



National Institute of
BUILDING SCIENCES™

The Intersection of Artificial Intelligence & Building Sciences

A New Era of Intelligent Infrastructure

NATIONAL INSTITUTE OF BUILDING SCIENCES

ONUMA Inc.



PRESENTERS



Roger Grant
Vice President,
Building Technology
Industry Standards Expert
National Institute of
Building Sciences



Jay Kline
BIM Program Manager
National Institute of
Building Sciences
U.S. Department of State
Bureau of Overseas Buildings
Operations



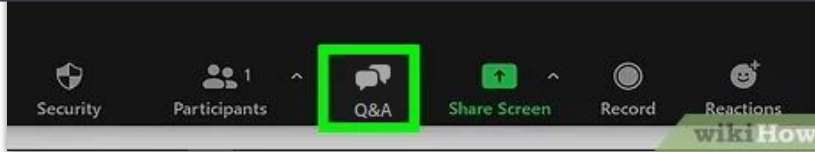
Kimon Onuma
FAIA
Architect
Prompt Architect
Onuma, Inc. /
BIMStorm.com



Artificial Intelligence
“AI”

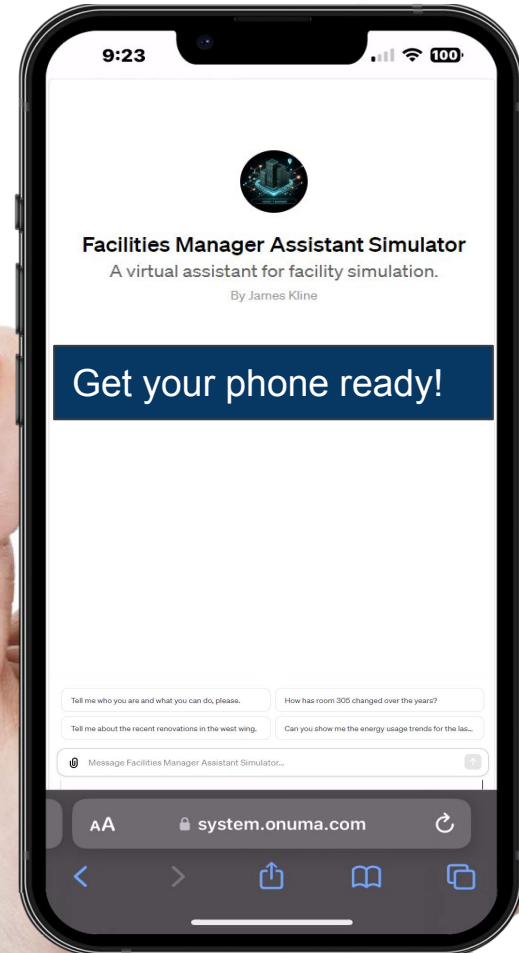


We will not have a formal Q&A at the end of this session.
Put your questions and thoughts in the Q&A.
Related links will be posted in the Q&A.



An AI Agent will be recording and taking notes of this session

A session immediately following this one at 3pm EST will be an open discussion about AI, Digital Twins and Asset Management.





OUR AREAS OF IMPACT

NATIONAL INSTITUTE OF BUILDING SCIENCES

NIBS represents an industry that has more than 733,000 employers* and creates over 7.56 million** construction jobs, as of December 2021. Each year, the industry creates nearly \$1.4 trillion worth of structures.

*<https://www.bls.gov/iag/tgs/iag23.htm>

**<https://www.agc.org/learn/construction-data>



Industry Leadership and Advocacy



Security and Disaster Preparedness



Facility Performance and Sustainability



Information Resources and Technology

Program Drivers

TOP DRIVERS FOR THE NATIONAL BIM PROGRAM

13-
21%

Increased Efficiency

Estimated savings via increased efficiencies in design and construction assembly in the next 10 years (Boston Consulting Group)

15%

Construction Cost

Potential public construction cost savings (UK Government Construction Strategy)

41%

Diminishing Workforce

Portion of the U.S. labor force that will retire by 2031, diversify through industrialized construction processes driven by digital automation (McKinsey)

60%

Construction Productivity

Long-term increased construction productivity through design-to-manufacturing processes supported by digital information (McKinsey)

100%

AECO Profitability

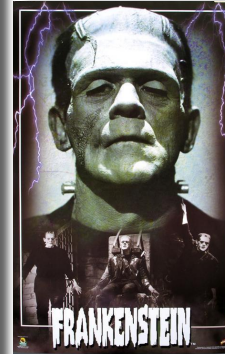
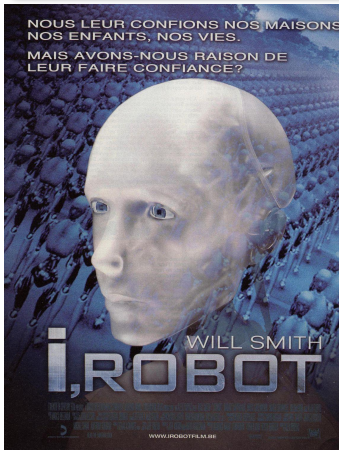
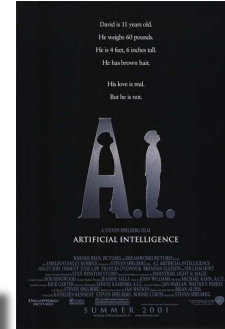
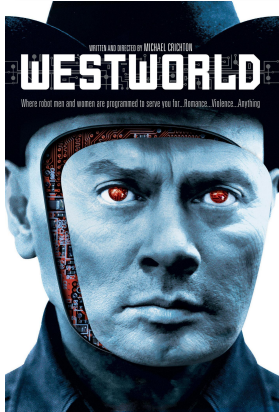
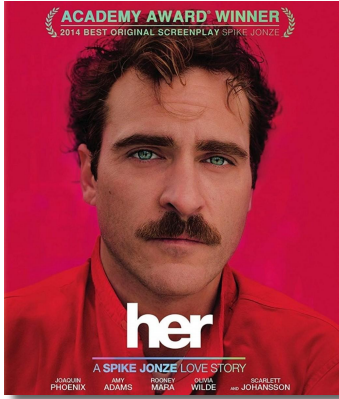
Proposed potential increase in profits for AECO players (McKinsey)

50-
52%

Greenhouse Gas

Reduce Greenhouse Gas emissions from 2005 by 2030. (Executive Order 14057)

The Rise of Artificial Intelligence: From Science Fiction to Building Science

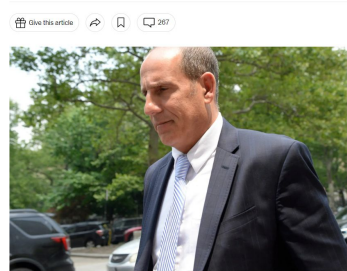


Rising AI and the Media

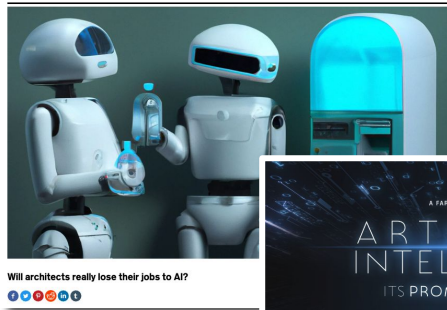


The ChatGPT Lawyer Explains Himself

In a cringe-inducing court hearing, a lawyer who relied on A.I. to craft a motion full of made-up case law said he "did not comprehend" that the chat bot could lead him astray.



Steven A. Schwartz told a judge considering sanctions that the episode had been "deeply embarrassing." Jefferson Sizer for The New York Times



Will architects really lose their jobs to AI?

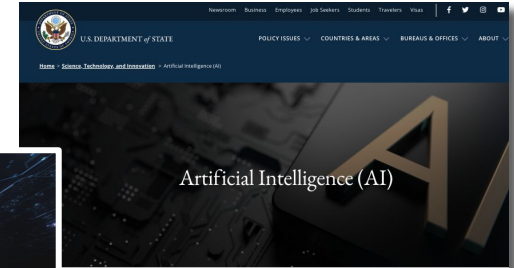


'New York Times' sues ChatGPT creator OpenAI, Microsoft, for copyright infringement



**Smaller firms will benefit...
Larger firms will benefit...
Many views...**

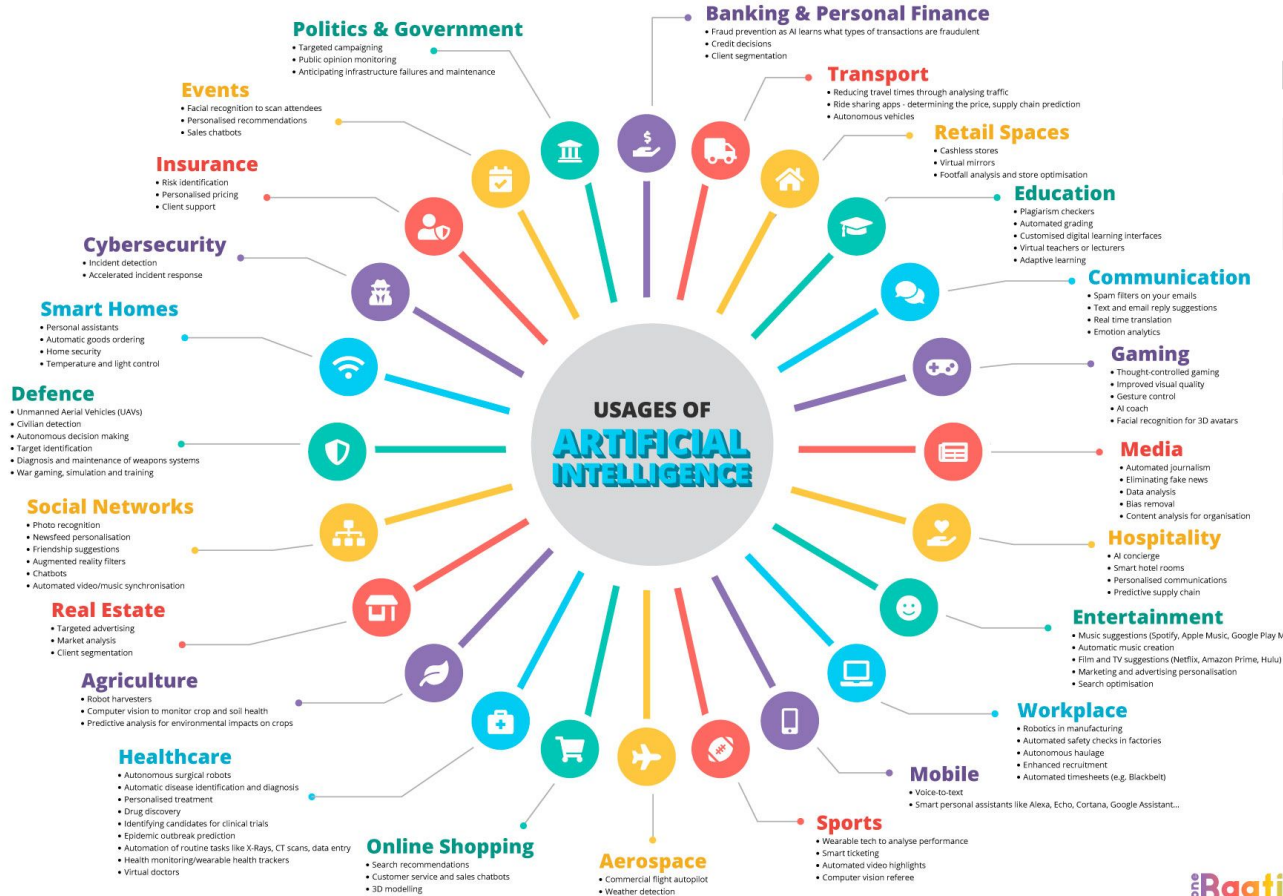
"A survey conducted by design technology firm RevitGods found that 55% of US architects are "moderately concerned" about being replaced by AI in the future, with a further 20% "very concerned"



Artificial Intelligence and Machine Learning to Accelerate Translational Research

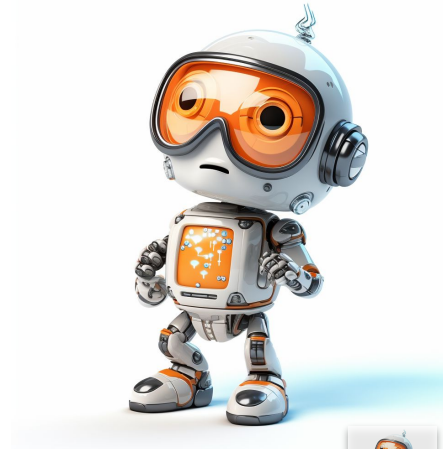


Ai is Being Used in our Everyday Lives



What IS AI?













Is Wave 3 suffering a Solow Paradox 2.0?

Digitization everywhere but uneven across sectors

Relatively low digitization  Relatively high digitization

● Digital leaders within relatively un-digitized sectors

2015 or latest available US data

Sector	Assets			Usage				Labor			GDP share %	Employment share %	Real productivity growth, 2005–15 %
	Overall digitization ¹	Digital spending	Digital asset stock	Trans- actions	Inter- actions	Business processes	Market making	Digital spending on workers	Digital capital deepening	Digitization of work			
ICT	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	6	3	4.4
Media	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	2	1	4.5
Professional services	Green	Green	Green	Orange	Green	Green	Green	Green	Green	Green	8	6	-0.4
Finance and insurance	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	7	4	0.8
Wholesale trade	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	6	4	0.6
Advanced manufacturing	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	3	2	1.7
Oil and gas	Green	Red	Red	Green	Green	Green	Green	Green	Green	Green	1	0.2	2.0
Utilities	Green	Red	Red	Green	Green	Green	Green	Green	Green	Green	2	0.4	-0.1
Chemicals and pharmaceuticals	Orange	Red	Red	Green	Green	Green	Green	Green	Green	Green	2	1	1.0
Basic goods manufacturing	Orange	Red	Red	Green	Green	Green	Green	Green	Green	Green	6	5	1.0
Mining	Orange	Red	Red	Green	Green	Green	Green	Green	Green	Green	1	0.3	-0.6
Real estate	●	Yellow	Red	Green	Green	Green	Green	Green	Green	Green	13	1	1.9
Transportation and warehousing	●	Orange	Yellow	Green	Green	Green	Green	Green	Green	Green	3	3	-0.7
Education	●	Green	Orange	Green	Green	Green	Green	Green	Green	Green	1	2	-0.6
Retail trade	●	Green	Orange	Green	Green	Green	Green	Green	Green	Green	6	11	-0.1
Entertainment and recreation	Red	Green	Red	Green	Green	Green	Green	Green	Green	Green	1	2	0.2
Personal and local services	Red	Green	Red	Green	Green	Green	Green	Green	Green	Green	5	10	0.1
Government	●	Yellow	Yellow	Orange	Orange	Orange	Orange	Orange	Orange	Orange	13	15	0.1
Health care	●	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	7	13	-0.2
Hospitality	●	Red	Red	Orange	Orange	Orange	Orange	Orange	Orange	Orange	3	9	-1.3
Construction	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	4	5	-1.5
Agriculture and hunting	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	1	1	0.6

- Knowledge-intensive sectors that represent the digital frontier, well-digitized across most dimensions
- Capital-intensive sectors with significant room to further digitize their physical asset base
- Service sectors with long tail of small firms and opportunities to digitize customer transactions
- B2B sectors with the potential to digitally engage and interact with their customers and users
- Labor-intensive sectors with the potential to provide digital tools and skills to their workforce
- Quasi-public or highly localized service sectors that lag across most dimensions of digitization

SOURCE: BEA; BLS; US Census; IDC; Gartner; McKinsey social technology survey; McKinsey Payments Map; LiveChat customer satisfaction report; Appbrain; US contact center decision-makers guide; eMarketer; Bluewolf; Computer Economics; industry expert interviews; McKinsey Global Institute analysis

2015 or latest available US data

Assets

Usage

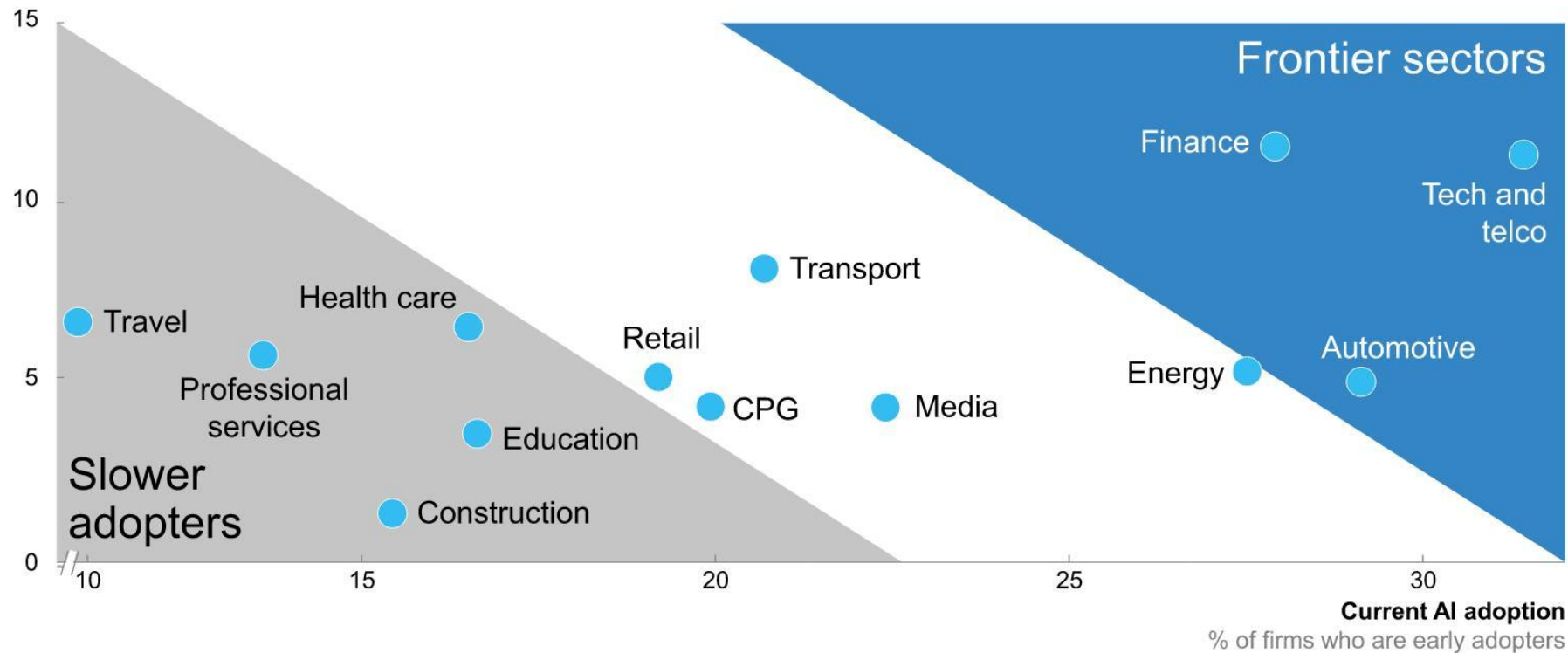
Labor

Sector	Overall digitization ¹	Digital spending	Digital asset stock	Transactions	Interactions	Business processes	Market making	Digital spending on workers	Digital capital deepening	Digitization of work	GDP share %	Employment share %	Real productivity growth, 2005–15 %
	ICT											6	3
Media		1									2	1	4.5
Professional services											8	6	-0.4
Finance and insurance											7	4	0.8
Wholesale trade					4						6	4	0.6
Advanced manufacturing											3	2	1.7
Oil and gas		2									1	0.2	2.0
Utilities											2	0.4	-0.1
Chemicals and pharmaceuticals											2	1	1.0
Basic goods manufacturing									5		6	5	1.0
Mining											1	0.3	-0.6
Real estate	●										13	1	1.9
Transportation and warehousing	●			3							3	3	-0.7
Education	●										1	2	-0.6
Retail trade	●										6	11	-0.1
Entertainment and recreation											1	2	0.2
Personal and local services											5	10	0.1
Government	●										13	15	0.1
Health care											7	13	-0.2
Hospitality	●	6									3	9	-1.3
Construction											4	5	-1.5
Agriculture and hunting											1	1	0.6

Currently AI adoption is uneven across sectors

Future AI demand

% Δ AI spending 2017–20



AI in Architecture, Engineering, Construction and Operations

TORIC AI Copilot Connectors Resources Pricing [Request a Demo](#) Log In

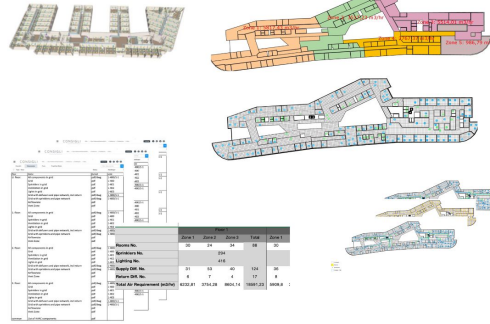
Join the Waitlist to our AI Copilot for Your Data. [Get Early Access](#)

AI + ETL for Construction

Back up all your construction data. Then put AI to work.

Collect Transform Visualize

TORIC.com



Consigli.no

What is Hypar?

Hypar is a design automation platform for buildings. Anyone, anywhere can create and share design logic so everyone can build better. Hypar delivers sector-specific applications, like our workplace planning solution, powered by our platform.

[Start building](#)

Hypar.io

ICC AI NAVIGATOR

Understand codes faster with ICC AI Navigator

The power of AI, trained by ICC experts.

[Use AI Navigator](#)

What is the minimum frequency for the inspection of commercial kitchen hoods?

In reference to Section 605.3.3.1 of the 2021 International Fire Code, the frequency of commercial kitchen hood inspections depends on...

Referenced Sections: 902.201.1(4)(3.3.1), 902.201.1(4)(3.3.1.1)

Harnessing the power of OpenAI
An AI assistant built for the future

- Navigate I-codes with the help of powerful AI
- Able to search multiple code years and across multiple I-Codes at once
- Trained and tested by ICC experts
- Users can help rate and improve the ICC's AI programming

If a building has more doors than required, do additional doors require exit signs?

When is glazing at the top of a stairway considered a hazardous location?

Are overflow drains required when repairing the roof of a historic building?

[Use AI Navigator](#)

Get answers to your compliance requirement questions anytime

AI Navigator can offer quick, helpful replies to basic code questions, and is programmed to help users navigate our I-Codes like an expert.

Codes.iccsafe.org/features/ai-navigator

Co-Author with TestFit's Real-Time AI

Site	Multifamily	Parking	Master Plan
Areaage	2.79 Units	319 1 Beds	150 Efficiency 84% Stalls 528 Stalls 528
FAR	2.77 Beds	431 2 Beds	112 Height 84.5 Average 390
DUI/AC	114.5 Stalls	431.9 Studios	57 Average 888 Ratio 1.66 Ratio 1.54
	Stalls Req.	479	Parking Req. 479

Testfit.io/

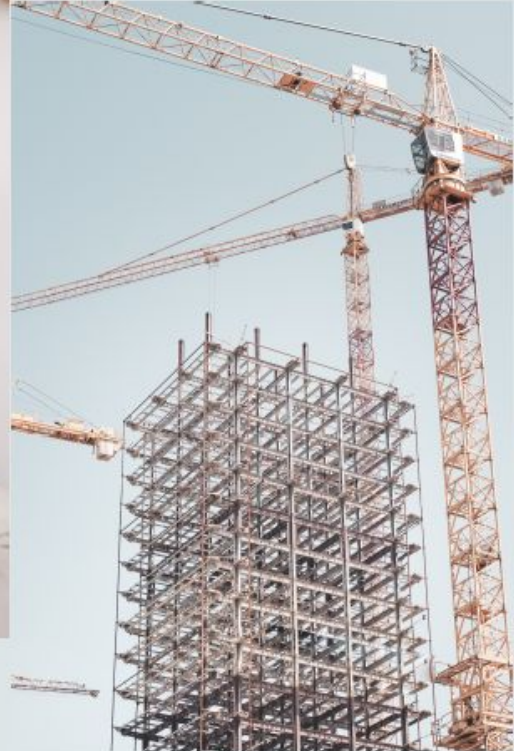
+ **Many more**

The autonomous engineer

Reduces cost, risk and carbon,

Contribute to a more sustainable real estate industry

Use AI and mathematics for optimised design and planning



CONSIGLI

Optimization using AI

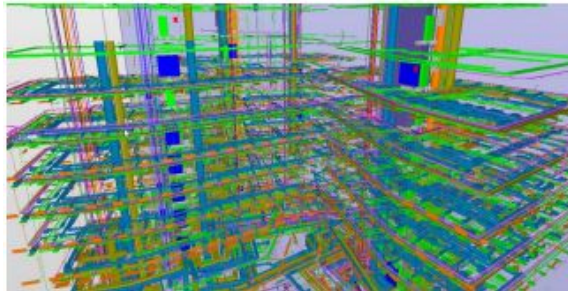
Precision



Performance



Materials



CONSIGLI

OPTIMISATION

Plant room

Room size reduction

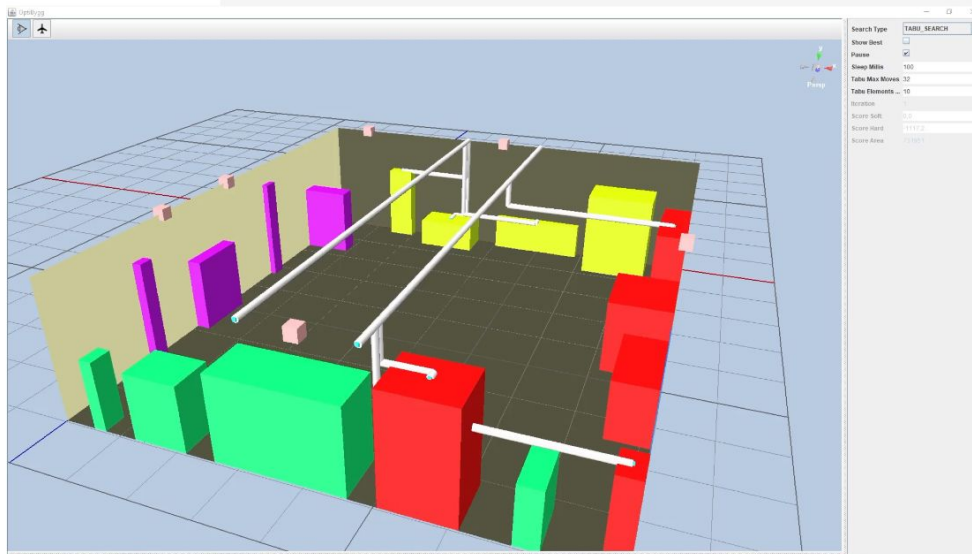
50%

Reduce the space needed for technical installations and get more lettable/sellable space

Reduced embodied carbon

20%

Reduce the amount of materials used in ducts, pipes and electrical installations, and reduce your embodied carbon



CONSIGLI

Owners and the Use of AI

The Future Of Work In The Age Of Generative AI: Insights From Davos

Ravin Jesuthasan Contributor @
I am a futurist and bestselling author on the future of work

Follow

Jan 21, 2024, 04:33pm EST



Davos 2024 RAVIN JESUTHASAN

Every year, after the inspirational whirlwind that is the Annual Meeting of the World Economic Forum (WEF) at Davos, I sit down to reflect on the themes that emerged during the week. Last year, we discussed the radical reassessment of how we think about work and jobs – what we called “Work’s Great Reboot.”

AI.gov Administration Actions Build your AI Skills Bring your AI Skills to the U.S. Make Your Voice Heard Apply Now Español

PRESIDENT BIDEN
MAKING AI WORK FOR THE AMERICAN PEOPLE
JOIN THE NATIONAL AI TALENT SURGE
Apply Now

PLAY VIDEO

INTRODUCTION
AI is one of the most powerful technologies of our time. President Biden has been clear that we must take bold action to harness the benefits and mitigate the risks of AI. The Biden-Harris Administration has acted decisively to protect safety and rights in the age of AI, so that everyone can benefit from the promise of AI.
Learn More about the Biden-Harris Administration's Actions

U.S. DEPARTMENT OF STATE
POLICY ISSUES COUNTRIES & AREAS BUREAUS & OFFICES ABOUT

Home > Science, Technology, and Innovation > Artificial Intelligence (AI)

Artificial Intelligence (AI)

Secretary Blinken's remarks at the NSCAI Global Emerging... Watch later Share

The Honorable Antony Blinken

U.S. SECRETARY OF STATE

Watch on YouTube

IT MODERNIZATION
Centers of Excellence Search CoE

Home About Us Centers Practice Areas Communities News Connect

Community of Practice: Artificial Intelligence

JOIN THE CONVERSATION

Artificial intelligence, the ability of machines to pattern human behavior at scale, is used in an increasing number of ways to help government agencies meet their missions.

About the AI Community of Practice

The **Artificial Intelligence Community of Practice (AI CoP)** unites federal employees who are active or interested in AI policy, technology, standards, and programs to accelerate the thoughtful adoption of AI across the federal government. We are an active community of 1200 members across 60 federal agencies.

Join the AI CoP

GAO
U.S. Government Accountability Office

For Congress | Press Center | Careers | Blog

REPORTS & TESTIMONIES VIEW TOPICS VIEW AGENCIES BIO PROTESTS & APPROPRIATIONS LAW ABOUT

Home > Reports & Testimonies > Artificial Intelligence: Agencies Have Begun Implementation but Need to Complete Key Requirements

Artificial Intelligence: Agencies Have Begun Implementation but Need to Complete Key Requirements

GAO-24-105980
Published: Dec 12, 2023. Publicly Released: Dec 12, 2023.

Jump To

+ **Many more**

Hallucinations in the Building Industry Existed Long Before AI

Retail trade

Entertainment and recreation

Personal and local services

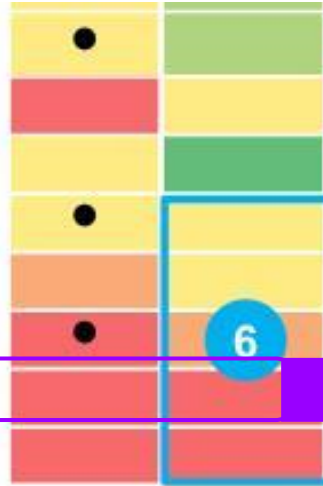
Government

Health care

Hospitality

Construction

Agriculture and hunting



Moving from AI Hallucinations to Informed Decisions

[BIMStorm.com/blog](https://www.bimstorm.com/blog)

Harnessing Proven Technology Strategies to Sidestep the Kodak Fate in the AECO Industry





BIM
STORM

A0CHARRETTE0FOR01
00010110110001010
ARCHITECTS0101001
100001011&1010010
110101010MACHINES
00010110110001010
00010110110010010
JOIN BIMStorm.com
5.27.2023101110AM

AiAIA

AIA Japan

PROMPT ARCHITECT



Owner Program Requirements

SPACE



Program2BIM.org



Healthcare BIM Room Templates



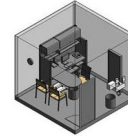
Exam (11)

SEARCH

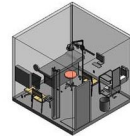
- Classroom
- Dental
- Exam
- Eye / Hearing
- Food / Rest
- Laboratory
- Laundry
- Library
- Meeting



EXEN1 - Exam, Ent
Area: 120 SF
Type: Exam
Total Components: 24
Select Quantity:



EXOS1 - Exam, Speech-Language Pathology
Area: 120 SF
Type: Exam
Total Components: 20
Select Quantity:



EXRG0 - Exam Room, VA
Area: 120 SF
Type: Exam
Total Components: 25
Select Quantity:

A Conversation Between Architects and AI for Planning with Data



Based on our chat, create a program requirement table to generate a BIM using Program2BIM



OpenAI
ChatGPT 4.0

Here is program requirement for a clinic to serve a population of 6,800 people.

Assuming that the new clinics in Shibuya, Ikebukuro, and Tachikawa will each serve a population of 6,800 people, we can use the existing program as a template and make adjustments where necessary. Here is a modified program for each of the new clinics:

Clinic in Shibuya:

Name	Number	Area	Air Change Rate	Floor Material	Lighting Level	Noise Level Maximum	Temperature Summer	Temperature Winter
Cashier	CASH-1	55.29410017	1	Carpet Tile	300	45	75	75
Cashier	CASH-1-1	55.29410017	1	Carpet Tile	300	45	75	75
Computer Room	CMP01	110.0003832	2	Raised Rubber Flooring	150	45	75	75
Computer Room	CMP01-1	110.0003832	2	Raised Rubber Flooring	150	45	74	70
Computer Room	CMP01-2	110.0003832	2	Raised Rubber Flooring	150	45	74	68



Learn this list of assets for a microgrid that can provide power to the field hospital:



Based on the list of assets for a microgrid, I can suggest a setup for a temporary field hospital. I'll consider the available assets that produce and consume energy and prioritize those that can provide a stable energy supply for the field hospital:



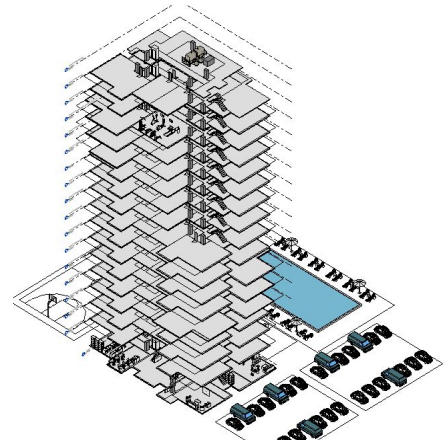
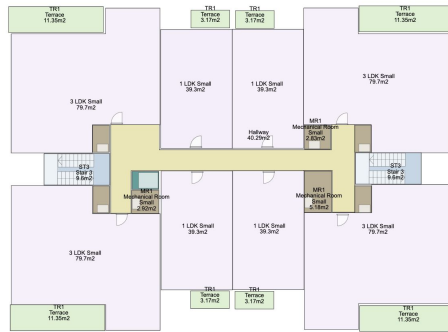
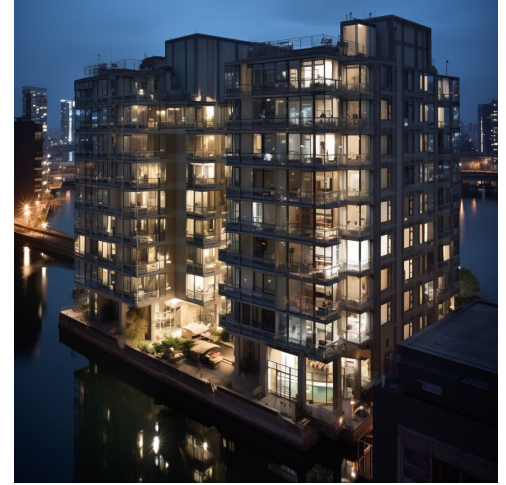
Asset List Published

Timestamp	Asset Name	Width	Depth	Height (optio- nal)	Does this asset consume or produce energy?	Quantity	ID C191 F102
5/25/2022	CLURA Healthcare Pod	8	20	80	Consume	1	F102
5/11/2022	Containerised Solar Microgrid				Produce		F102
5/11/2022	24kW Microgrid w/ Back-Up 20kW Diesel Genset	8.5	40	10	Produce		F103
5/11/2022	Panellized Solar Microgrid				Produce	2	F103
5/11/2022	Tent Structure				Produce	2	F103
5/11/2022	Galvanized Steel Poles	2	7	2	Produce		F104
5/11/2022	Connectors, Stakes, Ties	3	4	2	Produce	1	F105
5/11/2022	PowerPack 20 Units				Produce	6	F107
5/11/2022	20kW Solar Array	12	4	5	Produce	6	F108
5/11/2022	2kW NUJ Solar Kit	2	1	4	Produce		F109
5/11/2022	1kW Solar ChargeTarp	4	4	0.5	Produce		F110
5/17/2022	14kW Tesla Mobile Power Unit	4	4	5	Produce		T101
5/17/2022	10kW Solar Array	8	4	5	Produce		T103
5/15/2022	Genset 1 MW (Diesel)	8	40	8.5	Produce		T104
5/15/2022	Genset 2 MW (Diesel) (Large crane operation)	8	40	8.5	Produce		T105
5/15/2022	Containerised Resistive Load Bank	8	20	8.5	Produce		T106
5/16/2022	PowerPack Reefer Container MCGG-C500H	8	20	8.5	Produce		T107
5/16/2022	Energy Storage (est. 105kWh)	8	20	8.5	Produce		T108
5/16/2022	EV Charging Station with 20 x 150kWh fast charging points	8	15	8	Produce		T109
5/15/2022	Genset 1 MW NHQ Ammonia	8	40		Produce		T110
5/15/2022	Genset 2 MW NHQ Ammonia (Large crane operation)	8	40		Produce		T111
5/23/2022	40R Containerised Home (basic fit 0x0)	8	40		Consume		T112
5/23/2022	40R Containerised Office (basic fit 0x0)	8	40		Consume		T50
5/23/2022	40R Containerised Medical Unit	8	40		Consume	20	

These assets will provide power for the following energy-consuming assets in the field hospital:



Resulting BIM using AI and Program2BIM



BIM of Program Requirements, Cost & Energy Estimate

Ai Studies for Top Floors

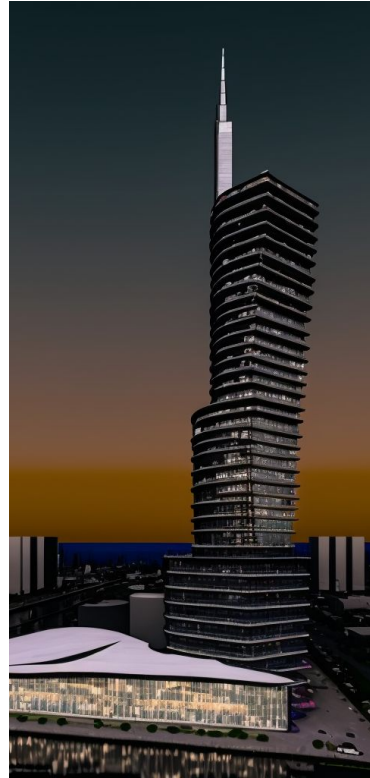
Ai Adjusted Massing Curves + Base

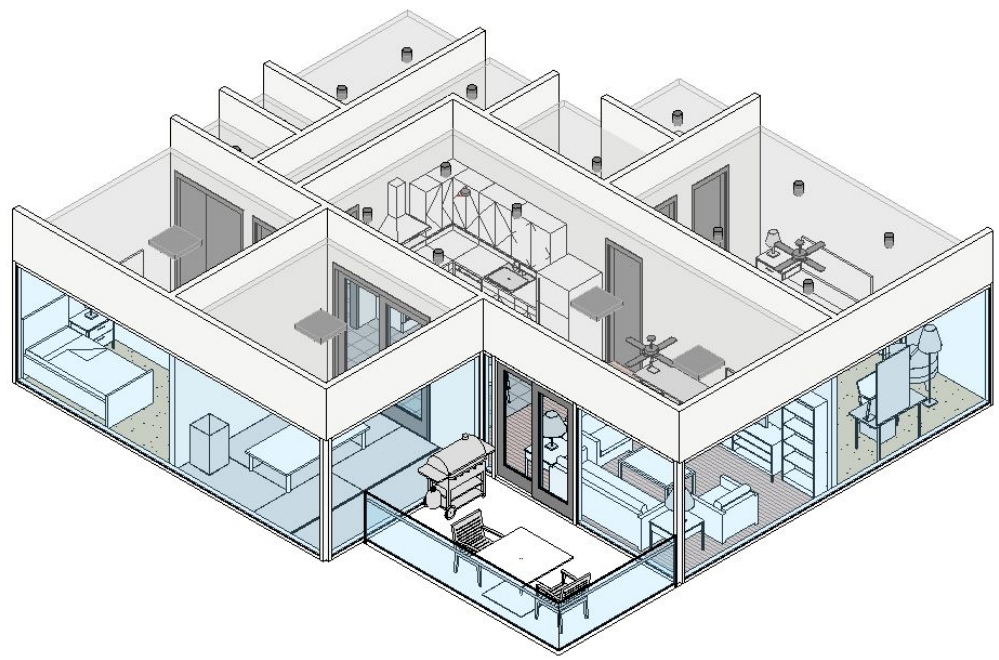
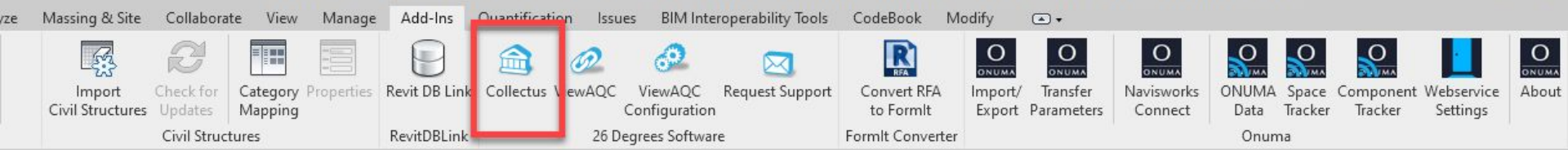
Architectural Prompt: Render the top four floors looking down at city. Night time view into units

\$288,570,110
¥39,387,944,309

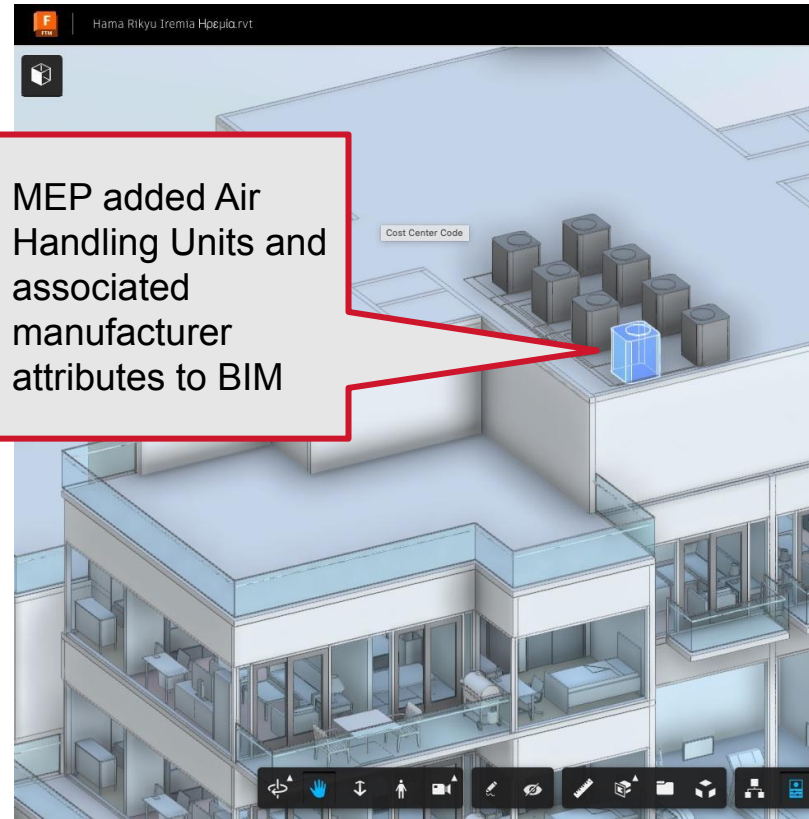
Building Name: Retirement Housing 30 Floors

Building Gross Area: 21,901.66 m²
Energy Generated kW: [Energy Generated kW]
Energy Consumed kW: [Energy Consumed kW]
Asset Category: [Asset Category]





Energy Monitoring



Hama Rikyu Iremia Hōejia.rvt

iel

Search

- 238143-ASHP-Split System
- 238143-ASHP-Split System
- 238143-ASHP-Split System
- 238143-ASHP-Split System
- 238143-ASHP-Split System
- 238143-ASHP-Split System
- 238143-ASHP-Split System
- 237313-ICSAHU-Horizontal

Site (1)

Entourage (28)

Walls (39)

Doors (1)

Railings

Ceilings

Fire Alarm Devices

Pipes

Pipe Fittings

Ducts

Air Terminals

Duct Fittings

238143-ASHP-Split System

Ctrl + Click to preview the link

Service Ven... JOHNNY COOL SPOT

Service Ven... 800-COOL-SPOT

Condition C... NEW

Condition a... 02 MAY 2023

Substantial ... 16 MAY 2023

Type Name 7kw

Assembly C...

Cost \$2000.00

Description AIR SOURCE HEAT PUMP CONDENSER UNIT

Keynote

Manufacturer CARRIER

Mech EQ Co... HP

Mech Gas H... No

Model 25VN

Type Comm...

Type Image

Air Handler 13

Air Handler 14

Air Handler 15

Air Handler 28

Air Handler 29

Air Handler 30

342.97 kW

64.32 °F

System Uptime: 23 days, 16:21:01

Building Power and OA Temperature - 1 Year

800

700

600

500

400

300

200

100

0

104

96

88

80

72

64

56

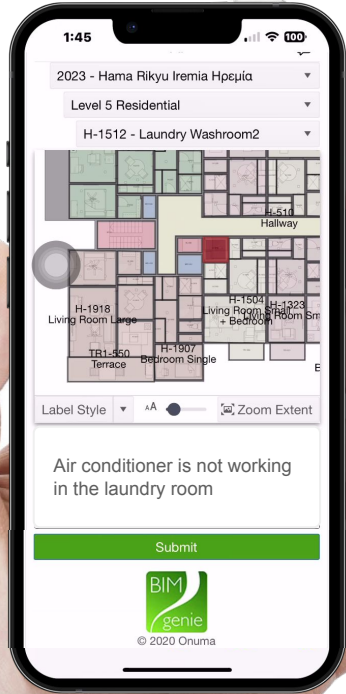
48

40

0



Delivery Back to Owner and a Digital Twin for the Life Cycle of Facilities - Real Time Work Orders



PortsStorm: Assets, Rules, and BIM Linked to the PortsStorm Digital Twin and Business Process Models

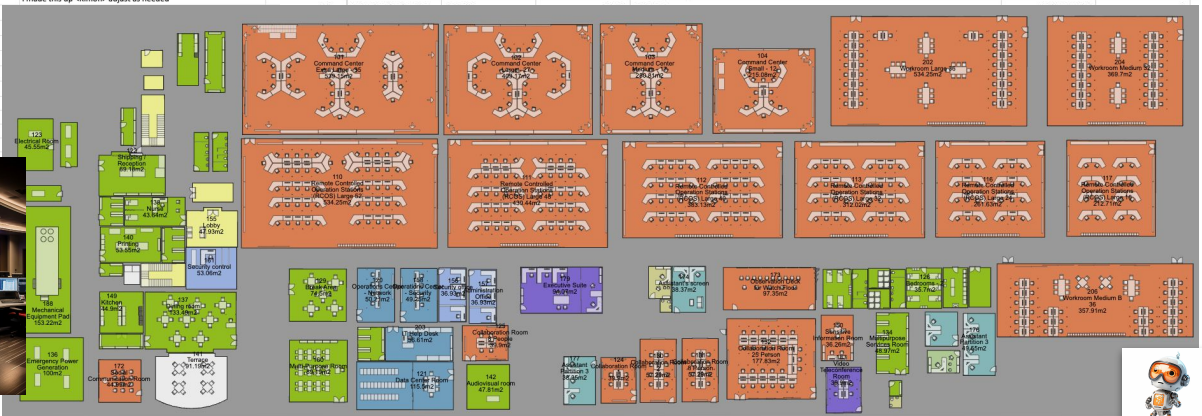
Port Asset Calculator	Edit These Values	Calculations	Workstations / Office Space	Personnel Needed	Building SM	Notes
1 Berth Length (Pull down to select other value)	400					
2 Berth Rule of Thumb per crane	100				Meters	Jon is this an ok first input to recalculate the items below?
3 Ship to Shore Crane (STS)		4			STS Cranes	Is this the correct Rule of thumb?
4 Rubber Tyred Gantry Crane (RTG)	3	12				Jon please confirm, calc, 3 RTG per 1 STS
5 Cargo Ship Length	400					
6 Cargo Ship (400 M)		1			Cargo Ships	
7 Rule of thumb for Yard Storage Per Cargo Ship	1000					I made this up <Kimon> adjust as needed
8 Containers in the Yard		1000				I made this up <Kimon> adjust as needed
9 RCOS Workstations Needed Per STS	1					Jon I see you adjusted this from 3 to 1, thanks
10 RCOS Workstations Needed Per 6 x RTG	2					Jon please confirm, calc, RCOS for STS and RTG total
11 RCOS Total Number of Workstations		6	6			I made this up <Kimon> adjust as needed
12 RCOS Number of Shifts per Day	3					I made this up <Kimon> adjust as needed
13 RCOS Maximum Number of Personnel all Shifts				18		I made this up <Kimon> adjust as needed
14 RCOS SM Per Workstation including Circulation	15					I made this up <Kimon> adjust as needed
15 Remote Controlled Operation Stations (RCOS) Total Area SM					90	Terminal Building
16 Command Centre Workstations Needed Regardless of STS	20					Fixed number regardless of STS or RTG, 15-20, using 20 for now
17 Command Center Number of Workstations		20				I made this up <Kimon> adjust as needed
18 Command Center SM Per Workstation including Circulation and Data Wall	20					I made this up <Kimon> adjust as needed
19 Command Centre Total Area					400	Terminal Building
20 Planning Room	1		6			Jon, added planning room with 6 workstations per your email
21 Personnel needed in Yard Per Crane, Includes all shifts	50					I made this up <Kimon> adjust as needed
22 Total Number of Personnel in Yard?				200		
23 Canteen/Rest Area SM Needed Per Employee	2					
24 Maintenance / Repair Workshop SM needed per STS	200				400	
25 Maintenance / Repair Workshop SM needed per STS					800	
26 Housing Provided for percent of staff	20%					
27 Total Personnel Housing		44				
18 Story Condo for Personnel Offsite					11104	
Total Office Space Needed			32			
Total Personnel all Shifts				218		
Total Building Area						

Program2BIM PortsStorm

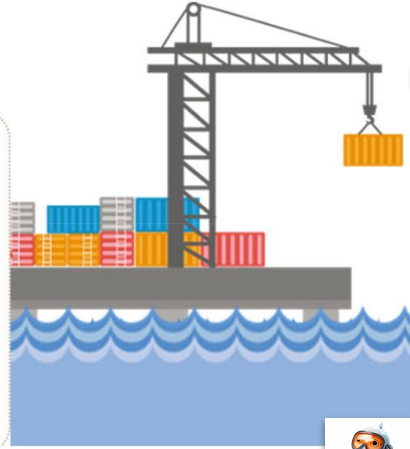
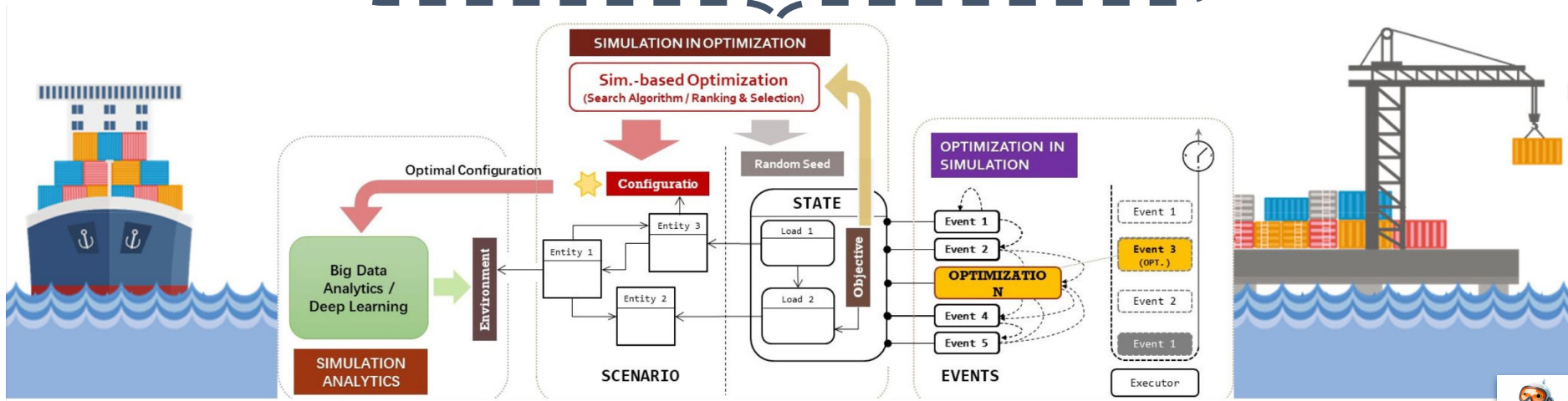
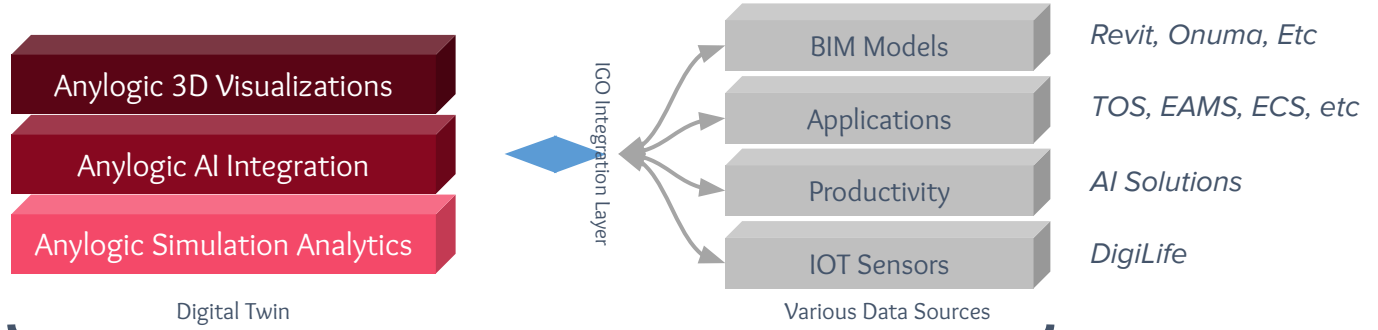
File Edit View Insert Format Data Tools Extensions Help

Menus 100% \$ % .0 .00 123 Arial 10 B I A

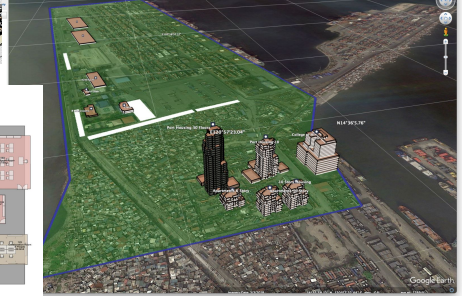
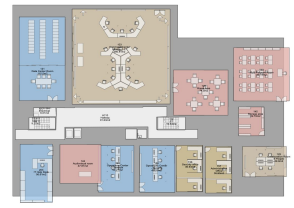
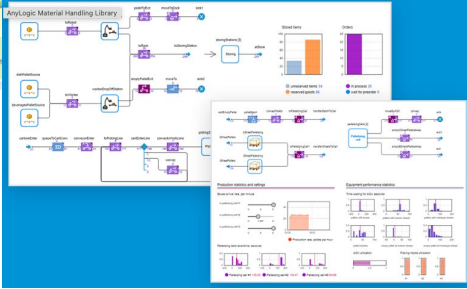
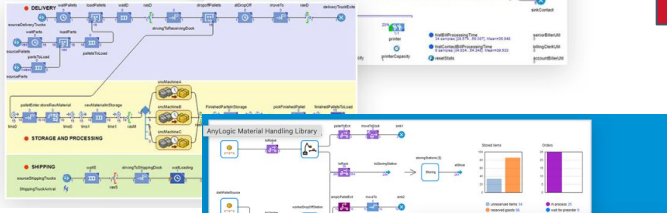
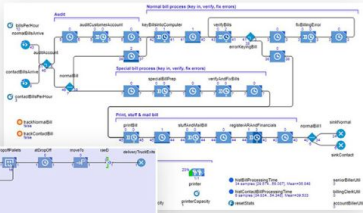
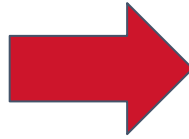
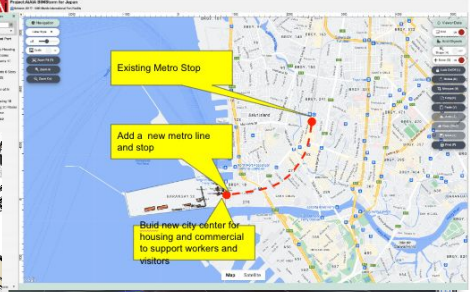
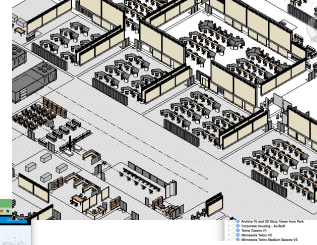
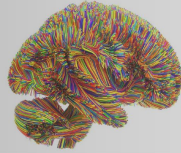
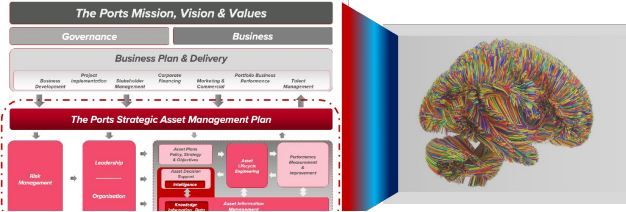
	A	B	C	D	E	F
	Floor	Space Code	Space Number	Space Name	Area	Quantity
1	Ground Floor	PT68	101	Stair 1	276	1
2	Ground Floor	PT31	102	Elevator	82.49999	1
3	Ground Floor	PT69	103	Stair 2	319.9548	1
4	Ground Floor	PT39	104	Lobby	515.8775	1
5	Ground Floor	PT61	105	Security control	571.1737	1
6	Ground Floor	PT64	106	Shipping / Reception	744.6908	1
7	Ground Floor	PT11	107	Cafe	296.7172	1
8	Ground Floor	PT70	108	Storage area	218.2349	1
9	Ground Floor	PT30	109	Electrical Room	149.1797	1
10	Ground Floor	PT33	110	Emergency Power Generation	1076.391	1



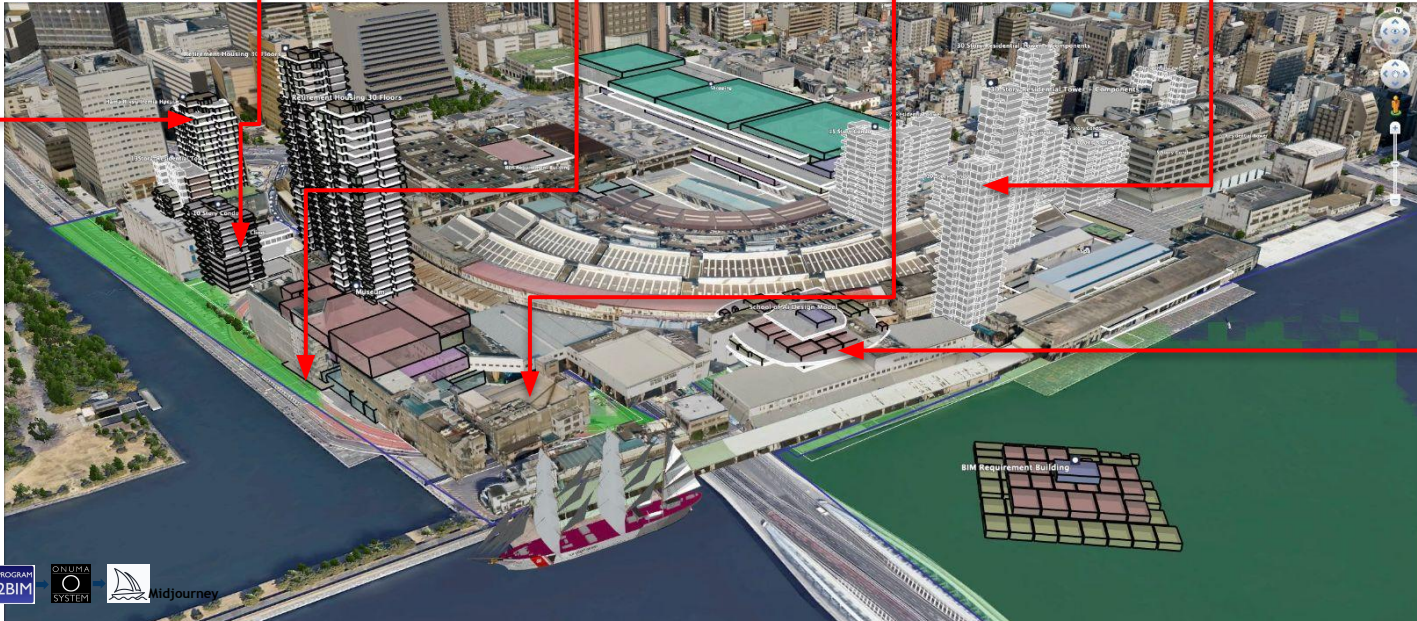
Digital Twins Visualized by Linking the Simulations to the Physical World and Scenarios



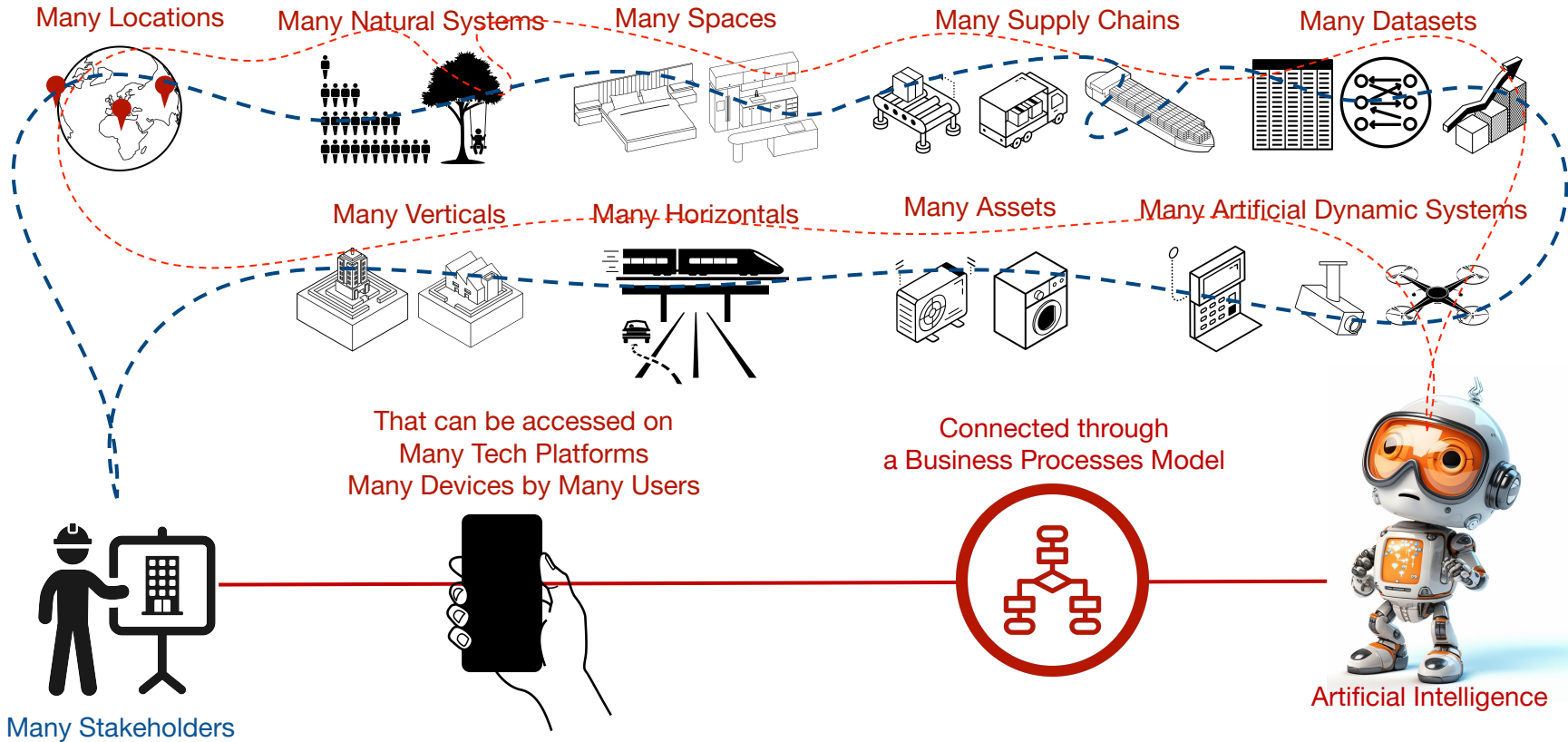
Business Process and Rules Driving into Digital Twins and AI



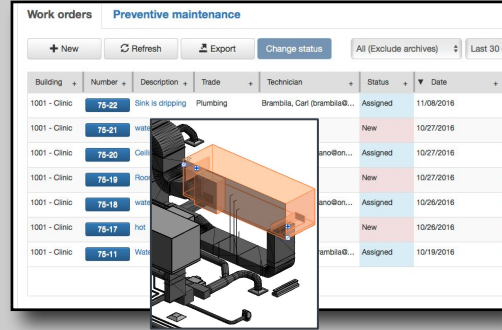
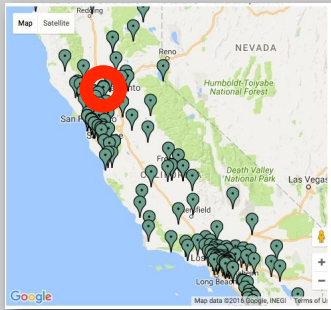
Program



Digital Twins and AI - Connected System of Systems



Digital Twin of the California Community Colleges 37



72 Districts
~5,000 Buildings
~90M sf / 8M sm

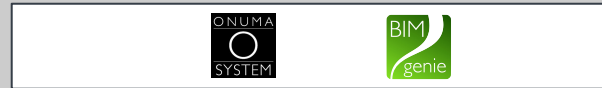
One District Level Such as:
Los Angeles Community Colleges
~742 Buildings, ~12M SF / 1.1M sm

Buildings and Spaces
Building Information Models
Accurate Geometries

Asset Management
Work Orders
Preventive Maintenance

Building and Space Inventory at State Level

Individual Asset at District Level

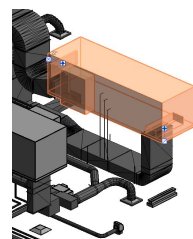
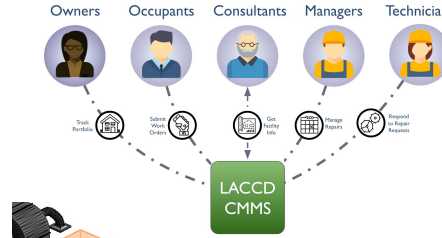
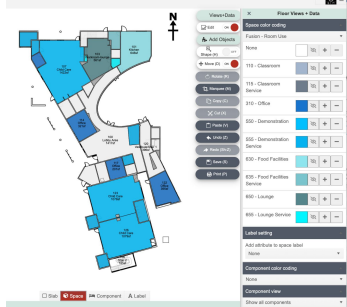


Data from BIM, GIS, CMMS into AI

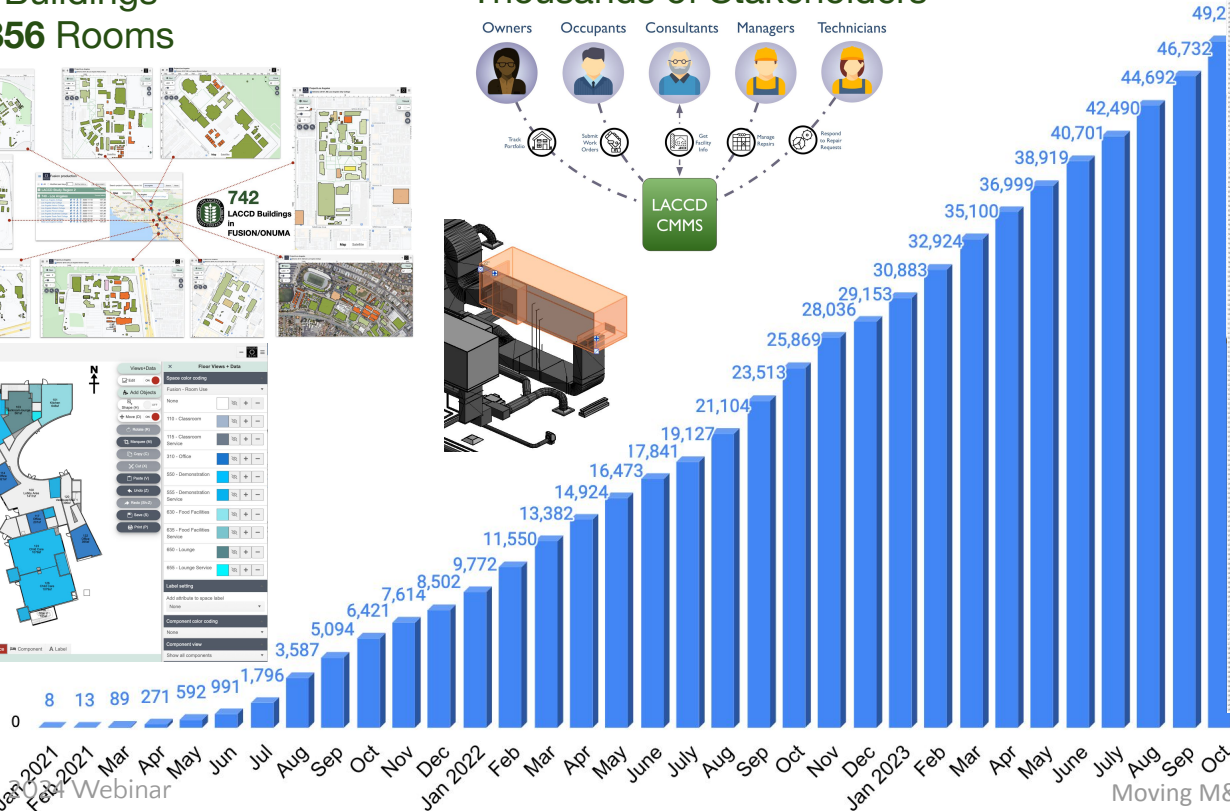


1,171 Acres
11,642,835 OGSF
742 Buildings
10,856 Rooms

Over 49,000 Work Orders
Over 5,000,000 Data Points
Thousands of Stakeholders




A lot of data, constantly updated



How to use AI and Chat



BIMgenie Campus 1 Analyst

Data Analyst for Campus 1 space and work order insights

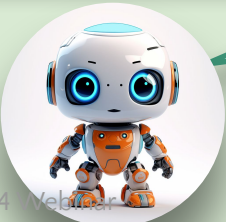
By Kimon G Onuma

What insights can I get as a facility manager at a community college from my data in the BIMgenie CMMS System?

Here..



OpenAI
ChatGPT 4.0



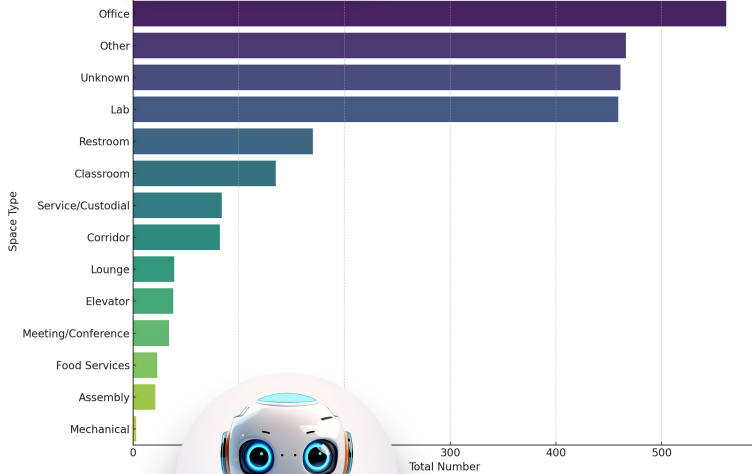
Campus 9 - Analyze Space Types and Work Orders



Analyze the space names, and create high level types. For example all restrooms, toilets or class classrooms, lab, laboratory. The names may vary but I want to group the spaces by type. Create a space type list.



Total Number of Each Space Type (Split Classroom/Lab)



Finished working

Show work

Here is a table of the space types along with the number of work orders requested and completed:

Space Type	Total Work Orders	Completed Work Orders
Office	561	230
Other	466	205
Unknown	461	199
Lab	459	216
Restroom	170	76
Classroom	135	38
Service/Custodial	84	31
Corridor	82	43
Lounge	39	13
Elevator	38	18
Meeting/Conference	34	16
Food Services	23	9
Assembly	21	4
Mechanical	3	2

From the table, we can observe that "Office," "Other," "Unknown," and "Lab" have the highest number of total work orders, while "Mechanical," "Assembly," "Food Services," and "Meeting/Conference" have the lowest number of total work orders. The "Completed Work Orders" column shows the number of work orders that have been marked as completed for each space type.

Campus 2 - Asset Counts for Preventive Maintenance



Analyze the type of Work Orders there are for PM Scheduler requests? For example Fire Extinguisher, filter changes etc



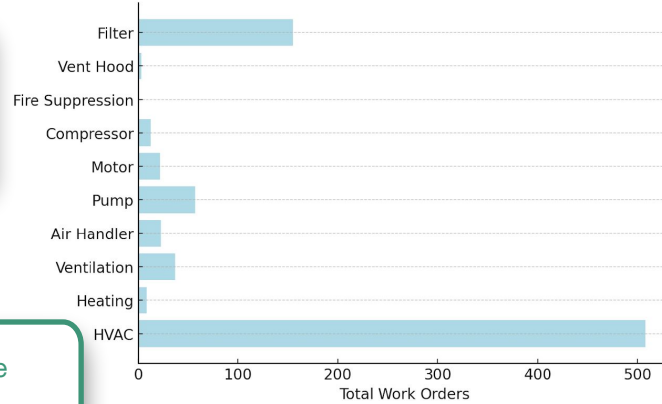
OpenAI
ChatGPT 4.0

Here are the most common themes or requests in the Preventive Maintenance (PM) Scheduler related work orders:

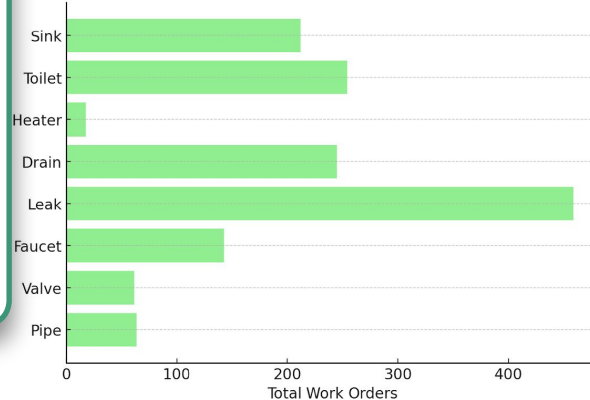
- Fire Extinguisher: 2,292 mentions
- Inspect: 2,004 mentions
- Maintenance: 1,587 mentions
- See Procedure: 1,578 mentions
- Roof: 1,272 mentions
- Monthly: 1,200 mentions
- Visually: 1,154 mentions
- Working: 1,150 mentions



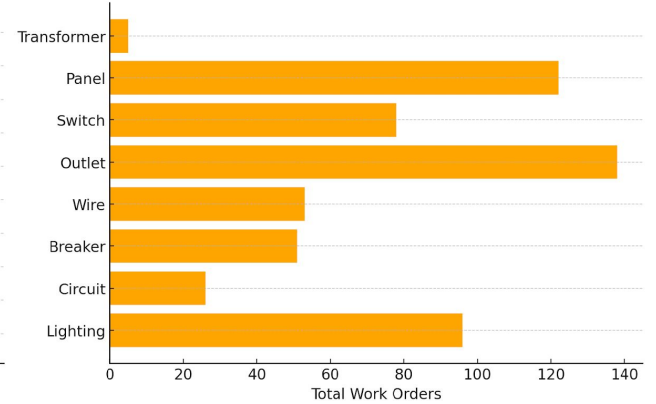
Mechanical



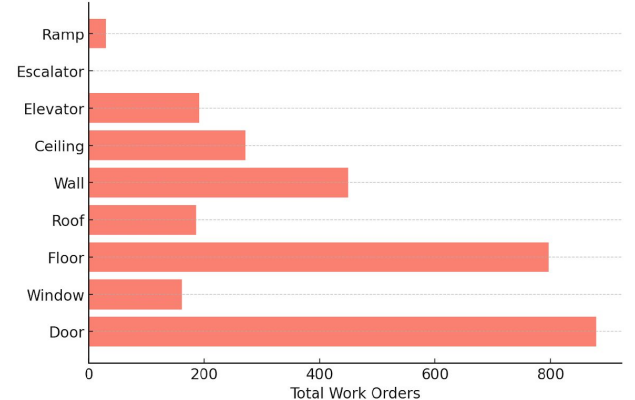
Plumbing



Electrical



Other



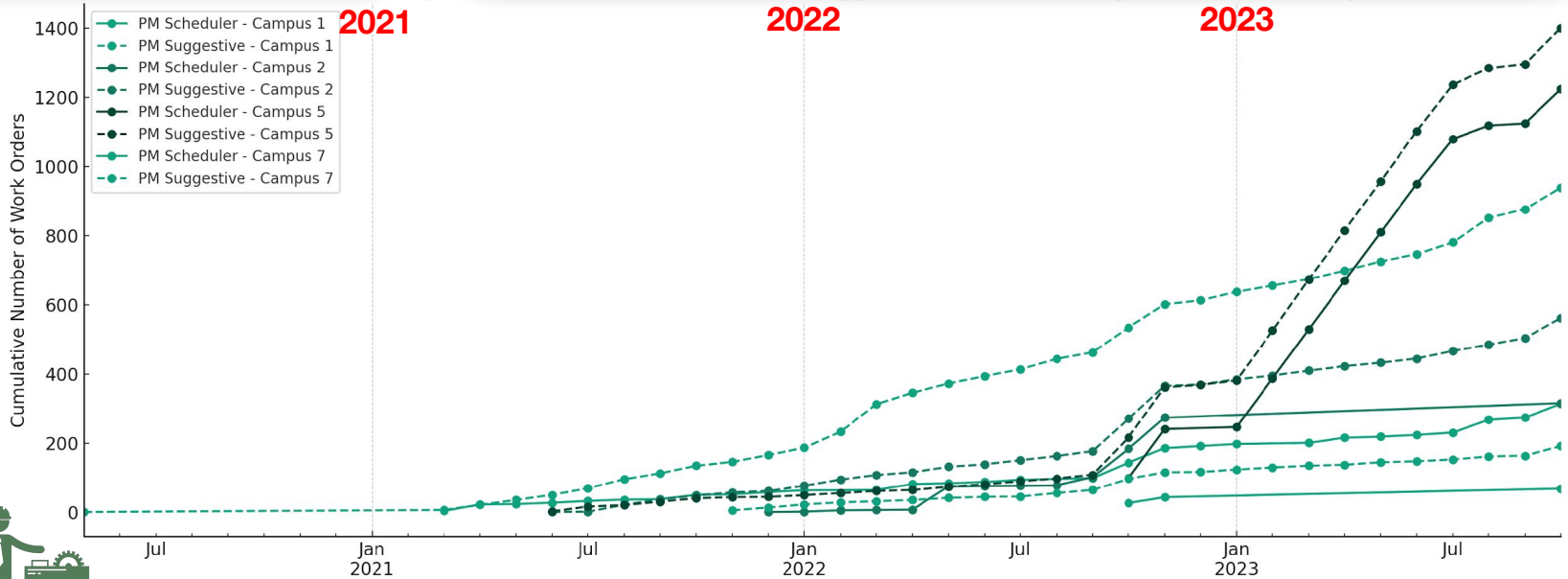
Four Campus - PM Schedule and PM Suggestive WO



Create a chart that shows a month by month timeline of the entire period of Request Date of Work orders that are PM Suggestive AND that are marked as submitted by "PM Scheduler" to see a trendline of PM Suggestive WO being moved in the PM Scheduler

- To create a cumulative comparison between PM Scheduler submitted work orders and PM Suggestive work orders we will:
 - Filter Work Orders: Filter the work orders to include only those submitted by "PM Scheduler" OR are PM Suggestive
 - Extract Request Dates: Extract the request dates from the filtered work orders.
 - Group by Month: Group the work orders by month and count the number of work orders for each month.
 - Create a Cumulative Chart: Create a chart that displays the cumulative trend of PM Scheduler submitted work orders and PM Suggestive work orders over time.

Cumulative Comparison of PM Scheduler and PM Suggestive Work Orders by Month for All Campuses



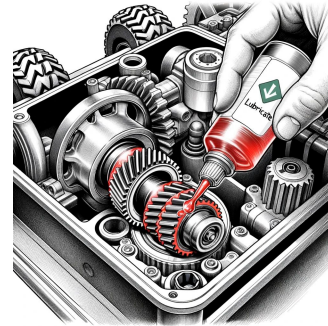
Four Campus - PM Schedules, Cart Maintenance



Create the steps I can feed into DALL-E 3 to create an Ikea type illustrated instruction manual for the technician to follow. Create the text now for me to use. Source the steps from the CMMS data for preventive maintenance.

Step 5: Lubricate Components

- Instruction: Lubricate according to manufacturer's recommendations.
- Tools Needed:
 - Manufacturer's recommended lubricant



OpenAI
ChatGPT 4.0



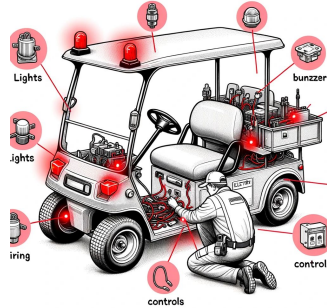
Step 1: Inspect Battery Terminals

- Instruction: Remove and clean battery terminals. Clean posts and reconnect terminals.
- Tools Needed:
 - Battery terminal cleaner brush
 - Measuring containers



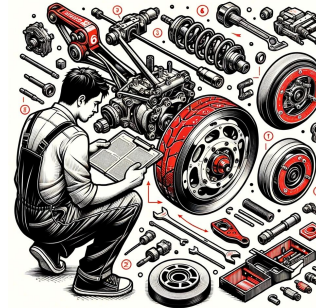
Step 2: Check Electrolyte Specific Gravity

- Instruction: Check electrolyte specific gravity with a hydrometer.
- Tools Needed:
 - Hydrometer



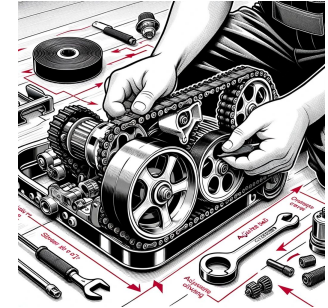
Step 4: Inspect Electrical Components

- Instruction: Inspect lights, buzzers, controls, and wiring for tight connections and proper operation.
- Tools Needed:
 - Leak detector (soap solution)



Step 6: Inspect Mechanical Components

- Instruction: Check brakes, clutch, wheels, tires, steering, and frame.
- Tools Needed:
 - Tire pressure gauge



Step 8: Adjust Belts and Chain Drive

- Instruction: Check and adjust as needed belts and/or chain drive.
- Tools Needed:
 - Tool Group B



Use Case Example: Rapid Training Course



OBO Core
Project Team



OBO
BIM Managers



AEC
Consultants



OBO
Facilities



I. Project Startup

Project Defined,
SOW Created,
BIM Execution Plan
Established

Contact BIM Managers,
Provide BIM Packages to
AEC Consultants, Create
SOW

Engage OBO PMs, DM at Project
Start, Review SOW, Initiate Project
into Portfolio Tracking, Initiate and
Moderate BIM Kickoff

Review SOW, Create
BEP, Create MMDR,
Initiate Model
Development

Get alerted of New Projects,
Ensure GMMS Package has
been provided to AEC Team



II. Project Execution

BIM Reviewed for
Completion at each
Phase from Concept to
Construction

Collaborate with BIM
Managers, Manage SOW,
Enforce BIM Standards

Review & Comment on BIM
Deliverables, Support
Stakeholders on BIM, Record
Project Activity

Deliver products per SOW,
BEP, MMDR, etc. at Each
Phase. Respond and adjust
per BIM Manager Reviews

Review COBie
Deliverables at each
Phase per MMDR



III. Project Review

BIM imported into OBO
Systems such as
Facility Management

Review and Approve
Final Deliverables
per SOW

Confirm Final set of BIM
Deliverables are per
SOW

Deliver BIM products per
SOW, BEP, MMDR, etc.

Import Final COBie into
GMMS and
Activate for Post



IV. Project Completion

Document Lessons
Learned,
BIM Files Archived,
BIM Data Integrated
into Portfolio Analysis

Project Closeout and
Capture Lessons Learned

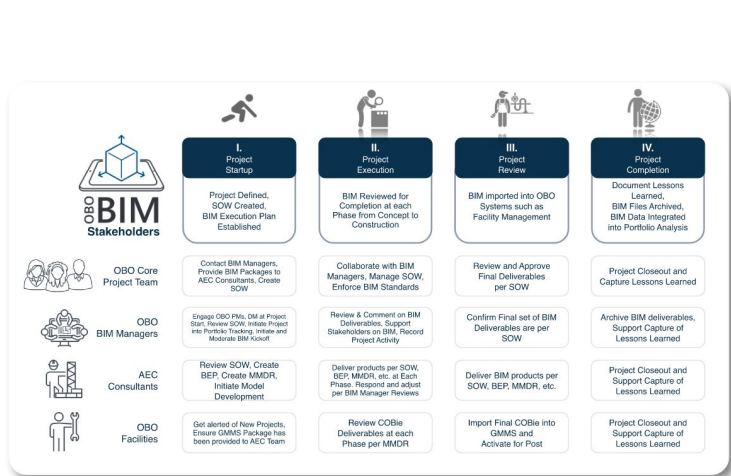
Archive BIM deliverables,
Support Capture of
Lessons Learned

Project Closeout and
Support Capture of
Lessons Learned

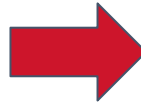
Project Closeout and
Support Capture of
Lessons Learned

Use Case Example: Rapid Training Course

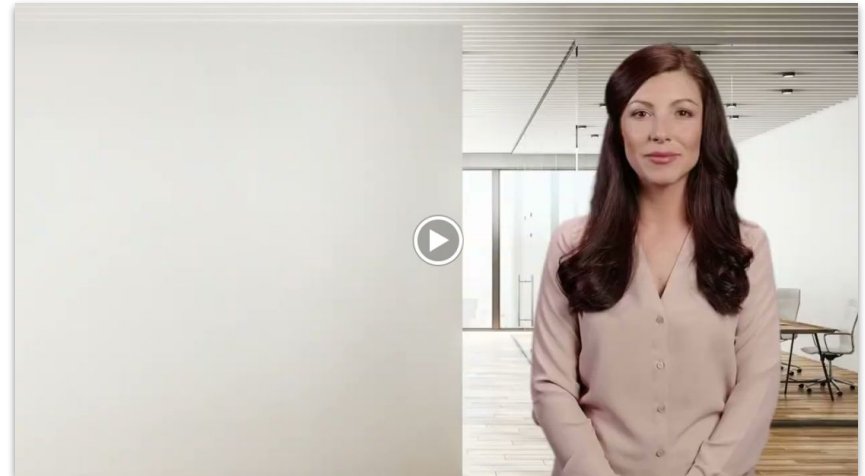
NIBS supporting OBO BIM Program



7 Minutes



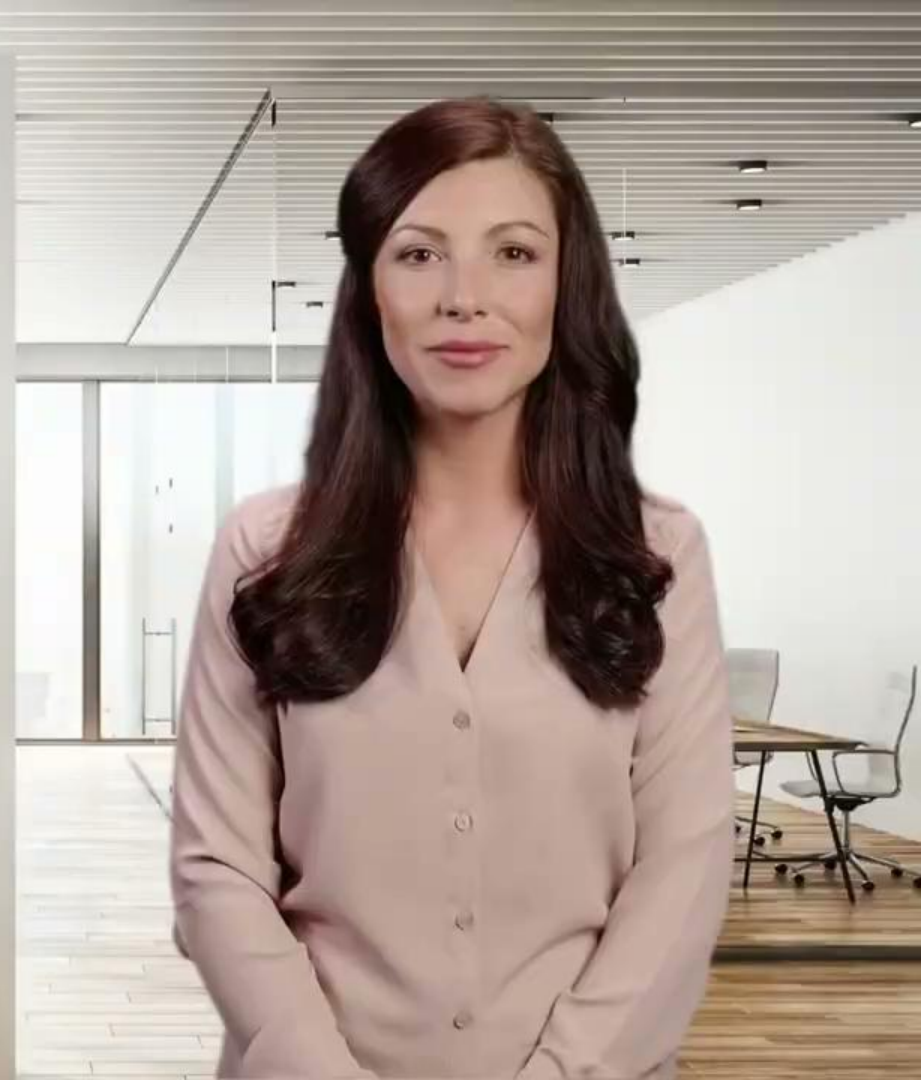
85%



<https://www.synthesia.io/homepage>



[View Videos Here >>](#)



Facilities Manager Assistant: Live Demos and Avatars



Use Case Example: Facilities Manager Assistant

Building History and Renovations: "Can you provide a history of renovations for building X since 1990?"

Space Utilization: "How has the usage of room 305 changed over the last five years?"

Maintenance Schedules: "What is the recommended maintenance schedule for AHU-3?"

Energy Efficiency: "Can you analyze the energy consumption trends for building Z over the past year?"

Weather Impact Analysis: "How does seasonal weather affect the energy usage in our main office building?"

Cost-saving Strategies: "What are some cost-effective measures we can implement to reduce energy usage in building 17?"

Safety Compliance: "Are there any safety compliance issues to be aware of for buildings constructed before 2000?"

Technology Integration: "How can we integrate smart technology to improve building management?"

Emergency Preparedness: "What emergency preparedness measures should be in place for our high-rise buildings?"

Environmental Sustainability: "What sustainable practices can we adopt to make our campus more eco-friendly?"

Contractor and Vendor Management: "How do we optimize our relationships with contractors and vendors for building services?"

Asset Management: "Can you provide a simulated analysis of the lifecycle of our major building assets?"



OpenAI
ChatGPT 4.0



Facilities Manager Assistant Simulator

A virtual assistant for facility simulation.

By James Kline

Tell me who you are and what you can do, please.

How has room 305 changed over the years?

Tell me about the recent renovations in the west wing.

Can you show me the energy usage trends for the las...

 Message Facilities Manager Assistant Simulator...

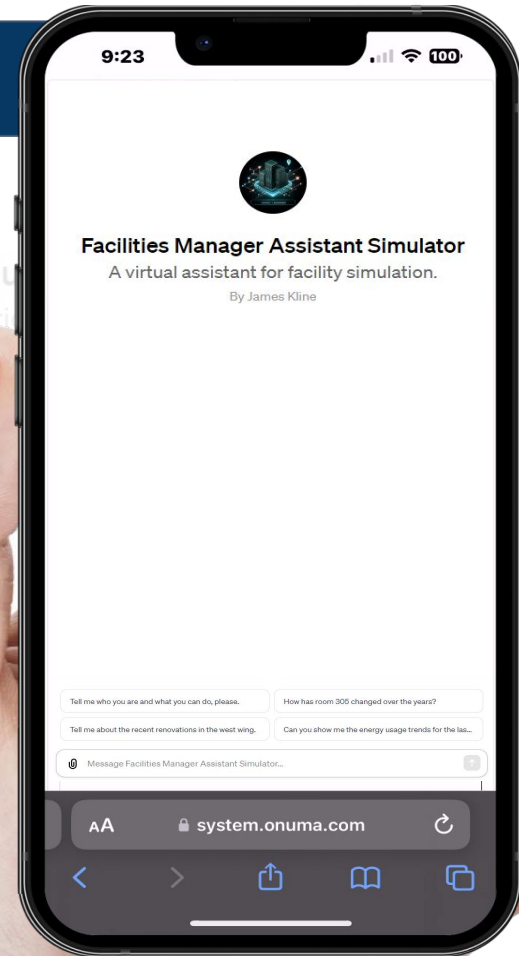


Live Demo: FM Assistant - Live Discussion (Phone) (New Facilities Manager)



OpenAI
ChatGPT 4.0

Facilities Manager Assistant Simulator
A virtual assistant for facility simulation.
By James Kline



Tell me who you are and what you can do, please.

Tell me about the recent renovations in the west wing.

Message Facilities Manager Assistant Simulator...

Live Demo: FM Assistant - Live Discussion (Phone)
(New Facilities Manager)



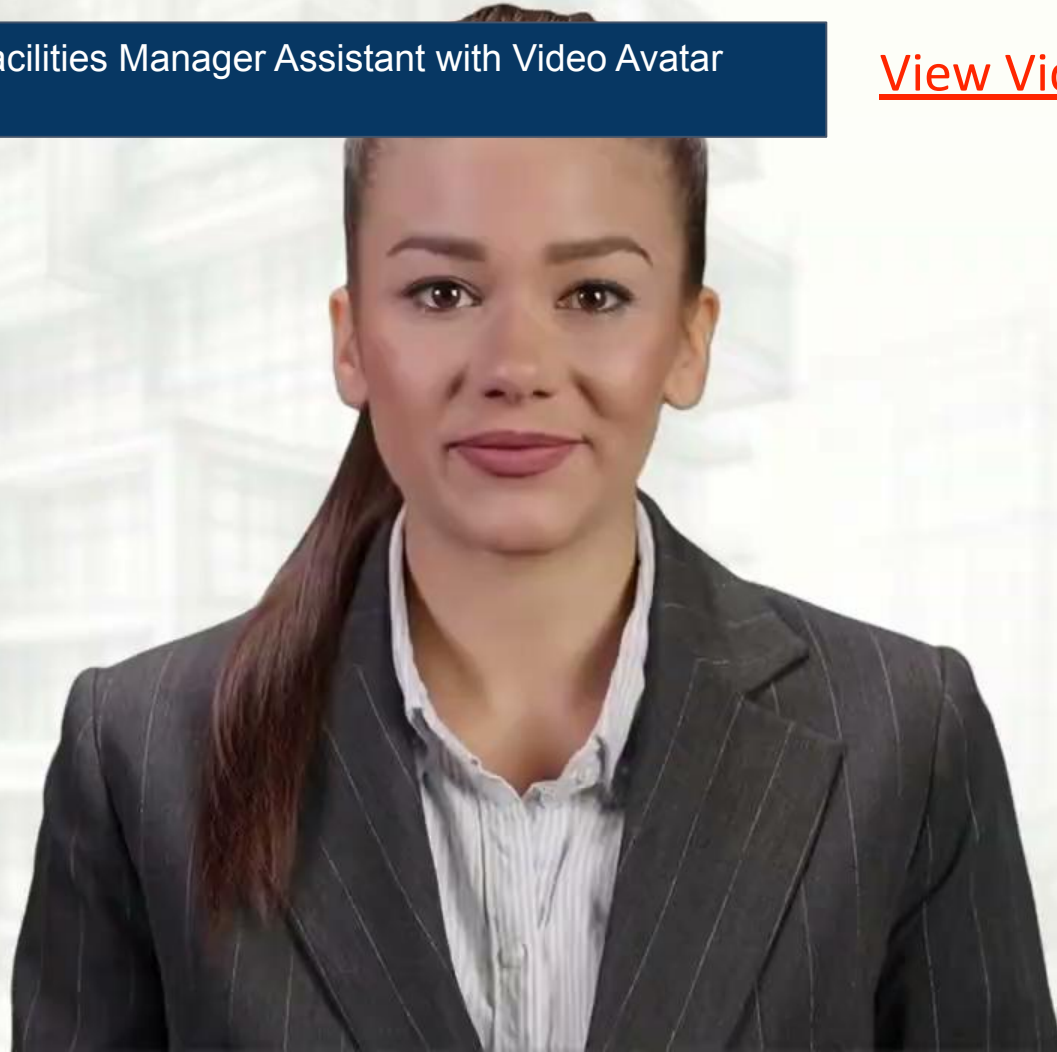
OpenAI
ChatGPT 4.0

**Enter your
question in the
chat!**



Use Case Example: Facilities Manager Assistant with Video Avatar
(Work Order Prompt)

[View Videos Here >>](#)



Use Case Example: Facilities Manager Assistant with Video Avatar
(Exhaust FAN WO)

[View Videos Here >>](#)







National Institute of
BUILDING SCIENCES™

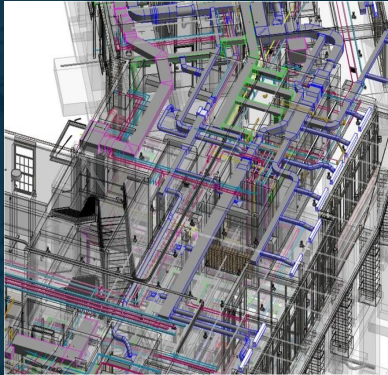
BIM and Digital Twins

A formal position on successful integration for the AECO industry

Building Information Model

A shared digital representation of physical and functional characteristics of a built environment asset.

NBIMS-US: definition of BIM



Digital Twin

A virtual representation of real-world entities and processes, synchronized at a specified frequency and fidelity.

DTC definition of Digital Twin



openBIM

Enables an accessible digital twin which provides the core foundation to a long-term data strategy for built assets.

bSI definition of openBIM



[NIBS.org/BIMC#committees](https://www.nibs.org/BIMC#committees)

Industry and Owner Standards at NIBS.org

U.S. NATIONAL BUILDING INFORMATION MANAGEMENT PROGRAM


Objective

The National Institute of Building Sciences (NIBS) is leading the development and dissemination of the next-generation of practice standards and processes for the built environment. The U.S. National Building Information Management Program will provide a step-change in capacity, creating a platform and community to support for digital innovation.

Why Does The U.S. Need a National BIM Program?

Building information modeling is now a widely used technology providing a data foundation for increasingly digitized processes, yet practices and procedures across the architecture/engineering/construction/operation (AECO) marketplace operate under no common standards for data formats. This program offers the opportunity to improve the relationships, performance and profitability of the increasingly digitized U.S. AECO industry.

Demand for construction is expected to increase to address these challenges and opportunities:

-  The public sector requires \$2 trillion in infrastructure investment, which is being funded in part by the Infrastructure Investment and Jobs Act.
-  Schools need upgrading to provide better and safer learning environments.
-  Coastal communities require building and infrastructure adaptation to cope with rising sea levels and climate change.
-  New energy infrastructure is needed to transition to carbon-free power sources.
-  New data centers and labs are required to support innovation and enhance growth and competitiveness.

Effective digital processes supported by common ways of working based on open standards are key to cost effectively realizing these benefits.



Critical outcomes of the program:



Allow owners to build and renovate more buildings, bridges and roads with less money by enhancing the efficiency of design, construction and asset operation.



Accelerate delivery, manage costs, and increase sustainability through information standards and protocols shared across the supply chain.



Build on U.S. leadership in AECO technology development to enable the next generation of building technology.



Strengthen U.S. industry access to global markets with U.S. standards compatible with worldwide programs.



Integrate buildings, lifelines and infrastructure for seamless management of the built environment to improve safety, security, resilience and sustainability.



Expand innovation in the development of new digital solutions and practices throughout the AECO industry.

usbimprogram.nibs.org

What are the top drivers for a National BIM Program?

13-21%

savings via increased efficiencies in design and construction assembly in the next 10 years (Boston Consulting Group)

60%

long-term increased construction productivity through design-to-manufacturing processes supported by digital information (McKinsey)

100%

increase in profits for AECO players (McKinsey)

15%

public construction cost savings (UK Government Construction Strategy)

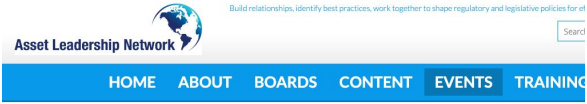
41%

of the U.S. labor force will retire by 2031, diversify through industrialized construction processes driven by digital automation (McKinsey)

NBIMS V4.0 BIM USES BEP COBie

BIM and Digital Twin Subcommittee

Coming Up: Immediately Following this Webinar at ALN and on Future NIBS and BIMStorm Events



ALN Th@3 pm

Event Time Zone: America/New York

Thursday 25 January 2024

At National Institute of Building Sciences

Register Here for ALN Th@3



<https://www.nibs.org/events/intersection-ai-and-building-sciences-new-era-intelligent-infrastructure>

Immediately after today's webinar



AssetLeadership.net/aln-th3/



JAN 25 2024
THE INTERSECTION OF AI AND BUILDING SCIENCES: A NEW ERA OF INTELLIGENT INFRASTRUCTURE
Virtual Event
In this session, we will delve into the captivating world of AI applications in the building sciences, share the lessons learned by these pioneers, and present outcomes from a series of global webinars that the National Institute of Building Sciences, Asset Leadership Network, and American Institute of Architects have participated in.

FEB 13 2024
NEW YORK BUILD 2024
New York, NY

MAR 19 2024
BEST6
Austin, TX
The Building Enclosure Science and Technology (BEST6) Conference brings together a cross-section of public and private building leaders, including design professionals, contractors, manufacturers, and educators.

APR 22 2024
AABE 2024
Anaheim, CA
The American Association of Blacks in Energy (AABE®) is a national association of energy professionals founded and dedicated to ensuring the input of African Americans and other minorities into the discussions and developments of energy policies, regulations, R&D technologies, and environmental issues.

MAY 22 2024
BUILDING INNOVATION 2024
Washington, DC
Building Innovation 2024 will bring together everyone who impacts the built environment to explore challenges, possibilities, the latest tools, groundbreaking strategies, and more.



Ten Artificial Intelligence Sessions

In early 2023, we began exploring the use of AI with ChatGPT and Midjourney with BIM and digital twins. The initial results were astonishing, revealing capabilities that exceeded our expectations, though not without a healthy dose of skepticism. Our breakthrough came when we fed our data into ChatGPT, streamlining the automation of Building Information Models (BIM). We presented this innovative workflow on March 22 through the Asset Leadership Network, an event that began a new chapter. This milestone spurred us to intensify our efforts, leading to significant advancements shared during subsequent BIMStorms.

1 The first use of Ai and ChatGPT in BIMstorm March 2023



BIMStorm.com



Group: AI for the Built Environment

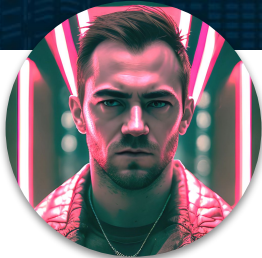
Chat with AI Presentations

<https://chat.openai.com/g/g-bgTnB6sji-building-intelligence>

PRESENTERS



Roger Grant
Vice President,
Building Technology
Industry Standards
Expert
National Institute of
Building Sciences



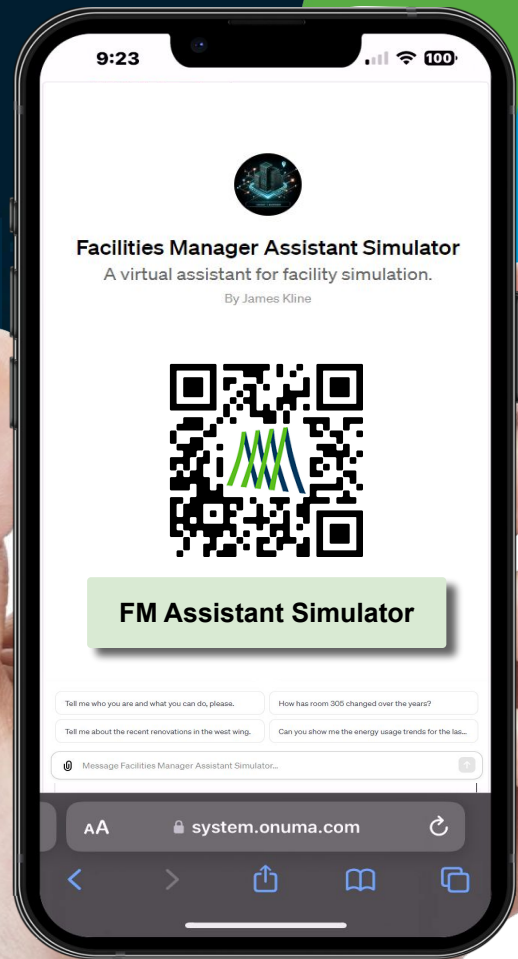
Jay Kline
BIM Program Manager
National Institute of
Building Sciences
U.S. Department of State
Bureau of Overseas
Buildings Operations



Kimon Onuma
FAIA
Architect
Prompt Architect
Onuma, Inc. /
BIMStorm.com



**Artificial
Intelligence
"AI"**



The Tools of Ai : Digital Twins, BIM and Artificial Intelligence



- Owner Standards in **CDV Systems BIM Execution Plan (BEP)**



- **ChatGPT** to analyze patterns, import to BIM



- **Program2BIM** to create BIM spaces from owner standards



- **ONUMA System** as a **BIM Server** and for collaboration

- **Consigli** for MEP and Space Plan Optimization



- **Google Workspaces, Earth** and **Midjourney** for visualization



- **Revit** BIM for design and construction from **ONUMA System**

- **CDV Systems Collectus Revit** harvests BIM data per the **BEP**



- Data harvested by **Collectus** to **BIMgenie** for facility management

- **Collectus BIM, ONUMA System, BIMgenie, Opto22** delivered to the owner for use as a **Digital Twin**



- **IGO and Trent** for Port Operations Digital twins



The Tools of Ai : Digital Twins, BIM and Artificial Intelligence

- **Otter.ai** Meeting recorder, transcript and Chatbot
- **DALL•E2** Image generator
- **ICC AI Navigator** International Code Council Chatbot
- **Building Intelligence Chatbot** Chat with our Presentations
- **BIMgenie Campus Analyst Chatbot** Chat with CMMS Data
- **FM Assistant Simulator Chatbot** Chat with Facility Data
- **Synthesis** AI Avatar Video