

The background of the slide is a complex, organic wireframe mesh in shades of gray. A solid blue horizontal band spans the middle of the image, serving as a backdrop for the text.

Talking with Robots about Architecture

Pragmatic applications of automation for AECO

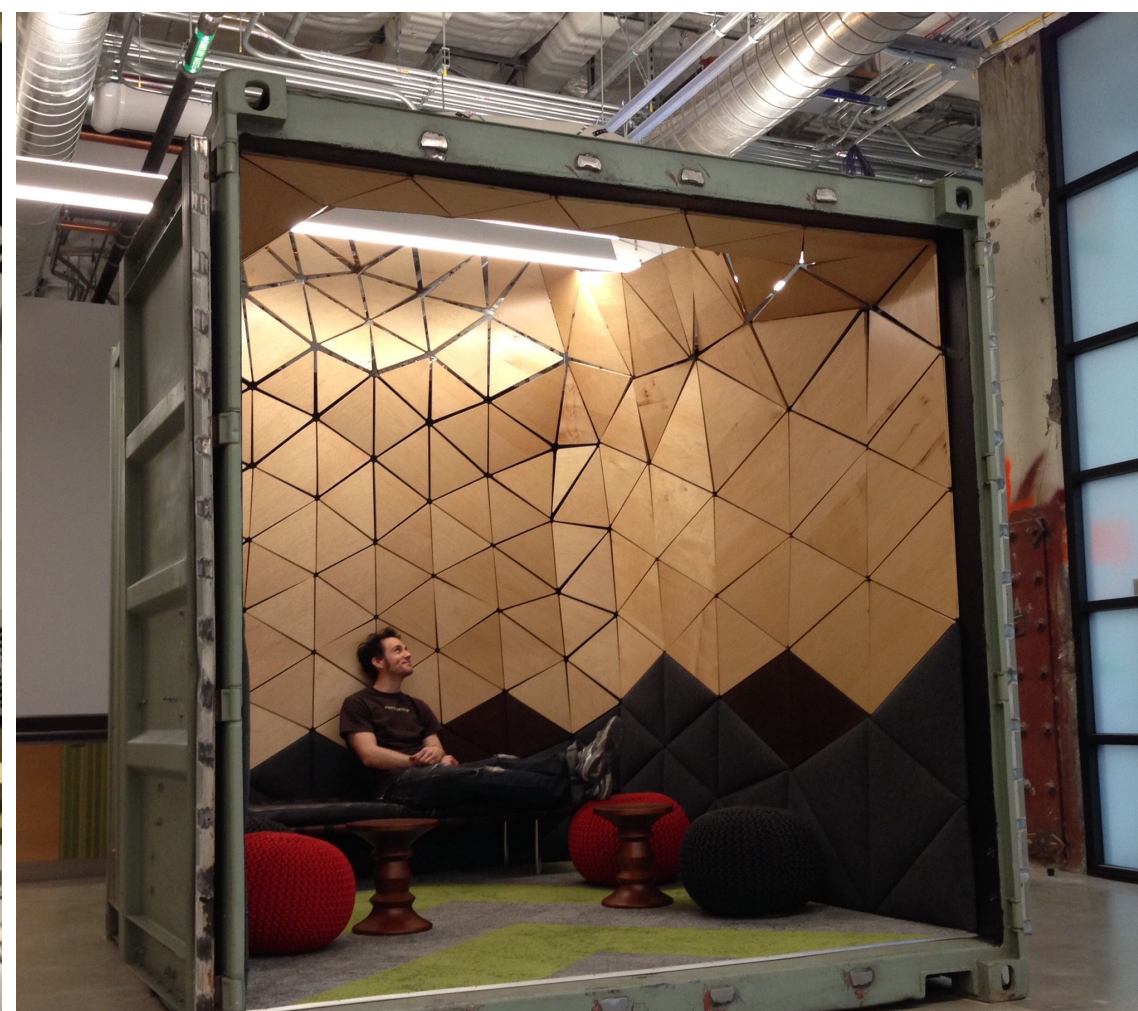
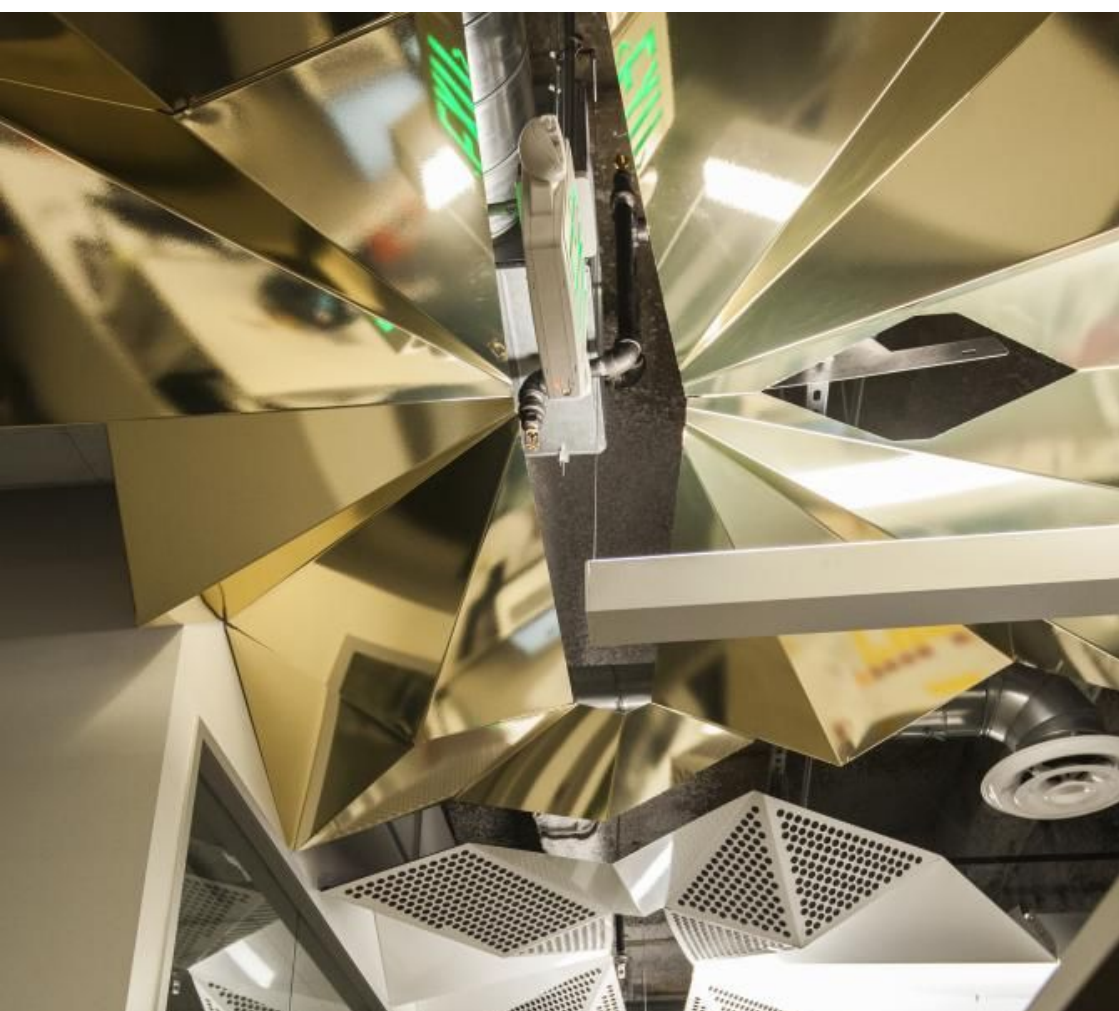
Jeffrey McGrew

Architect & Founder, Because We Can

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**BECAUSE
WE
CAN**



Automation is Awesome

- Automation is:
 - *Empowering*
 - *Interesting*
 - *Exciting*
 - *Profitable*

HOW LONG CAN YOU WORK ON MAKING A ROUTINE TASK MORE EFFICIENT BEFORE YOU'RE SPENDING MORE TIME THAN YOU SAVE?
(ACROSS FIVE YEARS)

		HOW OFTEN YOU DO THE TASK					
		50/DAY	5/DAY	DAILY	WEEKLY	MONTHLY	YEARLY
HOW MUCH TIME YOU SHAVE OFF	1 SECOND	1 DAY	2 HOURS	30 MINUTES	4 MINUTES	1 MINUTE	5 SECONDS
	5 SECONDS	5 DAYS	12 HOURS	2 HOURS	21 MINUTES	5 MINUTES	25 SECONDS
	30 SECONDS	4 WEEKS	3 DAYS	12 HOURS	2 HOURS	30 MINUTES	2 MINUTES
	1 MINUTE	8 WEEKS	6 DAYS	1 DAY	4 HOURS	1 HOUR	5 MINUTES
	5 MINUTES	9 MONTHS	4 WEEKS	6 DAYS	21 HOURS	5 HOURS	25 MINUTES
	30 MINUTES		6 MONTHS	5 WEEKS	5 DAYS	1 DAY	2 HOURS
	1 HOUR		10 MONTHS	2 MONTHS	10 DAYS	2 DAYS	5 HOURS
	6 HOURS				2 MONTHS	2 WEEKS	1 DAY
	1 DAY					8 WEEKS	5 DAYS

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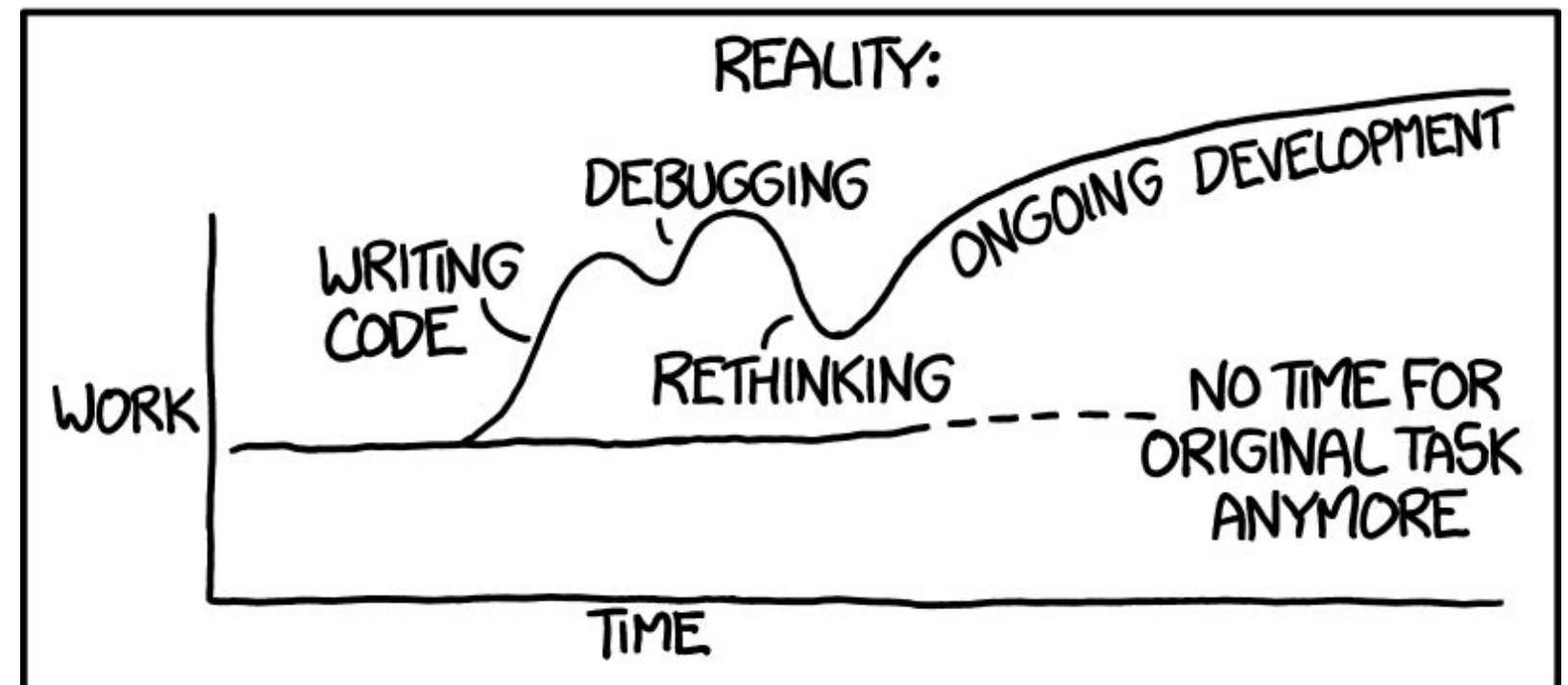
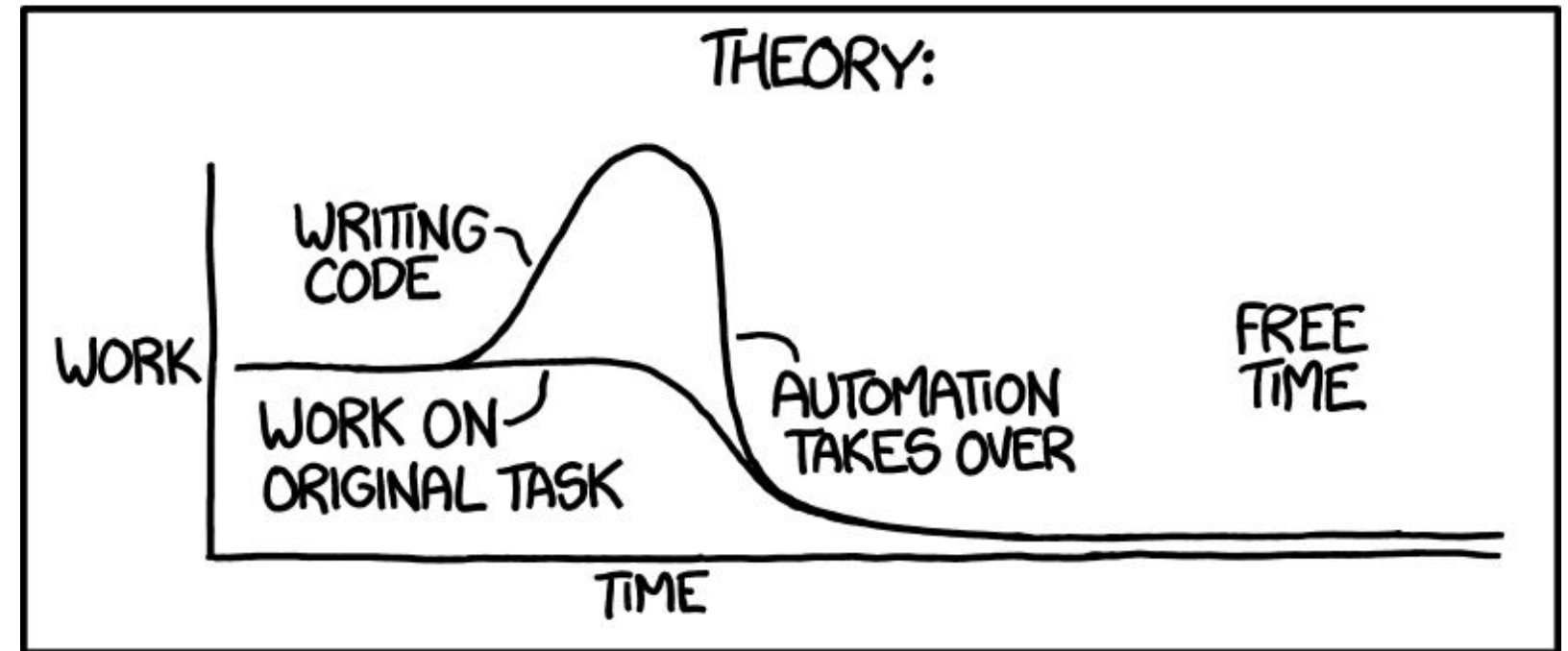
Automation is Terrible

- Automation is:
 - *Expensive*
 - *Difficult*
 - *Fragile*
 - *Disruptive*

...It's all about

Created Value.

"I SPEND A LOT OF TIME ON THIS TASK.
I SHOULD WRITE A PROGRAM AUTOMATING IT!"

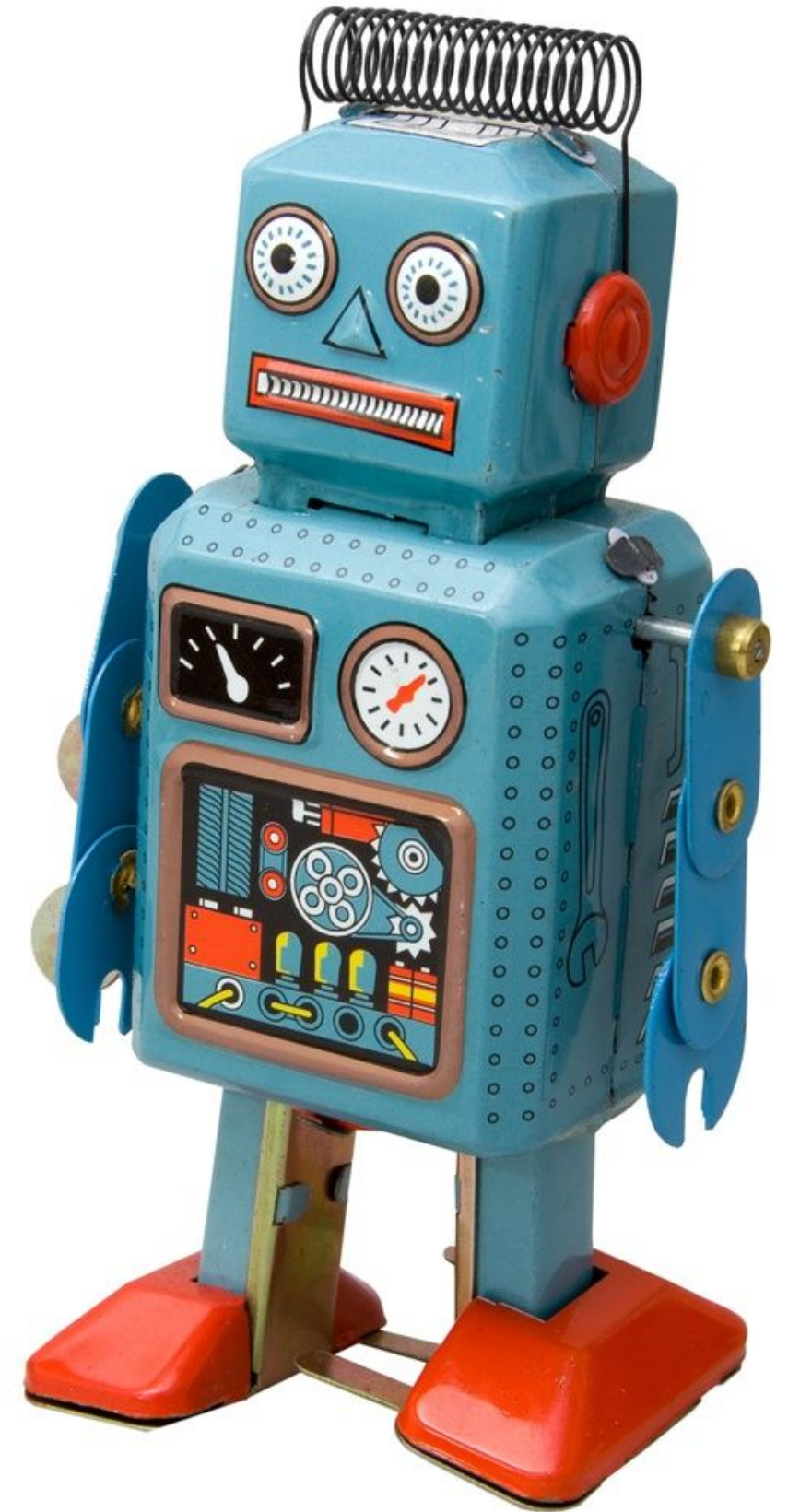




Tools on how to think about Automation

Four Types of Automation

- **Type One:** *Same Job, Only Cheaper*
- **Type Two:** *Automation Does It Better*
- **Type Three:** *Automation Makes It Easy*
- **Type Four:** *Automation Makes It Possible*

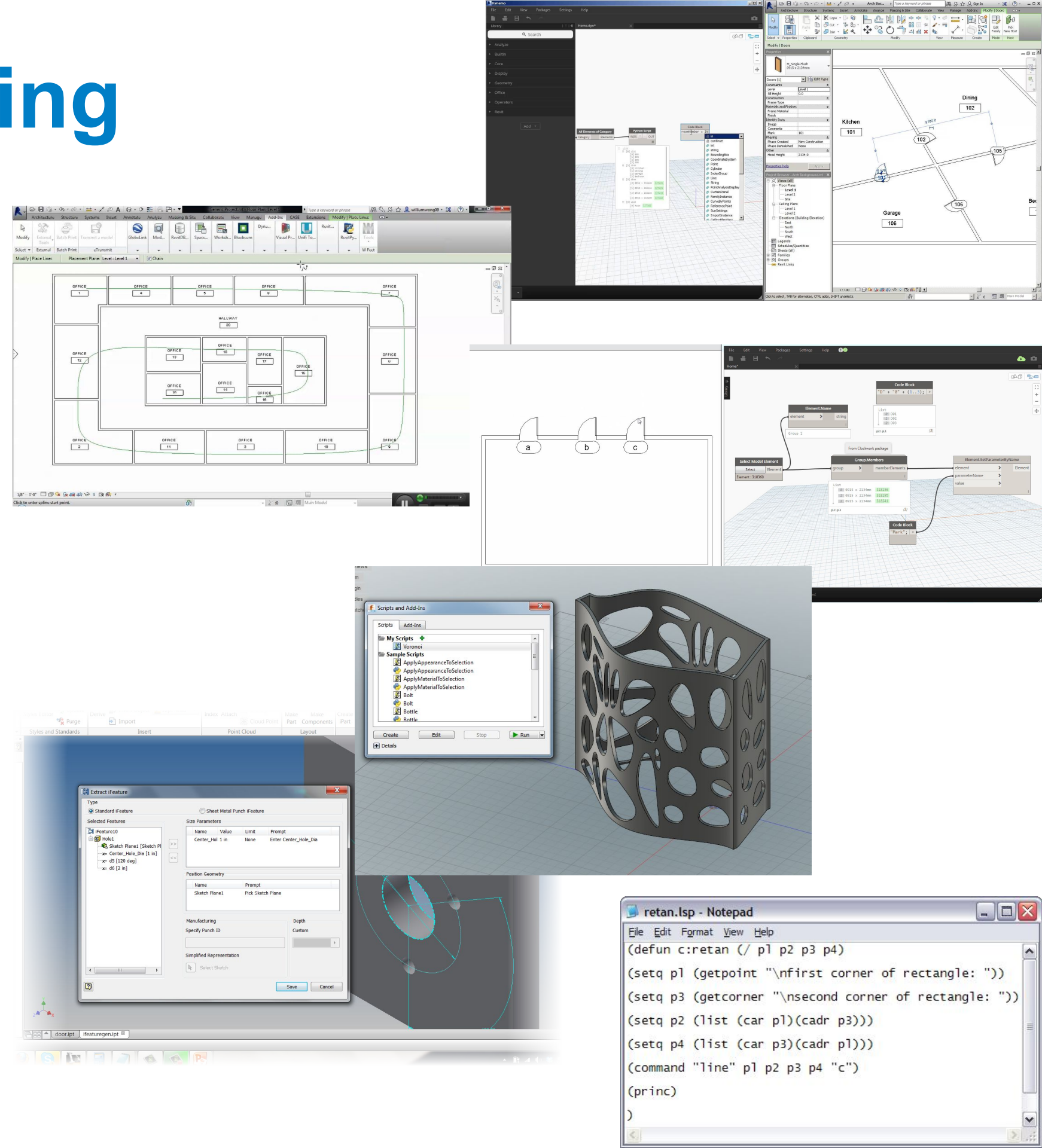


Type One: Same Job, Only Cheaper



Type One: Basic Scripting

- Macros, Dynamo, LISP of old...
- Automating simple repetitive tasks.
- Lets you do more and/or frees up skilled people to work on higher-value tasks.
- It's best to use whatever language is the most productive to build in & maintain.
- Isn't much difference between a worker vs. a script, other than the script *could* be faster.



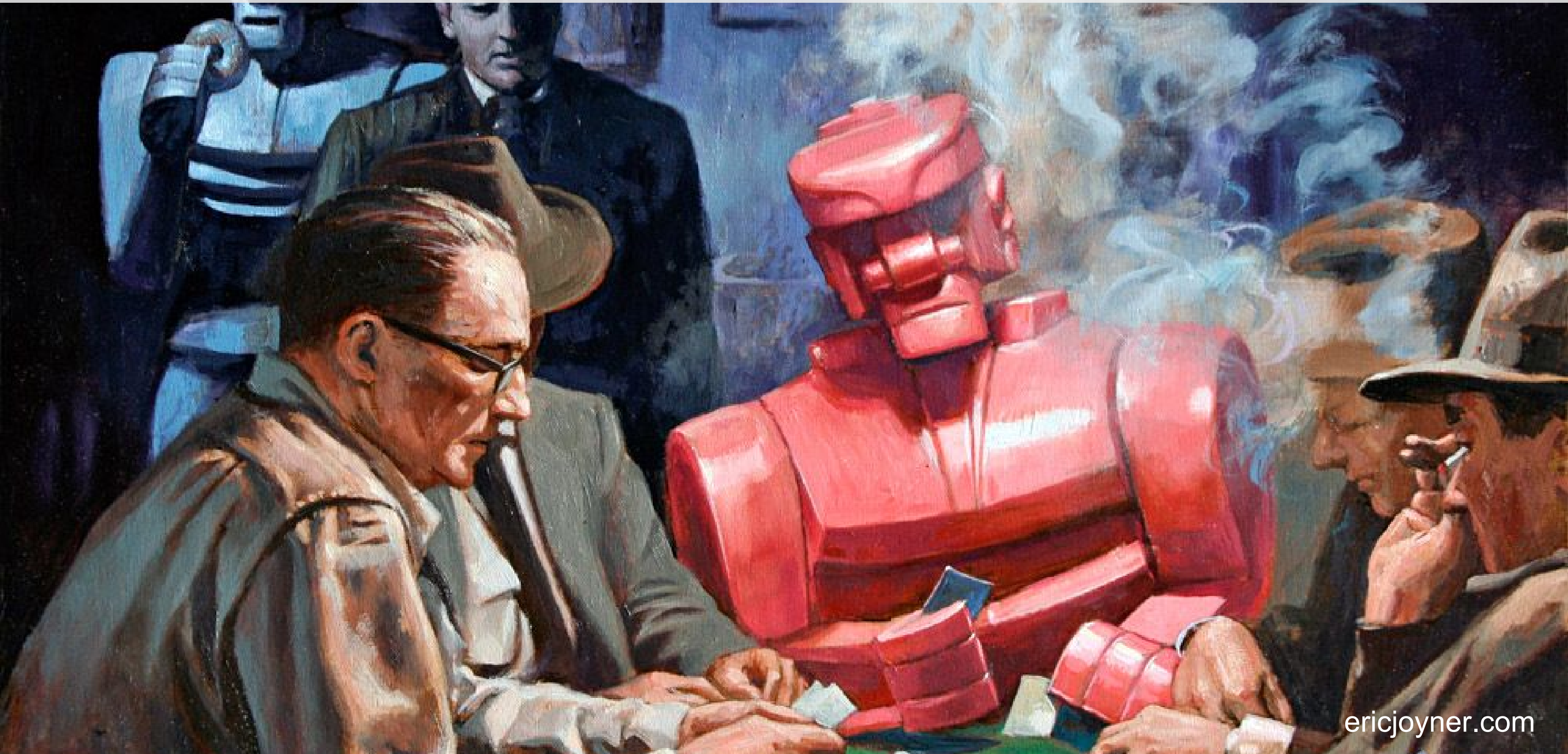
Type One: Automated Saw Stops

- Automated stops for cutting lengths,
- Can be linked to BOM, CAD, or direct input.
- While cool, it's really not doing anything a skilled fabricator can't do on their own, and it doesn't save *that* much time in all use cases.
- GIGO and over-reliance a problem too!

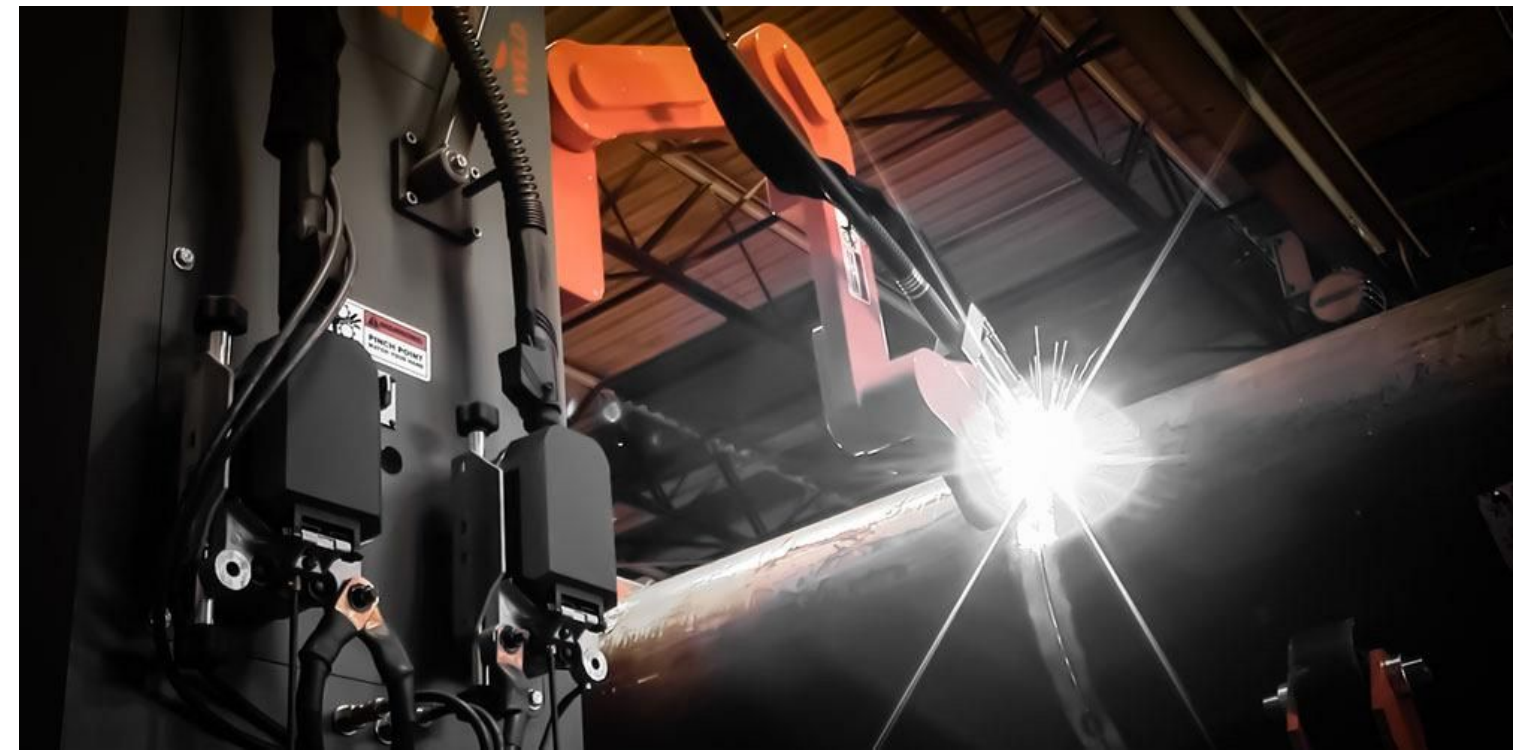
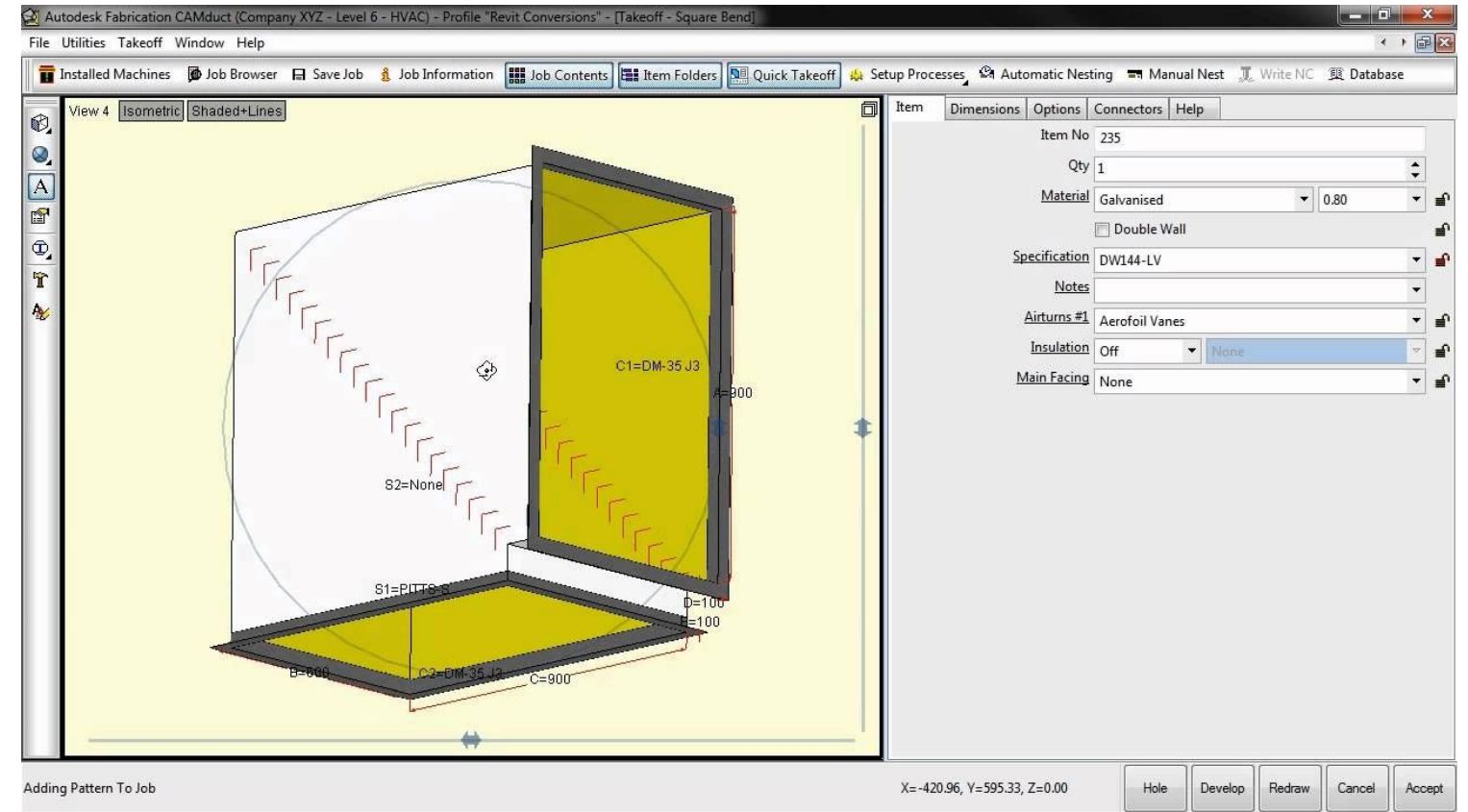
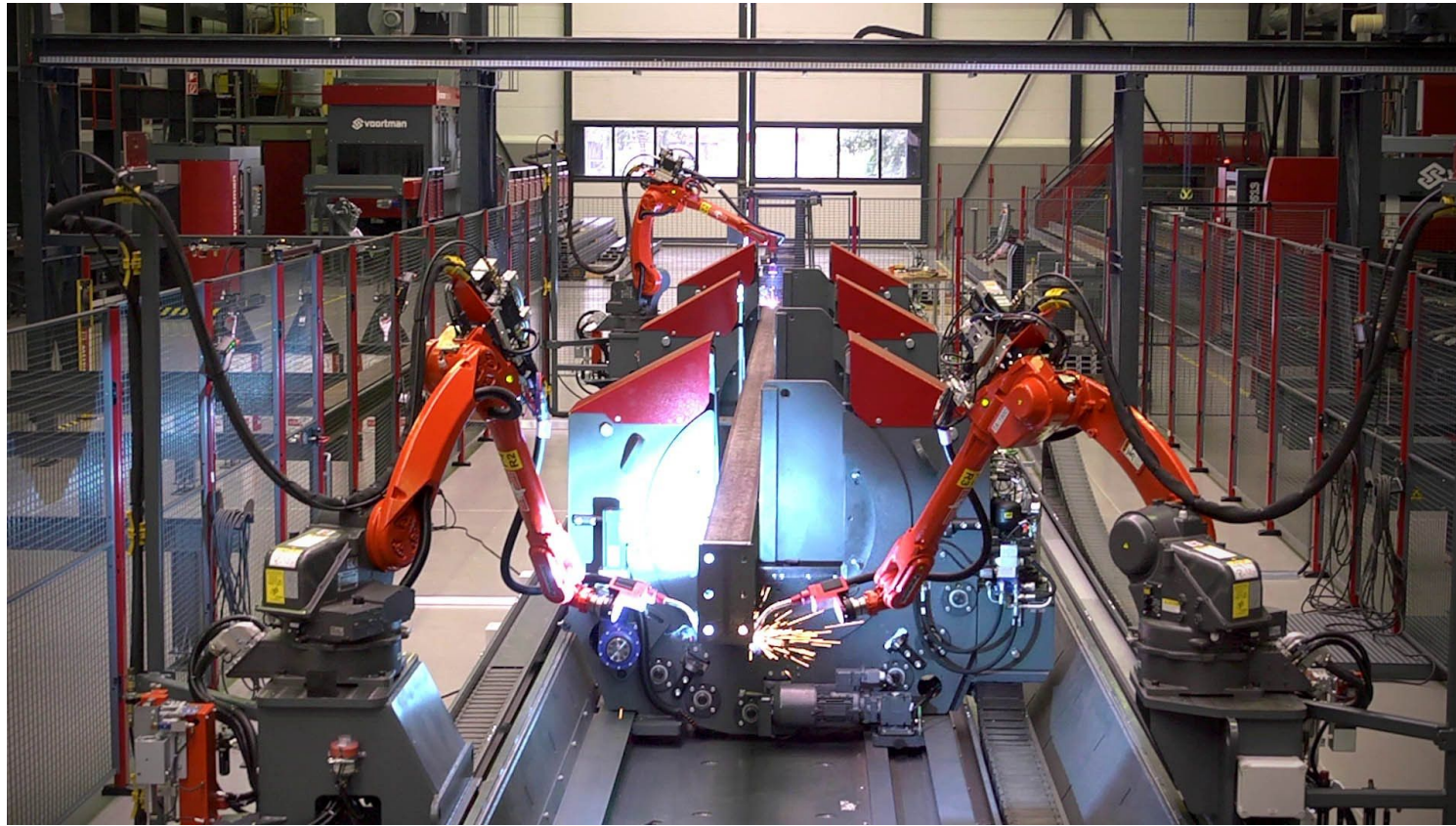


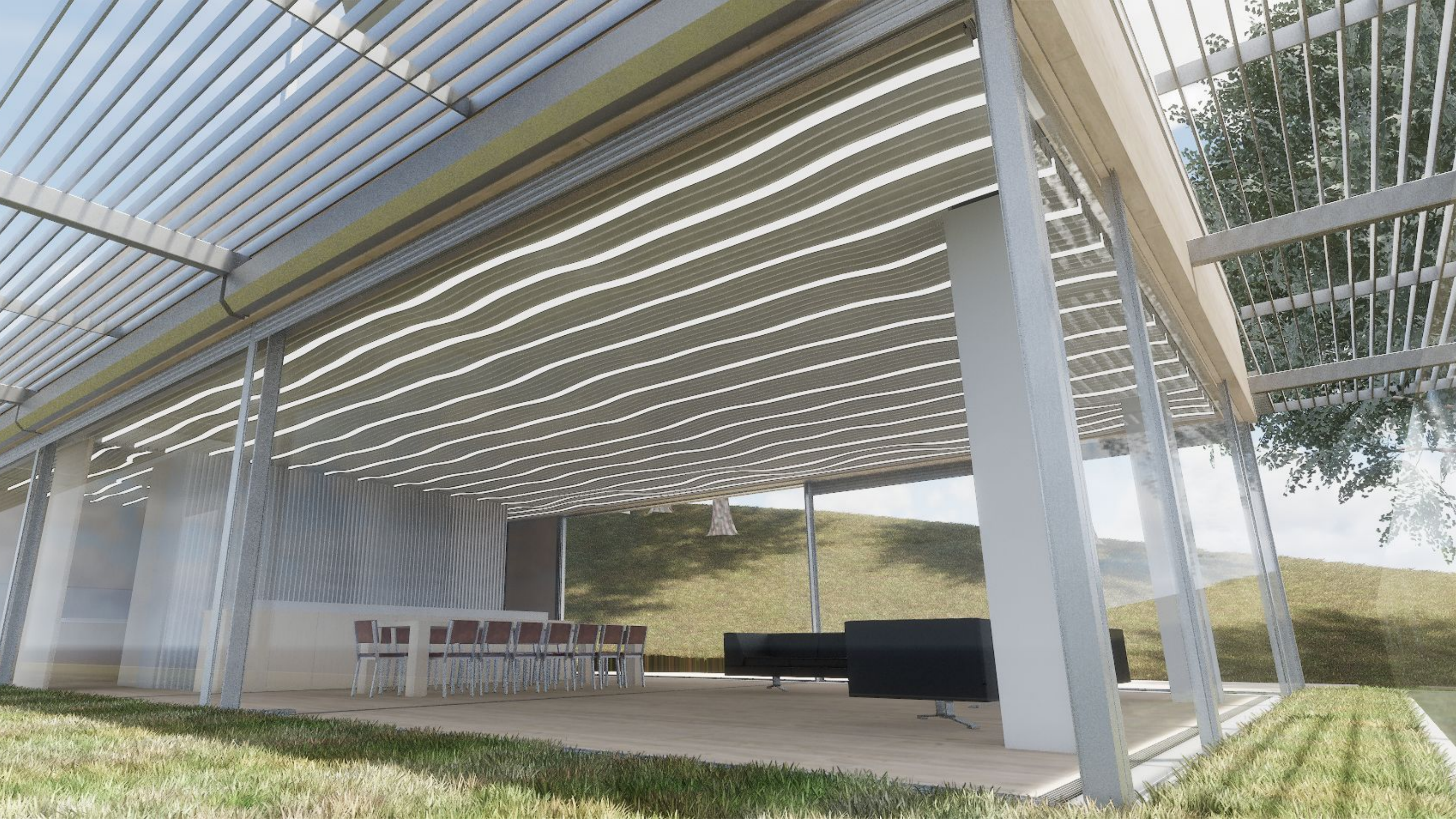
Copyright TigerStop

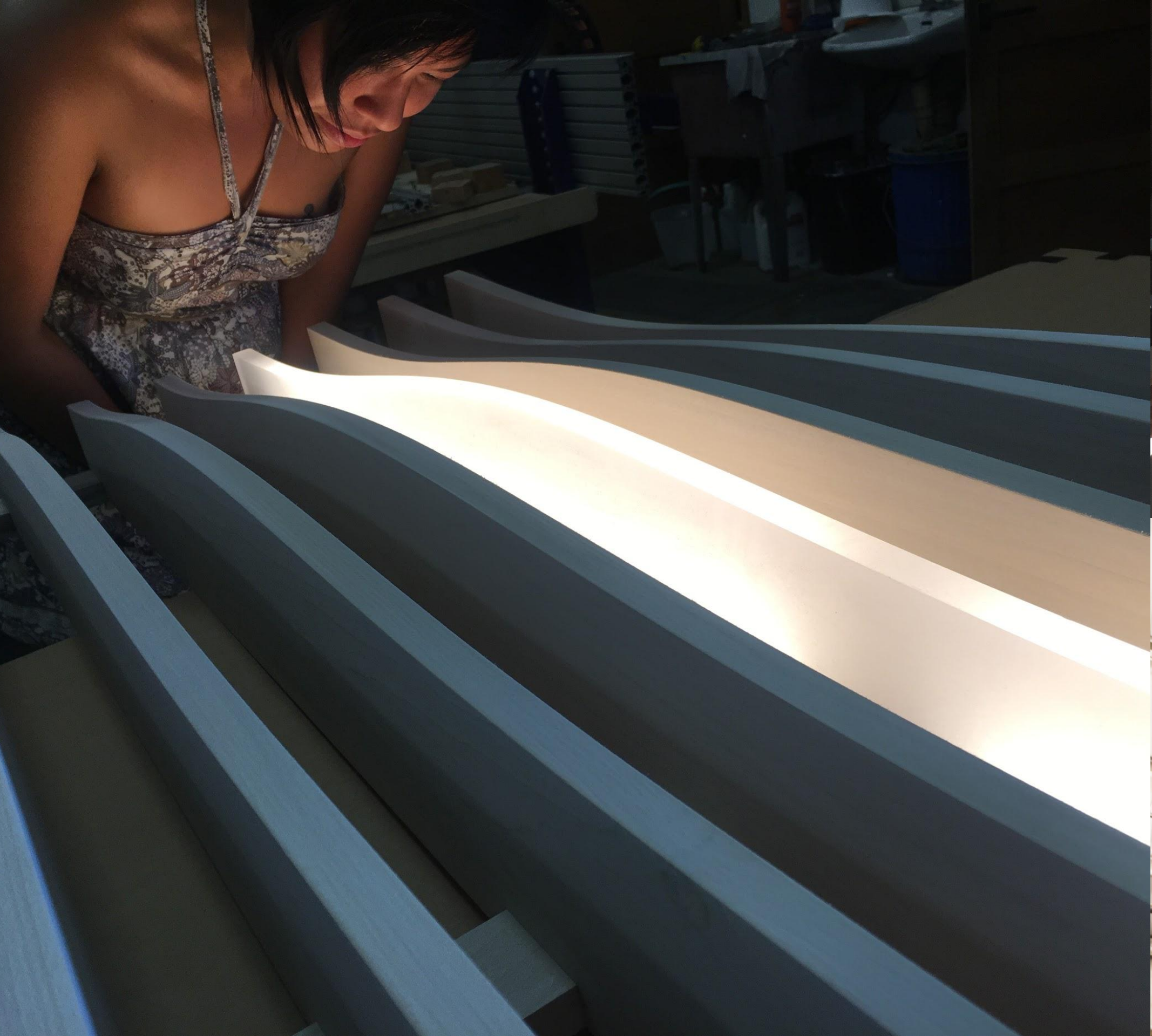
Type Two: Automation Does it Better



Type Two: BIM - to - Fabrication





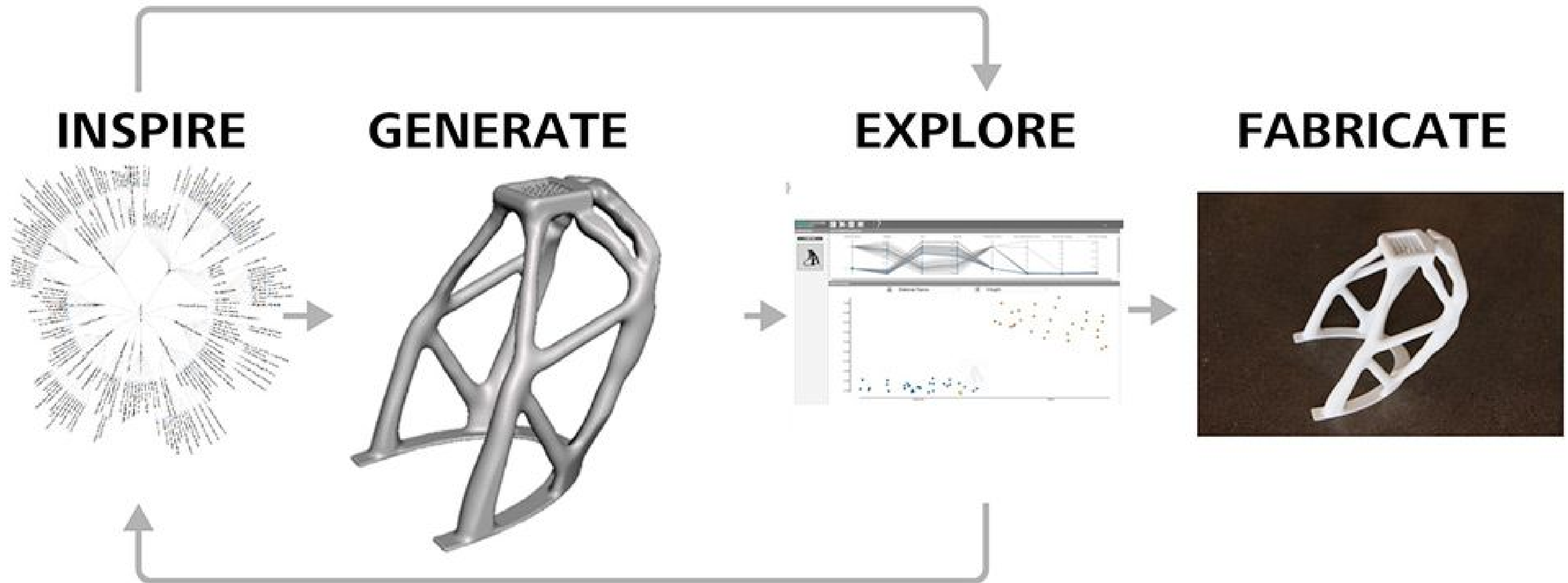




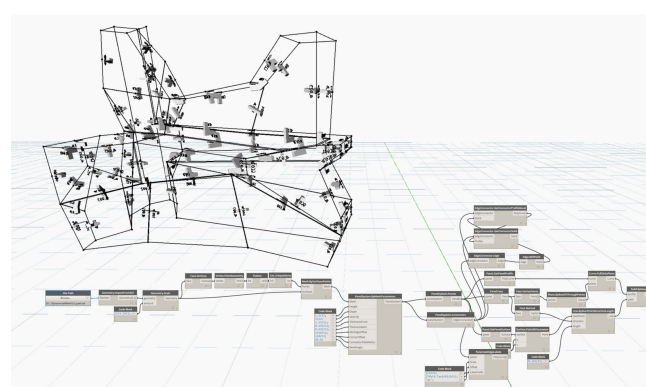
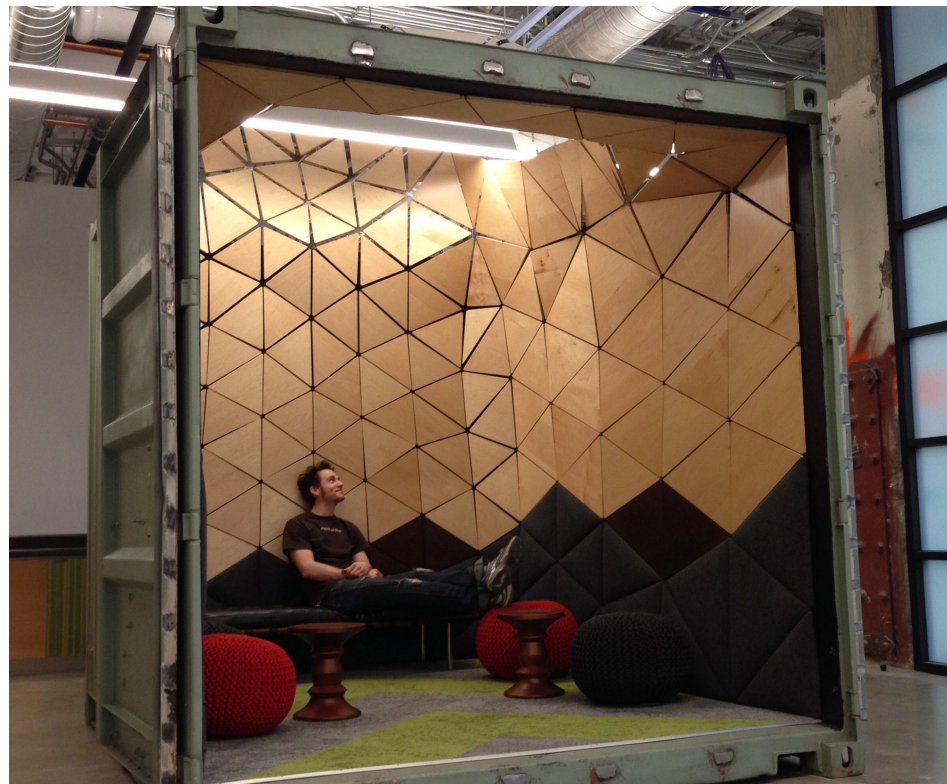
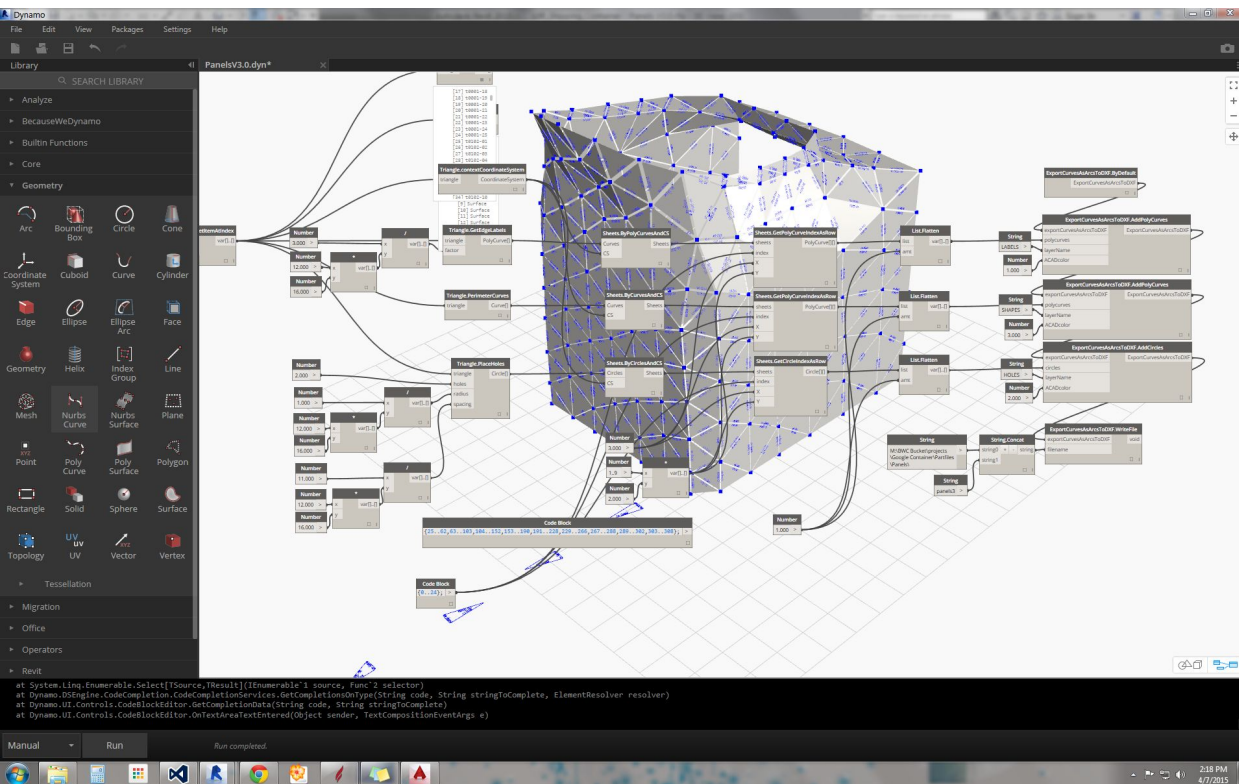


Type Three: Automation makes it Easy

Type Three: Generative Design



Type Three: Dynamo for Digital Fabrication

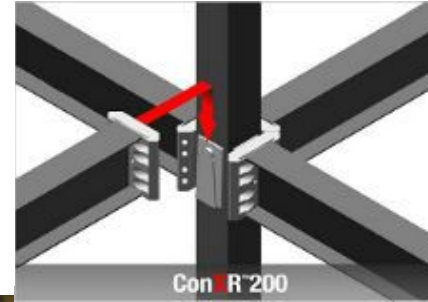


A detailed image of a Mars rover, likely a Curiosity or Perseverance, on the surface of Mars. The rover is positioned in the center-left, with its six large, treaded wheels visible. Its mast is extended upwards, carrying a camera and other instruments. A robotic arm is visible on the right side. The background shows a vast, reddish-orange landscape with rolling hills and a hazy sky. A semi-transparent white banner with blue text is overlaid across the middle of the image.

Type Four: Automation Makes it even **Possible**

Type Four: ConXtech

- Clever steel moment-frame system.
- Heavily automated from design to production to installation.
- Had to build own test frames to prove system worked, & had to write it's own plug-ins for lots of different 3D / MCAD / BIM platforms.
- Whole business is aligned to semi-automated production of structural frames.



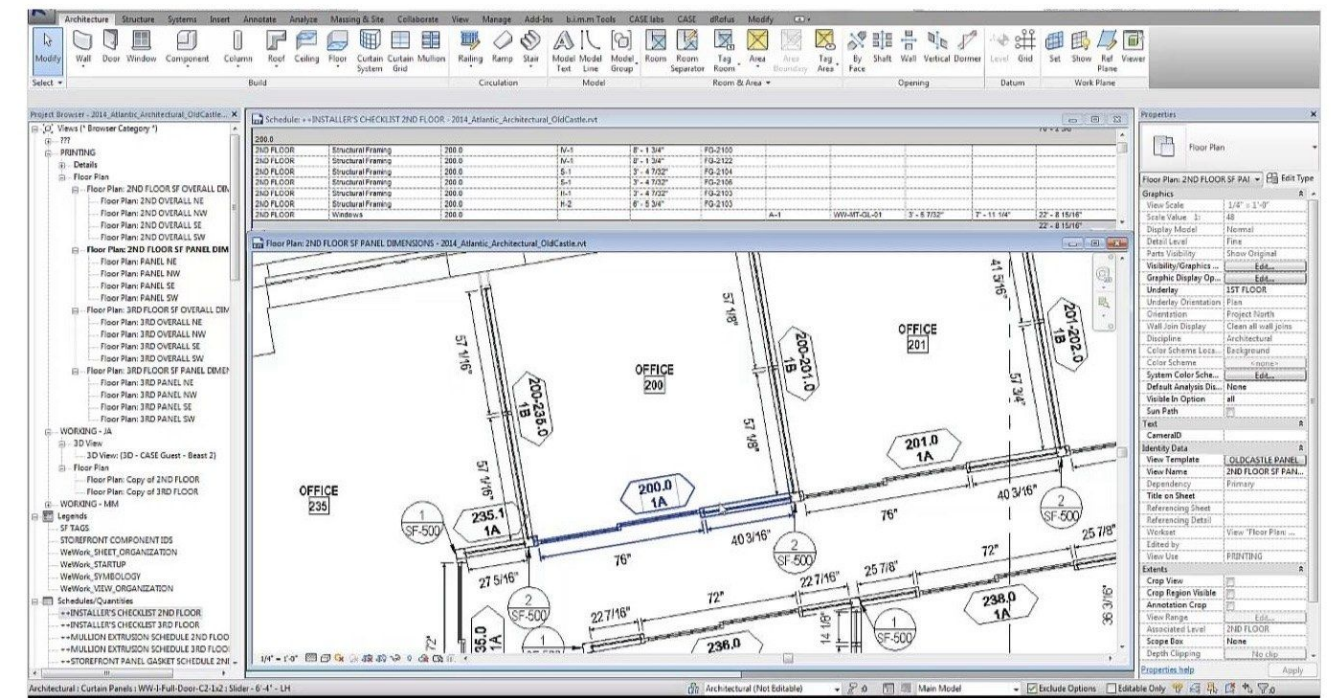
WeWork

- Very successful world-wide CoWorking company
- Heavily automating the design and construction of office space to reduce build-out costs
- Using automation to reduce operational costs via live data collection of users and spaces



FABRICATION DOCUMENTATION

Direct to fabrication workflows for our interior storefront packages





Tips when Automating something

Handle

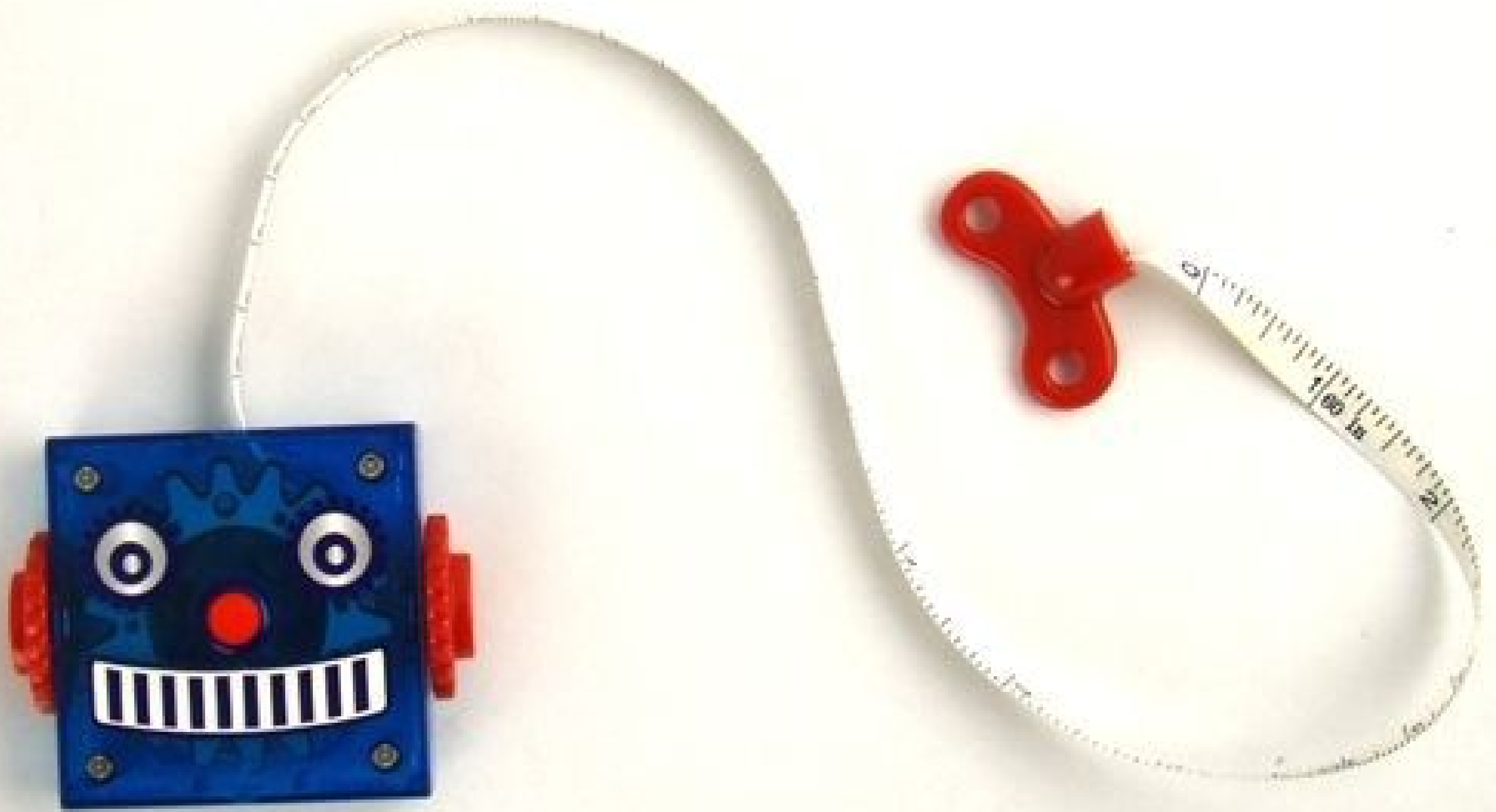
Body

Tip

Automation is just a tool



Measuring & Metrics





Technical Debt





Larger issues regarding Automation

Automation is Fragile



Automation is Stupid



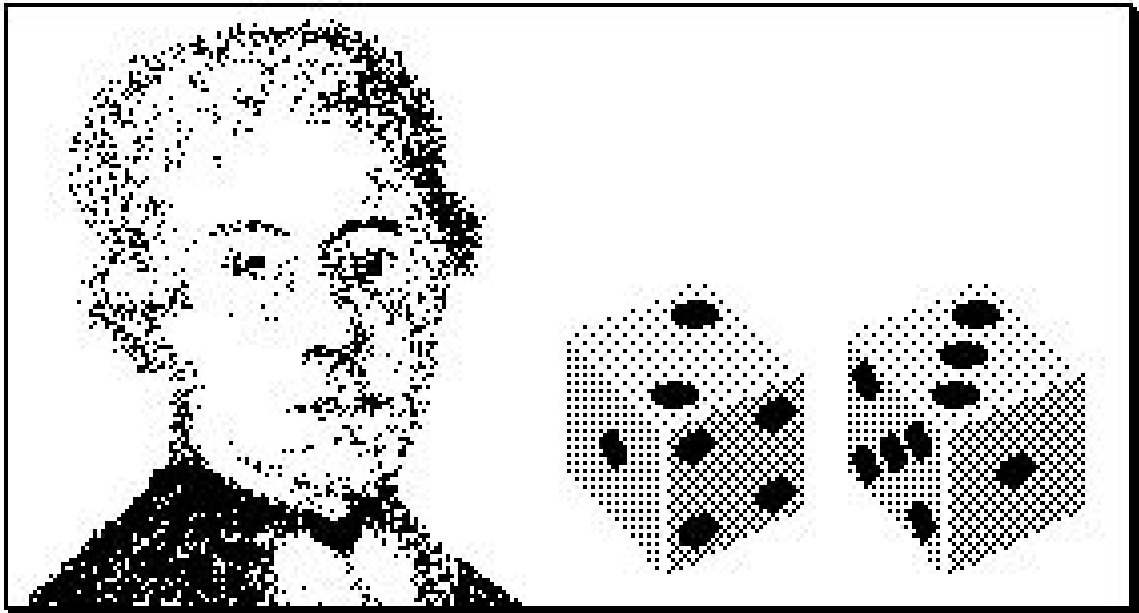
Simone Giertz

Automation is Boring

THE DICE WALTZ
by Wolfgang Amadeus Mozart
Written in EFA BASIC by Chris Earnshaw

DICE RECORD								
Part 1	6	11	6	7	11	9	10	11
Part 2	8	5	7	6	9	5	2	5

Dice
Mode



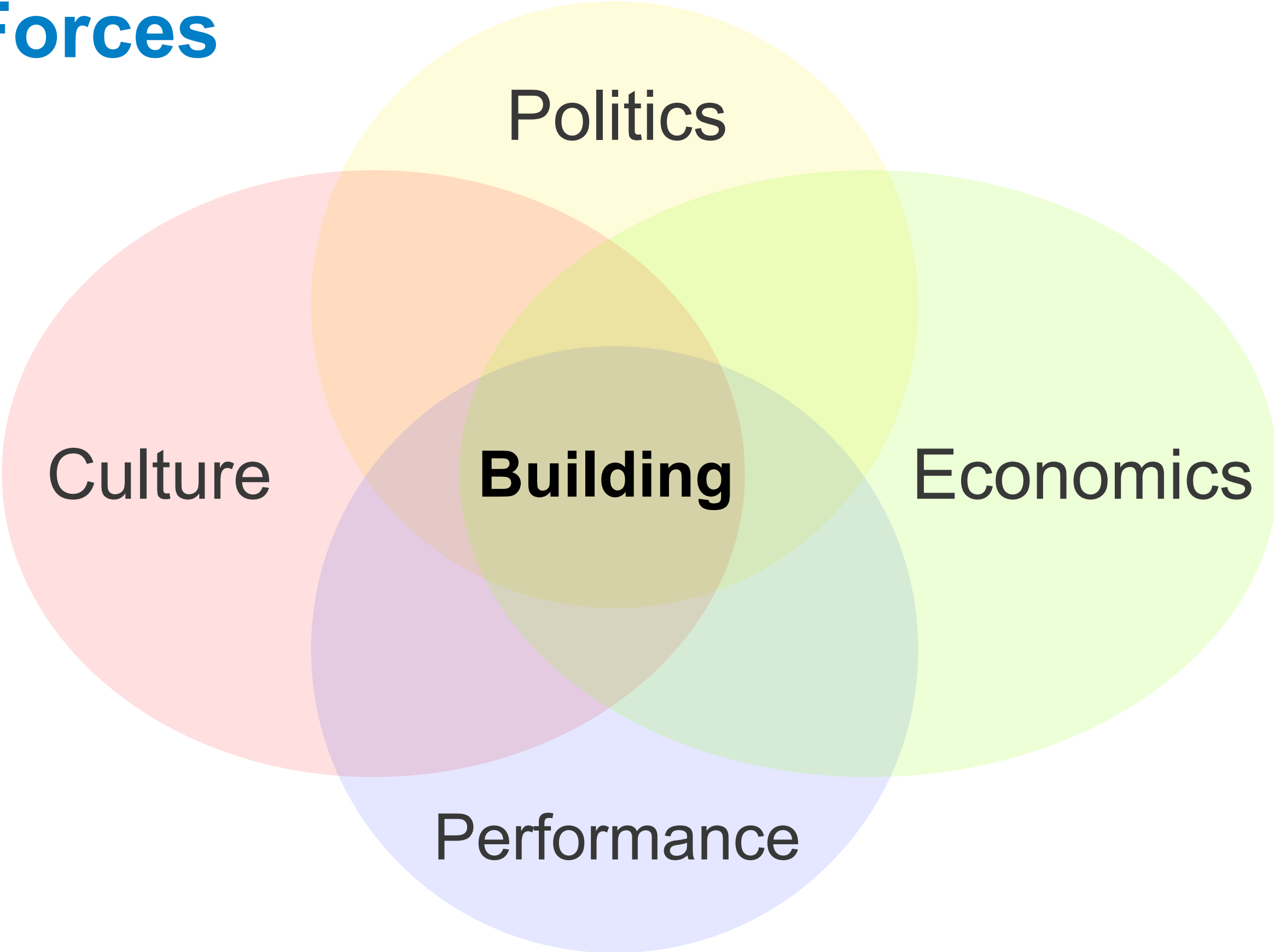
Music notation for 'The Dice Waltz' in 3/4 time, tempo = 120. The notation consists of two systems, each with a treble and bass staff. The first system includes a small dice icon above the staff. The second system includes first and second endings marked '1.' and '2.' at the end of the piece.

Compose Play Instrument Tempo Print Quit

Buildings Aren't Cars

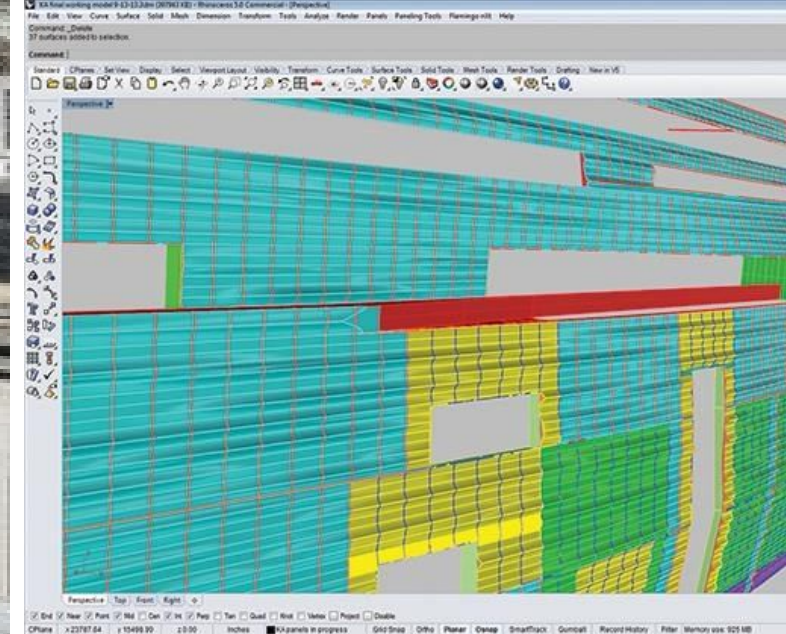


Four Forces





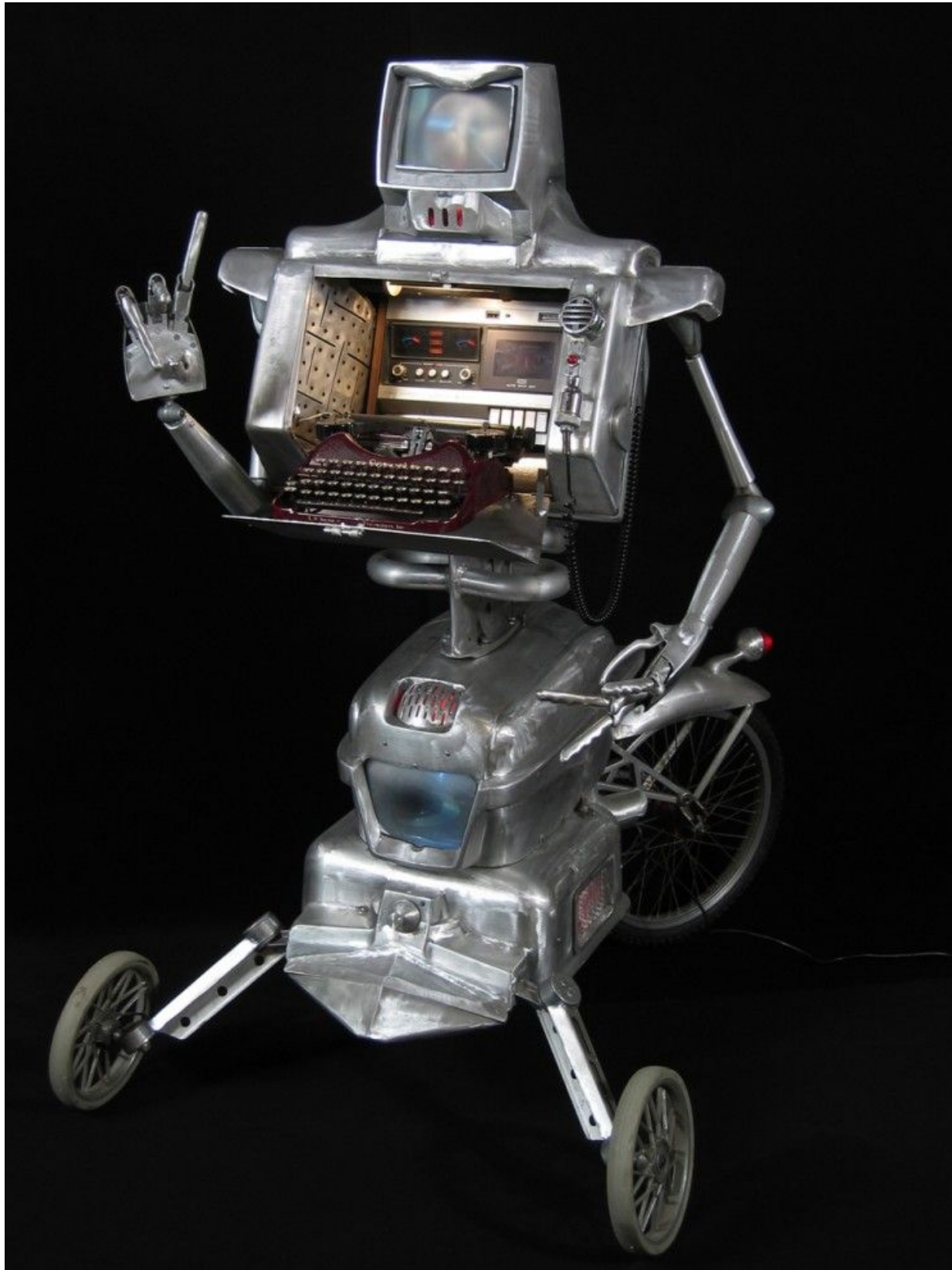
K R E Y S L E R &
A S S O C I A T E S





Strategies for Surviving Automation

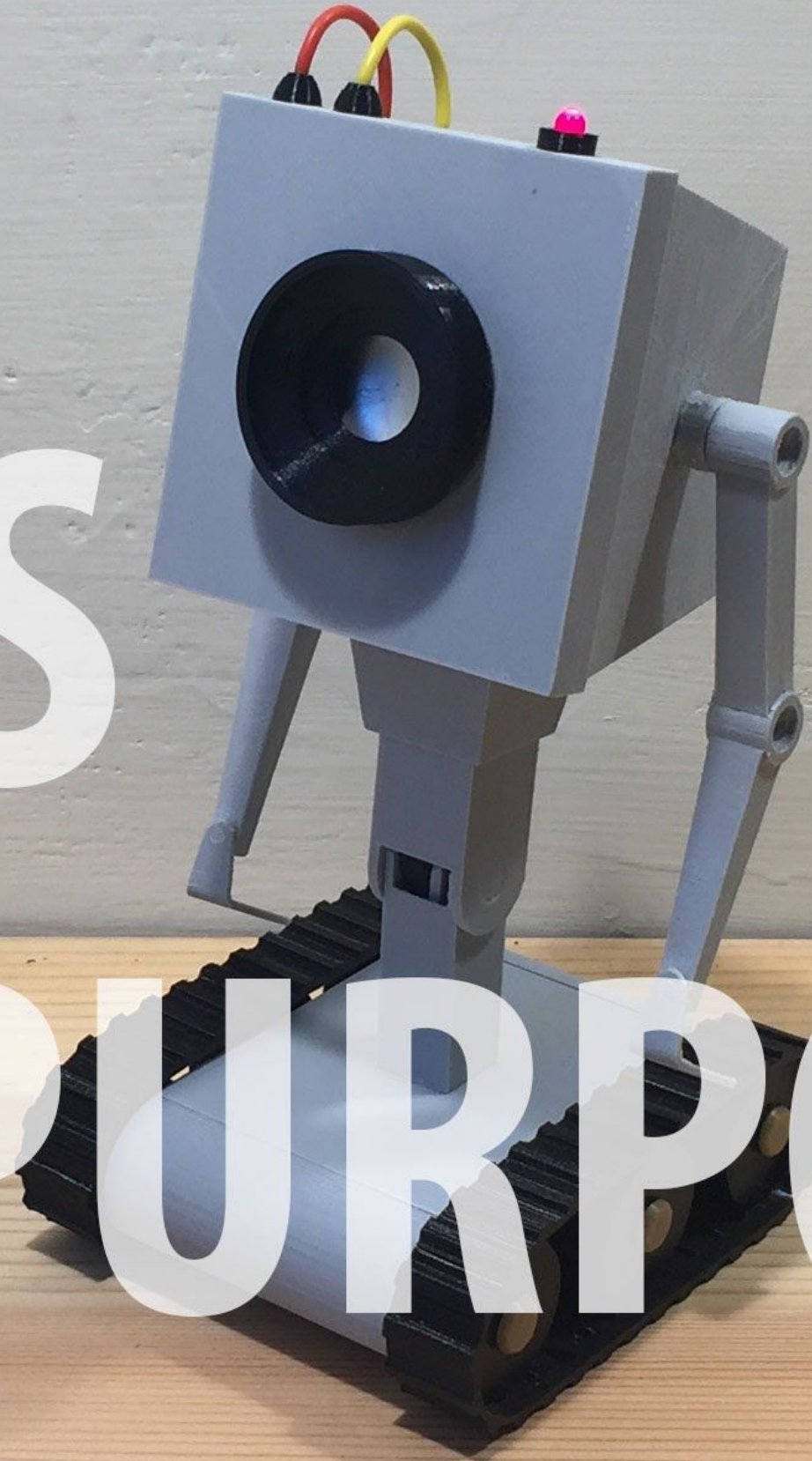
Empowerment vs. Disempowerment



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Wicked Problems

WHAT IS
MY PURPOSE?



‘Soft Skills’ will rule

When robots make the ‘hard’ skills so easy anyone can do them, the ‘soft’ skills become more important.

- Creative business-focused value-adding
- Designing Systems
- Sales, Marketing, and Relationships
- Humanities, Attention-getting, and Cultural Understanding

Add these skills onto what you already do to stay relevant!

