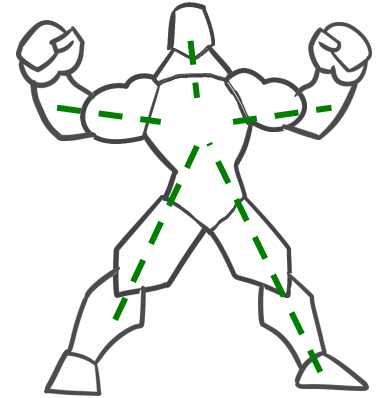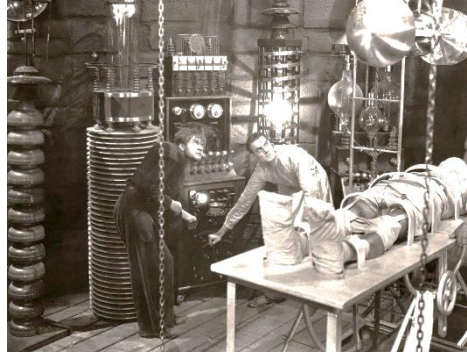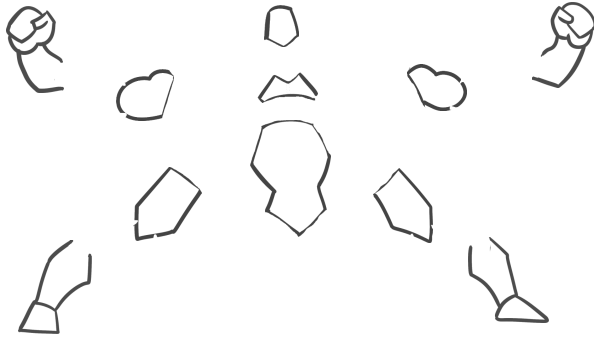# Sewing Together the Amputated Digital Twin

(BuildingSmart Feb 2020)

Luke Johnson

VDC Implementation Director

Yet Another Misused and Misunderstood Term

A **digital twin** is a digital replica of a living or non-living physical entity.[1]

Digital twin refers to a digital ==replica== of potential and actual physical assets (physical twin), processes, people, places, systems and devices that can be used for various purposes.[2]

The digital representation provides both the elements and the dynamics of how an Internet of things device ==operates and lives throughout its life cycle==.[3]

Definitions of digital twin technology used in prior research emphasize two important characteristics.

- Firstly, each definition emphasizes the ==connection== between the physical model and the corresponding virtual model or virtual counterpart.[4]

- Secondly, this connection is established by generating ==real time data== using sensors.

Is Your Digital **Really** a Twin?

- **Accurate** 3D Representation, usually As-Built

- Accurate operational data is embedded or **linked** directly to elements (not siloed or disconnected)

- There is a '**live**' connection to some data environment or monitoring sensors

- There is an **ongoing process of updating, feeding and maintaining the digital asset** with any changes to linked data or the physical asset/s or sensors
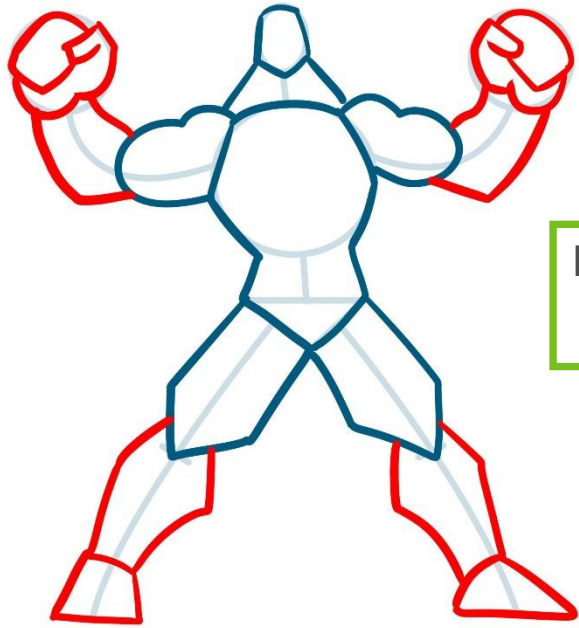
What you intended … ?

Physical ⟷ Digital Twin

… vs What You Might Actually Have

- **Not** As-Built

- Data is in a separate **silo**

- All connections are **manual** push-pull

- No clear **process** for **updating**

What Often Happens…

Project Lifecycle
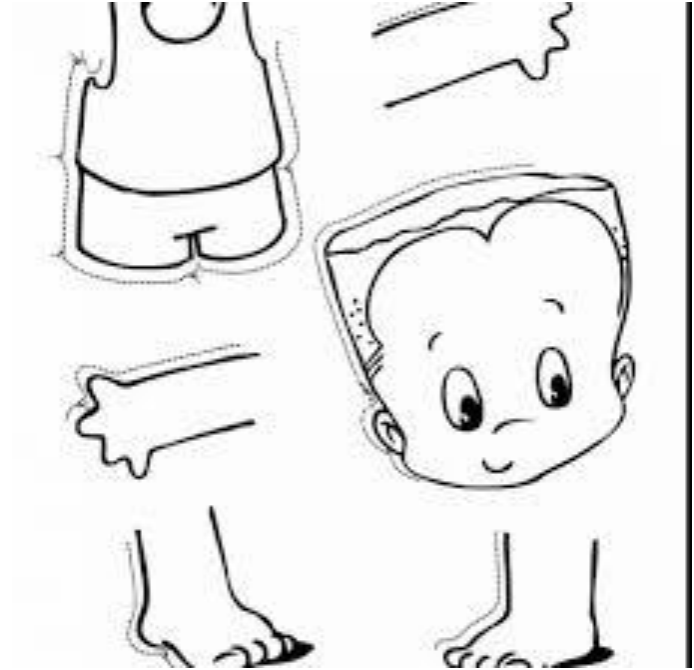
What Is Actually Going Wrong?

Digital

DISMEMBERMENT
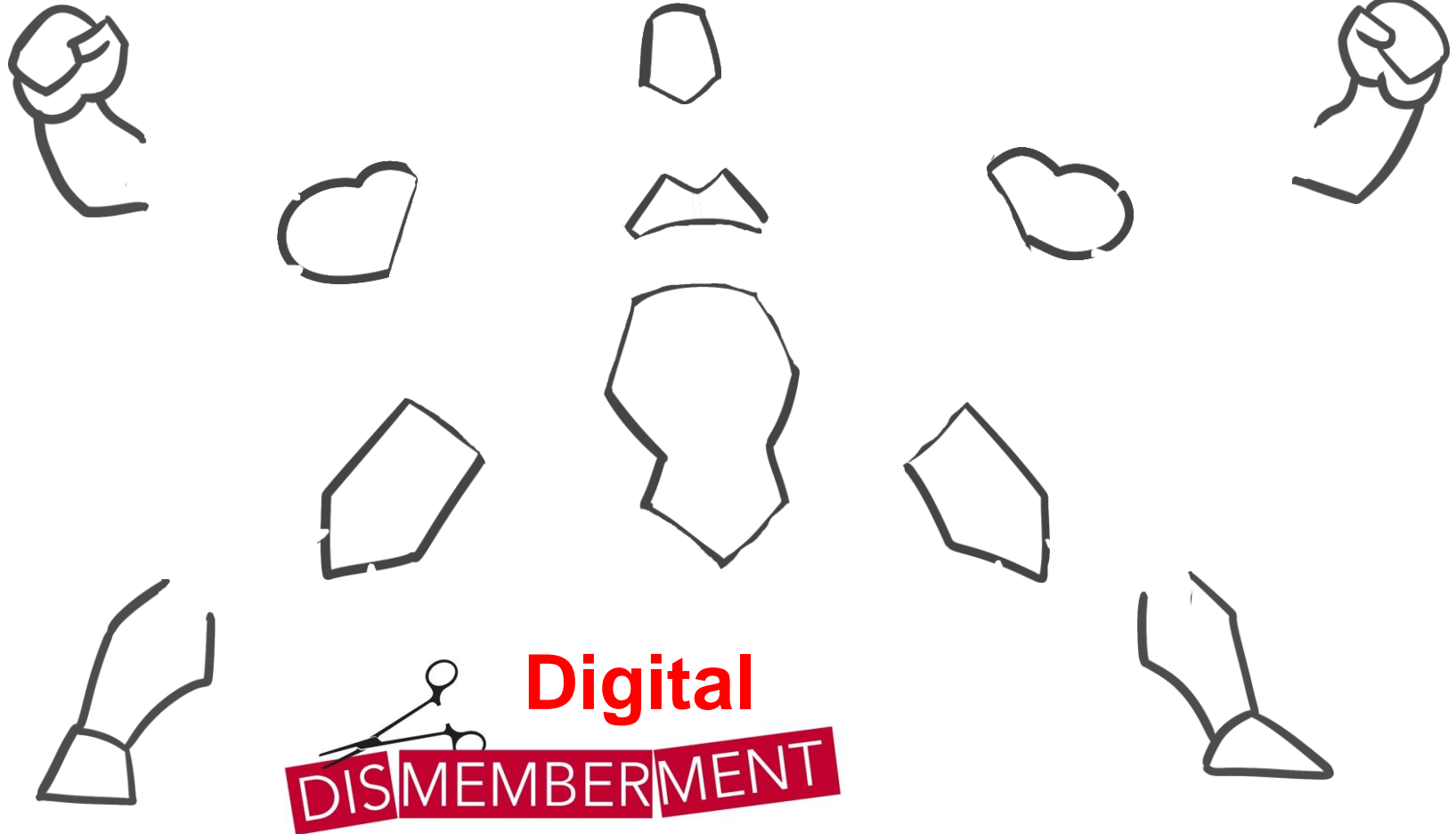
Is This Really a Digital Twin?

2D

ERP

Email

3D

Authoring Tool 2

Authoring Tool 1

CDE

Collaboration Platforms

Microsoft Excel !

Clouds

LANs & WANs
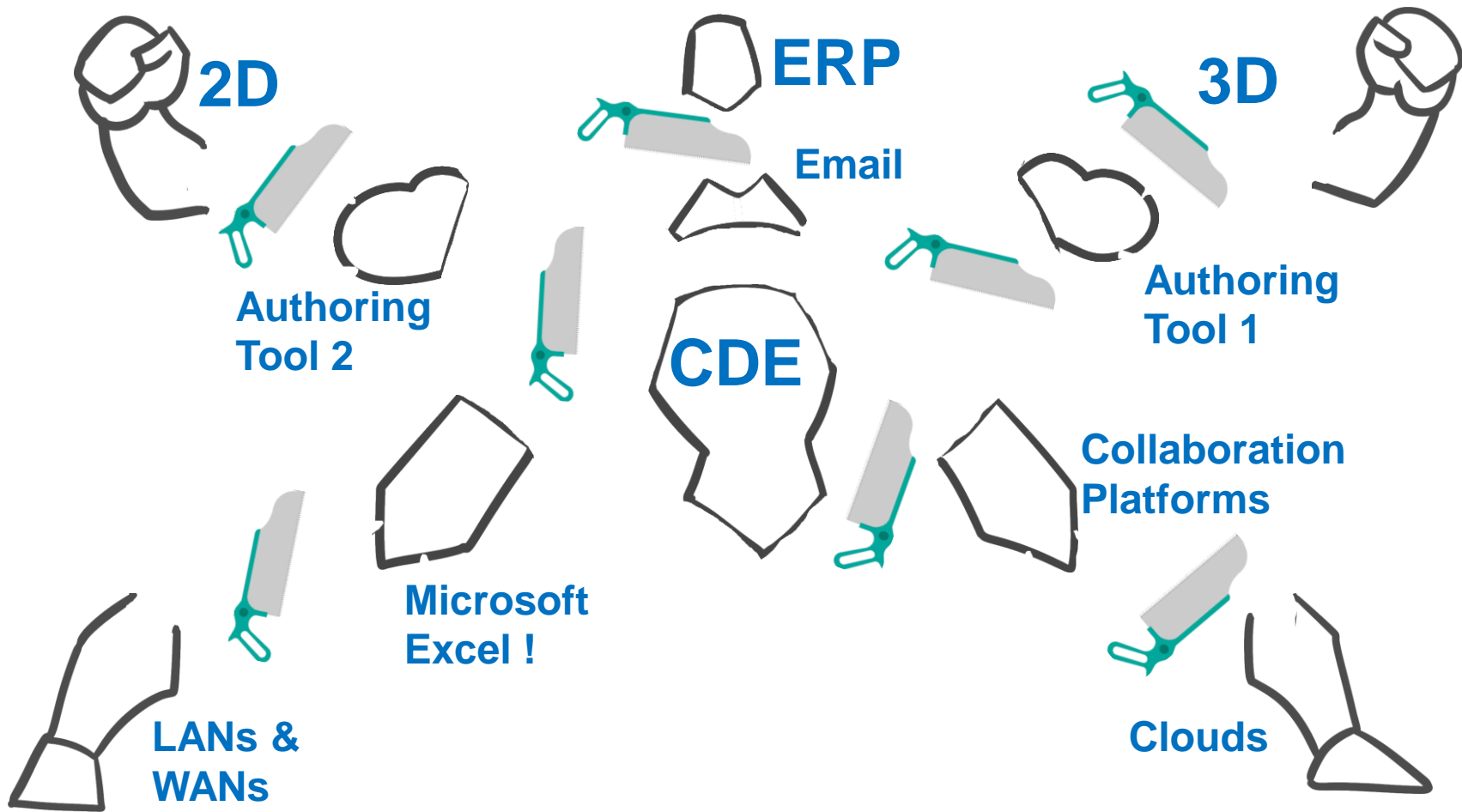
Amputation Methods

- Teams with different interests or **goals**
  (making a perfect digital twin is rarely a shared goal)

- Disparate **proprietary** platforms
  (without opportunity for integration or 'openness')

- **Security** and technical barriers
  (certain repositories not open to all parties)

- Lack of human resource **continuity**
  (people come and go on the project, even digital leaders)

Data Loss and Digital Obsolescence

- **Data loss** is an error condition in information systems in which information is destroyed by failures or **neglect** in storage, transmission, or processing.

- **Digital obsolescence** is a situation where a digital resource is no longer readable because of its archaic format.

  - Software obsolete (WordStar 1980s)

  - Hardware obsolete (Floppy disk)

  - Network, protocol, cloud obsolescence ???

The so-called "Digital Twin" Right Now

What Is Needed?

Determine Common Relationships that can be "sewn" together
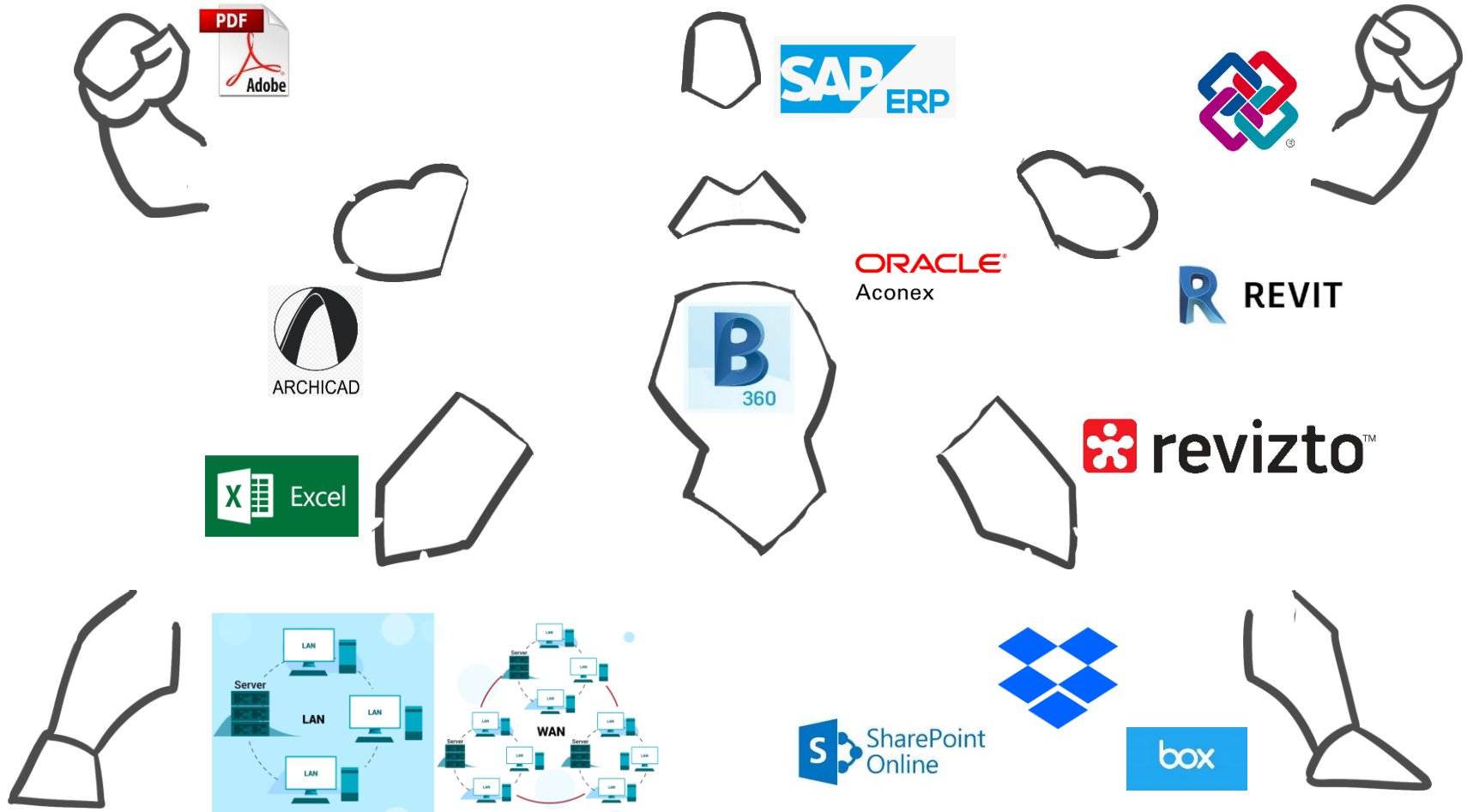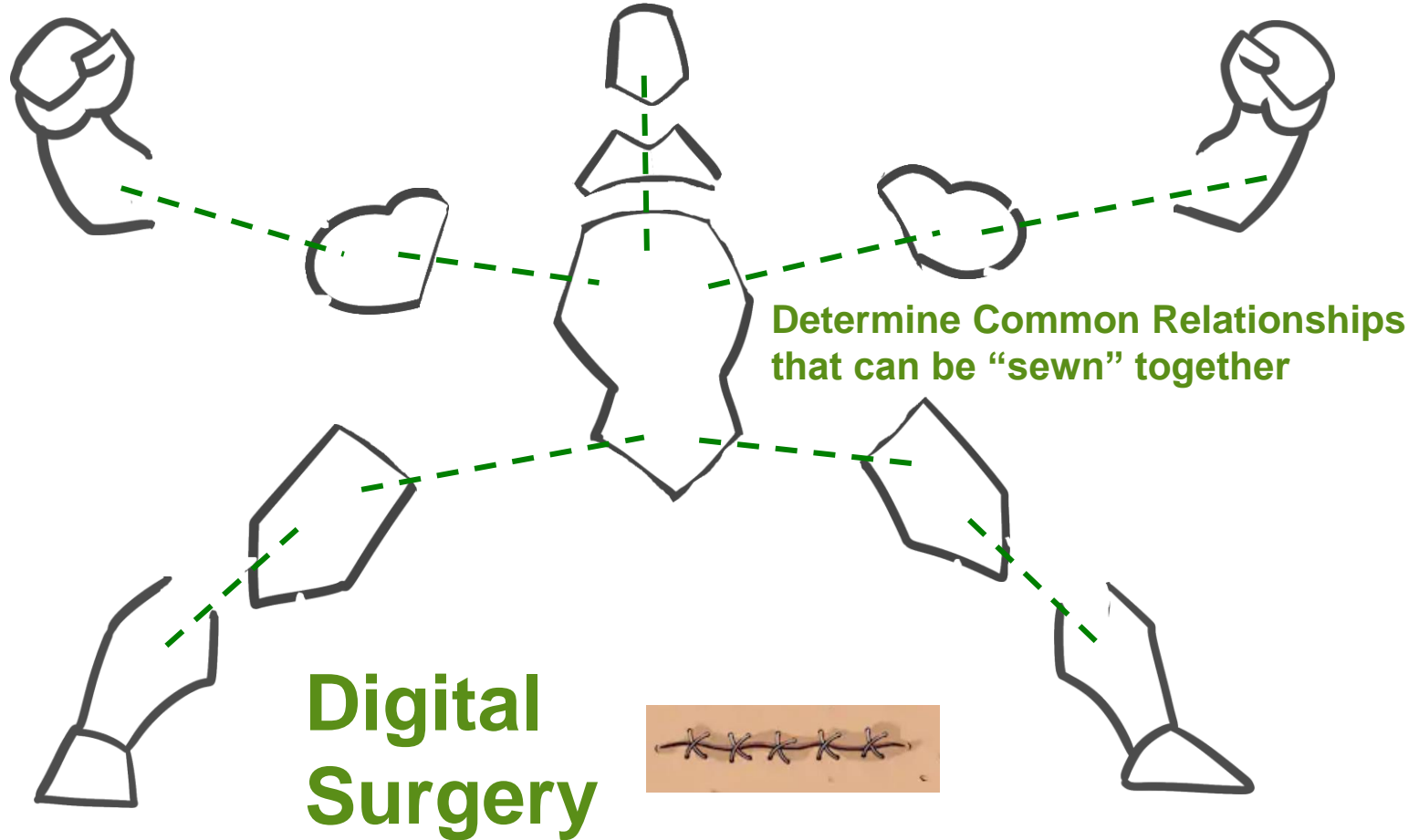
Digital Surgery

Solution: Connective Layer of Relationships

The connective covering or post-operative layer conceals the <u>actual surgical relationships</u>…

Case Study: BIM to Site to FM Handover Process
(the promise of BIM and the Digital Twin)
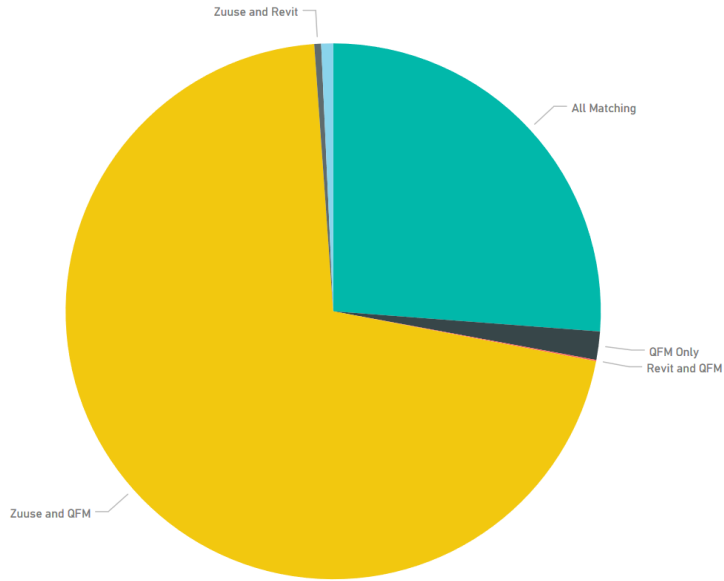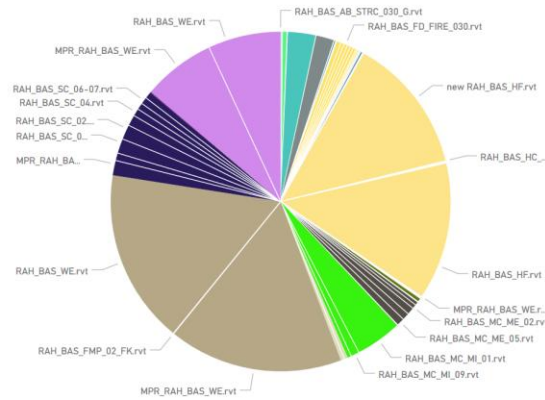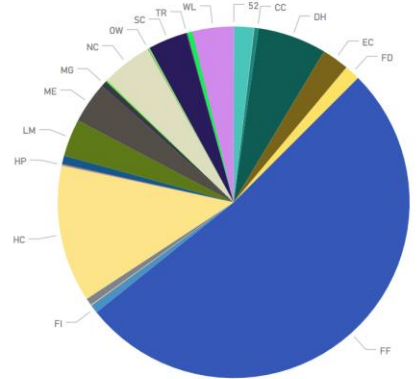
Can This Be Sewn Together?
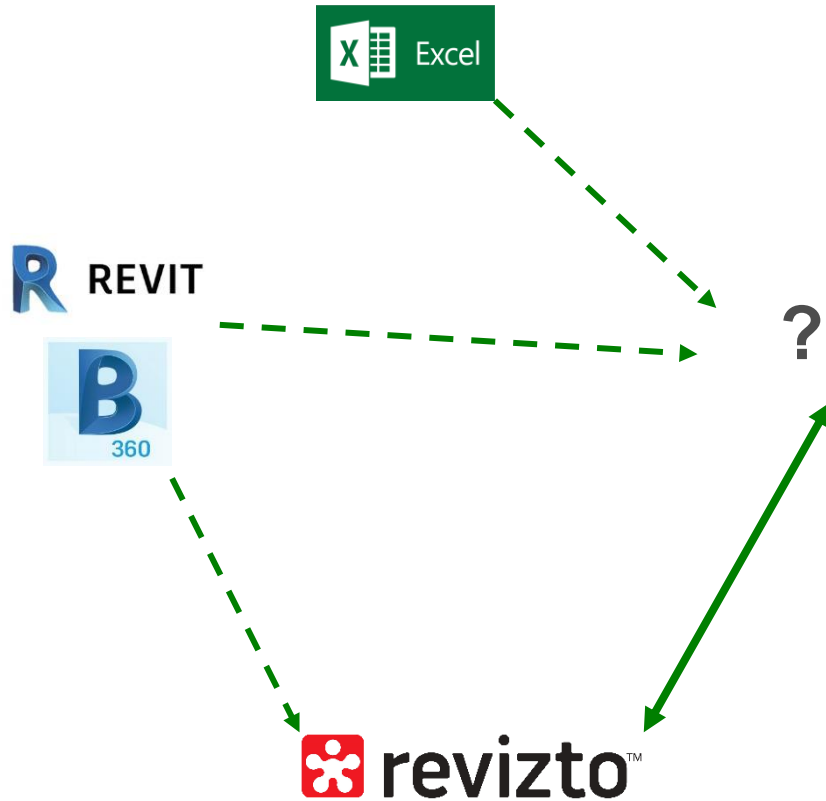
Stable Data Schema with Relationships
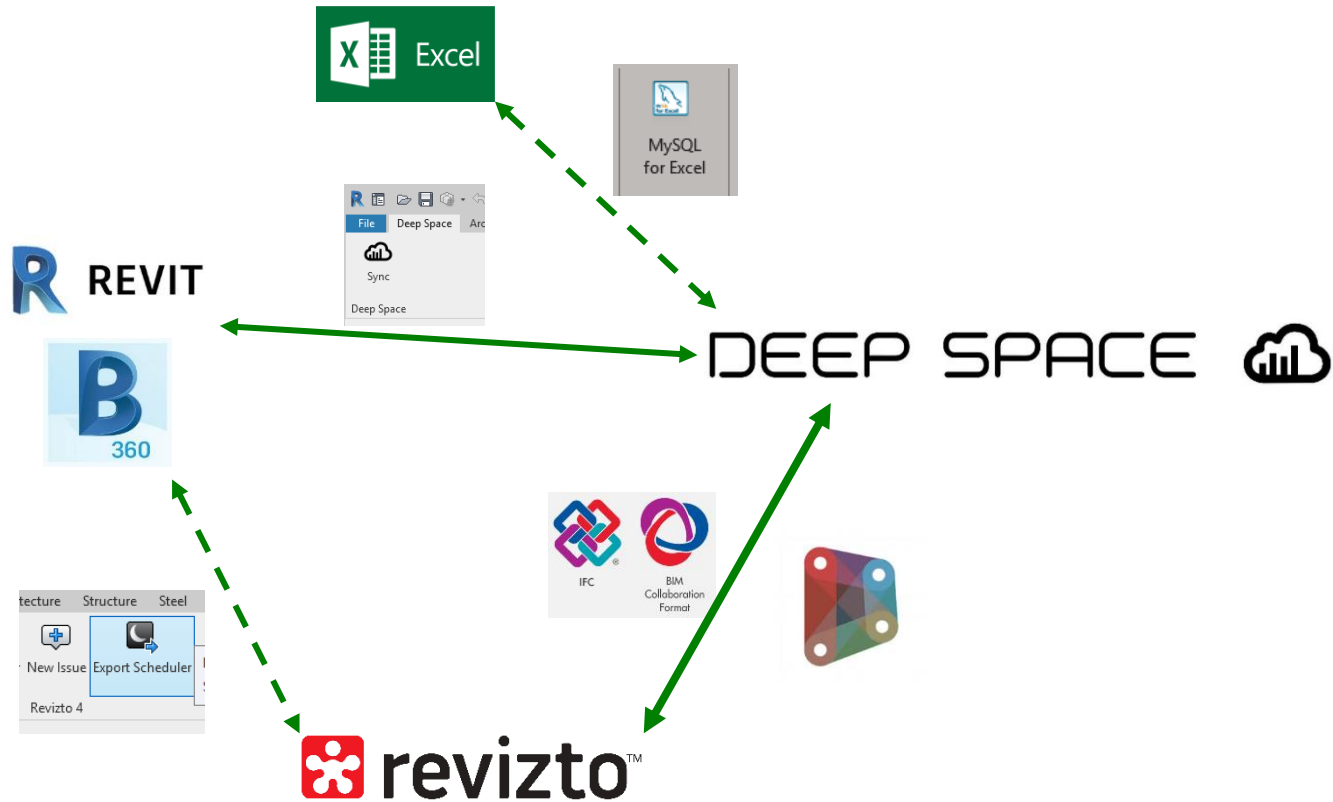
Data Rectification and Auditing

Stable Data Schema with Relationships

Revizto as a Digital Twin Interface (2D, 3D, Data Link)

Revizto used to Package Modification Works

Using IfcGUID, Dynamo, BCF and Deep Space

You are here: FM Data Management :: List

FM Data Management

Find New Record

Filter Results::
Type
All

	TABLENAME	FRIENDLYNAME	TABLEDETAILS	TYPE
	Open...	Room Number to Wayfinding Map	Table that shows Revit Room Number relationship to...	Input
	Open...	Rooms On Sheets	Allows searching between rooms and sheets	View
	Open...	DB Browser	Joined view of DB data from Revit, VSD, Mech, DB T...	View
	Open...	Distribution Board Tree	Distribution Board Tree	Import
	Open...	Mechanical Asset Register	Asset Register for Tier 2 Mechanical	Import
	Open...	FM Asset Register	View fm data	Import
	Open...	Asset Code Builder	Generator for asset codes from elements, spatials ...	View
	Open...	VSD Schedule	VSD Schedule	Import
	Open...	FM Asset Categories	FM Asset Categories	Input
	Open...	WebFM Portal	WebFM data	Import
	Open...	FM Asset Category List	List of Categories where Asset Data is required	Input
	Open...	FM Asset Register for Mining View	FM Asset Register for Mining	View
	Open...	Navisworks FM View with SmartPlant 3D	Navisworks FM View with SmartPlant 3D	View
	Open...	FM Code Filter	Filter view of FM data	View

With Selected:

Update Copy Delete

FOUND 14 RECORDS. SHOWING 30 RESULTS PER PAGE

RSS
Export CSV

Navigation

- VDC Manager
- Insights
- BIM Manager
- VDC Data
- VDC Views
- Architect
- Cloud
- Files
- Quick Links
- Model Tracker
- Tracker Menu
- Work
- 3D Coordination
- 4D Programme
- Model Compare
- Auditing
- Spatial
- FM
- AIM
- Classification
- Integrations
- Settings

Service provided by Virtual Built Pty Ltd

Developed by Luke Johnson and Michael Clothier

BIM-FM Lessons

- Clear + Validated Handovers

- Choose a platform early + <u>stick with it</u>

- Determine 'minimum data requirements'
  ↳ validate / audit
  ↳ enforce rectification

Stable Data Schema for Lifecycle

DEEP SPACE ☁
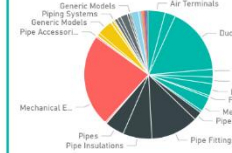
- custom schema
- automated
- live
- mobile

DEEP SPACE ☁

The Digital Twin is Aspirational… and that's OK
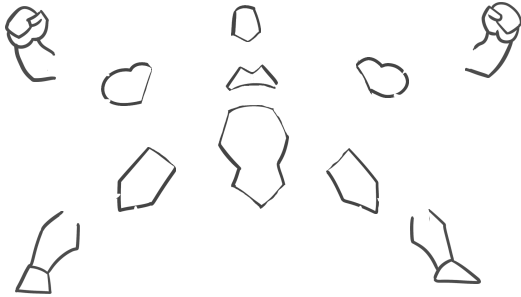
Start surgery on your Digital Twin now
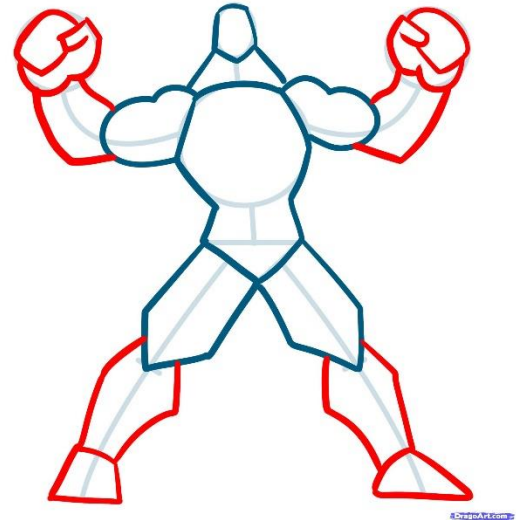
Choose a Platform That Enables Data Relationships
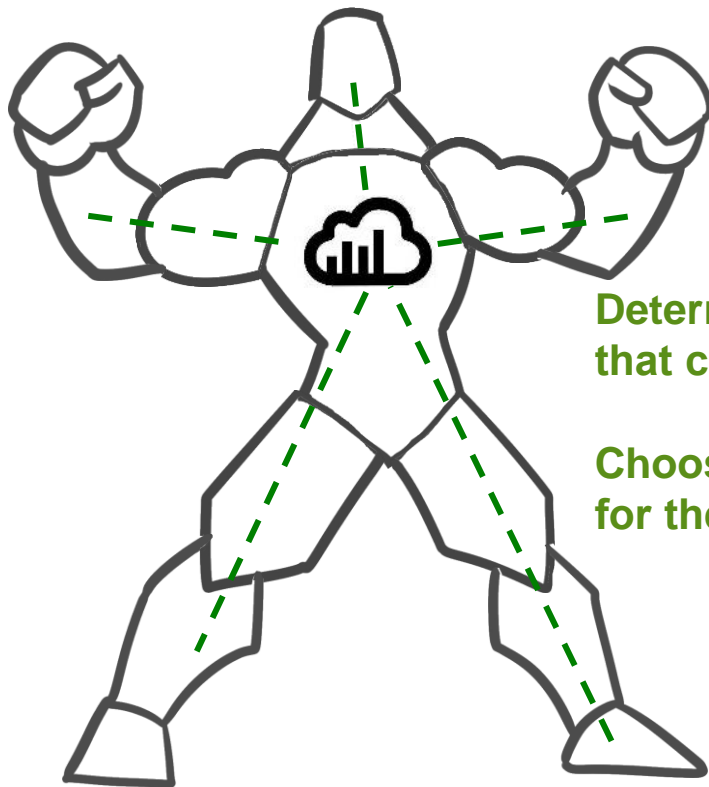
Determine Common Relationships that can be "sewn" together

Choose a Framework that allows for the Surgery to take place…

DEEP SPACE

So What… Now What?

"If we learn from our mistakes, shouldn't I try to make as many mistakes as possible?"

Modify your workflows based on what you learn

Questions?

Presented by: Luke Johnson
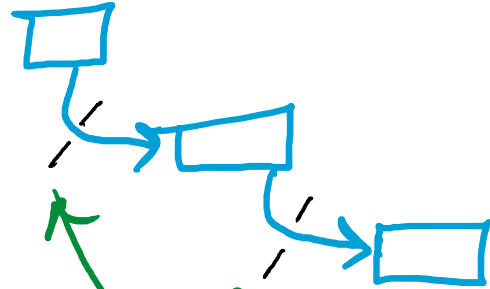
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Deep Space Sync   https://www.deepspacesync.com/

What Revit Wants   https://wrw.is/

Virtual Built   ljohnson@virtualbuilt.com.au

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                 Design and Construction Technology   DEEP SPACE