U.S. Department of Energy
Lighting R&D Workshop

Lighting Systems Data: What Are We Learning

A future perspective

By Sarah Dreger

Stantec

Without change there is no innovation, creativity, or incentive for improvement. Those who initiate change will have a better opportunity to manage the change that is inevitable.

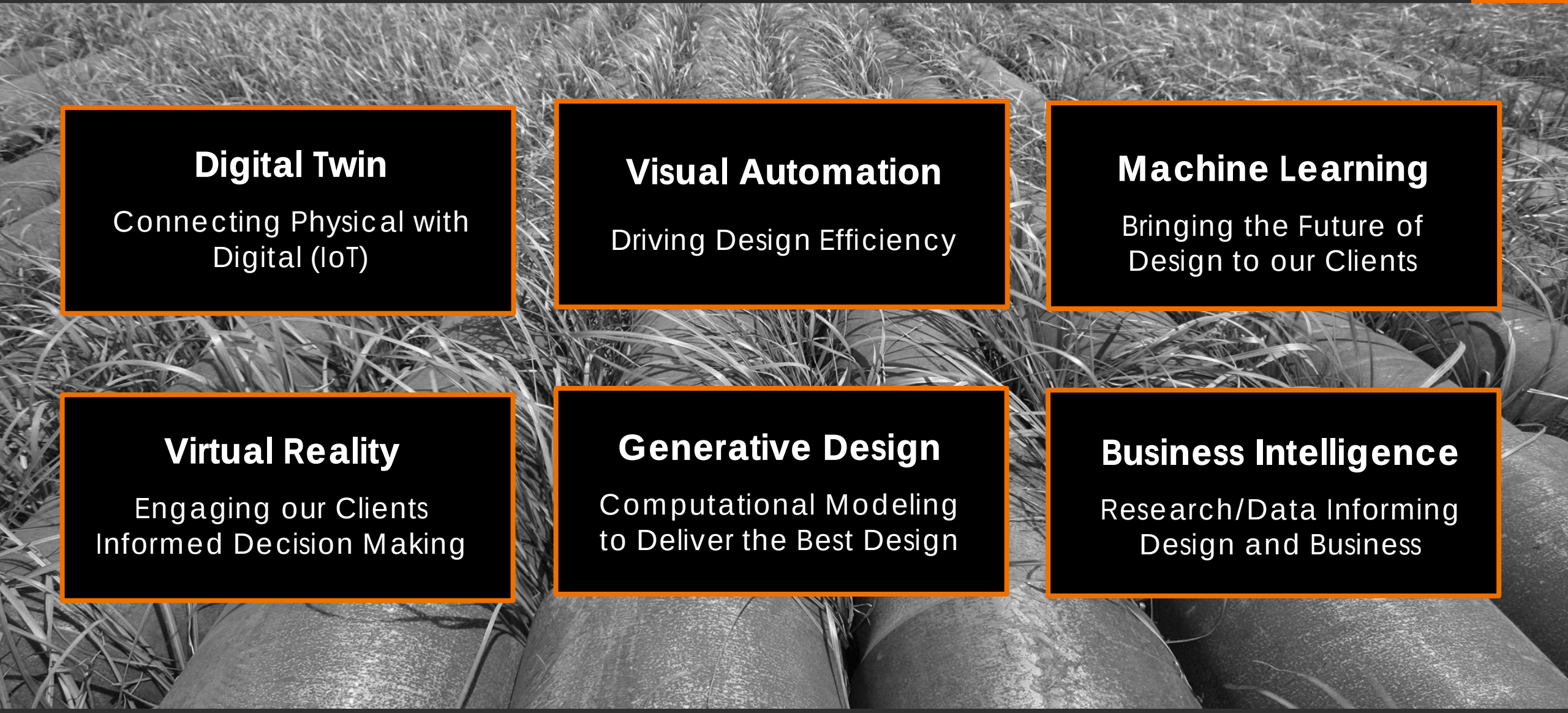
William Pollard

Sarah Dreger

Senior Principal, Discipline Leader Buildings Digital Practice Stantec

- Originally trained to be classical musician.
- Serial hobbyist.
- Strong mechanical background; emphasis on design build and construction.
- Actively managing projects and personnel in a dynamic field for nearly 20 years.
- Fluent in 8 programming languages.
- Expert level proficiency in too many applications to list and tinkerer of gadgets and gizmos.
- Global leader of technology for Stantec Buildings Practice aka Digital Practice.
- Crème brulee is my kryptonite.

A FEW AREAS OF FOCUS



Digital Twin

Connecting Physical with Digital (IoT)

Visual Automation

Driving Design Efficiency

Machine Learning

Bringing the Future of Design to our Clients

Virtual Reality

Engaging our Clients Informed Decision Making

Generative Design

Computational Modeling to Deliver the Best Design

Business Intelligence

Research/Data Informing Design and Business

Finished Space

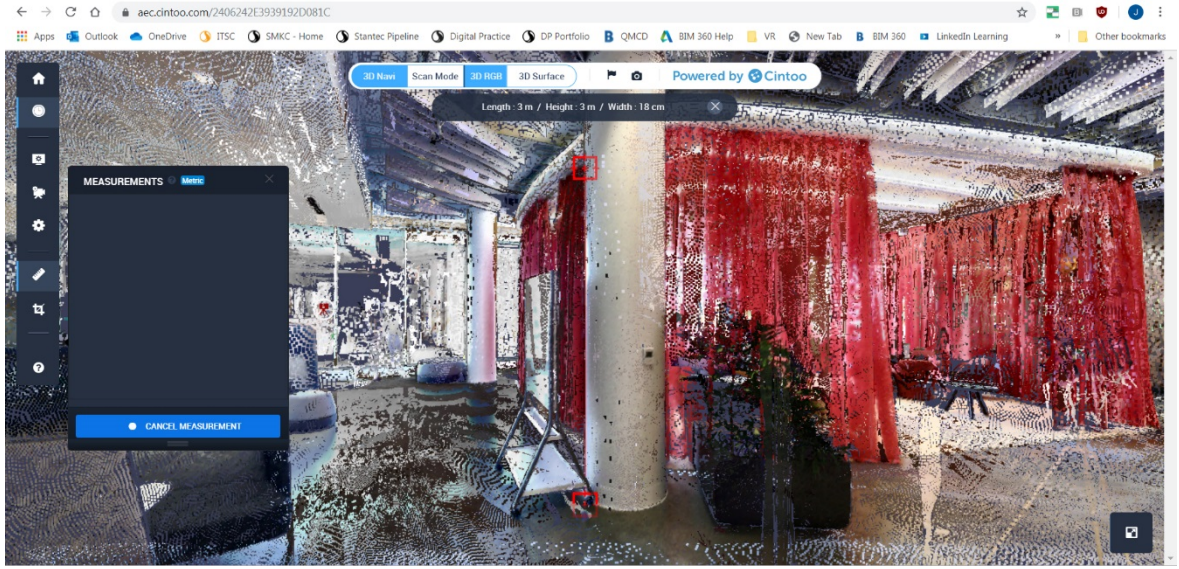
VISUALIZE

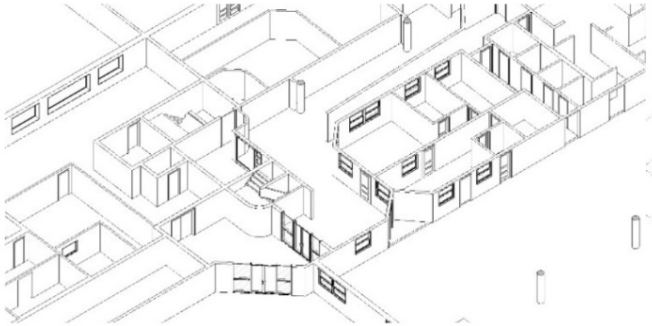
Virtual Reality (VR)

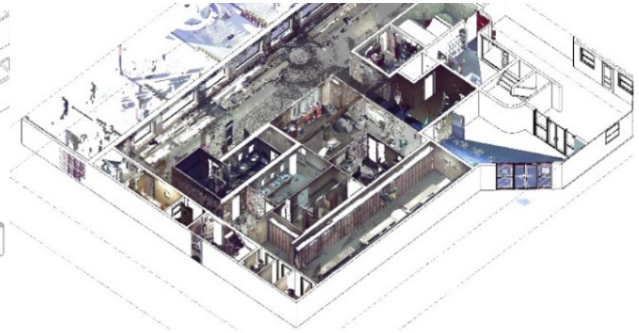
If you have iOS 11+ installed, simply open your camera and view the barcode

REALITY CAPTURE

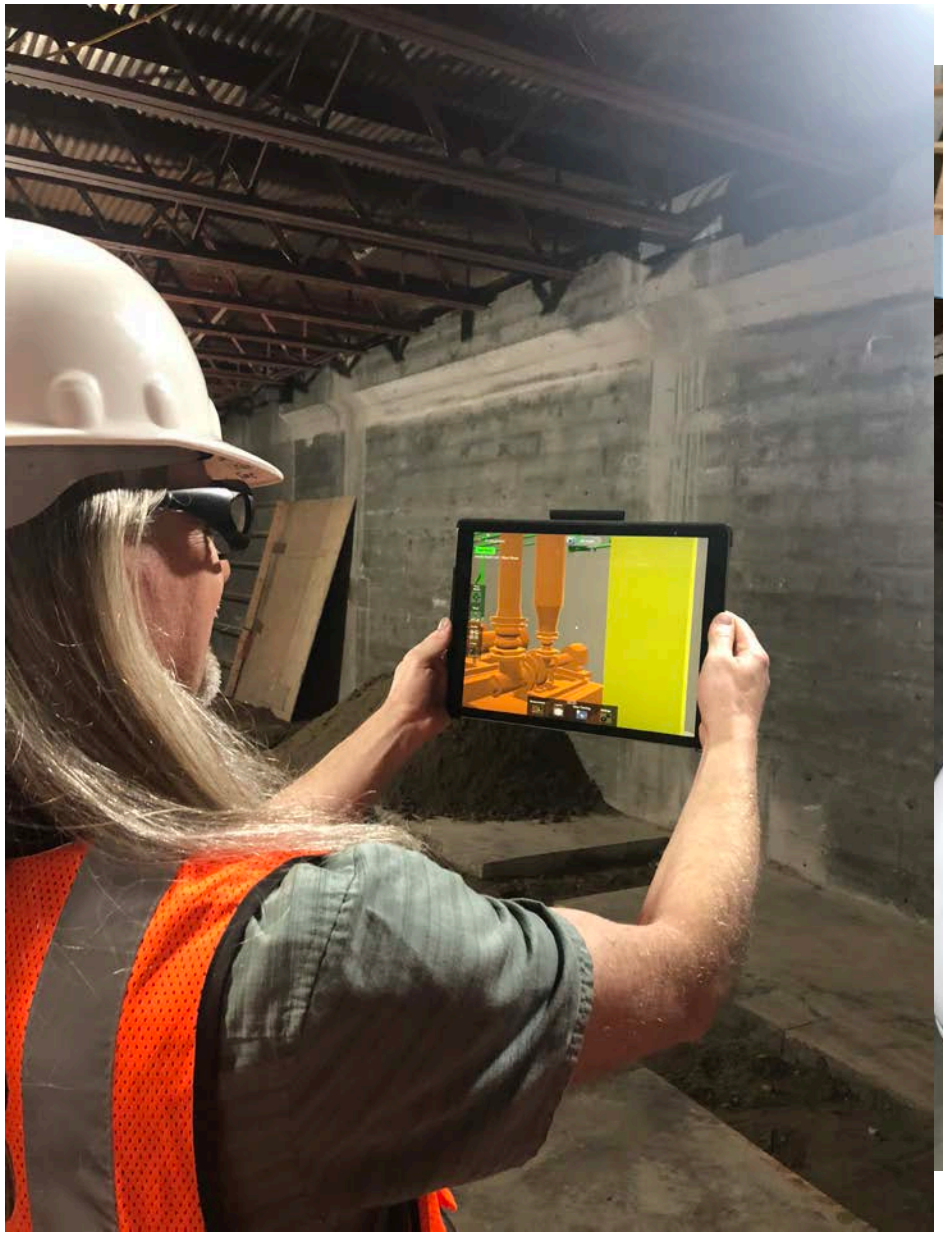
- Laser scanning
- Web-enabled access to imagery
- Query point cloud
- Conversion to Revit







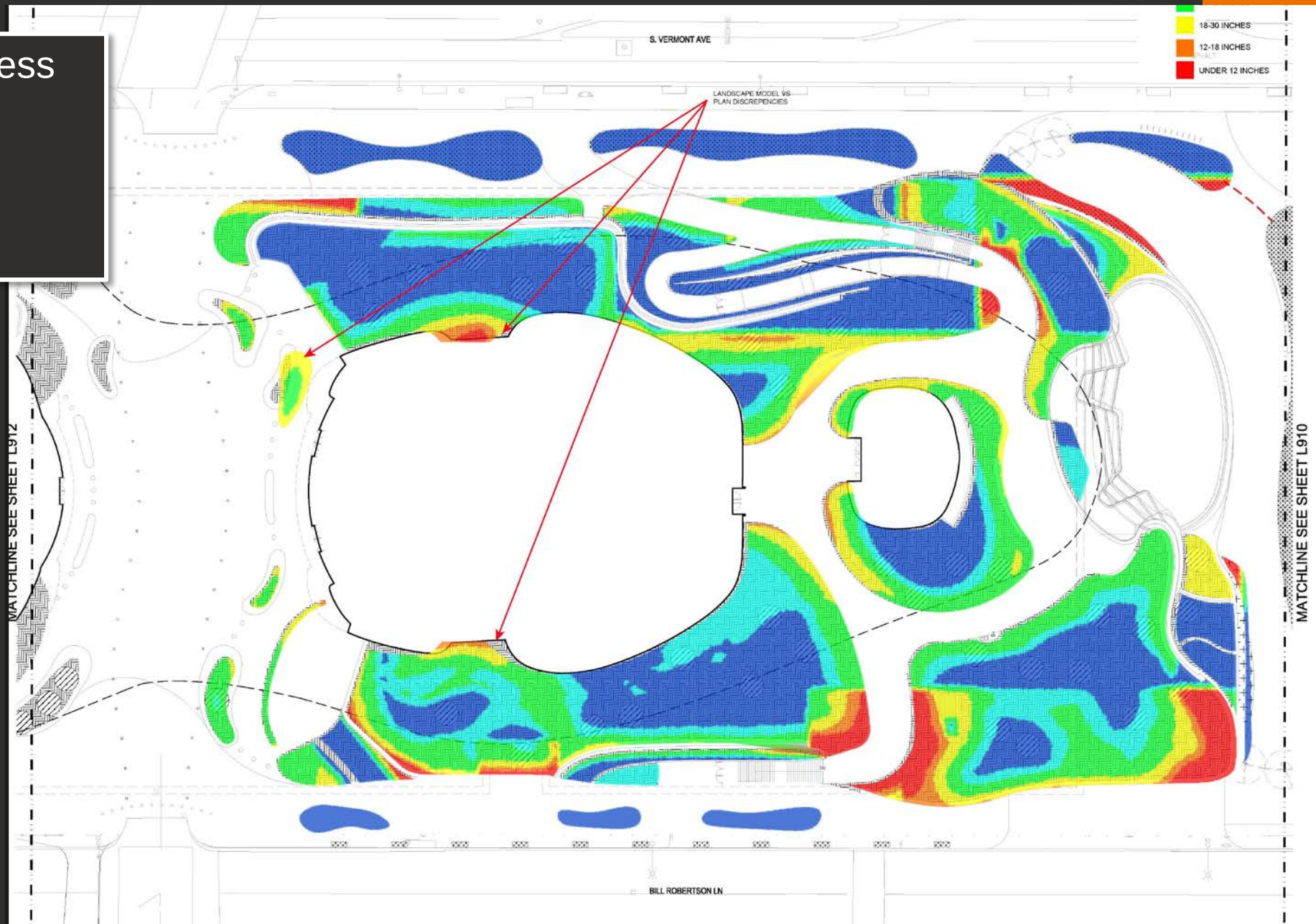
AUGMENTED REALITY



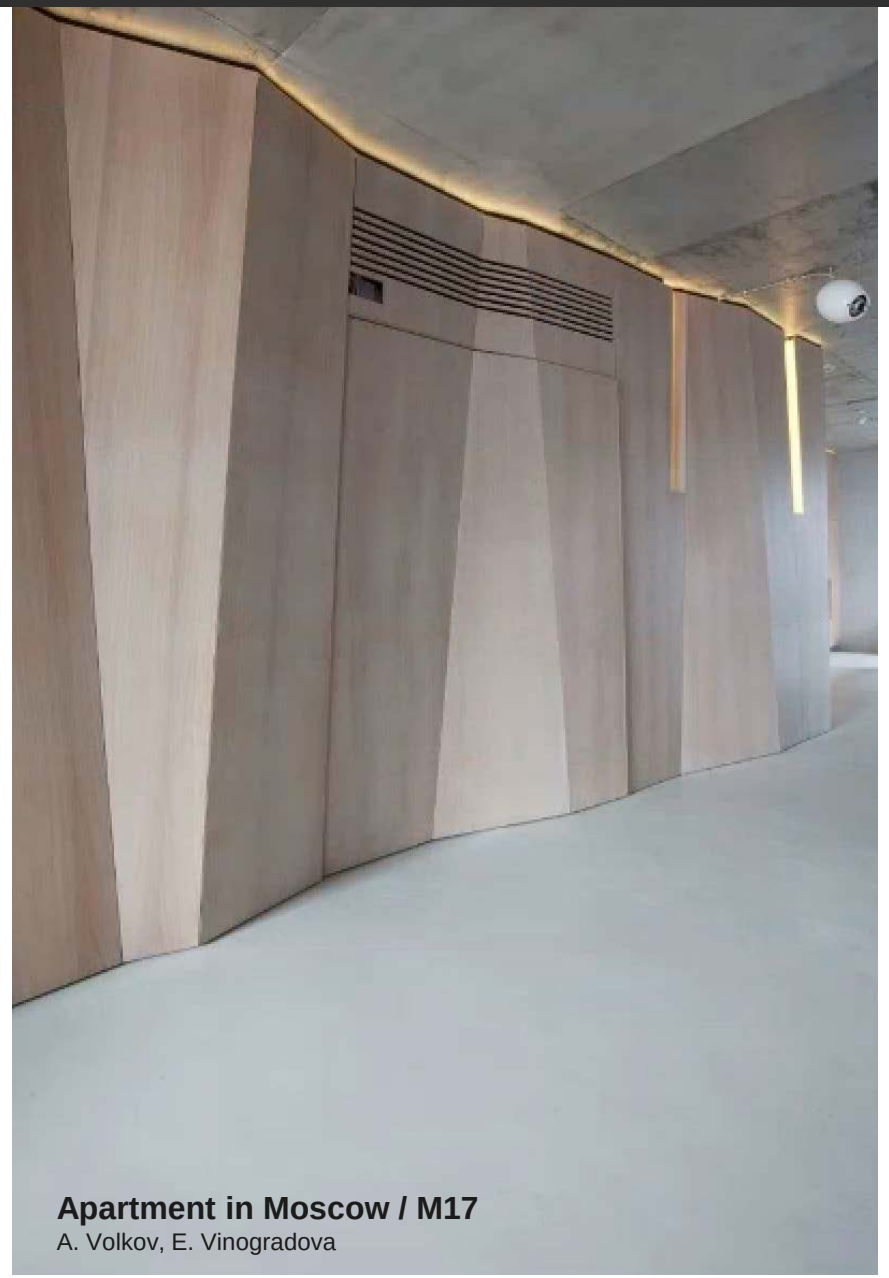
DATA + AUTOMATION = GENERATIVE DESIGN

DRIVING DESIGN: Optioneering

- Automate repetitive process
- Run complex simulation
- Create and Share
- Many communities and resources available



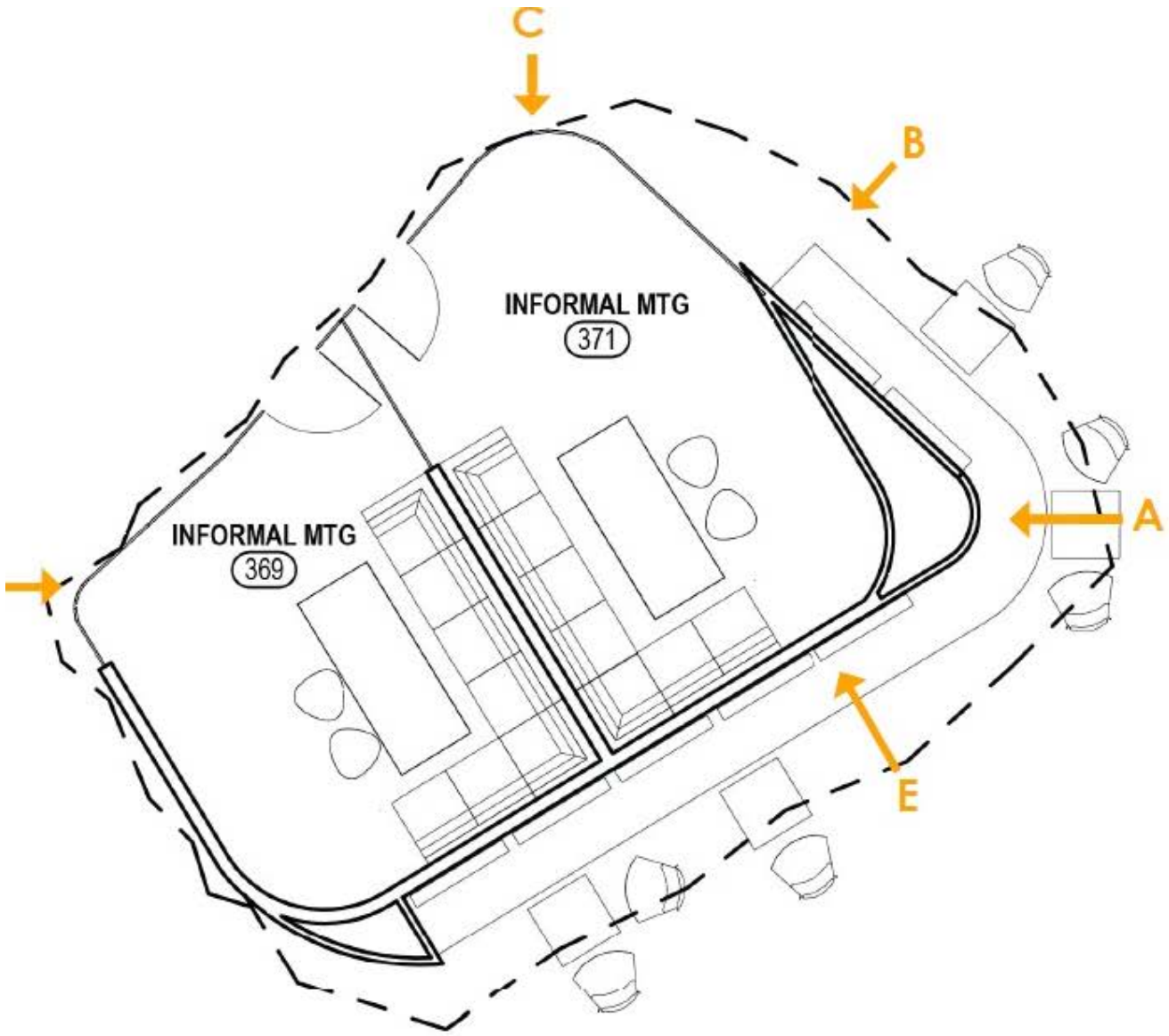
DRIVING DESIGN: Inspiration



Apartment in Moscow / M17
A. Volkov, E. Vinogradova

BNP Paribas Invertment Partners, Amsterdam
Fokkema & Partners Architects

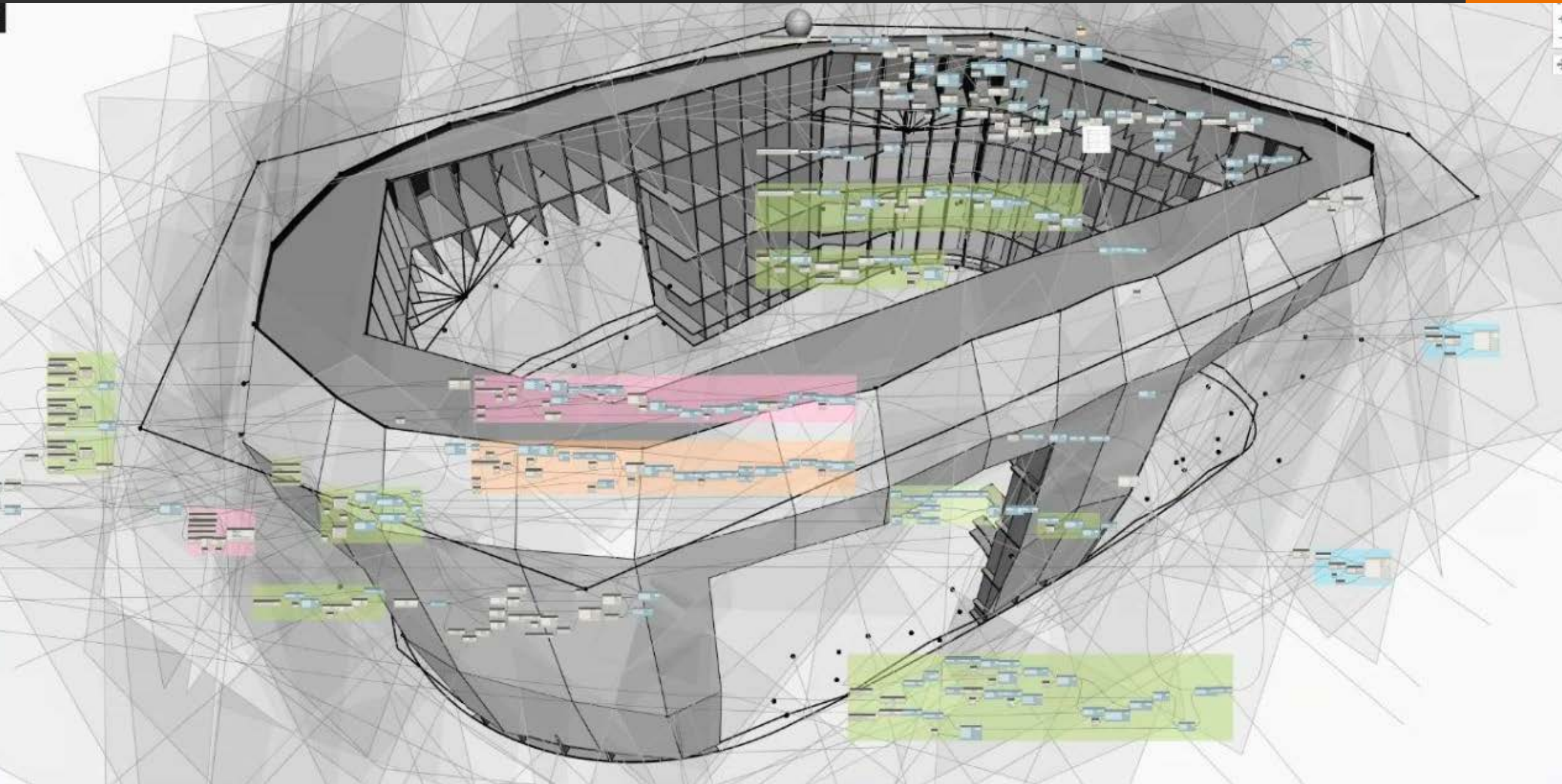
DRIVING DESIGN: Initial Sketch



Banquette Seating:

INFORMAL SEATING
VIEW A

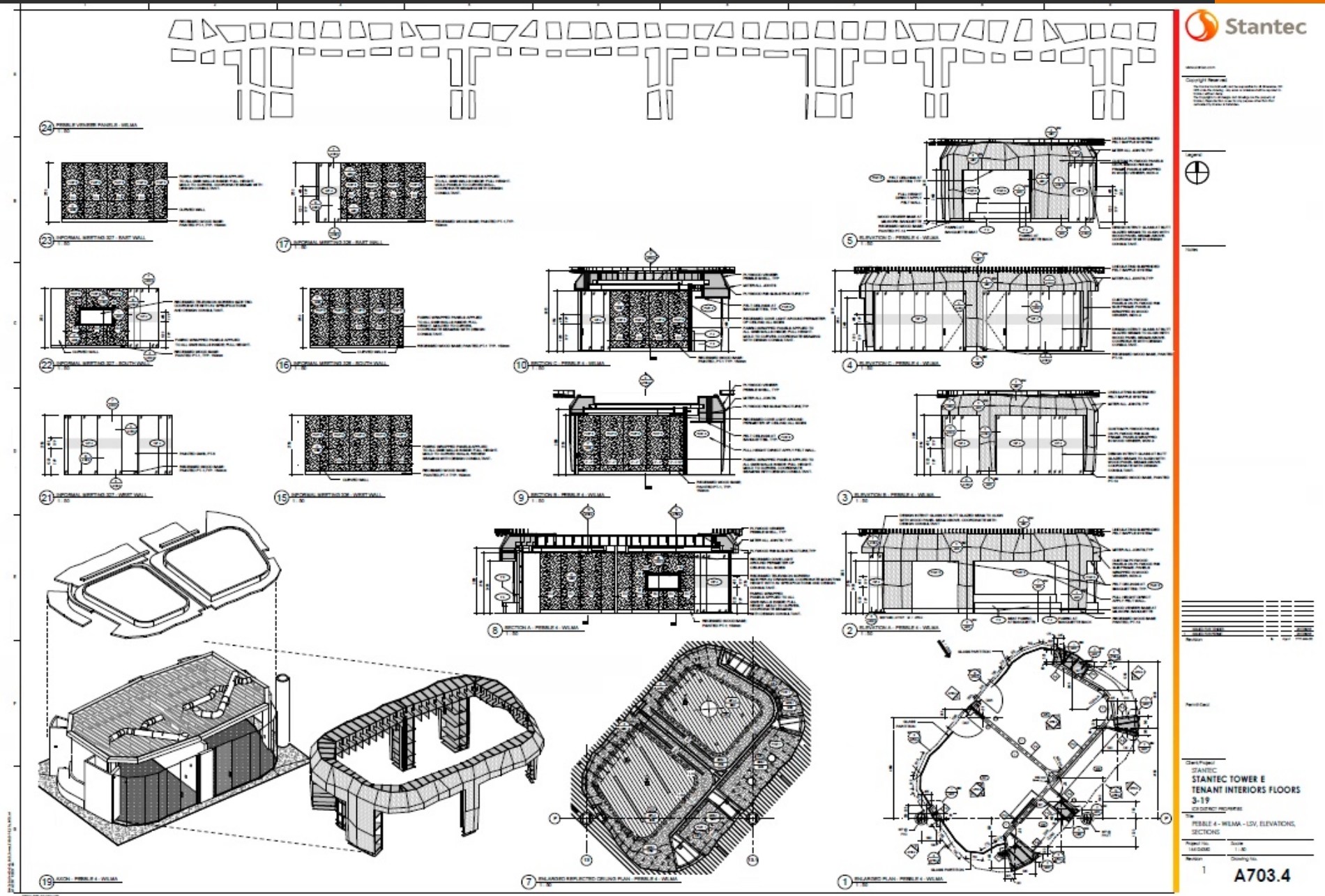
DRIVING DESIGN: Visual Automation



DRIVING DESIGN: Documentation

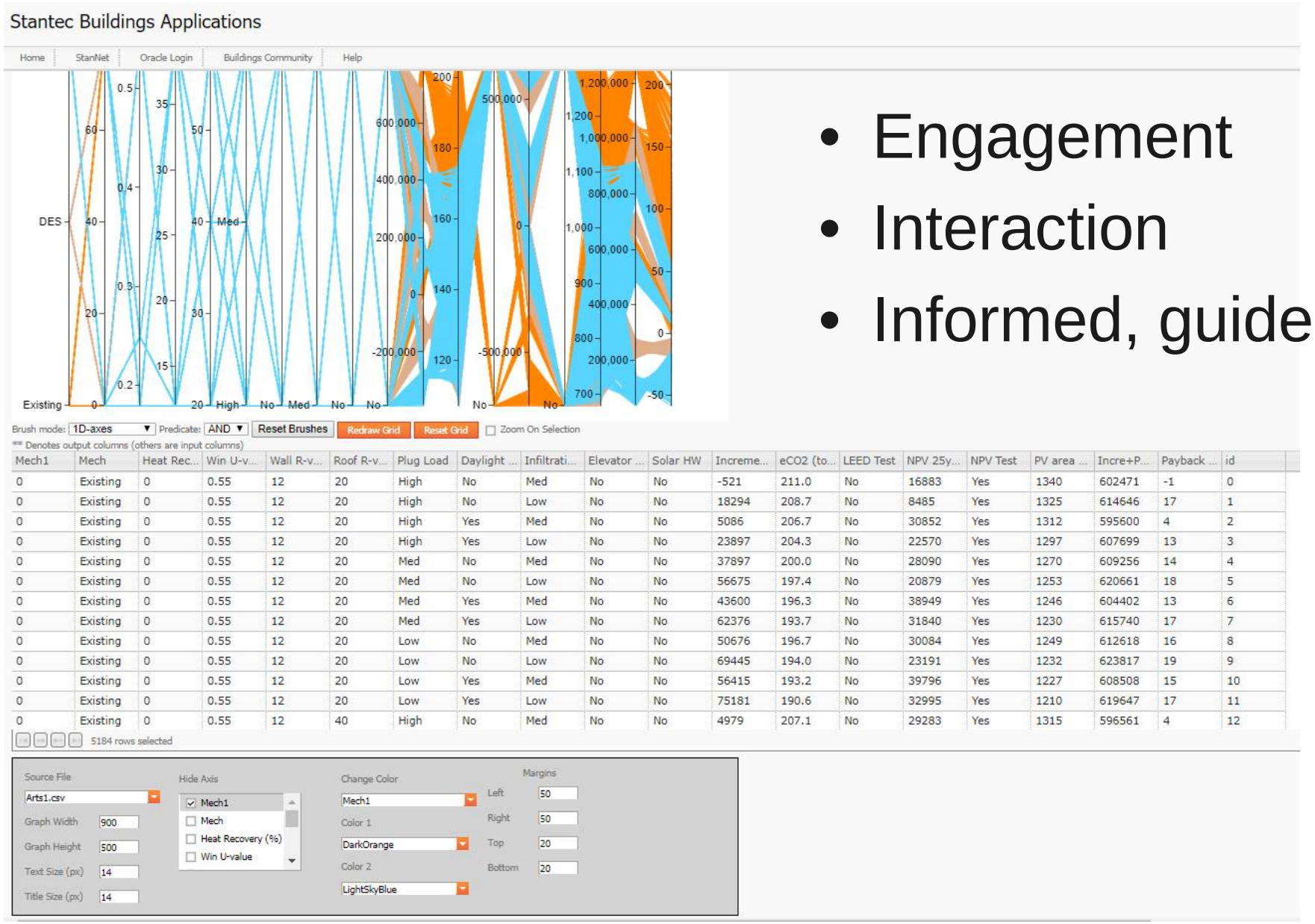
Distributed Team

- Building Location
  - Edmonton, AB
- Design Team
  - Edmonton, AB
  - Calgary, AB
  - Boston, MA
  - Vancouver, BC



DRIVING DESIGN: Physical Mock-Up

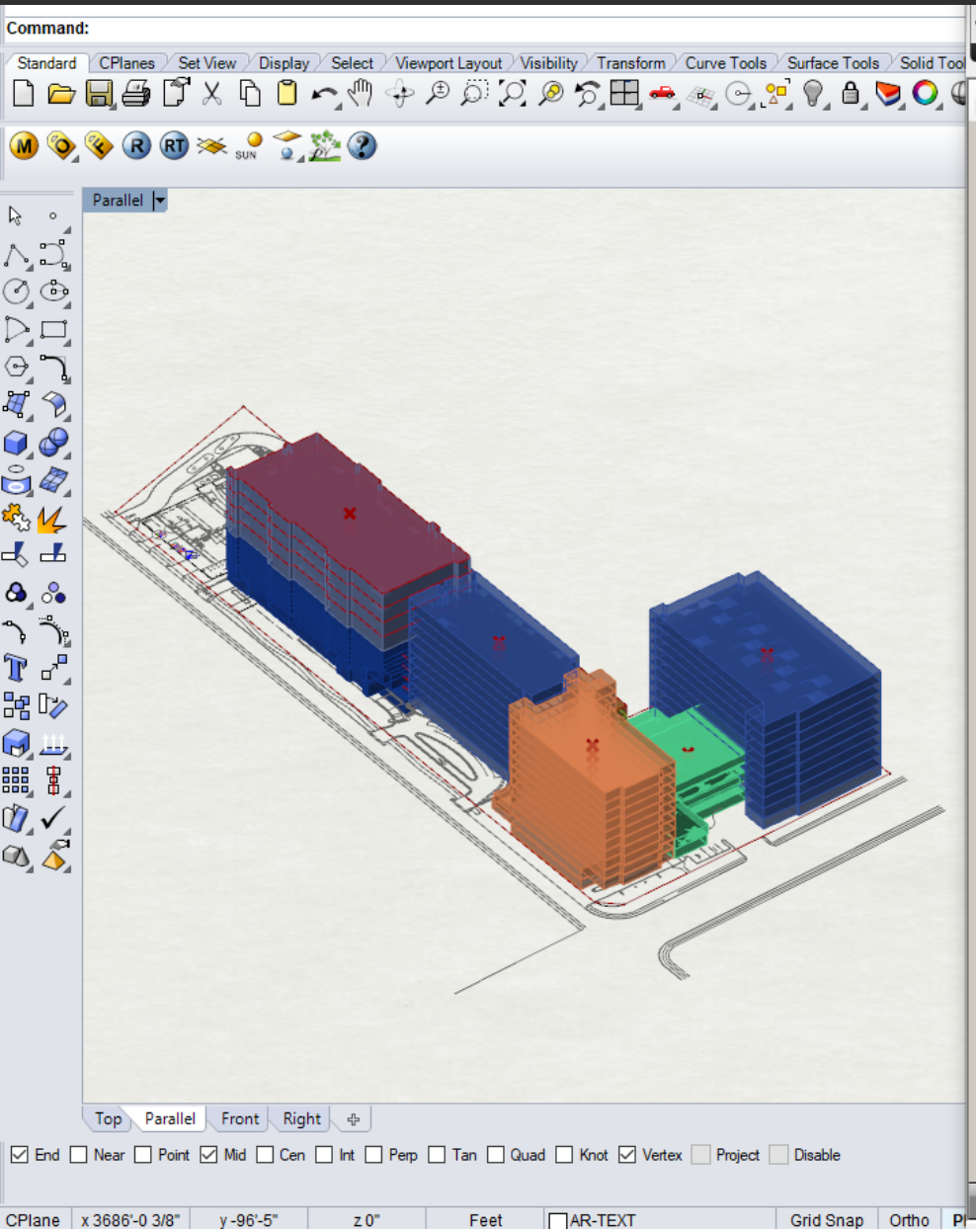
BI: Dynamic Client Facing Tools

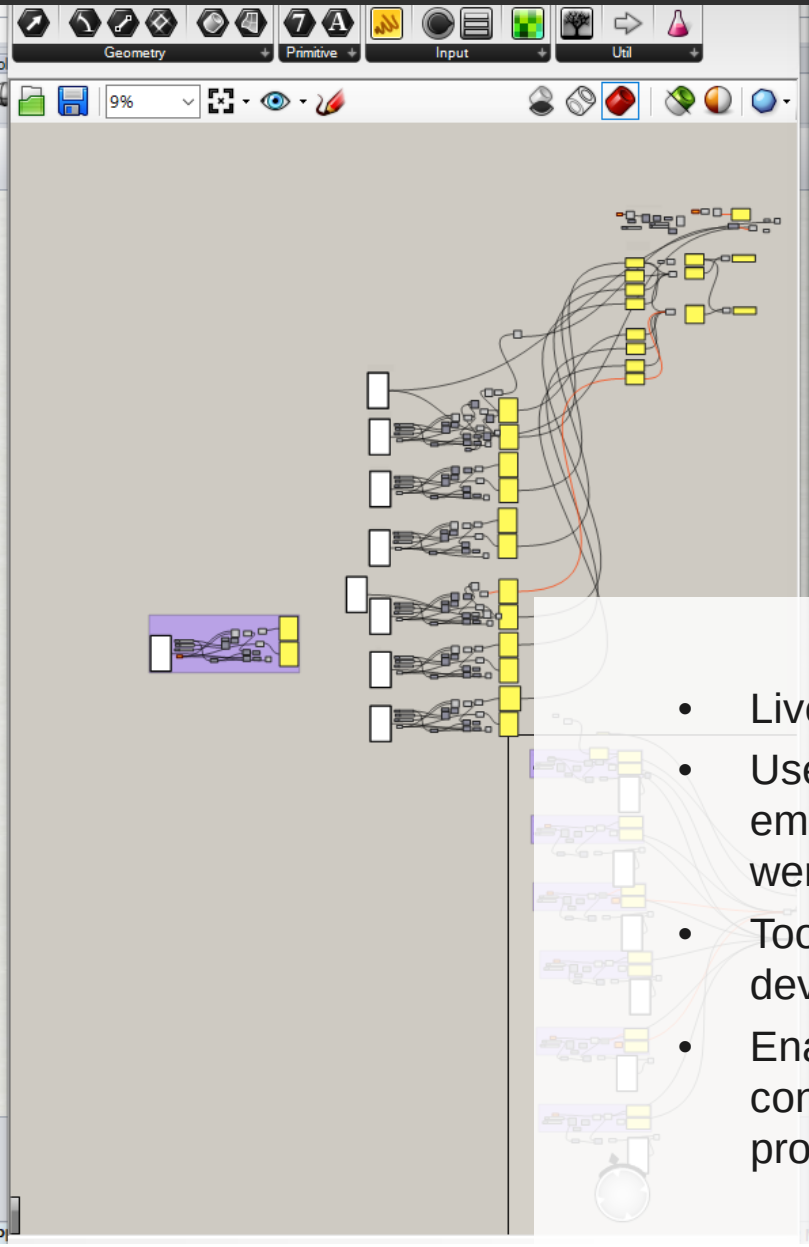


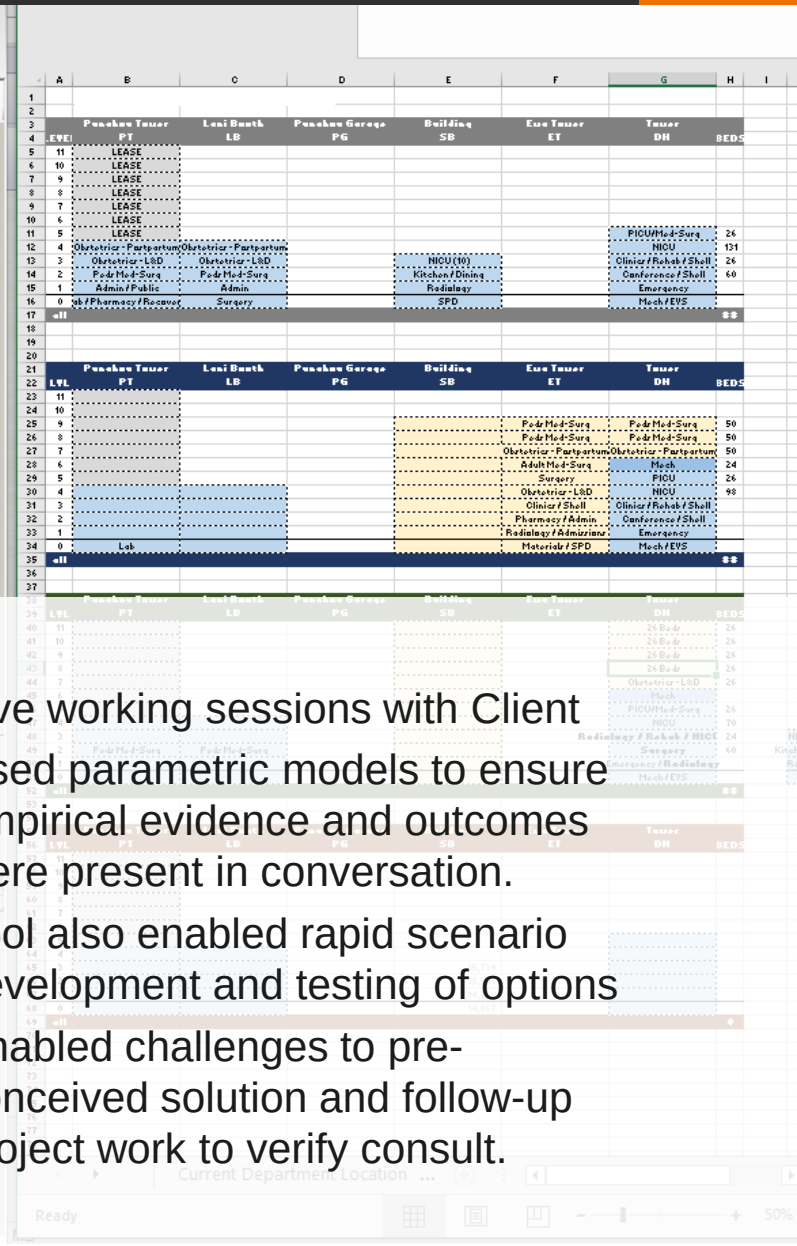
Mech1	Mech	Heat Rec...	Win U-v...	Wall R-v...	Roof R-v...	Plug Load	Daylight ...	Infiltrati...	Elevator ...	Solar HW	Increme...	eCO2 (to...	LEED Test	NPV 25y...	NPV Test	PV area ...	Incre+P...	Payback ...	id
0	Existing	0	0.55	12	20	High	No	Med	No	No	-521	211.0	No	16883	Yes	1340	602471	-1	0
0	Existing	0	0.55	12	20	High	No	Low	No	No	18294	208.7	No	8485	Yes	1325	614646	17	1
0	Existing	0	0.55	12	20	High	Yes	Med	No	No	5086	206.7	No	30852	Yes	1312	595600	4	2
0	Existing	0	0.55	12	20	High	Yes	Low	No	No	23897	204.3	No	22570	Yes	1297	607699	13	3
0	Existing	0	0.55	12	20	Med	No	Med	No	No	37897	200.0	No	28090	Yes	1270	609256	14	4
0	Existing	0	0.55	12	20	Med	No	Low	No	No	56675	197.4	No	20879	Yes	1253	620661	18	5
0	Existing	0	0.55	12	20	Med	Yes	Med	No	No	43600	196.3	No	38949	Yes	1246	604402	13	6
0	Existing	0	0.55	12	20	Med	Yes	Low	No	No	62376	193.7	No	31840	Yes	1230	615740	17	7
0	Existing	0	0.55	12	20	Low	No	Med	No	No	50676	196.7	No	30084	Yes	1249	612618	16	8
0	Existing	0	0.55	12	20	Low	No	Low	No	No	69445	194.0	No	23191	Yes	1232	623817	19	9
0	Existing	0	0.55	12	20	Low	Yes	Med	No	No	56415	193.2	No	39796	Yes	1227	608508	15	10
0	Existing	0	0.55	12	20	Low	Yes	Low	No	No	75181	190.6	No	32995	Yes	1210	619647	17	11
0	Existing	0	0.55	12	40	High	No	Med	No	No	4979	207.1	No	29283	Yes	1315	596561	4	12

- Engagement
- Interaction
- Informed, guided decision making

BI: Dynamic Client Facing Solutions

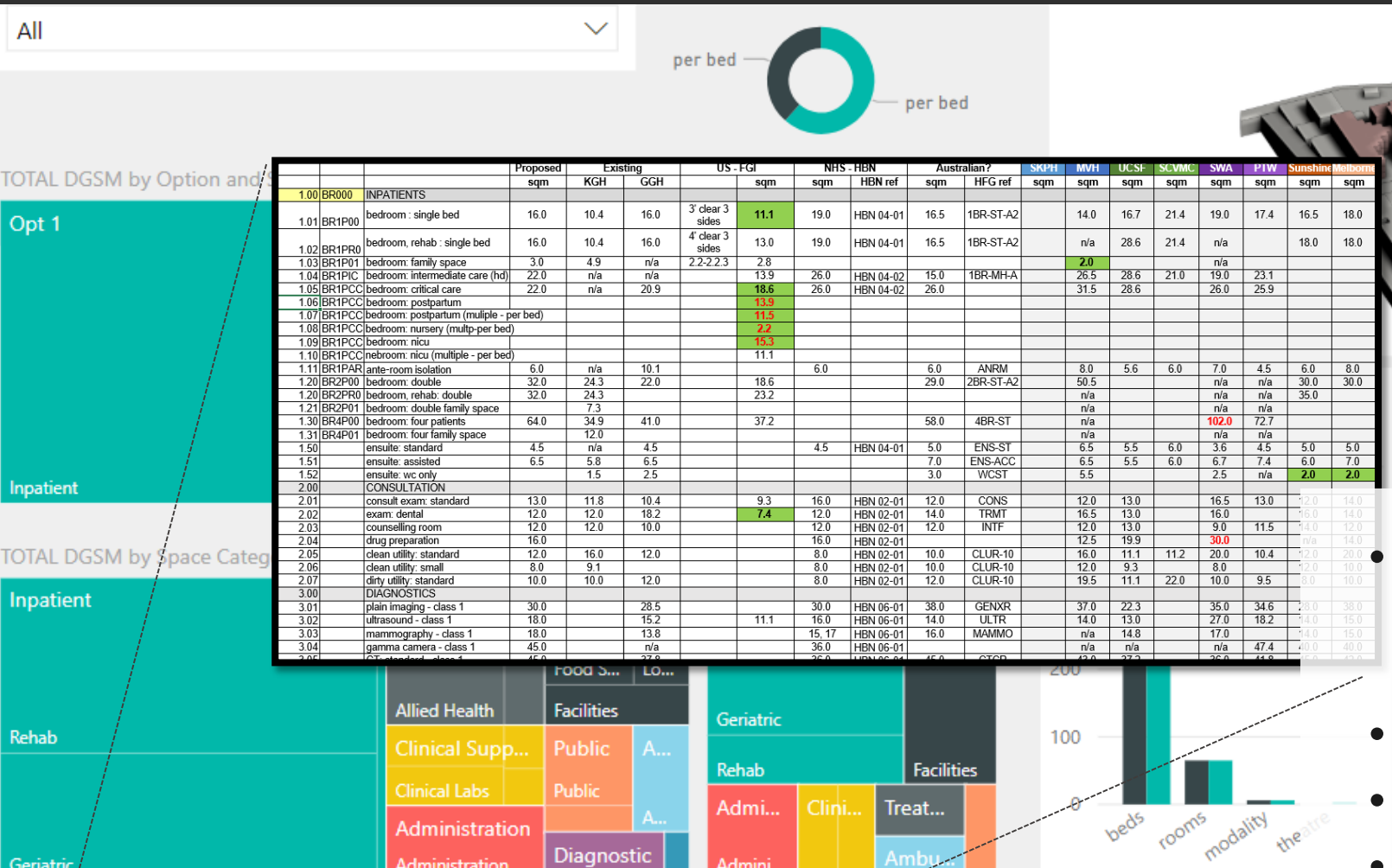




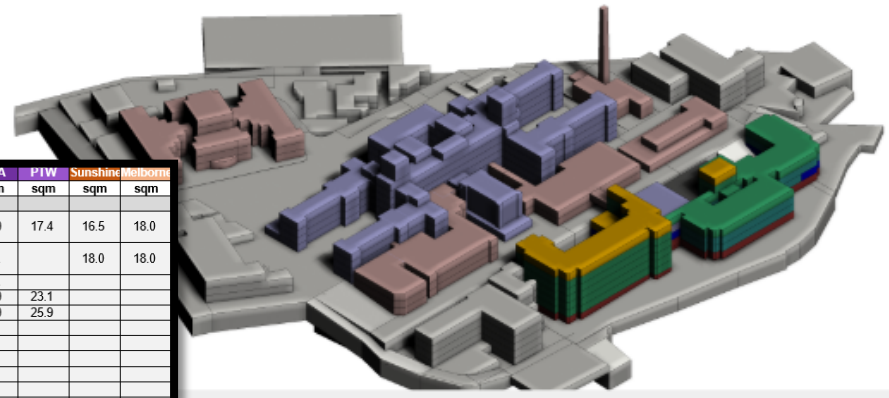


- Live working sessions with Client
- Used parametric models to ensure empirical evidence and outcomes were present in conversation.
- Tool also enabled rapid scenario development and testing of options
- Enabled challenges to pre-conceived solution and follow-up project work to verify consult.

BI: Dynamic Client Facing Solutions



			Proposed	Existing		US - FGI		NHS - HBN		Australian?		SKPH	MVH	UCSF	SCVMC	SWA	PTW	Sunshine	Melborne
			sqm	KGH	GGH		sqm	sqm	HBN ref	sqm	HFG ref	sqm	sqm	sqm	sqm	sqm	sqm	sqm	sqm
1.00	BR000	INPATIENTS																	
1.01	BR1P00	bedroom : single bed	16.0	10.4	16.0	3' clear 3 sides	11.1	19.0	HBN 04-01	16.5	1BR-ST-A2		14.0	16.7	21.4	19.0	17.4	16.5	18.0
1.02	BR1PR0	bedroom, rehab : single bed	16.0	10.4	16.0	4' clear 3 sides	13.0	19.0	HBN 04-01	16.5	1BR-ST-A2		n/a	28.6	21.4	n/a		18.0	18.0
1.03	BR1P01	bedroom: family space	3.0	4.9	n/a	2.2-2.2.3	2.8						2.0			n/a			
1.04	BR1PIC	bedroom: intermediate care (hd)	22.0	n/a	n/a		13.9	26.0	HBN 04-02	15.0	1BR-MH-A		26.5	28.6	21.0	19.0	23.1		
1.05	BR1PCC	bedroom: critical care	22.0	n/a	20.9		18.6	26.0	HBN 04-02	26.0			31.5	28.6		26.0	25.9		
1.06	BR1PCC	bedroom: postpartum					13.9												
1.07	BR1PCC	bedroom: postpartum (muliple - per bed)					11.5												
1.08	BR1PCC	bedroom: nursery (multp-per bed)					2.2												
1.09	BR1PCC	bedroom: nicu					15.3												
1.10	BR1PCC	nebroom: nicu (multiple - per bed)					11.1												
1.11	BR1PAR	ante-room isolation	6.0	n/a	10.1			6.0		6.0	ANRM		8.0	5.6	6.0	7.0	4.5	6.0	8.0
1.20	BR2P00	bedroom: double	32.0	24.3	22.0		18.6			29.0	2BR-ST-A2		50.5			n/a	n/a	30.0	30.0
1.20	BR2PR0	bedroom, rehab: double	32.0	24.3			23.2						n/a			n/a	n/a	35.0	
1.21	BR2P01	bedroom: double family space		7.3									n/a			n/a	n/a		
1.30	BR4P00	bedroom: four patients	64.0	34.9	41.0		37.2			58.0	4BR-ST		n/a			102.0	72.7		
1.31	BR4P01	bedroom: four family space		12.0									n/a			n/a	n/a		
1.50		ensuite: standard	4.5	n/a	4.5			4.5	HBN 04-01	5.0	ENS-ST		6.5	5.5	6.0	3.6	4.5	5.0	5.0
1.51		ensuite: assisted	6.5	5.8	6.5					7.0	ENS-ACC		6.5	5.5	6.0	6.7	7.4	6.0	7.0
1.52		ensuite: wc only		1.5	2.5					3.0	WCST		5.5			2.5	n/a	2.0	2.0
2.00		CONSULTATION																	
2.01		consult exam: standard	13.0	11.8	10.4		9.3	16.0	HBN 02-01	12.0	CONS		12.0	13.0		16.5	13.0	12.0	14.0
2.02		exam: dental	12.0	12.0	18.2		7.4	12.0	HBN 02-01	14.0	TRMT		16.5	13.0		16.0		16.0	14.0
2.03		counselling room	12.0	12.0	10.0			12.0	HBN 02-01	12.0	INTF		12.0	13.0		9.0	11.5	14.0	12.0
2.04		drug preparation	16.0					16.0	HBN 02-01				12.5	19.9		30.0		n/a	14.0
2.05		clean utility: standard	12.0	16.0	12.0			8.0	HBN 02-01	10.0	CLUR-10		16.0	11.1	11.2	20.0	10.4	12.0	20.0
2.06		clean utility: small	8.0	9.1				8.0	HBN 02-01	10.0	CLUR-10		12.0	9.3		8.0		12.0	10.0
2.07		dirty utility: standard	10.0	10.0	12.0			8.0	HBN 02-01	12.0	CLUR-10		19.5	11.1	22.0	10.0	9.5	13.0	10.0
3.00		DIAGNOSTICS																	
3.01		plain imaging - class 1	30.0		28.5			30.0	HBN 06-01	38.0	GENXR		37.0	22.3		35.0	34.6	34.0	38.0
3.02		ultrasound - class 1	18.0		15.2		11.1	16.0	HBN 06-01	14.0	ULTR		14.0	13.0		27.0	18.2	14.0	15.0
3.03		mammography - class 1	18.0		13.8			15, 17	HBN 06-01	16.0	MAMMO		n/a	14.8		17.0		14.0	15.0
3.04		gamma camera - class 1	45.0		n/a			36.0	HBN 06-01				n/a	n/a		n/a	47.4	40.0	40.0
3.05		CT: standard - class 1	45.0		37.8			36.0	HBN 06-01	45.0	CTSR		43.0	37.2		36.0	41.8	50.0	47.0

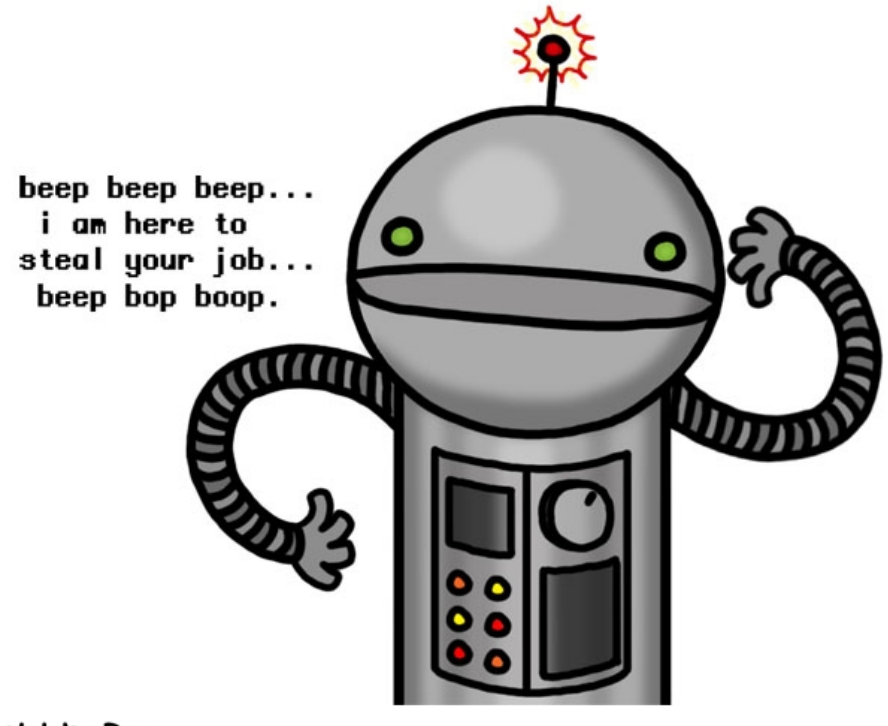


Option	Existing			Opt 1	
Space Category	TOTAL DGSM	TOTAL DRIVERS	AVG	TOTAL DGSM	TOTAL DRI
Administration	1,595.57	275	5.80	2,310.00	
Ambulatory	725.90	20		1,162.52	
Diagnostic	0.00	6		1,139.78	
Education	0.00	275		231.00	
Non-Clinical Support	3,466.05	825	12.60	4,158.00	
Public	1,541.21	275		1,848.00	
Treatment	3,850.60	45		4,570.46	
Total	15,959.64	3646	25.30	40,796.66	

- Our ability to survive and thrive will rely on our ability to amass and leverage data
- Mine from multiple sources
- Organize information
- Identify trends
- Make accessible
- Make informed decisions

```
SELECT  *
FROM  Healthindustrystds;
```

FUTURE…??



Travel Agents Mortgage Brokers **Engineers**
BookKeepers Lawyers Broadcasters
Middle Managers **Casino Cashiers** IT Support Personnel
Financial Planners Floral Designers
Postal Workers **Photo Processors** Data Entry
Clerks Switchboard Operators Farmers and Ranchers
Architects Fast Food Cooks Newspaper Reporters
Jewelers Textile Machine Workers Furniture
Finishers **Door to Door Sales** Print Binding and
Finishing Workers Detective Primary Care Physicians

Informing ML and AI

"*I am not a robot*"- Training the Machine

Majority Thought:

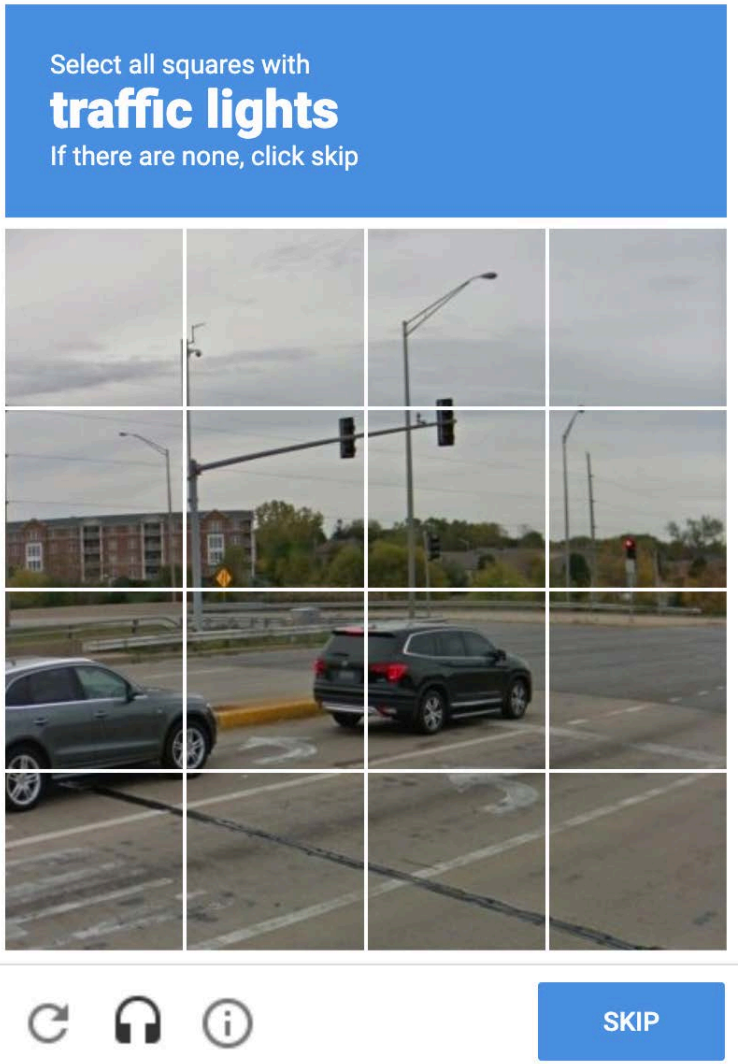
- Human vs. Bot
- Additional Security Measure
- A hassle

Reality:

- Crowd sourced proofing and editing of not only books but other periodicals as well
- Image recognition and identification training

Benefits:

- Better search results
- Informing new tech (driverless cars –autonomous vehicles)



Images courtesy of Wikipedia

Opportunity

Questions?

Sarah Dreger
Sarah.Dreger@Stantec.com