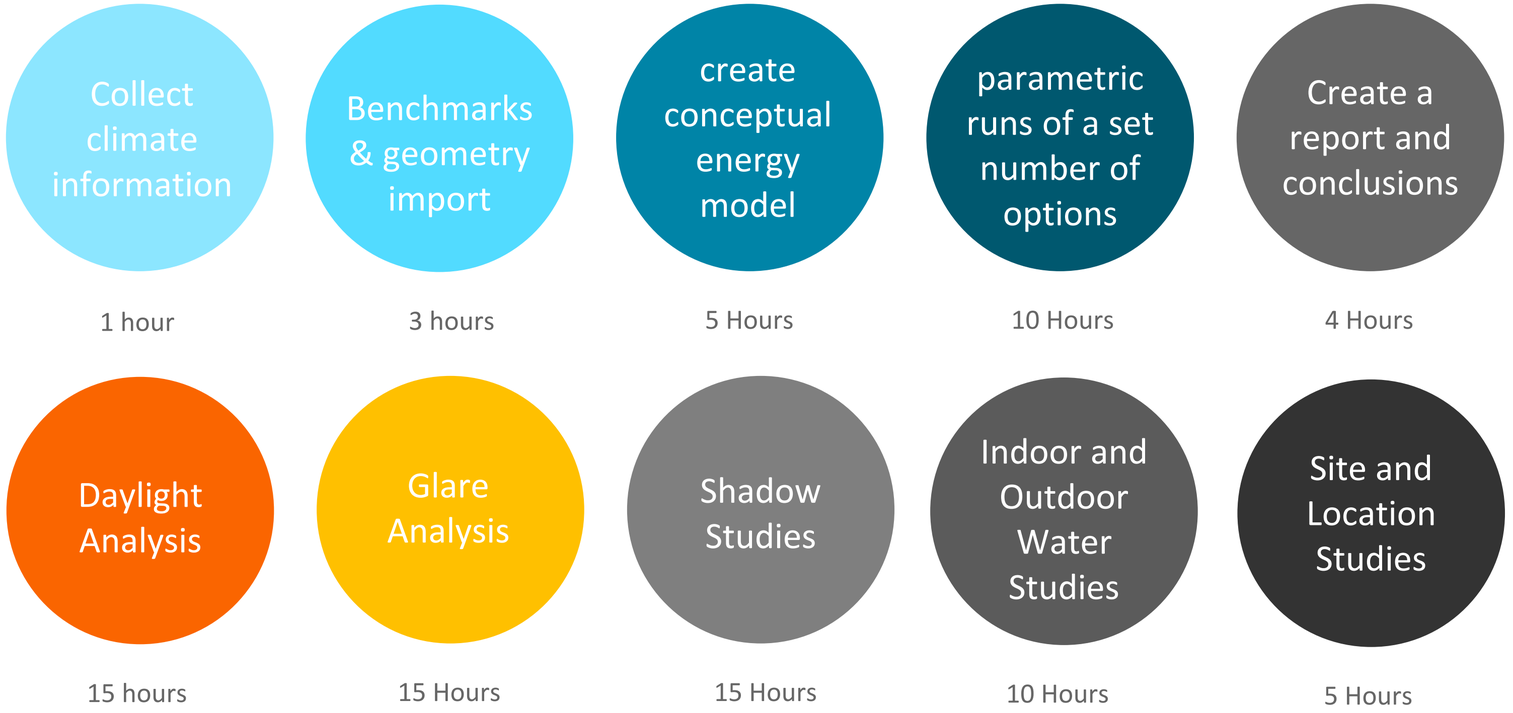
Linking all decisions back to a common metric (cost) links together design, construction, and manufacturers.

SOURCE: https://www.cove.tools/

Save 80 Hours with cove.tool

SOURCE: https://www.cove.tools/

Compare the time saved and savings earned to generate the results yourself with cove.tool!

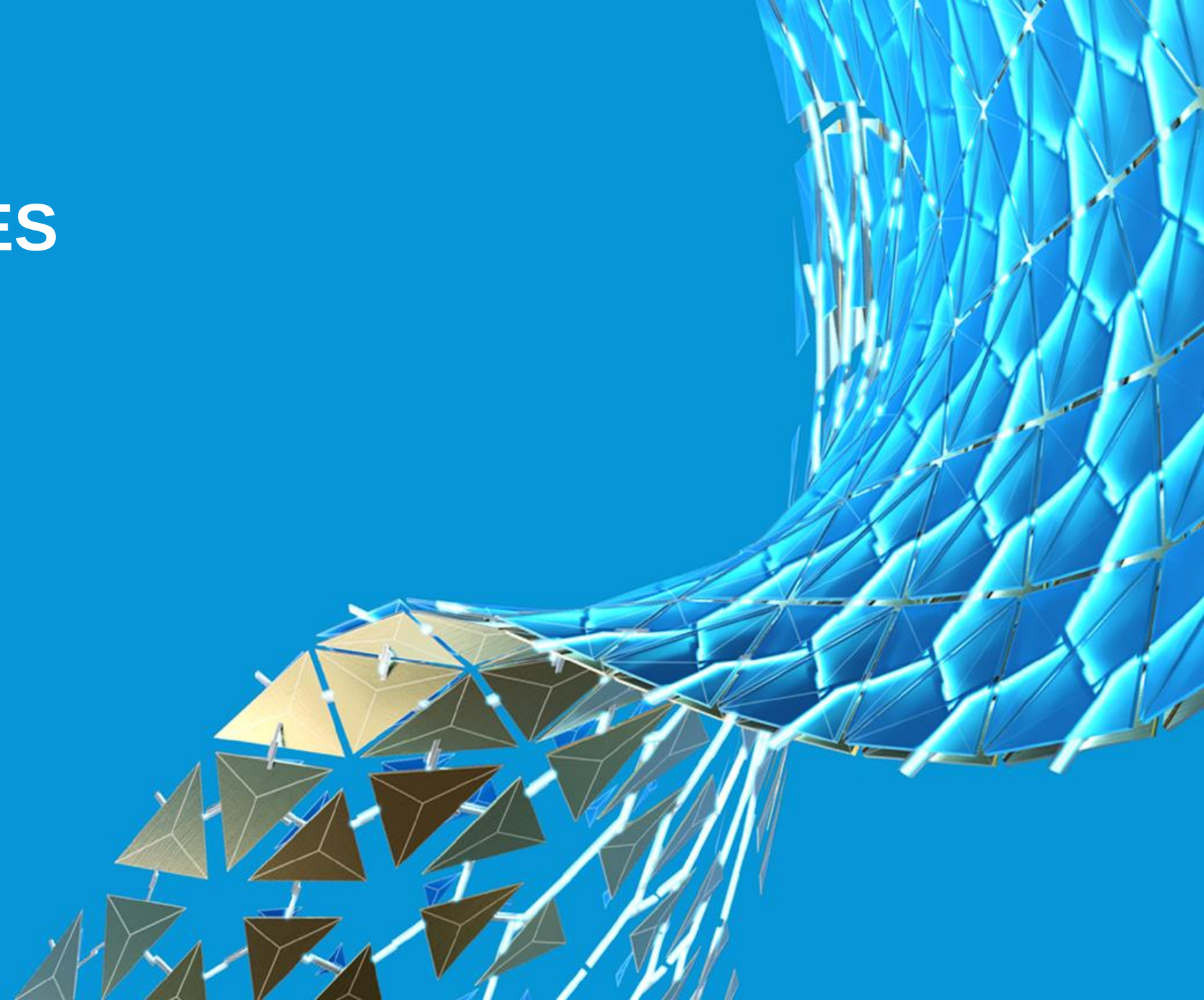


Average Billable Rate
$200/Hour

$16000/Report/Project

Testfit: Great Resource to Iterate faster designs.

CASE STUDIES



MICHIGAN STATE UNIVERSITY

Broad College of Business Pavilion

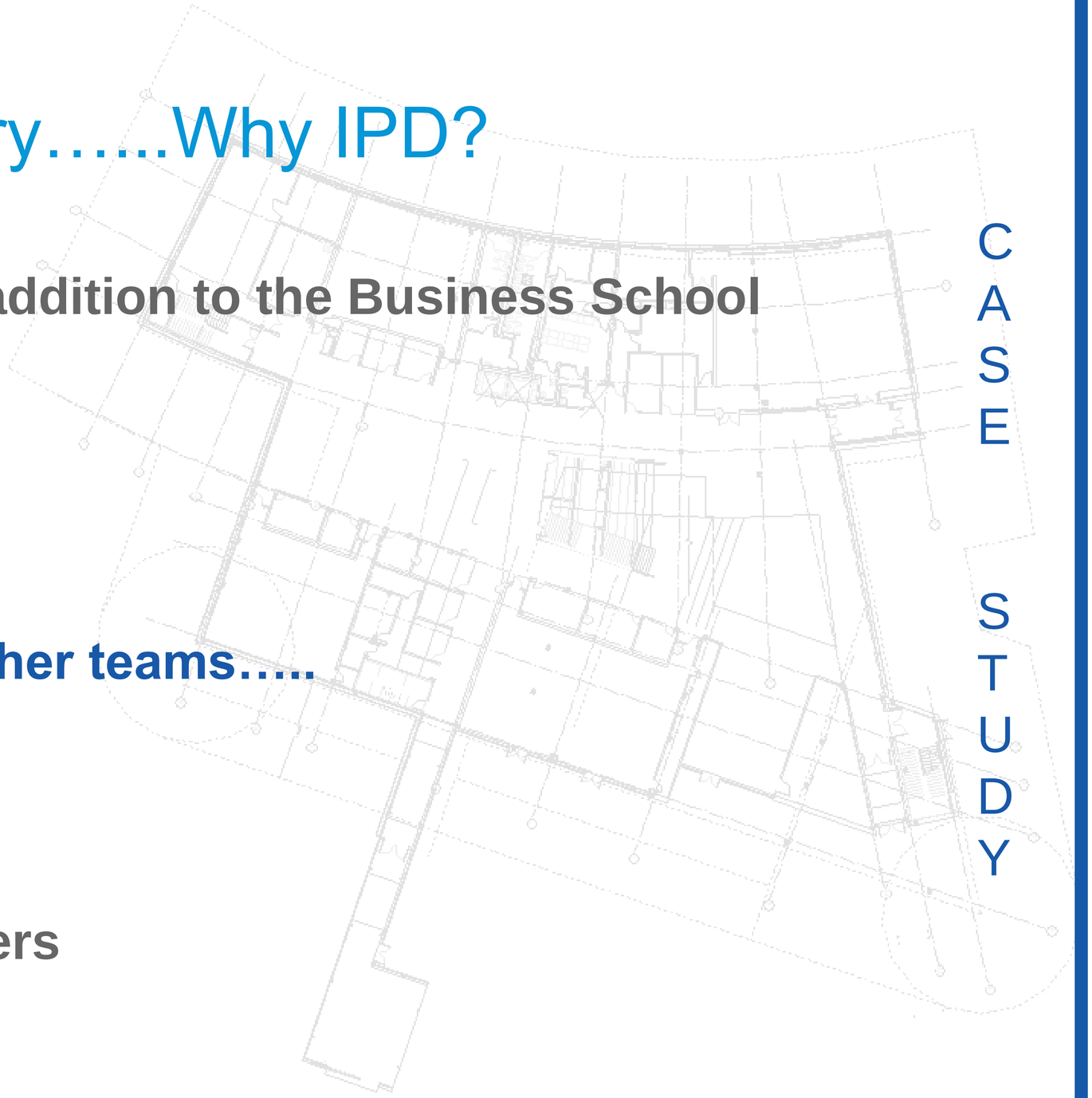
East Lansing, Michigan

In this Case Study, we shall

- **Examine the salient points of the BIM Execution Plan**
- **Summarize the workflow engaged in this IPD project**
- **Describe any challenges**
- **Summarize lessons learned.**

CASE STUDY

The Story……Why IPD?



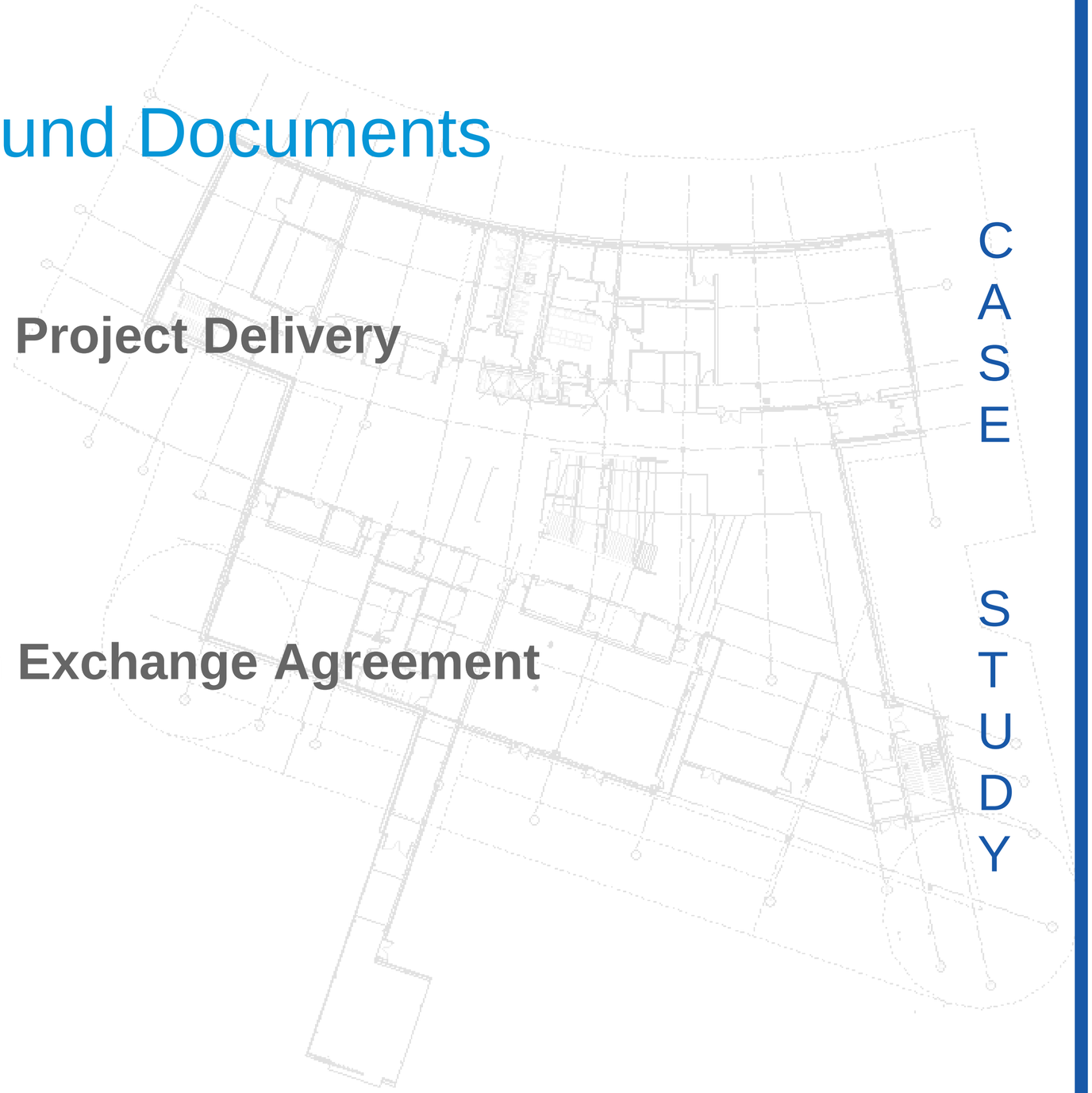
CASE STUDY

- **Approximately 95,000 SF addition to the Business School complex**
  - Classrooms
  - Advising
  - Administration

A large team made out of other teams…..

- **Core Group**
- **Design Team**
- **Design Assist Trade Partners**

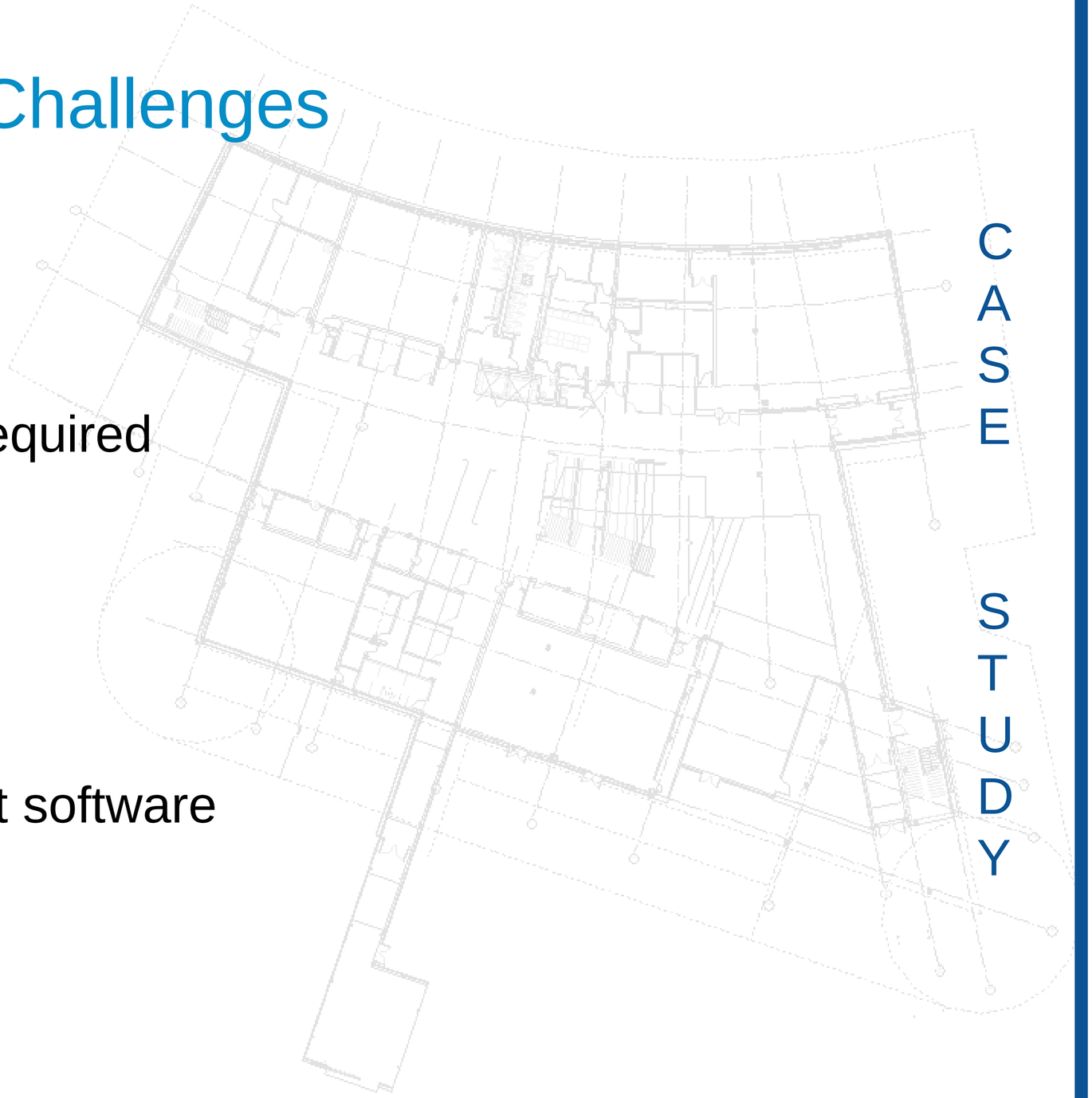
Background Documents



CASE STUDY

- **Contract Type - Integrated Project Delivery**
  - Pre-Construction
  - Construction
  - Post-Construction / Operation
- **Digital Project Information Exchange Agreement**
  - BIM Execution Plan
  - Building Information Model
  - Construction Documents
  - Digital Project Information

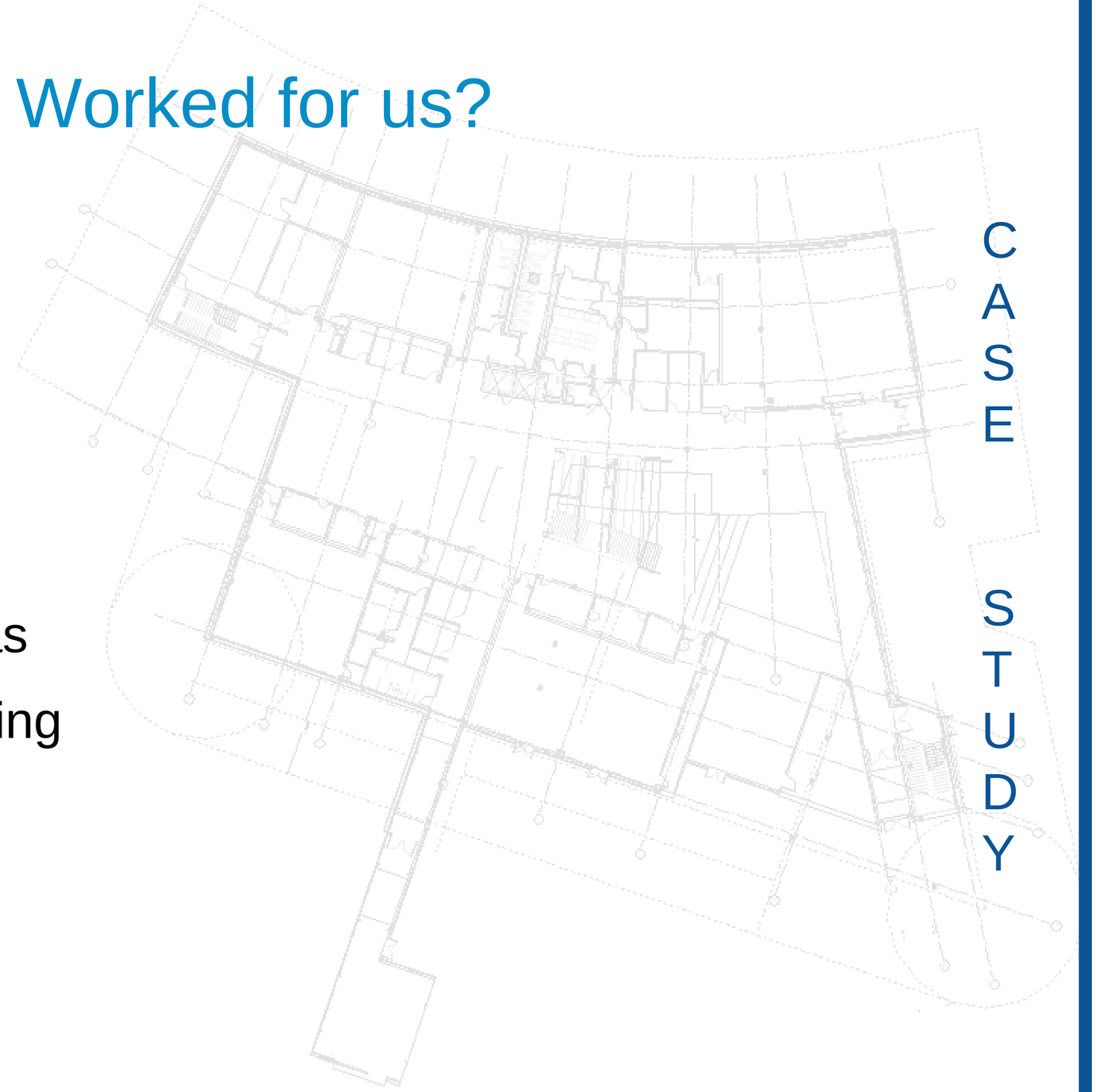
Challenges



- Size of the Project
- Amount of communication required
- Size of the deliverable
- Size of the team
  - geographic locations
  - team members on different software

CASE STUDY

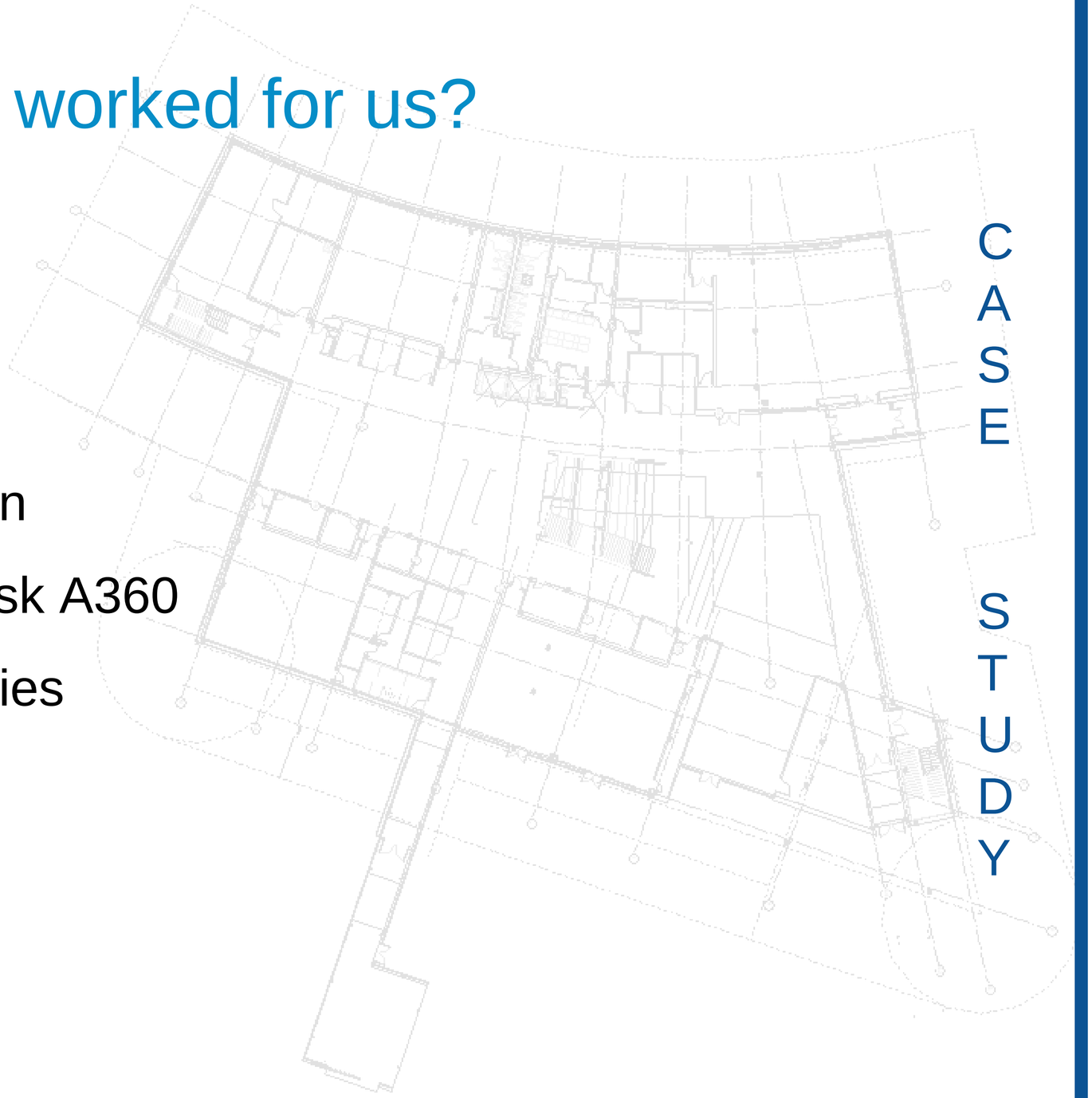
What Worked for us?



CASE STUDY

- Donor Funded Project
  - Formal Target Budget was established at the beginning

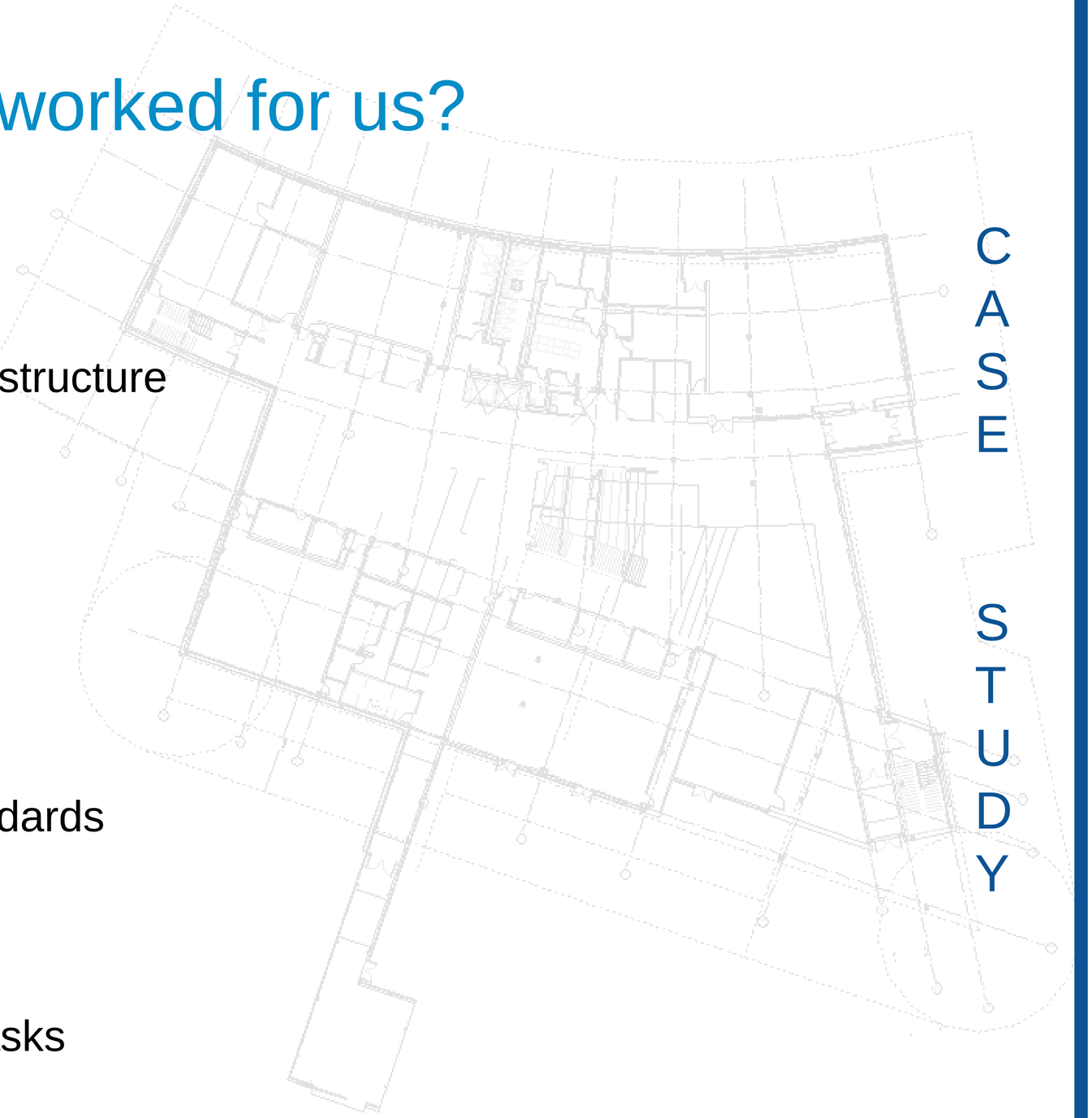
What worked for us?



CASE STUDY

- Collaborative approach
  - Extensive Communication
  - Collaboration via Autodesk A360
  - Allocation of responsibilities

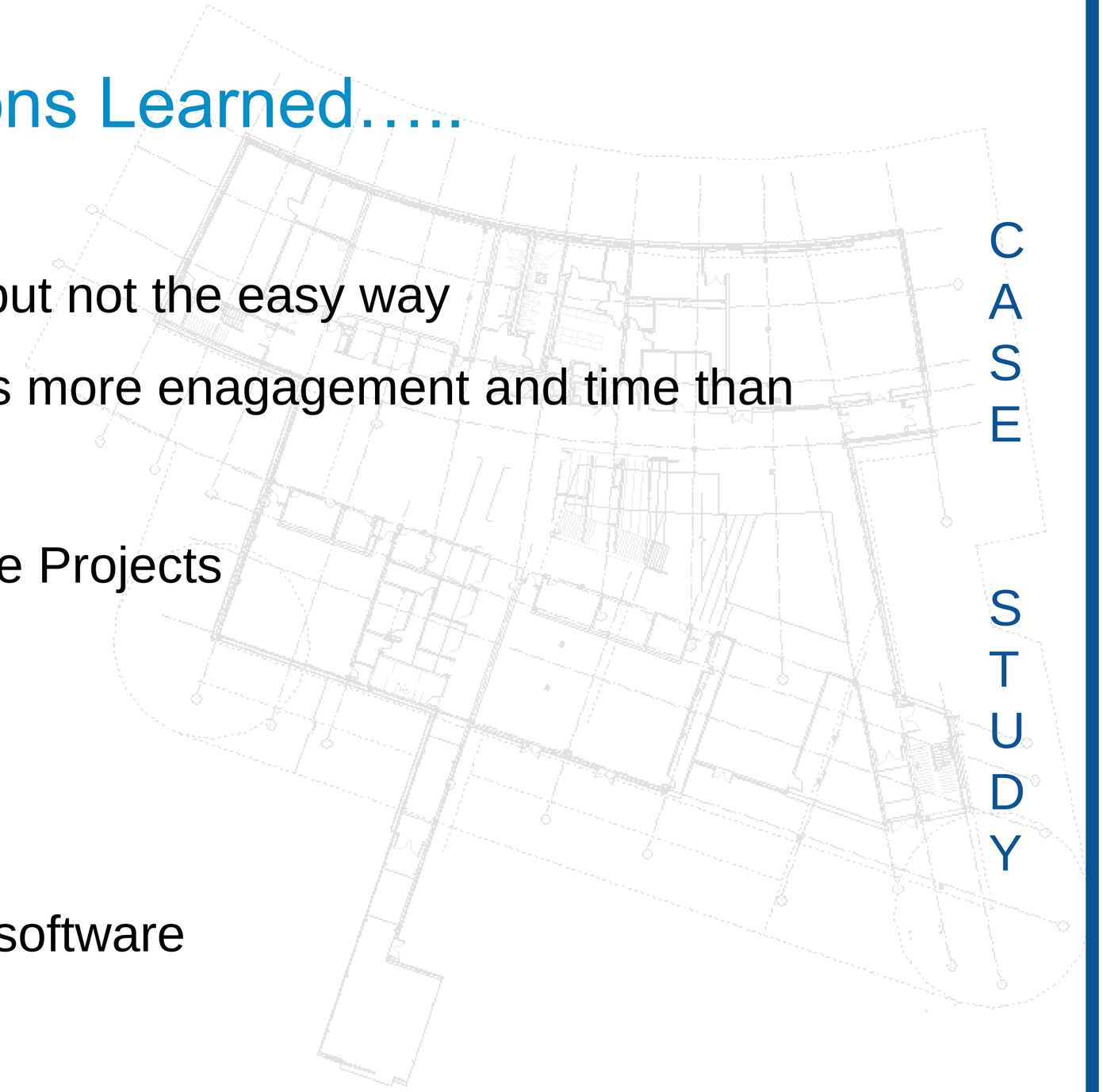
What worked for us?



CASE STUDY

- Established Protocol
  - Technology resources / Infrastructure
  - BIM Uses
  - Model data exchange
  - Model Quality Control
    - Model Accuracy
    - Clash Detection
    - Compliance with BIM Standards
  - File naming conventions
  - Frequency of model updates
  - Assigned responsibility for tasks

Lessons Learned…..



- Exceptionally Rewarding - but not the easy way
- Very collaborative - requires more enagagement and time than conventional methods
- Best strategy to deliver large Projects
  - Quickly
  - With best value
- Team members
  - Should be on the same software

CASE STUDY

CASE STUDY

“JUGNU”

THE FIREFLY

CASE STUDY

CASE STUDY

The Biggest Lesson We Learned…..

IPD is intrinsically lean…….
and collaborative to the core……

What was your biggest takeaway from this presentation?

Please leave a response in the Comments section for this class!

Acknowledgements

Thank you for your contributions -

Chris Kretovic, Cliff Baker, and Dan Laustein (Fishbeck)

Manoj Gunasekaran

Thank you **“Deepak Maini”** for outstanding Mentorship!

Thank you to **“Autodesk University” Team** & **“Janice Miller Kellerman”** for shepherding us.

Thank you to our families, colleagues and everyone part of this class for this opportunity to present our humble presentation.

Please reach us through comments if we can be of help or assistance.

Contact:

1. Ravi Wood

1. Rina Sahay

Sources:

1. https://econsultancy.com/how-to-plan-your-digital-strategy-with-the-prosper-framework/
2. **Penn State BIM Guide**: https://www.bim.psu.edu/owners_guide/
3. **Penn State BIM Guide**https://www.bim.psu.edu/owners_guide/
4. Lupiter: https://lupiter.co.in/contact-us
5. **NIBS National Institute of Building Science** https://www.nibs.org/page/nbgo
6. https://geospatial.blogs.com/.a/6a00d83476d35153ef01b8d08ebfa5970c-popup
7. https://cdn.ymaws.com/www.nysapls.org/resource/resmgr/2019_conference/handouts/hale-g_bim_loa_guide_c120_v2.pdf
8. https://www.autodesk.com/autodesk-university/blog/Top-AU-2019-Classes-CAD-and-BIM-Managers-2020?linkId=82229071
9. https://www.autodesk.com/sustainability/overview
10. https://www.autodesk.com/solutions/generative-design/architecture-engineering-construction
11. https://blog.capterra.com/comparison-of-5-construction-erp-software-options/
12. https://www.jansen.com/en/building-systems-profile-systems-steel/services-steel-systems/planning-bim-steel-systems.html
13. https://www.cadoutsourcingservices.com/blog/how-to-use-bim-in-facilities-management.php
14. https://www.aceee.org/grid-interactive-efficient-buildings-gebs
15. Autodesk: www.autodesk.com/autodesk-university/article/Forge-BIM-360-Docs-IoT-Hub-2019
16. Cove Tools: https://www.cove.tools/
17. Autodesk A 360.
18. Testfit.