

The Future of Model Coordination is more than Clash Detection!

Andrell Laniewicz

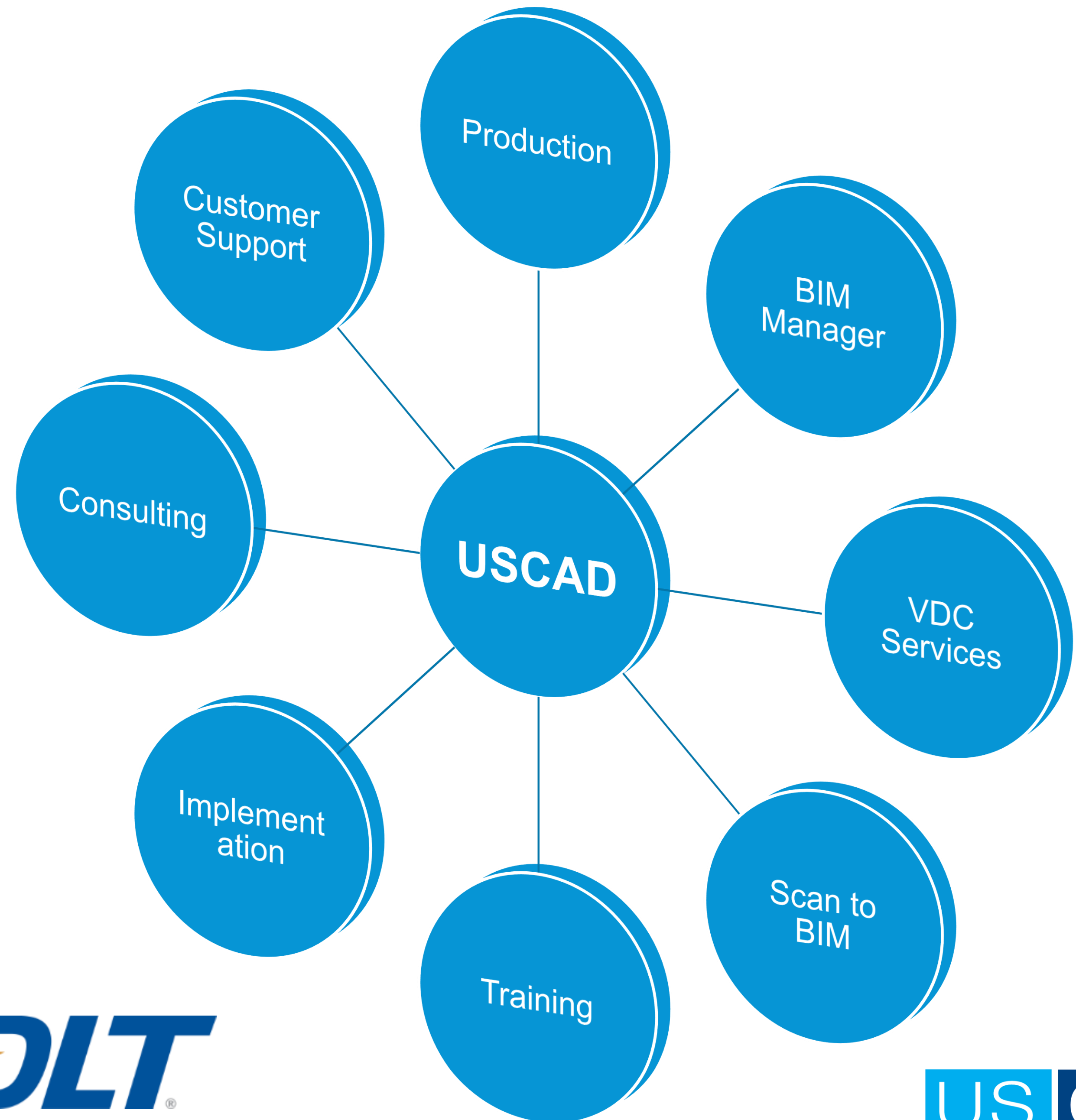
Senior Technical Specialist | @AndiLaniewicz



About the speaker

Andrell Laniewicz, CM-BIM

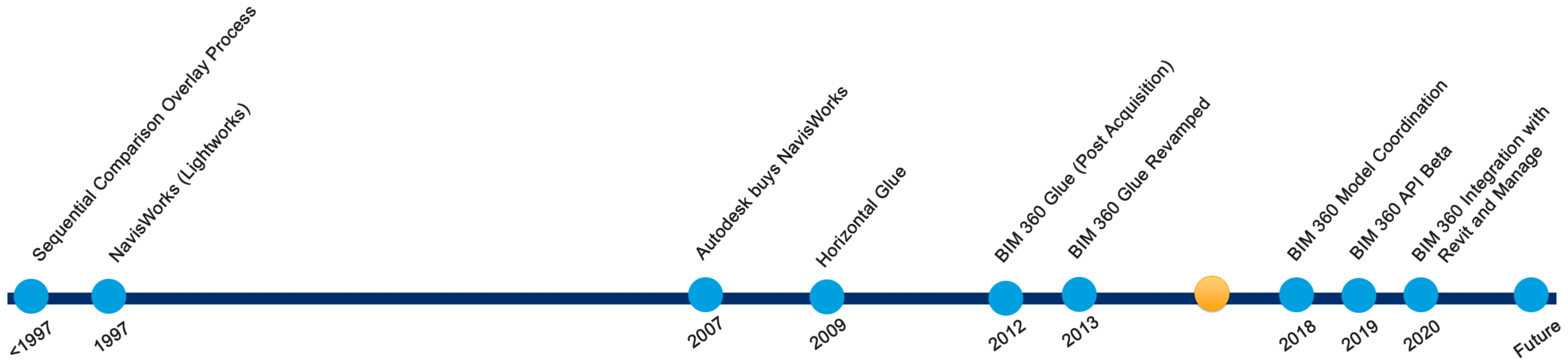
- M. of Arch. from Savannah College of Art and Design
- General Contractor VDC work for 5+ years
- MEP Design and Fabrication Firm - Corporate BIM Support 2+ years
- Taught BIM for CM at University 4 years
- Revit, Navisworks, BIM 360, FormIt, Msuite
- Presented at AU and BiLT
- AUGI World Author: BIM 360 and FormIt



Time Travel + Nerd = Dr. Who References



Doctor Who, BBC America (10th Doctor – David Tennant)



“It’s been a long road, getting from there to here”

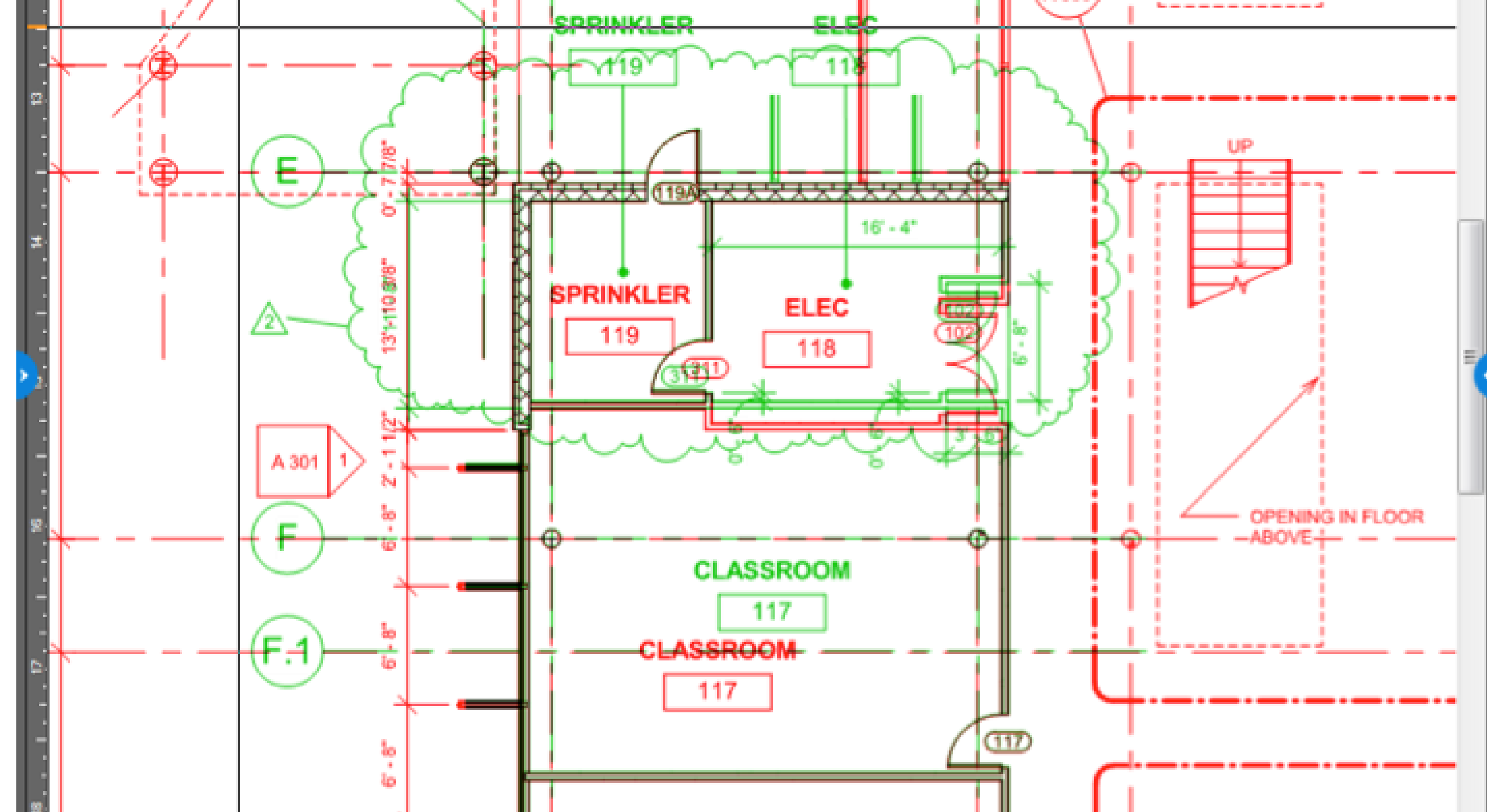
Where My Heart Will Take Me by Russell Watson

- 12 years to get from standalone to a cloud solutions
- 6 years to get from the standalone cloud to integrated cloud solution with machine learning
- 2 years to get hybrid integration between the cloud and desktop solutions
- Autodesk has expanded BIM 360 to the ACC with 4 additional solutions in the last 2 years





The Past: 23+ to 11 years ago



Light Tables

Challenges:

- Drawing versions
- Scale
- Legibility
- Math
- Human Eyes

PDF Overlays

Challenges:

- Legibility
- Math
- Knowledge
- Human Eyes

Less than Ideal

PROJECT TYPE

D-B-B is relatively new, despite it being called “traditional”. D-B is close to the Master Builder concept.

Both impacted workflow for coordination processes – if they existed.

HUMAN ERROR

Understanding of systems is a must, but so is math and plan reading. Misreading a number or forgetting to carry a 1 has repercussions.

Eye fatigue, lining up incorrect drawings, and time spent are all impactful on success.

HIGH EFFORT

Draw/Print each drawing and compare to others. Manually overlay and review each drawing. Per trade, per floor or area.

Many steps before ASIs or Change Orders are considered.

MORE COMPLICATED SYSTEMS

1970’s is when Central Air Conditioning and OSHA change everything.

1980s-2000s sees Electronics get integrated and technology booms!

Additional Systems advance – fire suppression, fire proofing, sound, and more.

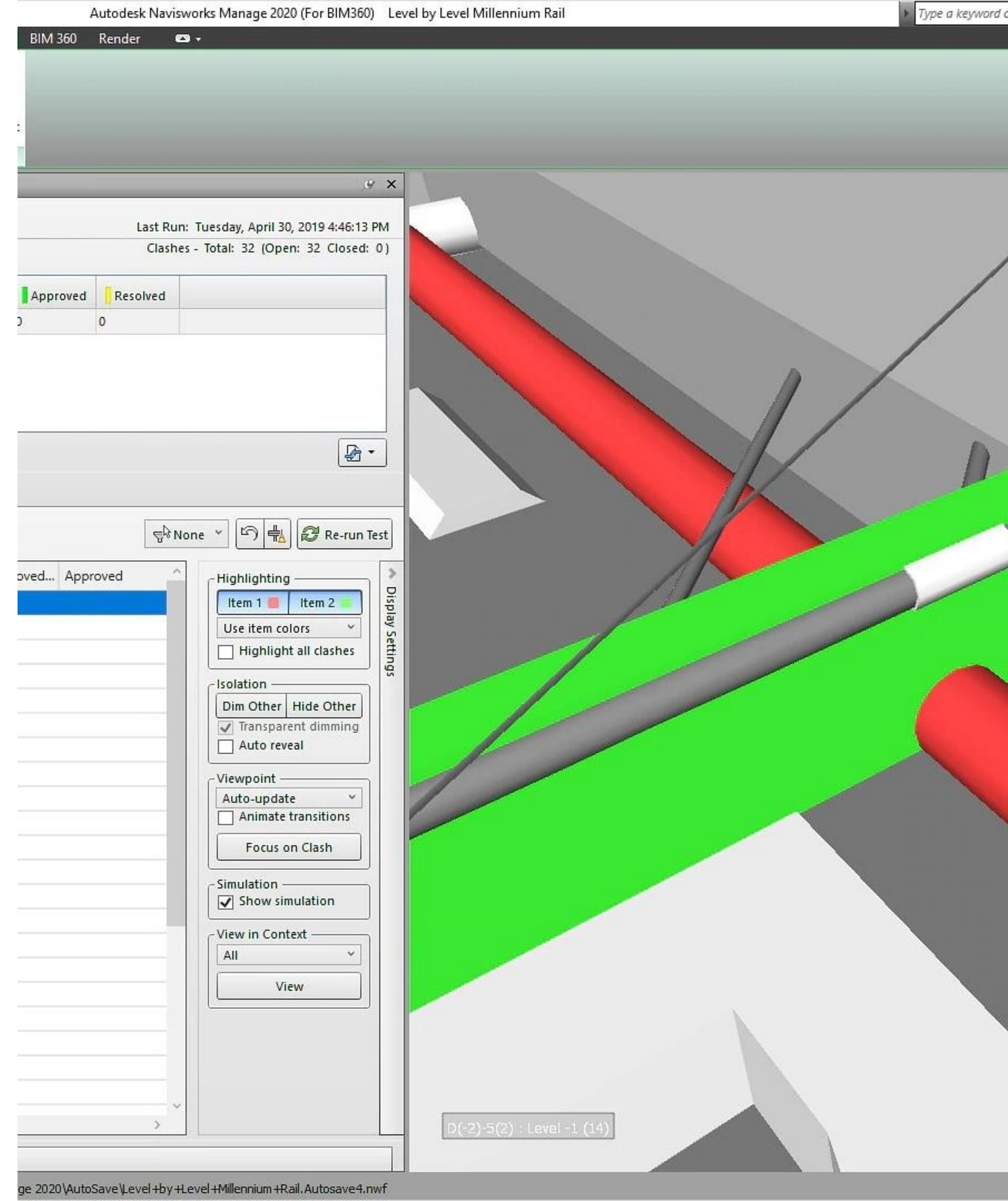
Next Stop Please



Doctor Who, BBC America – 12th Doctor Peter Capaldi

Navisworks

- 3D modeling: prototype of the building
- Improved buildings
- Software runs coordination: no math required
- Reduced time, but still a long process
 - Upload
 - Download
 - Run Reports
 - Upload Reports
 - Update Models
 - Repeat
- **Clash Detection more than Model Coordination**
- **Multiple file types – solution agnostic**
- **Switchback**



Better than Before

2D AND 3D CHALLENGES

Not all trades are modeled in 3D.

2D drawings can be used but are not ideal.

Point Clouds are large and cumbersome to measure to/from.

Units and Transforming can help and hurt.

MODEL ACCURACY

Are the drawings and the models in agreement?

Were there items that were changed but not updated in the model?

Is everything modeled correctly?

What data is included, and should it be?

RELIANCE ON SOFTWARE

Less knowledge needed about how systems work for the coordinator.

If items are not intersecting, they are not clashing – visually inspect the entire building.

VERSIONING

“I’ve already fixed that in this latest model – that you don’t have”

Was the latest model uploaded? Downloaded?

Were any links broken and data lost?

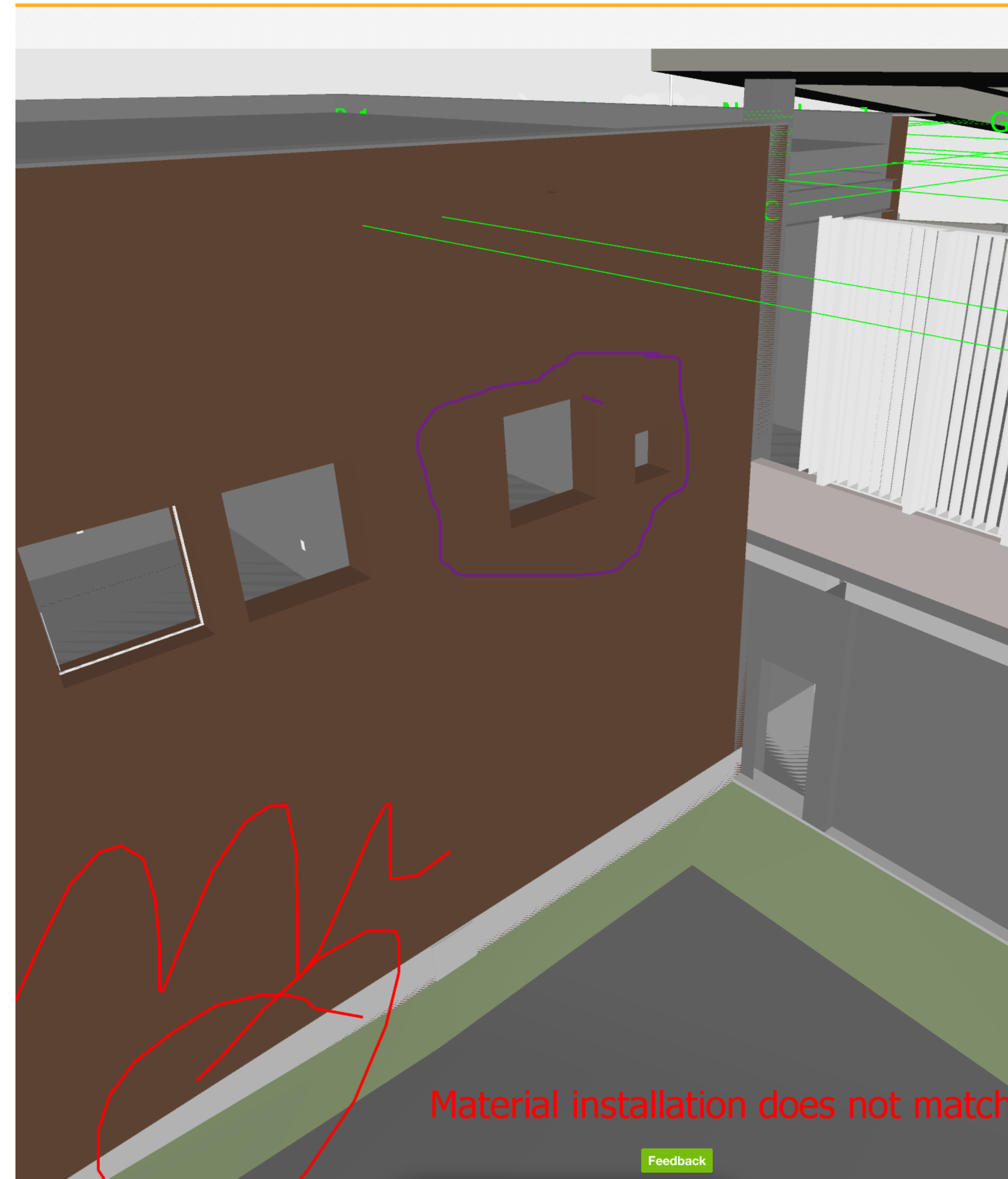
Software versions can be a hassle too.



The Present: 4 years ago to now

Cloud Solution: Glue

- **Viewable on an iPad in the Field**
 - No need to have a jobsite computer that can use Freedom
- **Up-to-date models: no upload/download**
 - As long as the latest model is “Glued” and Synced
- **Clash Detection, Views, and Markups**
- **Desktop, Web Viewer, and Mobile Apps**
 - Accessibility
- **Connects to Navisworks Manage**
 - Share views
- **Simple Interface**
- **Fewer Tools than Manage**



Material installation does not match

Getting Better with Glue

NO MANUAL CLASH GROUPING/SETTINGS

Simplified interface means grouped clashes are set at the object level only.

Workflows must adapt from being individual clashes to areas to where stakeholders are responsible for more of reviewing the report.

LIVE MODELS

Good and bad here. Latest Clashes, but limited time to set up reports for Clash Meetings.

Each stakeholder should be able to handle their own clashes at any point.

With no Search Sets, cropped Views may need to be set up to Glue specific items.

VIEWER ISSUES

Does not work on Chrome without an Add-in.

Viewers need updated – and IT usually needs to manage them for field personnel.

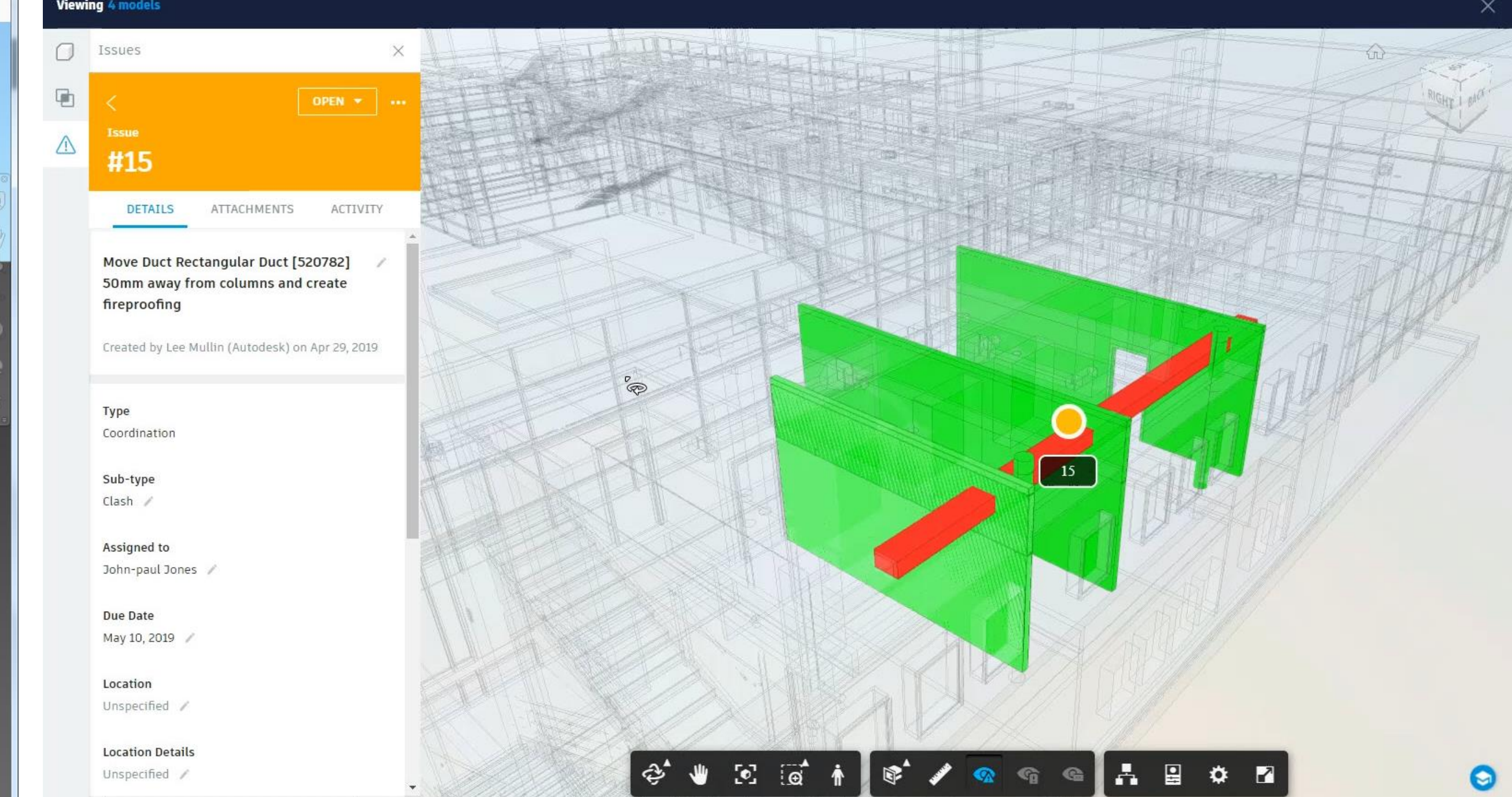
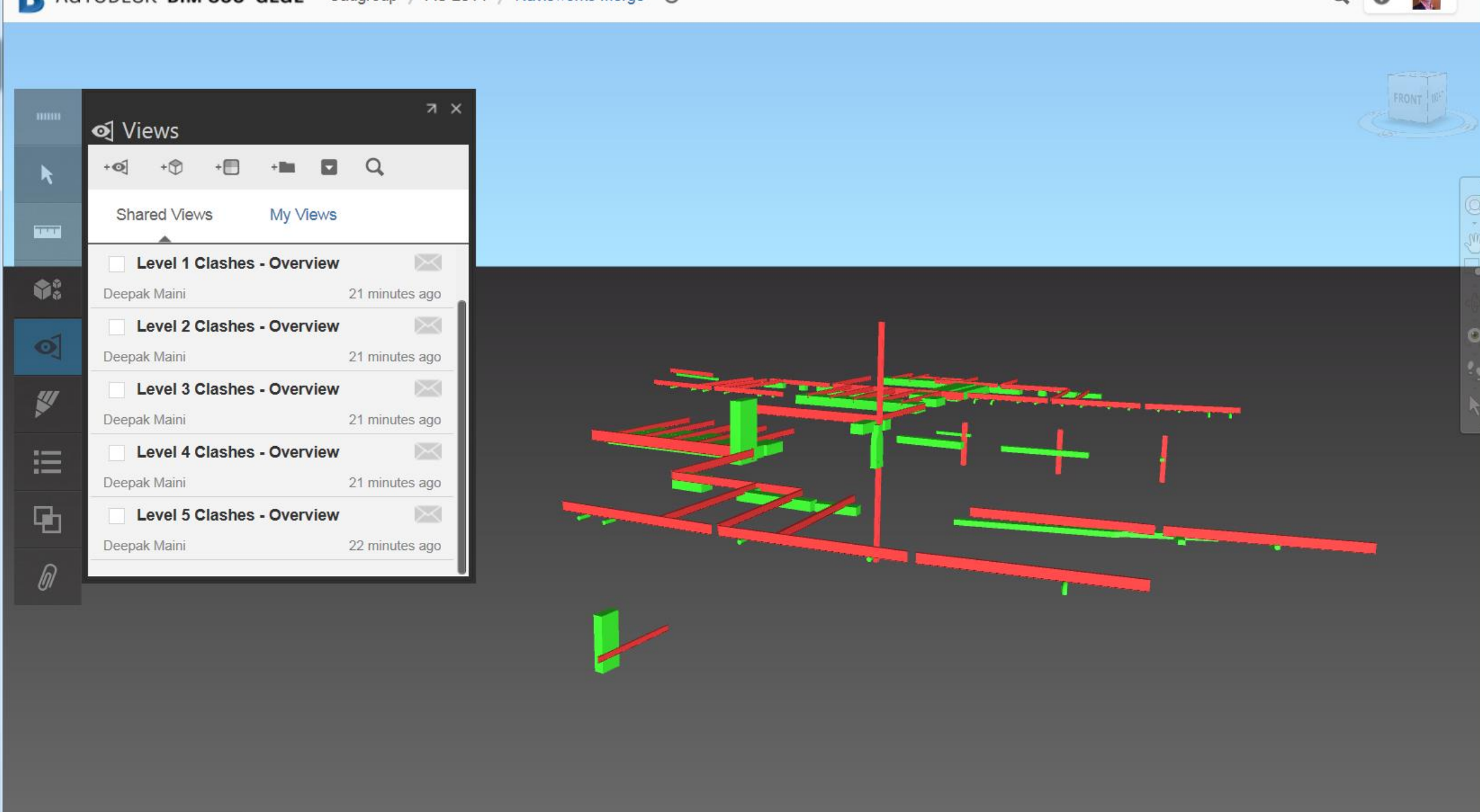
Some tools are only available on the App or the Desktop, not the web browser.

MANAGE CONNECTIONS

Manage and Glue work together – at least through Views.

Clashes are not shared – both will show the same clashes.

Glue does not use Appearance Profiles.



Glue

- Groups by Object Only
- 3 Different Applications with different tools
- Connection Integration and Shared Views
- Live Model Copies

Model Coordination

- Choice to group by Object, System, or Type
- All Tools available on any Application
- Connects to all of BIM 360; Integrates Issues with Manage and Revit; and open API access
- Live Models or Copies

Model Coordination: Module, not Process

SEPARATE CLASH LISTS

Manage and Model Coordination do not share their Clash Test results.

Just like Glue, each will find the same Clashes.

ADMINISTRATION

VDC/BIM needs Project Admin rights to properly set up Coordination Spaces.

Project Admins have access to all parts of the project.

NO APPEARANCE PROFILE OR SETS

No Find Items or Sets Tool – and the ones from Manage do not transfer into the Module.

Appearances are limited to what is modeled.

Appearance Profiles do not Transfer, only what is visually published from the model.

NO FREE VIEWER

Manage has Freedom.

Model Coordination has Docs as the lowest viewable level.

Project Files can be shared externally, but that does not include the ability to assign Issues.

Integration Workflows



WITH BIM 360

Access models within any folder in Document Management to run Clash Reporting on Issues are Issues are Issues. Regardless of where they are created Issues can be RFIs, tied to Meeting Minutes, Reported on, and Exported for Record



WITH NAVISWORKS MANAGE

**BIM 360 Issues Plugin allows Manage to access the Issues within a BIM 360 Project
The Plugin also allows for access to a Model Coordination Space – which can then be saved as a NWF
Can create Issues that BIM 360 will share**



WITH REVIT

**BIM 360 Issues Plugin (Beta) allows Revit to import Issues within BIM 360 within that view only
Cannot create Issues to send up to BIM 360
Take a Clash from MC or Manage, put an Issue Pin in it, Open Revit, Show Issues, and go right to the geometry that needs to be fixed!**

When you finally get Integration!



Doctor Who, BBC America – 10th and 11th (Matt Smith) Doctors

Now add Plugins!

CLASH STATUS

PRIORITY IS REQUIRED

- Grouping Options
- Set Priority of Clashes
- Color Options



CONSTRUCTION

CONNECTION NEEDED

- Connect to Construction Management Software that is not Autodesk based



MANAGEMENT

THOUSANDS OF CLASHES

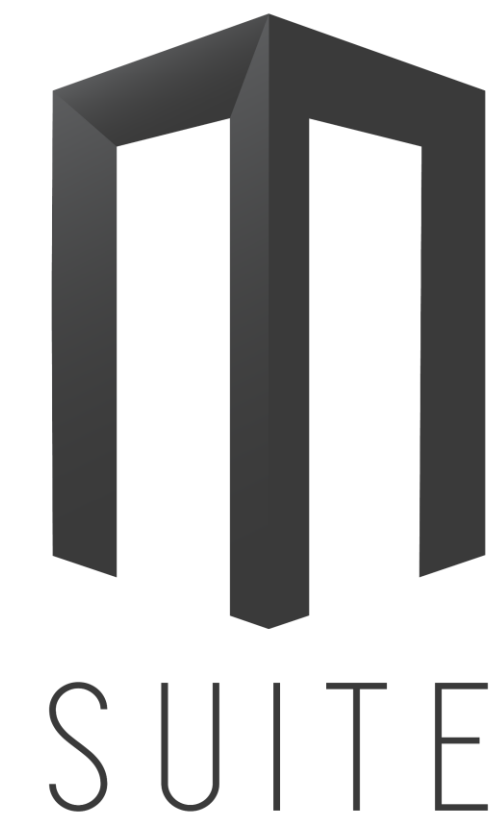
- Manage Clash Results
- Track clashes
- Set up workflows



PREFAB STATUS

BETTER RESOLUTION

- What has already been spooled?
- Decide what clash resolution would be best based on Spool status
 - Cost
 - Schedule





The Now Future: 2020

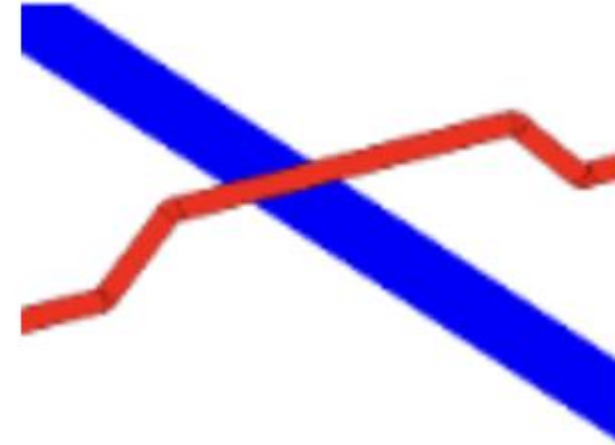
The number of transistors
that can be packed into a
given unit of space
will double about every
two years

Gordon Moore – 1965

Moore's law bent in 2010s – we make this leap quicker

Moore's law will break in the 2020s – physical capabilities will max with current technology

Bleeding Edge



Spot

LASER SCANNING
ROBOT

Up/ Down

CLASH RESOLUTION

Tridify

ANY IFC IN THE
CLOUD

Opening

AUTOMATIC
OPENINGS IN HOSTS

Boston Dynamics

Automatic Scan/Upload

Save on Labor

Safety, Schedule, and
Records

BIMSoft Solutions

Automatic Clash Solver
for MEP

Affordable

Simple UI
Federated Models

Hi-Tech Company

Openings Inserted at
Any Interference Point
Rules Based
Penetration Drawings

Hot Topics

GENERATIVE DESIGN

Feed it Rules and it gives you Design Options.

Have analysis run on a design and find improvement options.

AUTOMATION - VIRTUAL

Machine Learning – the more real-world examples the machine is fed, the more it learns.

Low-Value tasks can be programmed.

AUTOMATION - PHYSICAL

New production methods create new end product possibilities.

Brick Laying, Measuring and Cutting Pipe/Sticks, and Duct that builds itself.

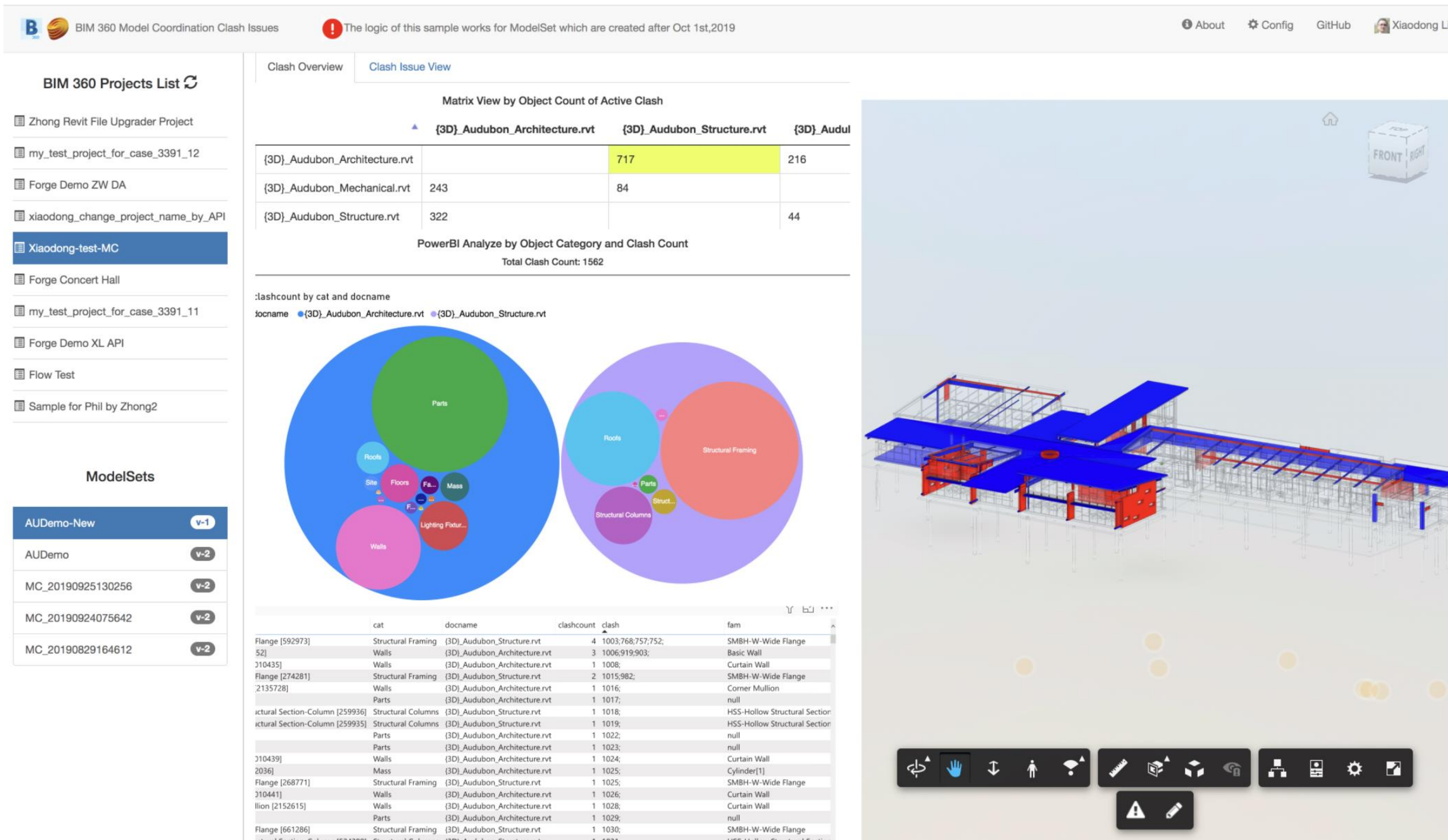
IOT AND DIGITAL TWINS

Connected Physical Data to the Virtual Model through the IoT will create Digital Twins.

Google Maps.

Jobsite Safety, Schedule for Record and for Billing, and Accurate Data for Better Decisions.

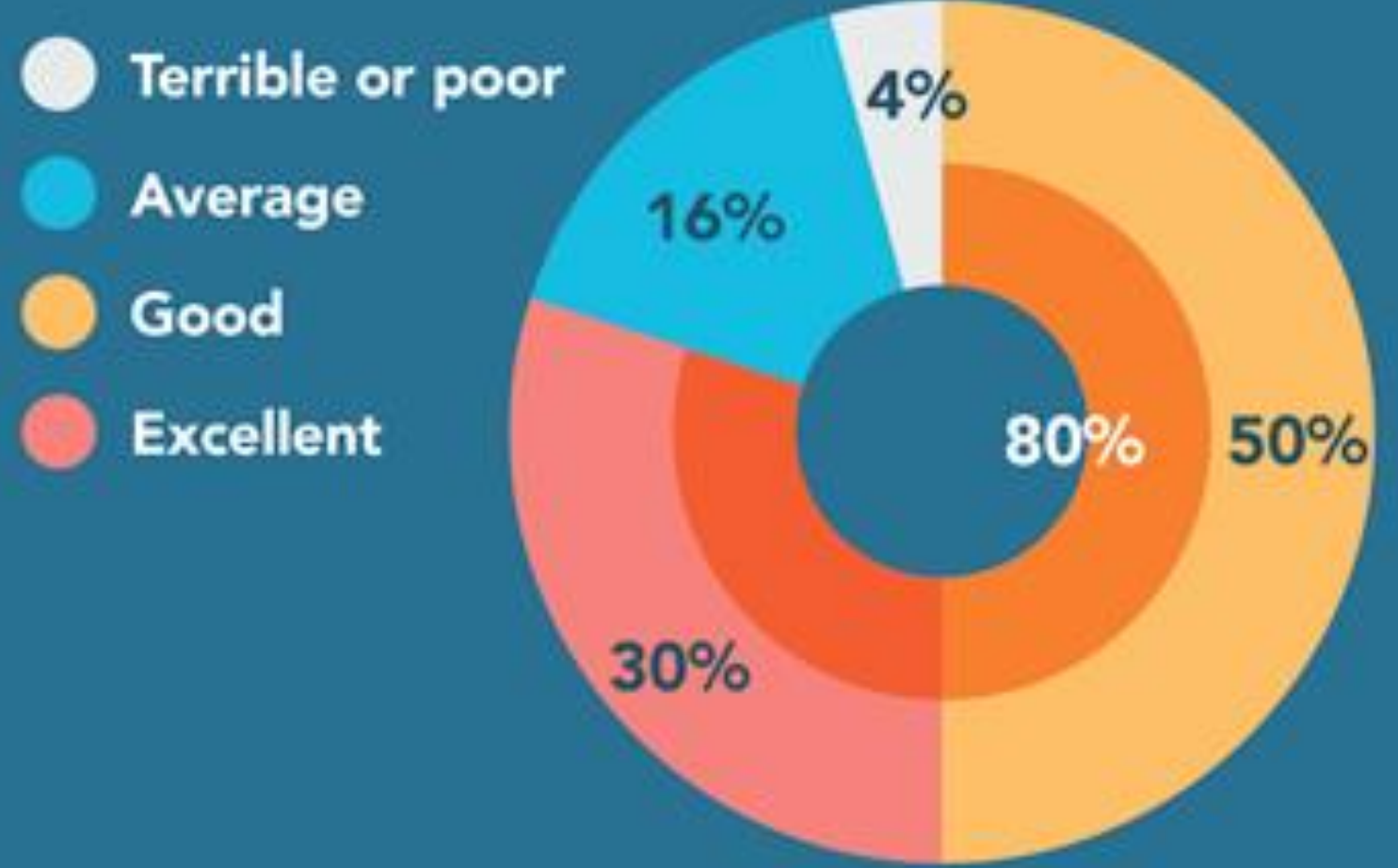
Model Coordination and PowerBI



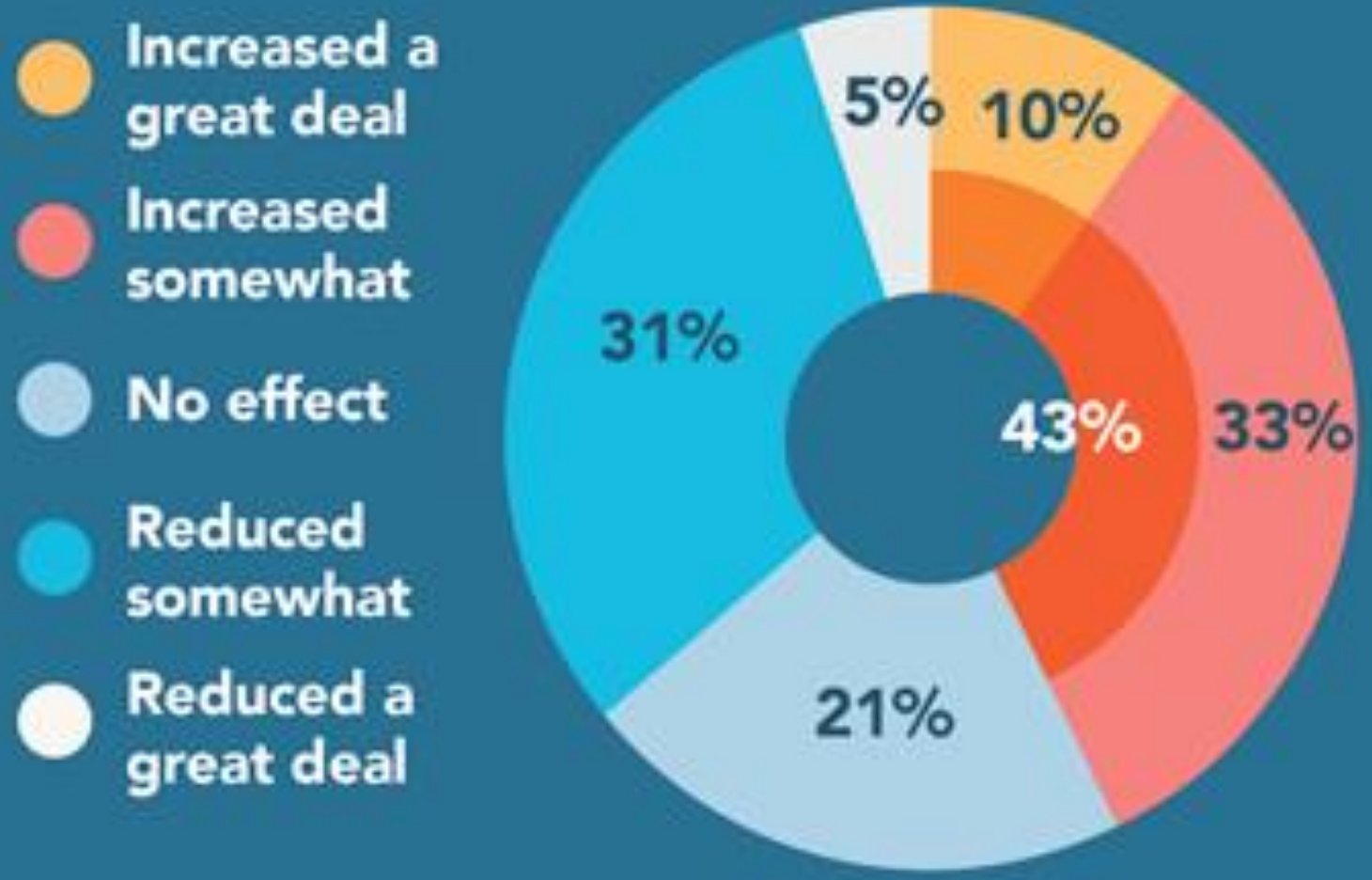
GitHub

Exposed API will lead to more tools, more apps, and more integrations! Programmers will become a big part of the Industry – and not just for the software companies.

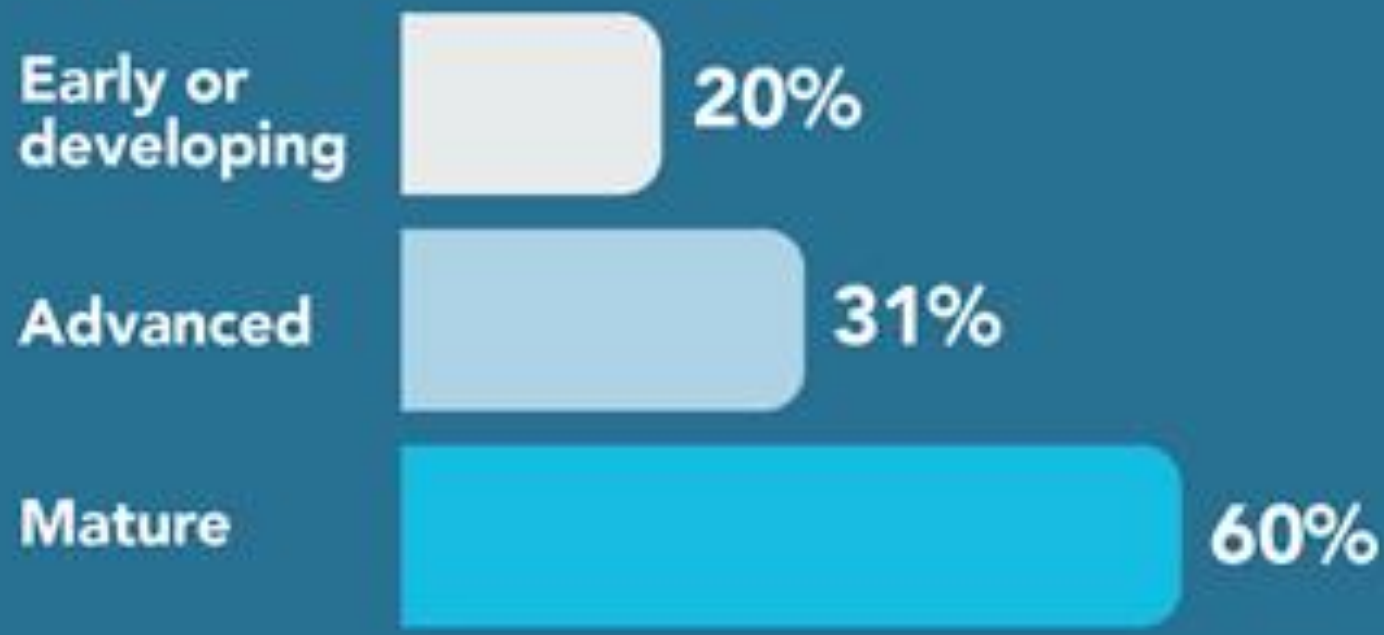
Most respondents were pleased with their remote working experiences, rating them:



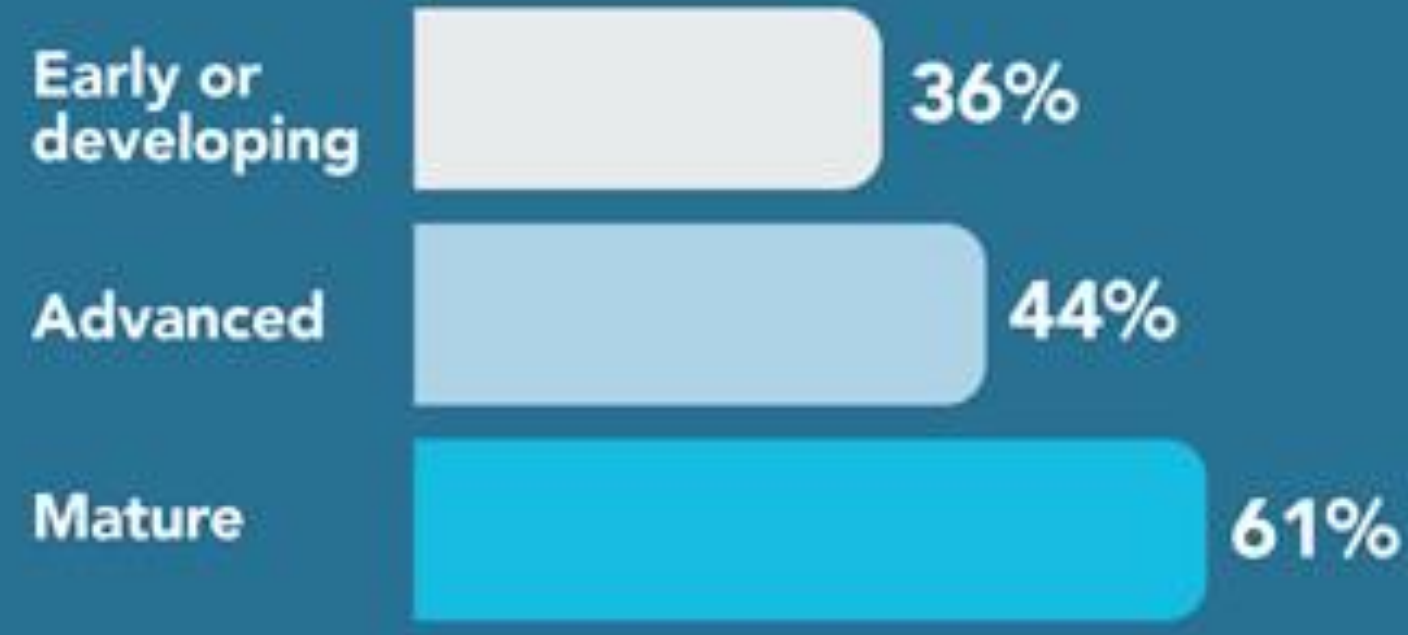
Working remotely has had a generally positive impact on productivity.



And digitally mature organizations were more likely to have found the experience excellent.



Increases in productivity were highest among digitally mature organizations.



SOURCE: LAWLESS RESEARCH, 2020

We are living in Sci-Fi Reality!



Doctor Who, BBC America – Impressive!

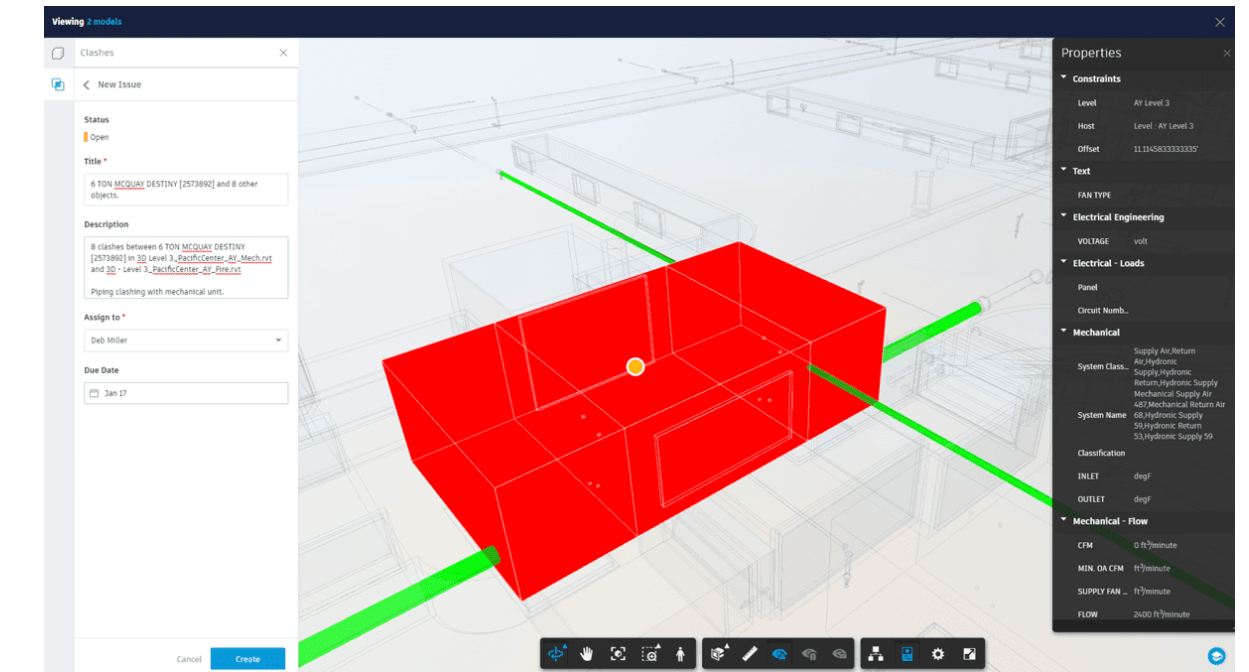
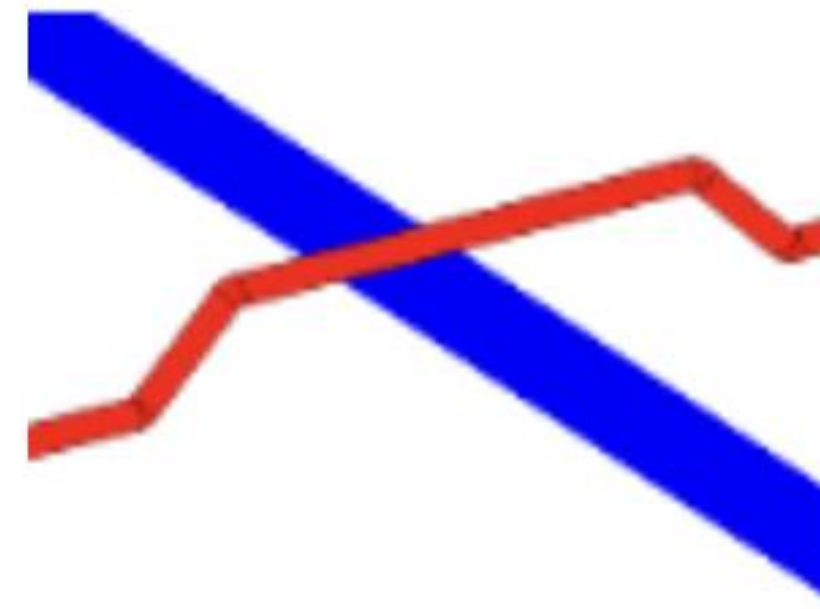


The Future: 2021 onward

Automatic Clash Resolution

DETECT AND GROUP CLASH

- Model coordination grouping
- Group all items to help determine which geometry to move

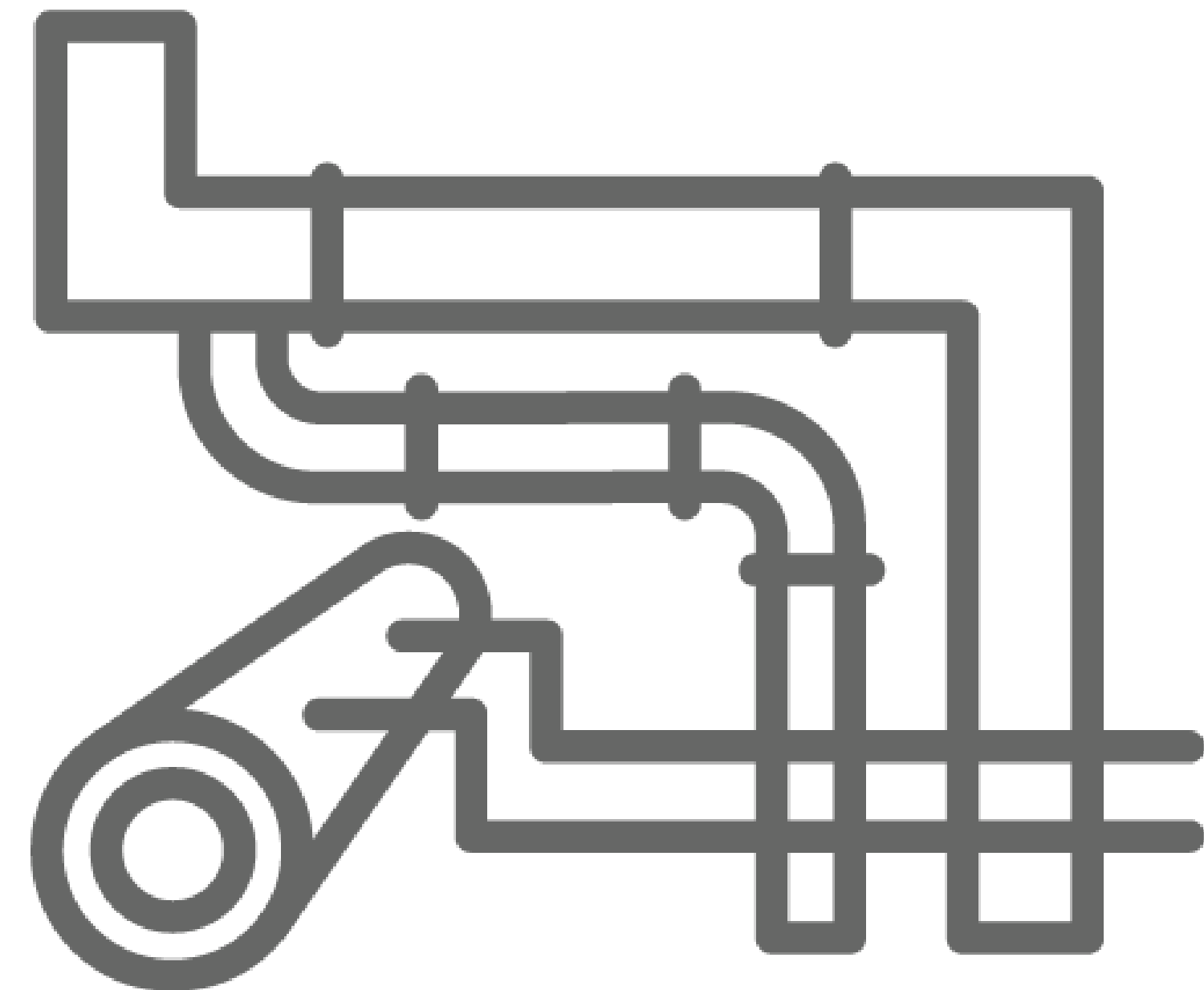


USE EXISTING TOOLS TO ADJUST MODEL

- Up/Down or Auto MEP Clash Resolve Tools
- Will update model using database and existing parts in the model

MACHINE LEARNING TO CHOOSE SOLUTION

- Pictures of what is modeled compared to what was built
- Verify what was installed/spooled already
- Weigh costs of changes for best outcome



Connected Cost Data

ASSETS WILL BE CONNECTED TO COSTS

- Any item can be an Asset in BIM 360*
- Assets are tied to a Manufacturer
- This connection will be live

DATA WILL COME FROM THE MANUFACTURER

- **Manufacturers can update their pricing as needed**
- **Data will disseminate to tagged items in Assets**

ESTIMATORS WILL ADJUST AND TRACK

- **Estimators will be able to take those costs from Assets into Cost Module**
- **Add Labor, Overhead, Profit, etc**
- **Get a full project cost picture**



Asset

SPECIFIED

X

CE_M_104

DETAILS

ISSUES

CHECKLISTS

ATTACHMENTS

Asset ID	CE_M_104
Category	Computer Equipment
Description	Unspecified
Barcode	Unspecified
Location	Central Core > ADMIN > Ground > 2.F01.01 OPEN OFFICE
Serial number	On the back
Submittal	Unspecified
Purchase order	Amazon Receipt
Purchase date	Sep 28
Installation date	Unspecified
Warranty start date	Unspecified
Warranty end date	Unspecified
Expected life (years)	4
Installed by	Unspecified
Spec section	Unspecified
Manufacturer	BENQ
Model	32" 4 k

Cost Management

Income

Contracts

Change Order

Budget

Main Contract

Budget Payment Application

⌂ Lock budget

Export

General				Income								
Budget Code ^	Cost Type	Budget Name	Supplier Contract	Original Budget	Internal Budget Transfer	Approved Owner Changes	Revised Budget	Pending Owner Changes	Projected Budget	Orig. Commitment	Chan	
				79,058,796.81	0.00	0.00	79,058,796.81	56,550.00	79,115,346.81	33,913,089.07		
001.012900.0	INT	Risk Contin...	***	4,015,409.54			4,015,409.54		4,015,409.54			
001.012900.1	INT	Fee	***	3,686,227.55			3,686,227.55	1,000.00	3,687,227.55			
001.013100.0	INT	Site Manag...	*** Site Manageme...	5,590,420.37			5,590,420.37		5,590,420.37	5,590,416.37		
001.013100.1	INT	Post Constr...	***	159,671.45			159,671.45		159,671.45			
001.013500.0	FEE	Architects	***	3,060,719.23			3,060,719.23		3,060,719.23			
001.013500.1	FEE	Consulting ...	***	3,164,936.40			3,164,936.40		3,164,936.40			
001.013510.1	FEE	Insurance	***	1,000,000.00			1,000,000.00		1,000,000.00			
001.013511.1	FEE	Bond	***	500,000.00			500,000.00		500,000.00			
001.015000.0	GEN	Accommod...	*** Post Constructi...	21,449.14			21,449.14		21,449.14	21,449.14		
001.015000.1	GEN	Site Accom...	***	473,622.72			473,622.72		473,622.72			
001.015000.2	GEN	Enabling W...	***	36,051.06			36,051.06		36,051.06			
001.015000.3	GEN	Client Team...	*** Post Constructi...	32,082.05			32,082.05		32,082.05	32,082.05		
001.015000.4	GEN	Offsite Acc...	***	54,997.80			54,997.80		54,997.80			

3D Printing



CUSTOM SHAPES

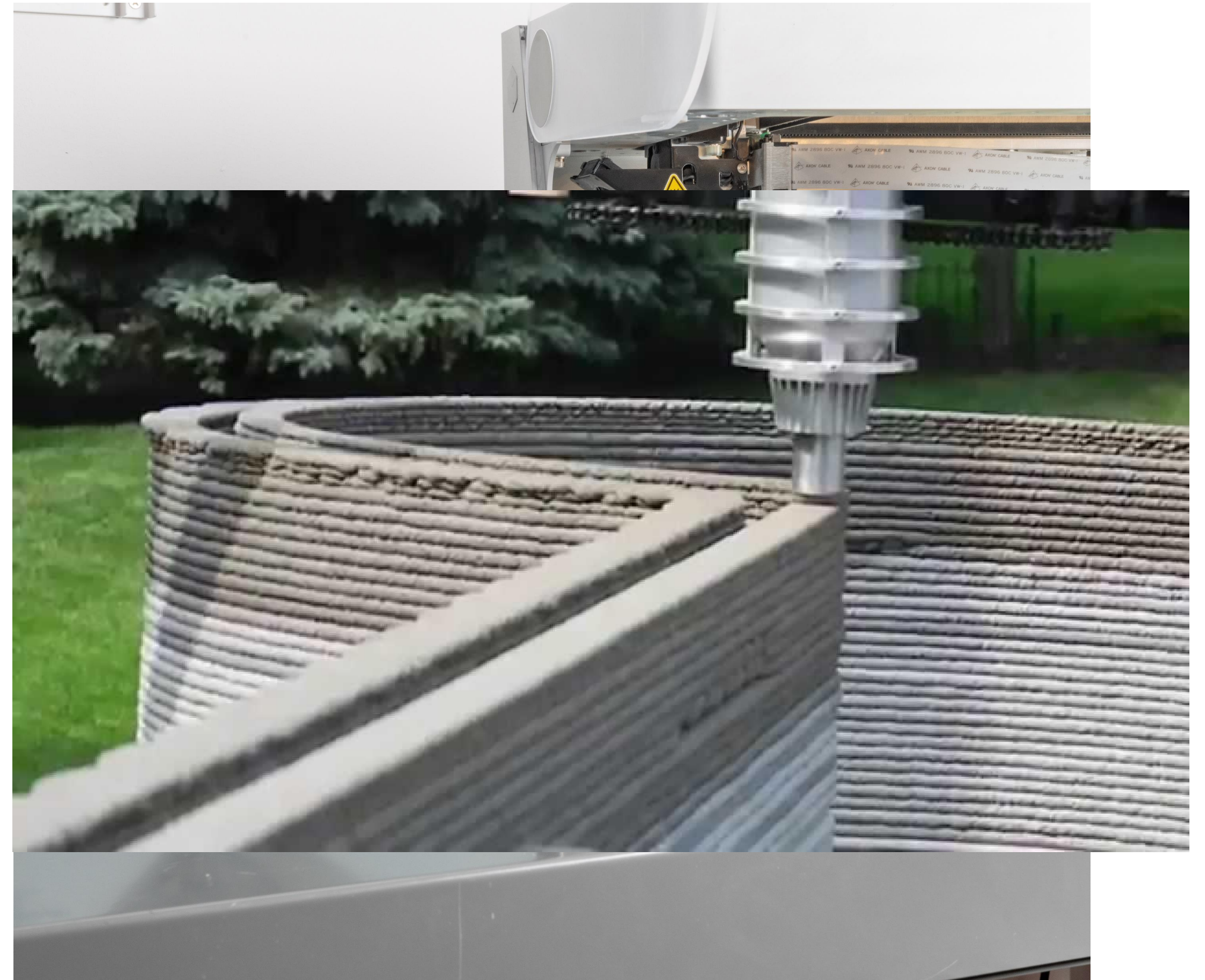
- Printing parts makes shapes possible that were previously unable to be made
- Printers can produce 24/7

WHOLE BUILDING STRUCTURES

- Modular buildings or rooms
- Complete with cutouts for systems, components, and more

BUILDING COMPONENTS

- Steel or Concrete Structures of custom shapes
- In-place furniture
- Hosted items



Automatic Schedules



CONNECTED DEVICES

- Trackers
- Scanners

STATUS TRACKERS

- Update progress: Modeled, Fab, Install, Test
- Helps determine % complete and % billable

LASER SCANNING

- Scan what is installed
- Compare to what is modeled
- % Complete and Project Status

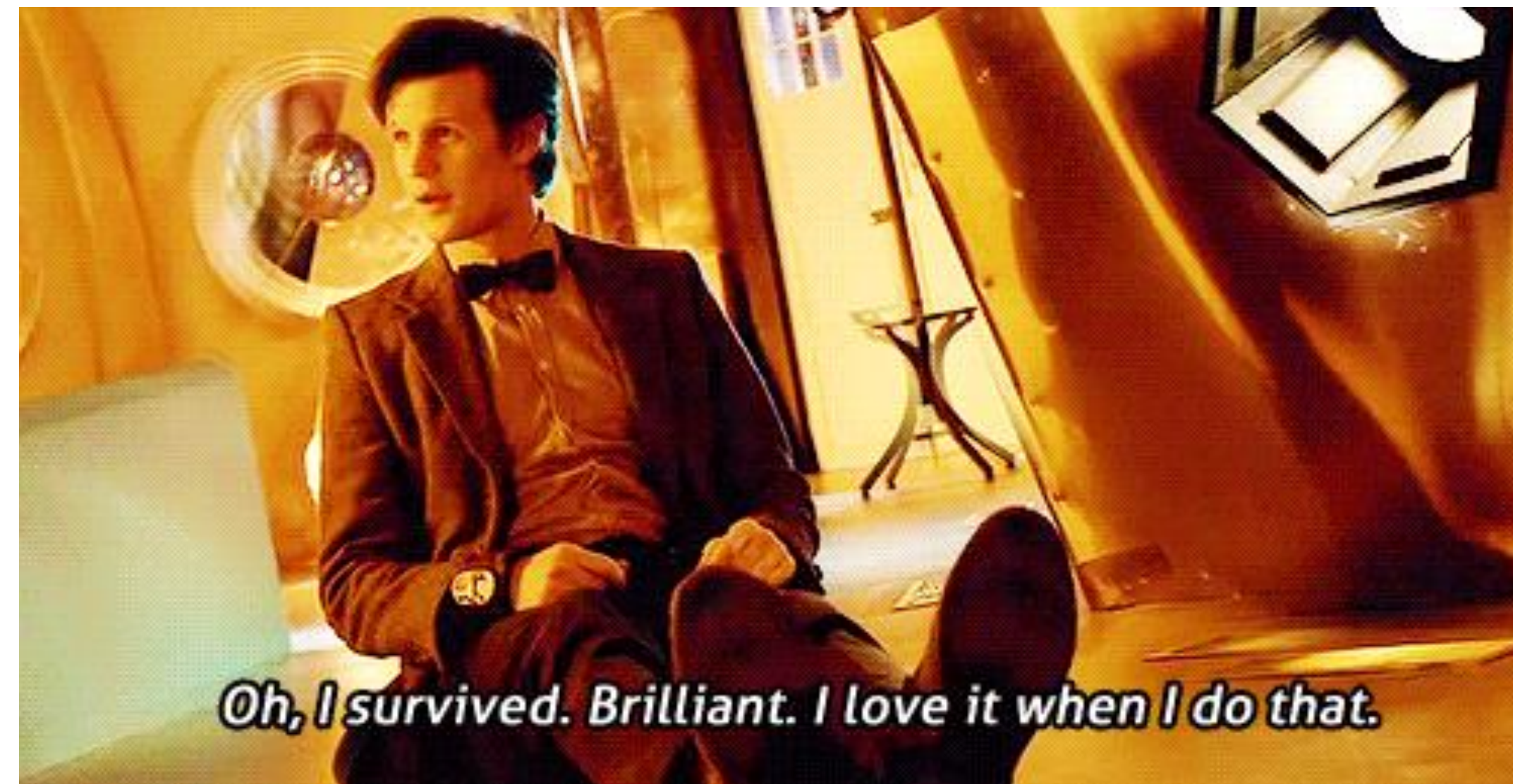


VDC Future Role(s)

- No Clash Detection
- Programming: either manage or create
 - PowerBI
- Basic IT – still required
- ROI Tracker
- Virtual and Augmented Reality Specialist
- Robotics Technician: troubleshoot and basic repair of connected devices, scanners, drones, and wearables
- R&D: supplemented out to Tech Companies – must manage the process and make decisions
- Process Manager: implement new technology and workflows
- Broad knowledge scope to connect all pertinent data



Job Security



Doctor Who, BBC America

Basic Design Automated

GENERATIVE AND ITERATIVE DESIGN

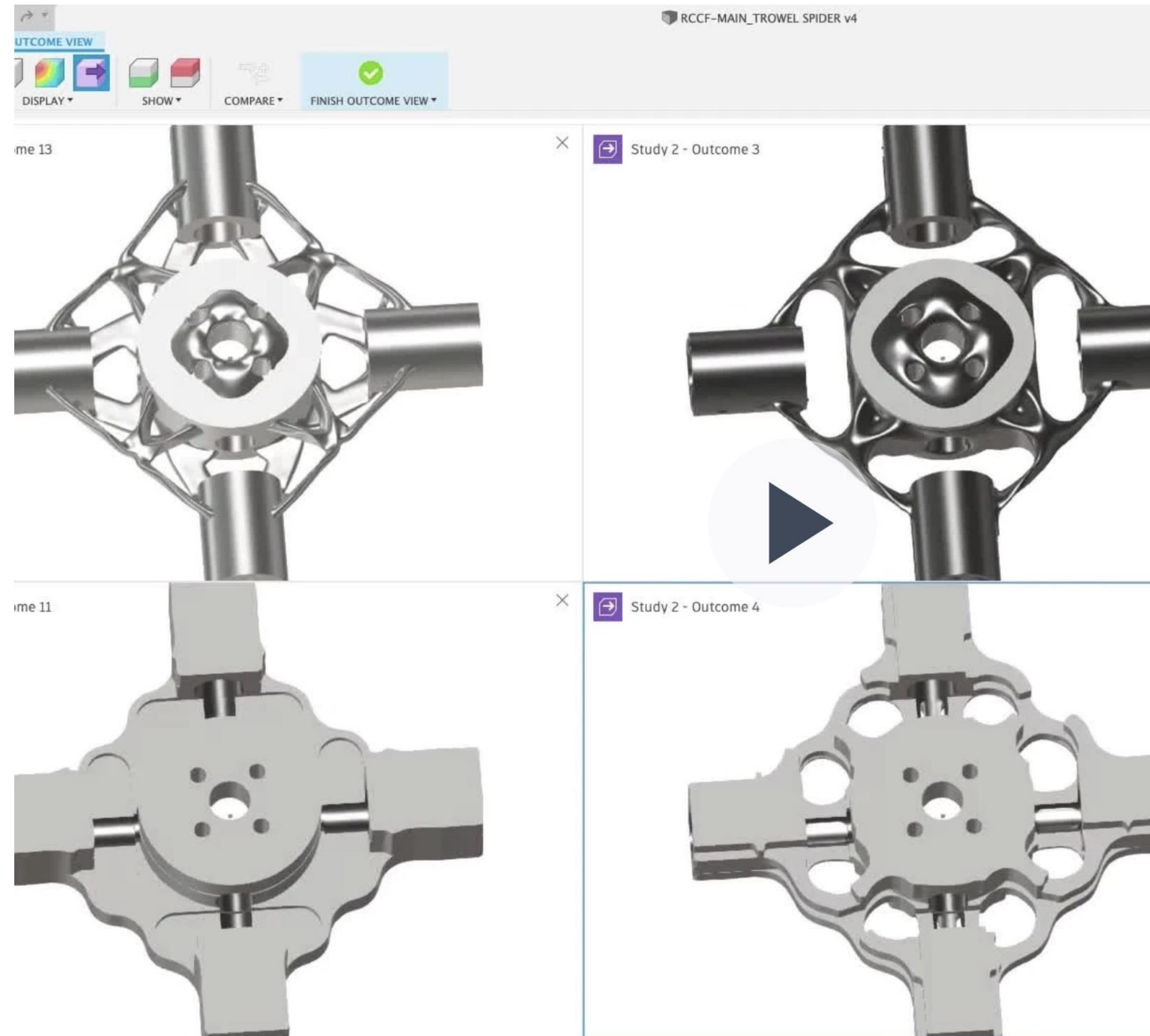
- Generic Design outlines
- Start modeling from these concepts
- Detailed designs flushed out via programming

MACHINE LEARNING

- Data from real world on fail rates
- Material costs and sustainability scores

BUILDING IMPROVEMENTS

- Performance data
- Costs and Schedule impacts per design option
- User ratings



Project Consistency



MANUFACTURER CONTENT CHECKED

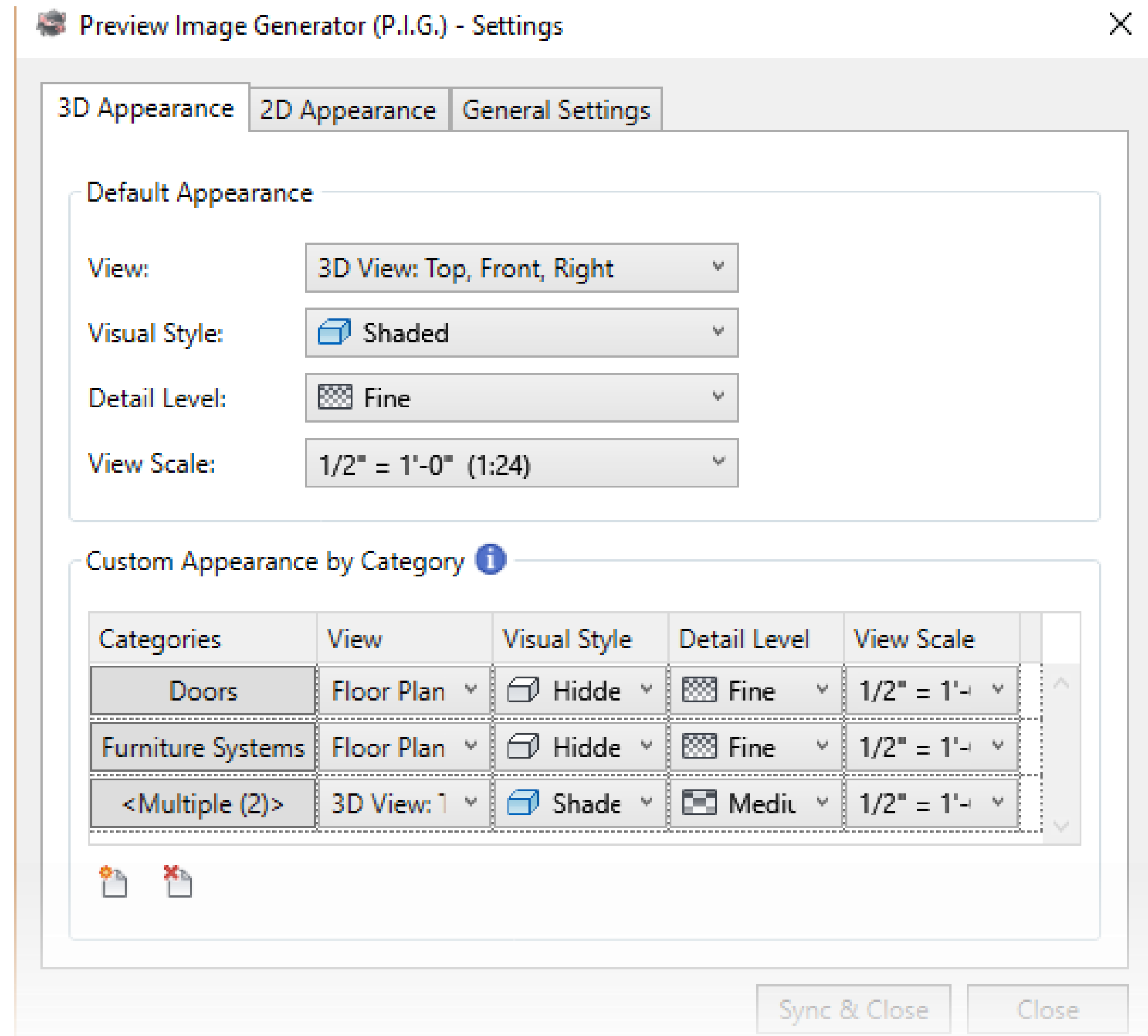
- Keep models safe
- Consistent visuals
- Mapped parameters

LIBRARY AND TEMPLATE MANAGEMENT

- Save time and rework
- Reduce training and modeling workload
- Manage in one place

LIBRARY AND DATA MANAGEMENT

- All document types for projects
- Content managed including information per phase
- Data and Integration feed automation



LOD Upgrading

LEVEL OF DEVELOPMENT

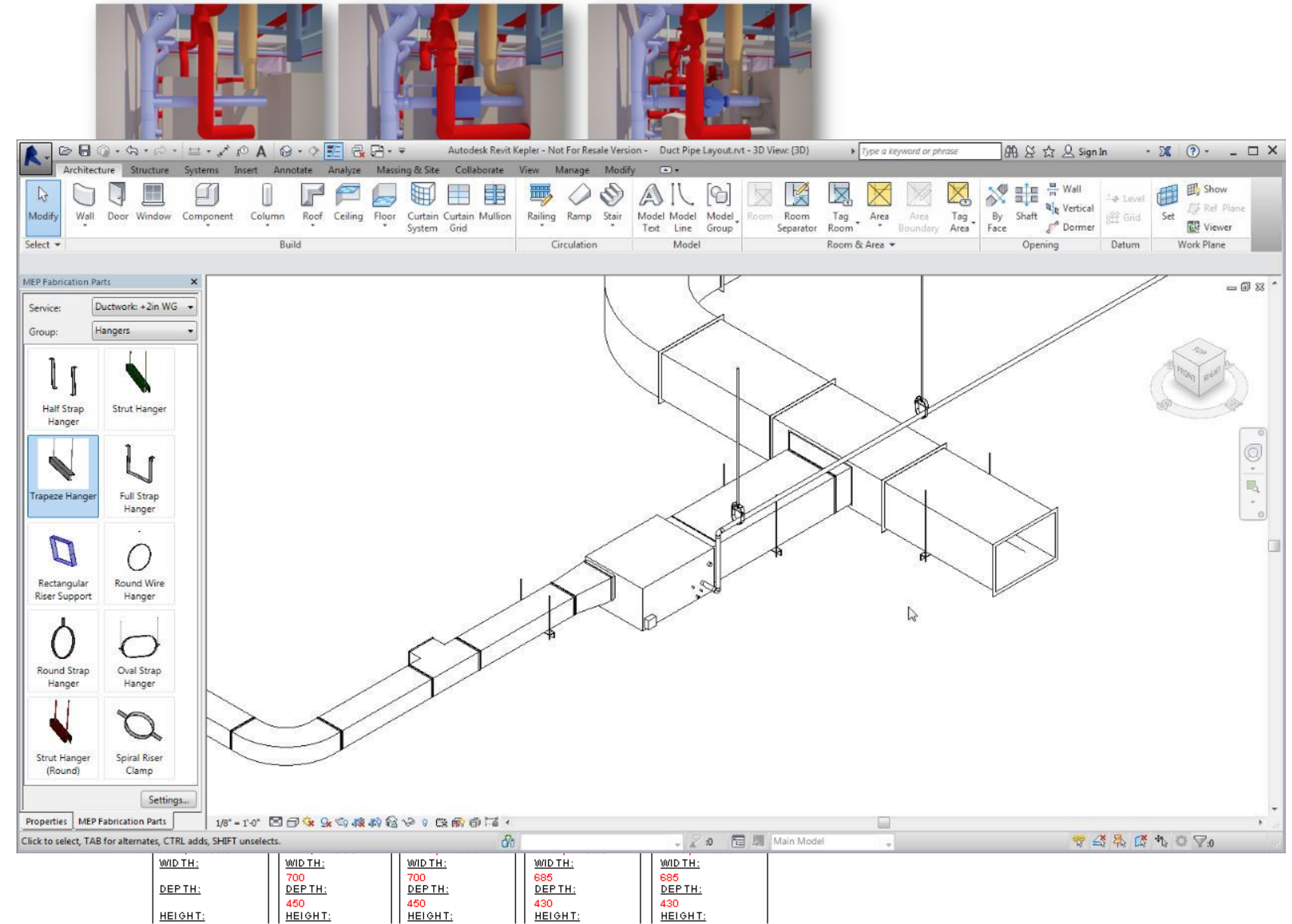
- How much is modeled
- Accuracy of what is modeled

LEVEL OF DETAIL

- How much information is attached to the object
- How much the object represents the real life version of itself

AUTOMATIC UPGRADING

- Per project phase
- As a designer models in lower LOD, machine learning can feed real life parts reducing rework and suggesting improvements



AI Interns

AUTOMATIC DOCUMENTATION

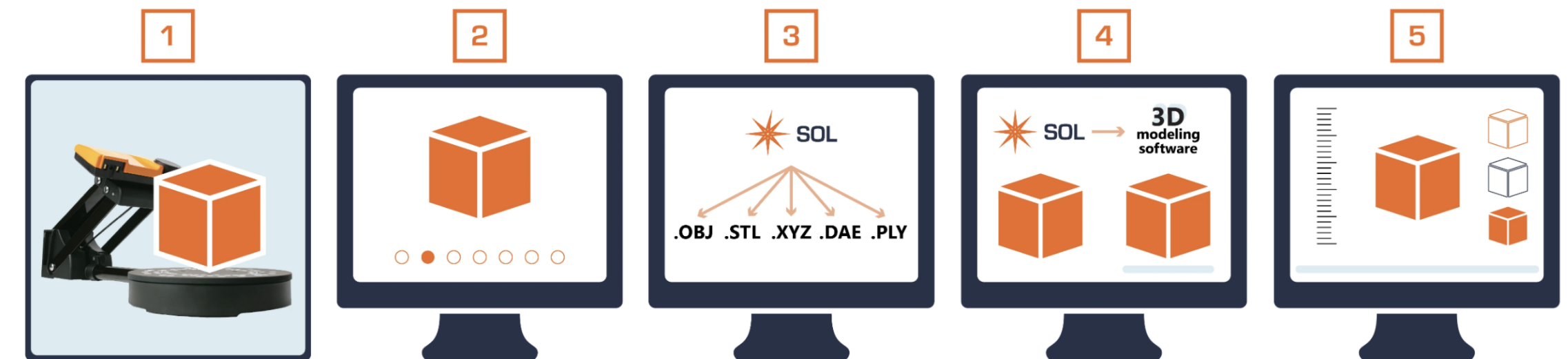
- MSuite and others currently do this
- Send drawings/Models right to next stakeholder with BIM 360 Integration

ISSUES AS REDLINING

- BIM 360 Model Coordination
- Machine Learning warnings
- Suggestions from real life buildings

FAMILY AND DETAIL CREATION

- Manufacturers are modeling families
- Limited number of items to create
- Scan to model capability

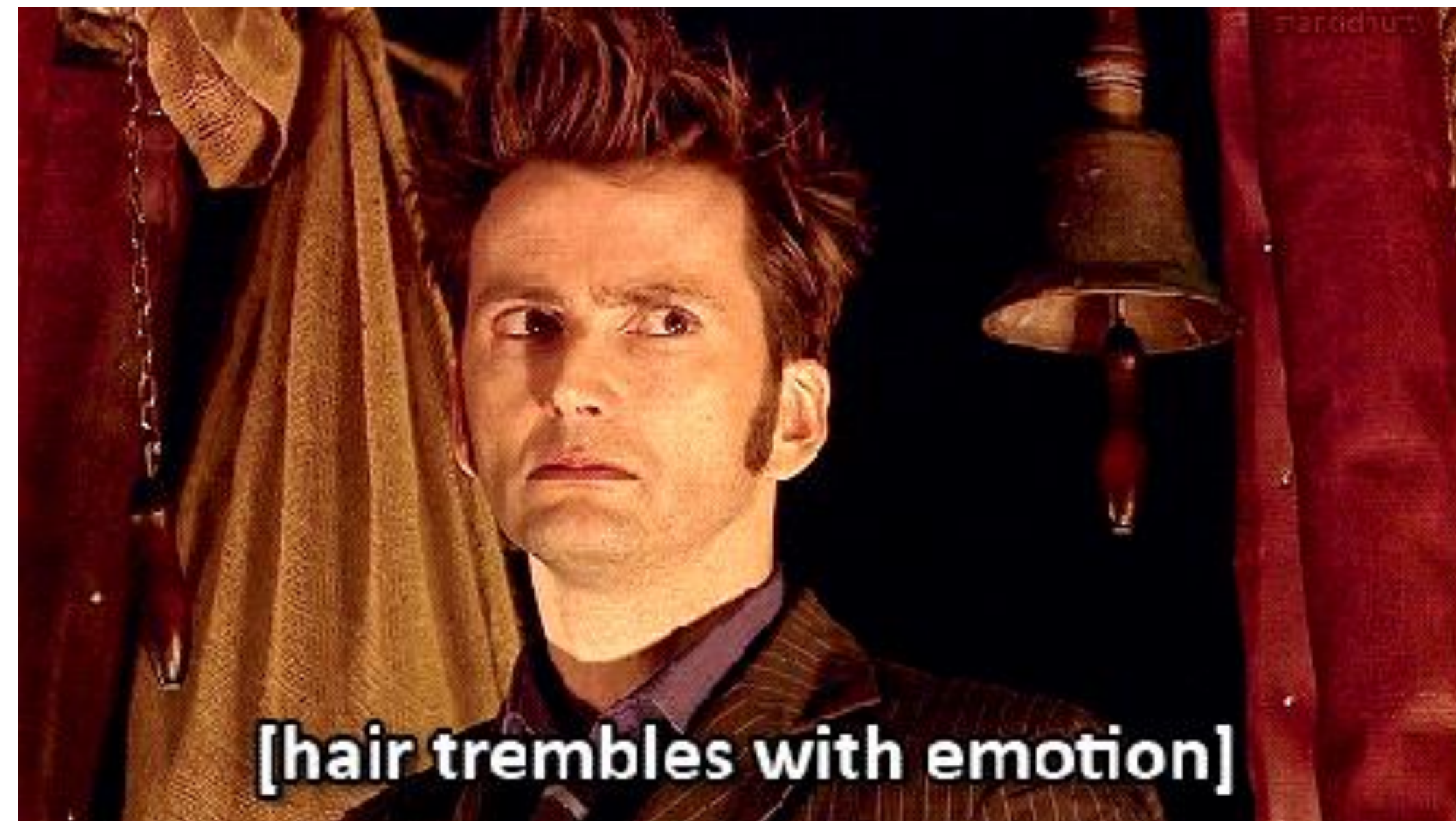


BIM Manager Future Role(s)

- Understand what technology needs to go into the buildings to make Smart Cities
- Keep Data connected
- Reduce rework
- Integrate technology solutions and keep updated on new options
- Manage cloud projects
- R&D: partner or outsource
- Virtual reality specialist
- Basic IT
- Be able to Program at a basic level
- Training: designers on generative design, PMs on management options, and users on Apps/New Features



Shocking Future



Doctor Who, BBC America

Model Based Project Delivery

COMPLETE MODELS

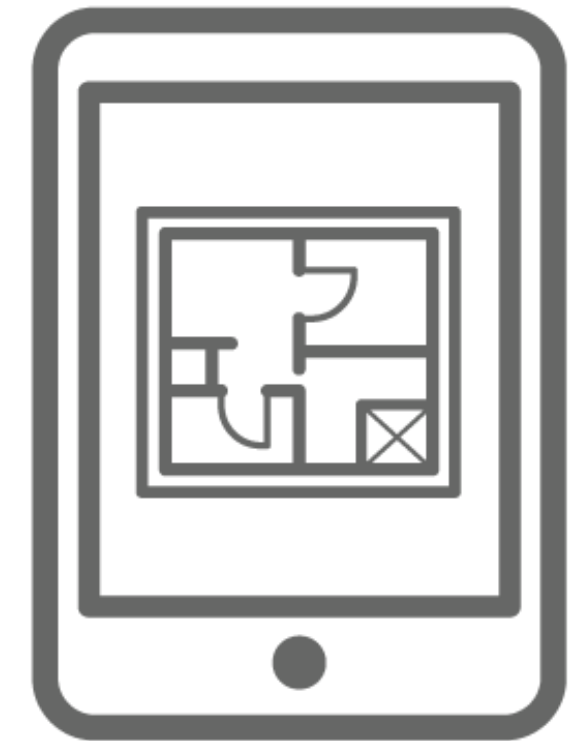
- No fake parts
- Connected data including GIS for Cities
- Full Prototype

BUILDINGS BUILT BETTER

- Issues rectified earlier
- Buildings produced faster due to streamlined processes and decisions

UNFORGIVING MARKET

- Owners get a clearer picture of what they are getting and who they are working with
- No room for Pretty BIM



Modeling in the Cloud

CLOUD REVIT: BIM 360 MODELING

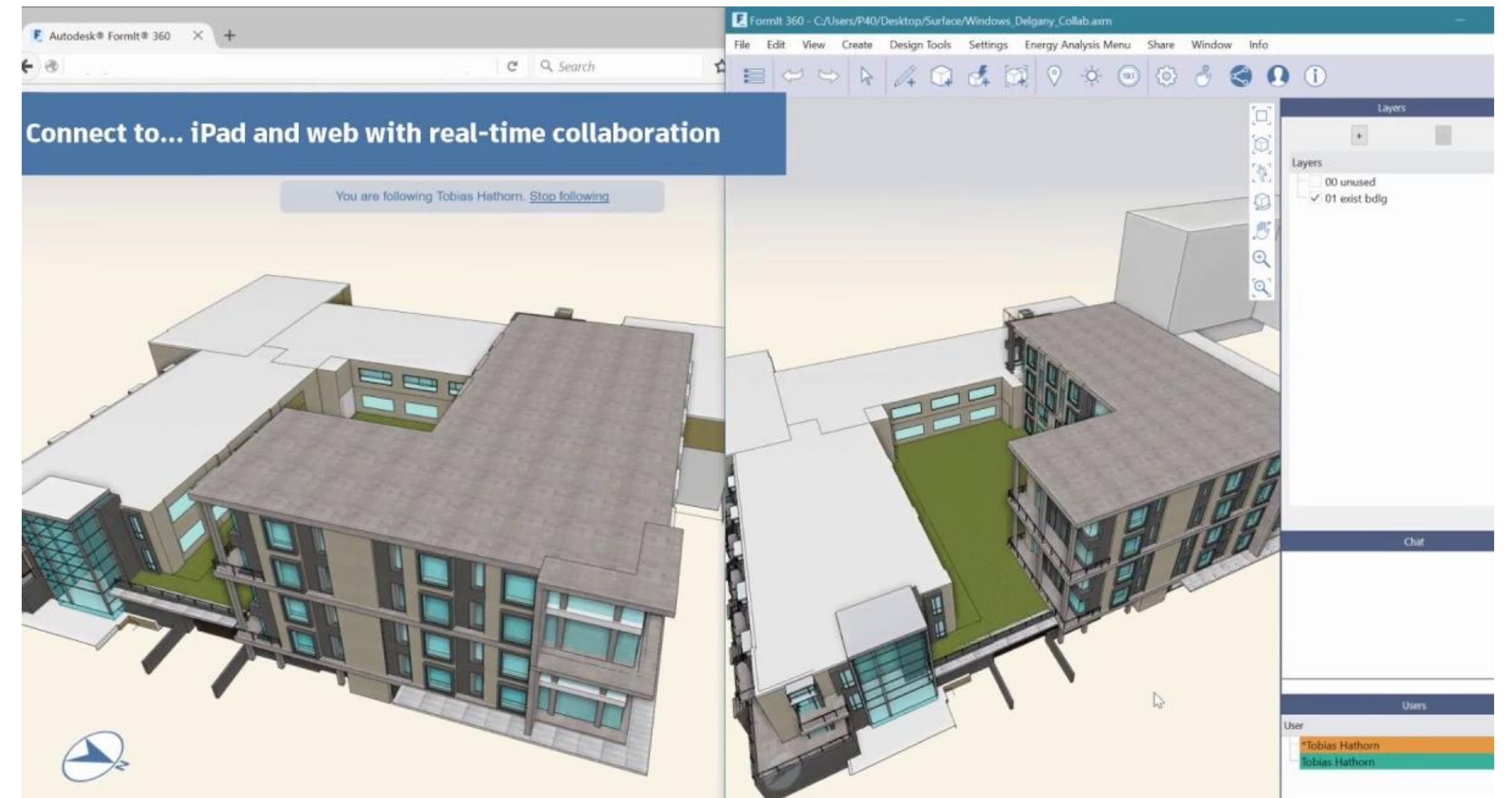
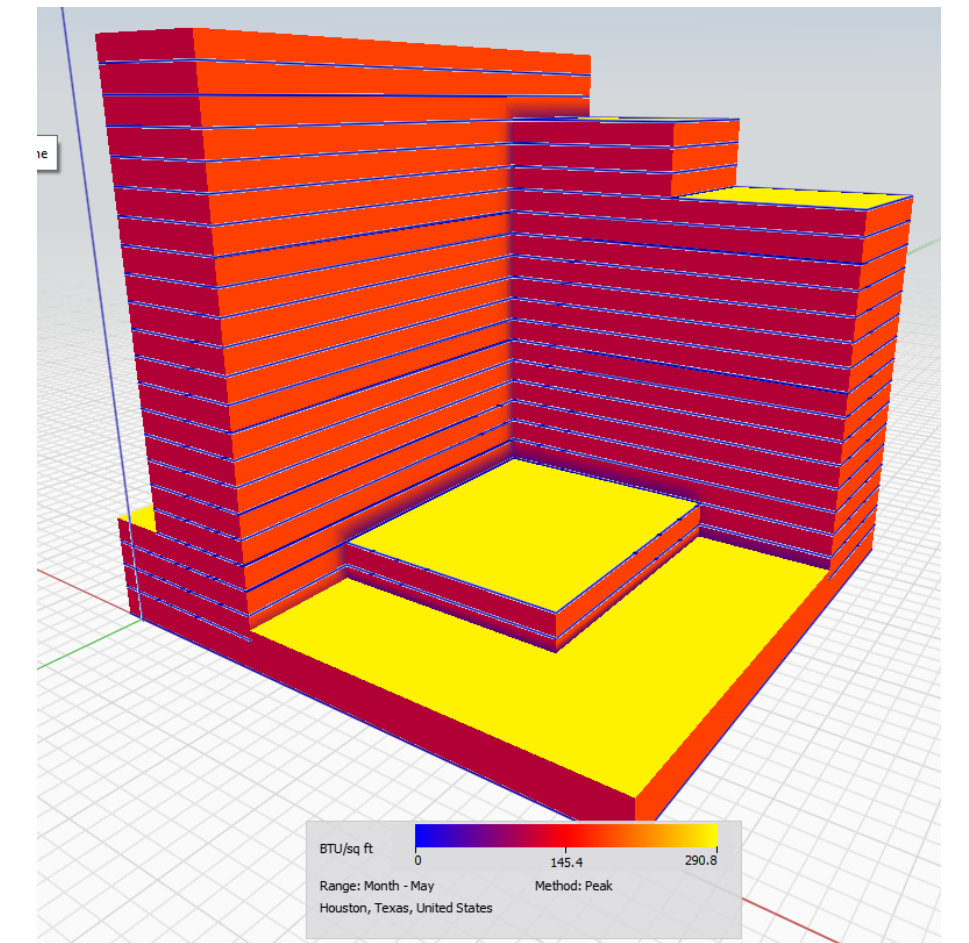
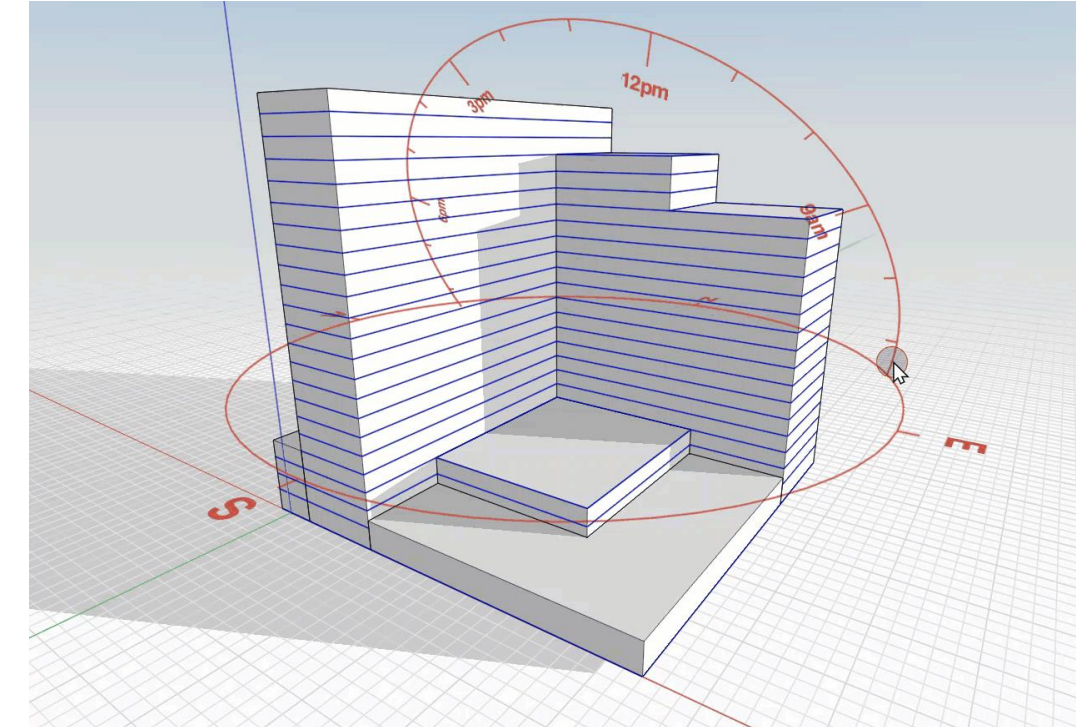
- No more single processor
- Everyone in the 'same' model
 - Increased stakeholder cooperation

INTEGRATION

- Connected Data without add-ins
- Stakeholder communication

COMPUTER SETUP CHANGES

- No need for heavy duty machines
- More touch enabled capability



Machine Learning

MORE INFORMATION THAN EVER

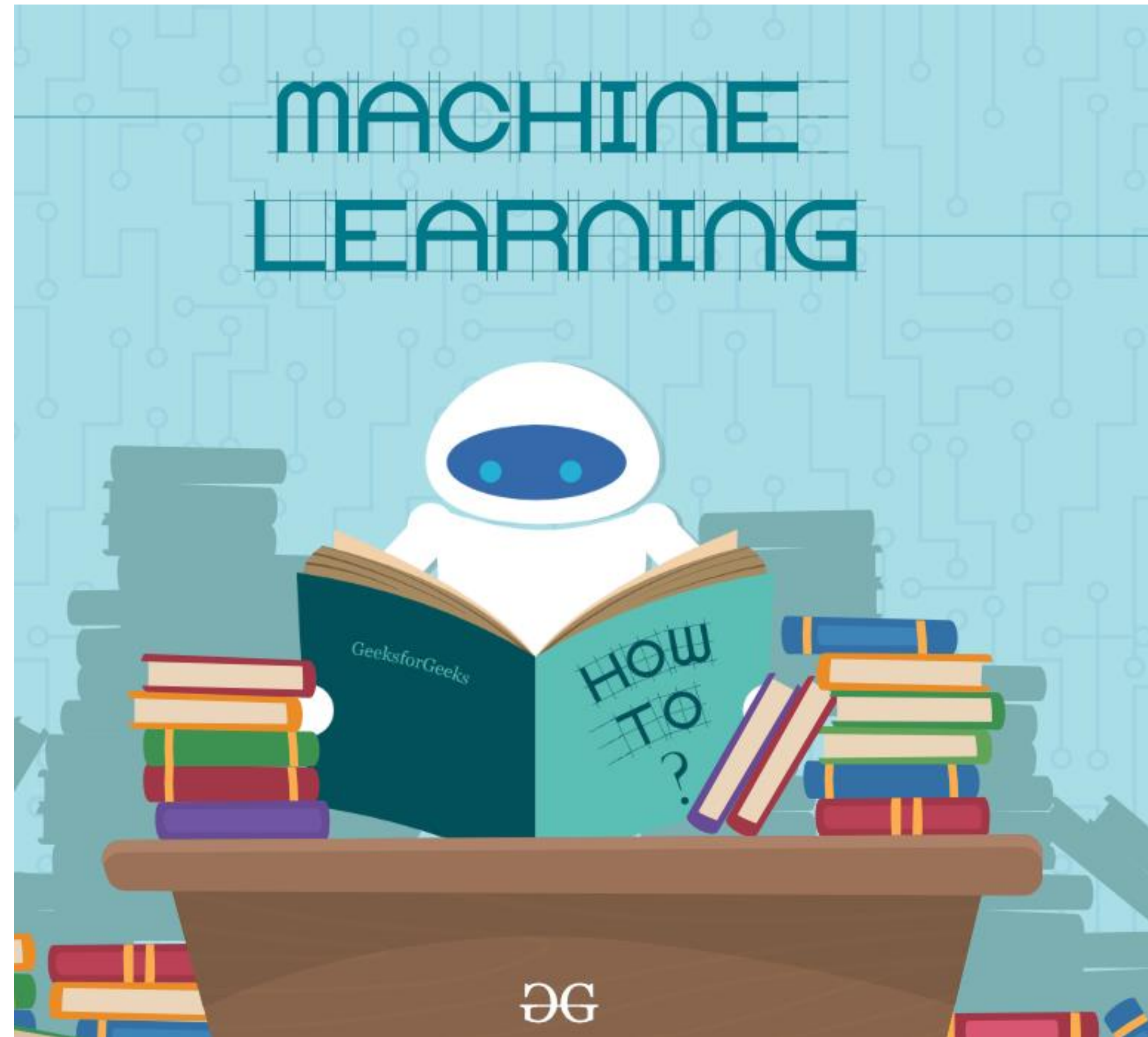
- There is now more information than a person can consume available
- Supplemental support frees our brains

COMPLEX PROBLEMS

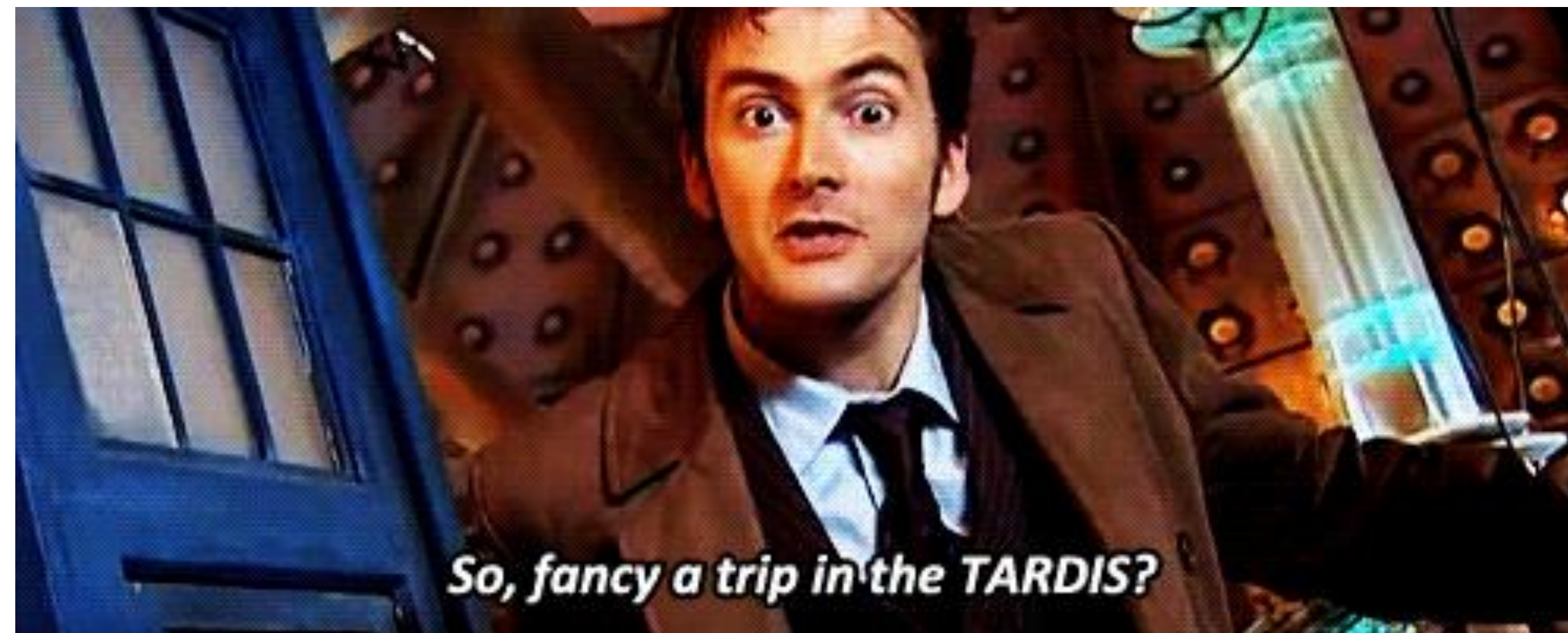
- 'Run simulation': cannot design simulation
- Humans are 'outside of the box' while machines are fact checkers and number crunchers

IMPROVE END USER KNOWLEDGE

- As a user sees more solutions, they will start creating fewer problems to solve
- While we are a small community, there is still a whole world of experience out there



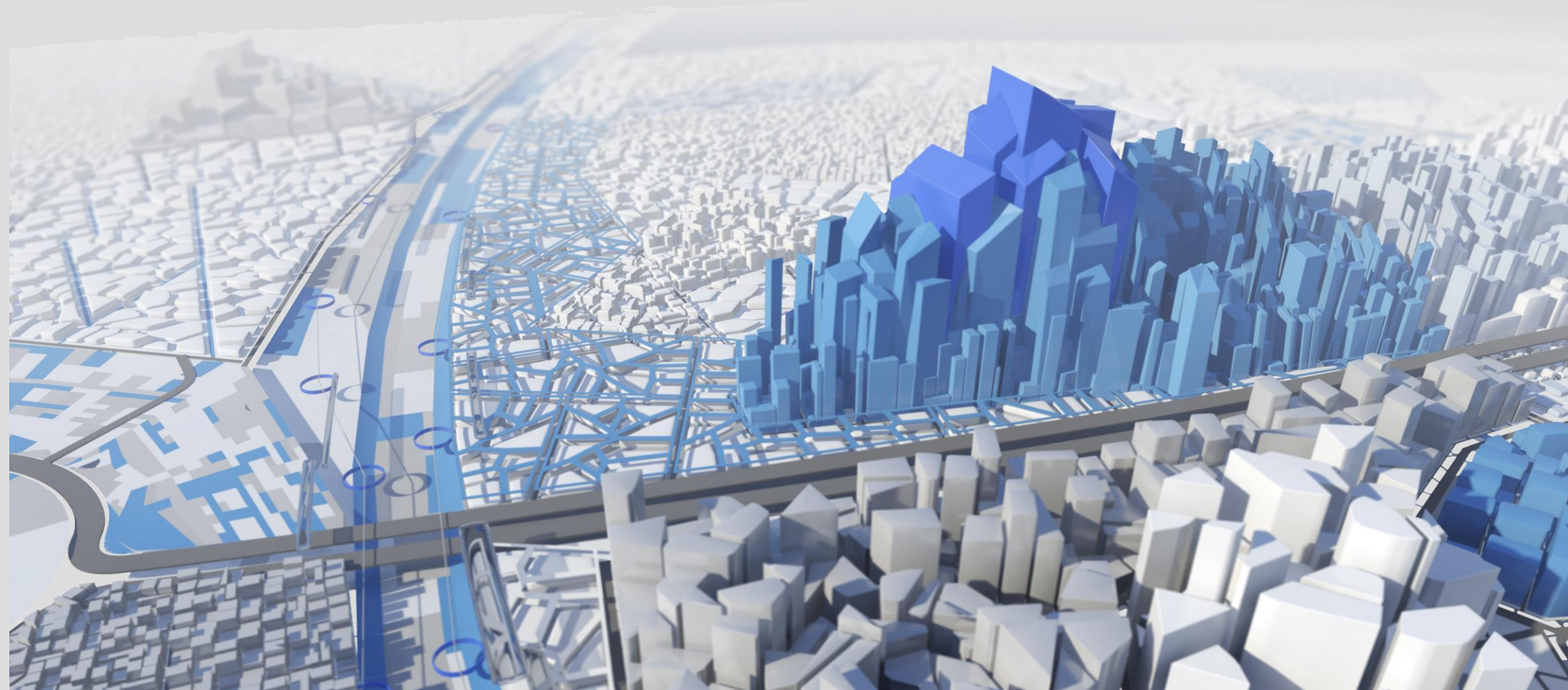
Thank you for time traveling with me!



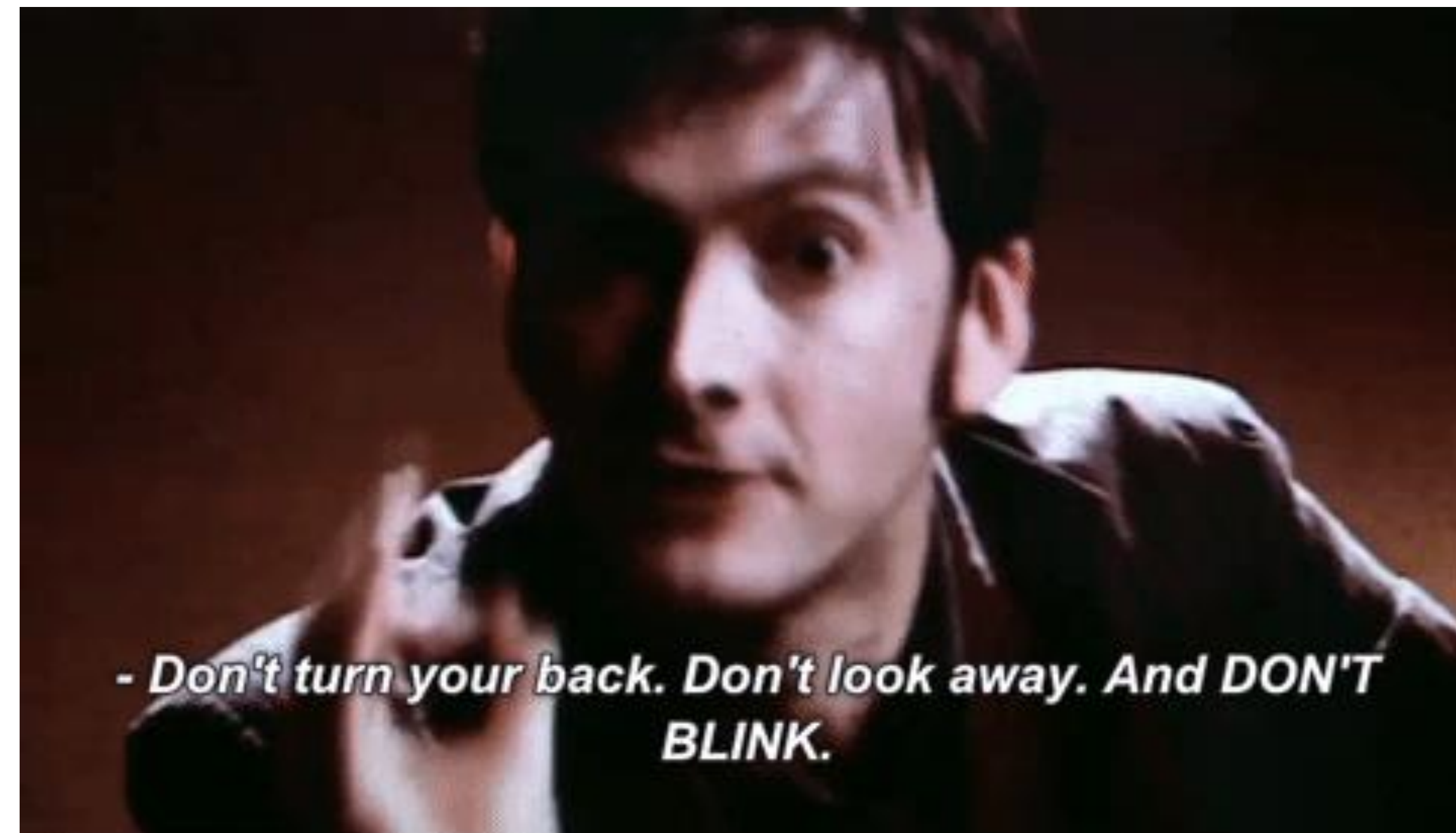
Doctor Who, BBC America

Watch the BLEEDING edge to stay on the LEADING edge.

Instant, accurate data allows for the swiftest responses which saves time, energy, and money with the best outcome in quality and lessons learned.



Future Advice



Doctor Who, BBC America – technically about the Angels, but repurposed for this presentation advice



ACHIEVE **MORE.**

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