1

OUTLINE

- **Introduction**
  - Digital Design at Thornton Tomasetti
  - Speakers
  - Problem
  - Solution Outline
- **Live Demo**
- **Deep Dive into Tool Components**
  - Dynamo
  - Power BI
- **Q/A**

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2

2

INTRODUCTION

Digital Design (D2) at Thornton Tomasetti

Design Practices

- Structural Engineering
- Construction Engineering
- Protective Design
- Forensics
- Renewal

Information Technology

Digital Design

CORE

GOLDEN CIRCLE

WHY DO YOU DO WHAT YOU DO? WHAT'S THE PURPOSE?

HOW DO YOU DO WHAT YOU DO?

WHAT THE HELL DO YOU DO?

WHY?

HOW?

WHAT?

IDEA: SIMON SINEK
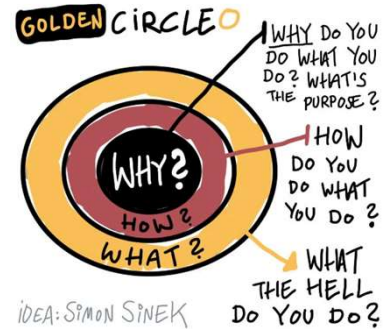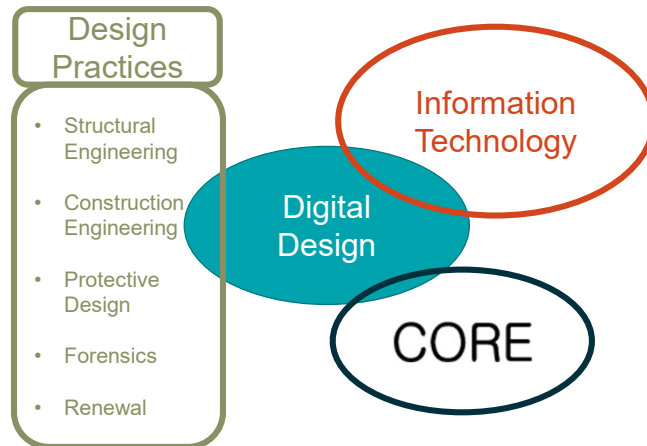
Why?

So project teams can do work that is worth their time; to focus on high value, high impact problems rather than the commodity activities.

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3

3

INTRODUCTION

Presenters

Dr. Kristopher Dane
Director of Digital Design
Seattle, WA

Sean McDonald
Corporate BIM Manager
Chicago, IL

Dr. James Feracor
Digital Design Technologist
Seattle, WA

We're hosting another session tomorrow at 10:45am:
3.2.08 "AirTable for Version Tracking of Revit Details"

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4

4

THE PROBLEM

Model Review is Hard

- Checking Revit models is resource intensive!

    - Time-consuming, tedious, and inconsistent when performed manually

    - Not easy to query / search elements in model using Revit UI… and tons of elements!

- Need ability to diagnose model health quickly, consistently, on demand
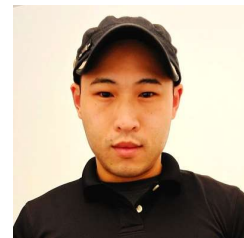
- Checks yield info valuable in diagnosing potential model issues / measuring model health

Some questions for models

- How many sheets do I have?

- How many views are on sheets?

- Are the right kinds of things in the right views?

- Are objects in the correct worksets?

- How much and what kind of stuff so I have in my model?

- What are the design quantities of the model elements?

- Can I dump model data to Excel for further analysis?

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5

THE SOLUTION

TASK 1:
Dynamo Scripts -> JSON files

User manually triggers Dynamo scripts…

TASK 2:
Update Power BI Template to read JSON files + refresh data

TASK 3:
Customize Report for intended end users in Power BI

Power BI Template ingests data automatically!

TASK 4: (Optional)
Improve workflow for repeatability

End users consider opportunities to scale + streamline workflow
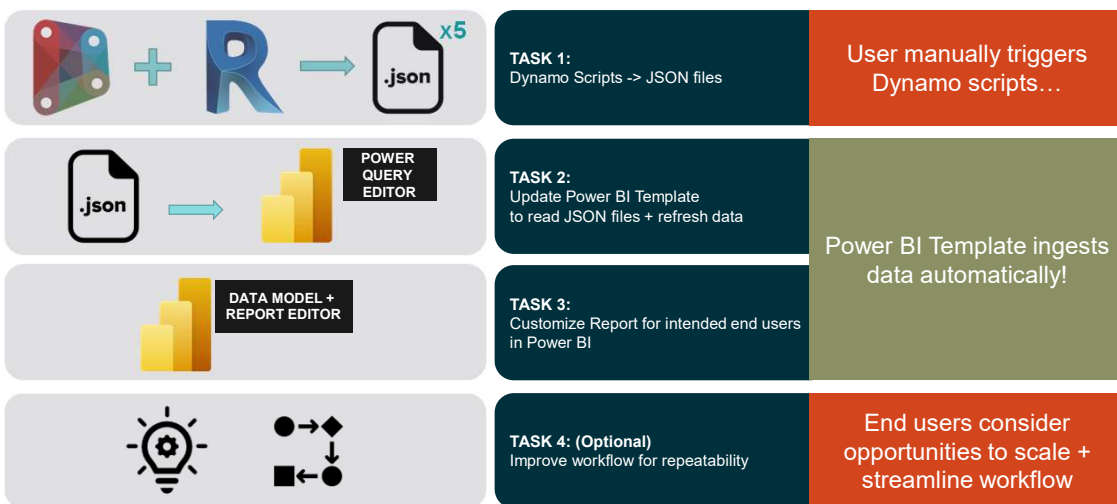
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We're going to make solution available to all of you (via GitHub)!

6

LIVE DEMO

7

REVIT MODEL

8

THE MODEL

Revit Sample Models

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9

9

DYNAMO SCRIPTS

10

WHY DYNAMO

- **Why Dynamo**
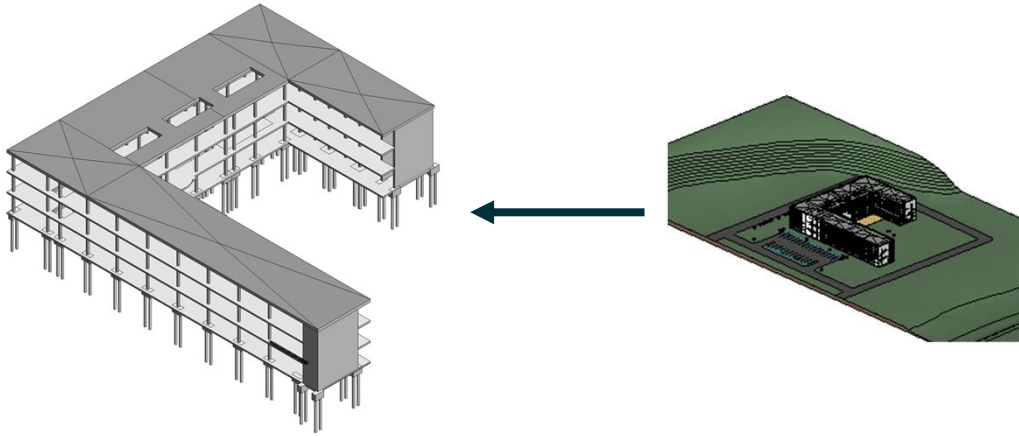 - Its free and installed with Revit
  - "Easily" modifiable
- **Drawbacks to Dynamo**
  - It can be slow
  - It needs to be run manually
  - It can be prone to issues
  - Issues can be machine specific
  - You can't stop a run without killing Revit

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11

11

REQUIREMENTS

- **Packages**
  - JsonData
    Exporting Revit data to JSON
  - Archi-lab.net
    Element selector
    Linked model info

Packages		
Name	Path	Version
JsonData	C:\Users\smcdonald\AppData\Roami	2.0.2
archi-lab.net	C:\Users\smcdonald\AppData\Roami	2022.212.3222

- **Sample Files**
  - Creating using the Autodesk Revit Architecture and Structure sample files (both basic and advanced)
  - Modified slightly and linked to make the data export slightly more realistic
- **Revit**
  - Sample made using 2022.1.2

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12

12

THE SCRIPTS

Script 1: Elements

Script 2: Links, views, sheets, warnings

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13

13

SCRIPT 1 | ELEMENT DATA

- Using archi-lab.net collector to get all model and annotation categories list

- Selecting all elements by category using those categories
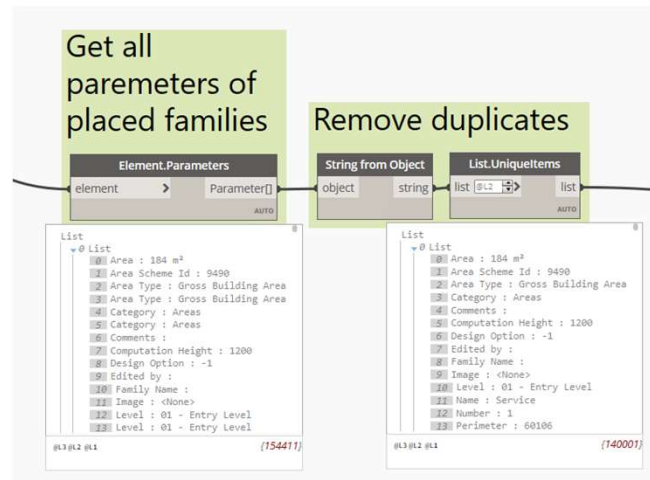
- Flattening and cleaning the list of elements

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14

14

SCRIPT 1 | ELEMENT DATA

- Get all parameters from the list of elements
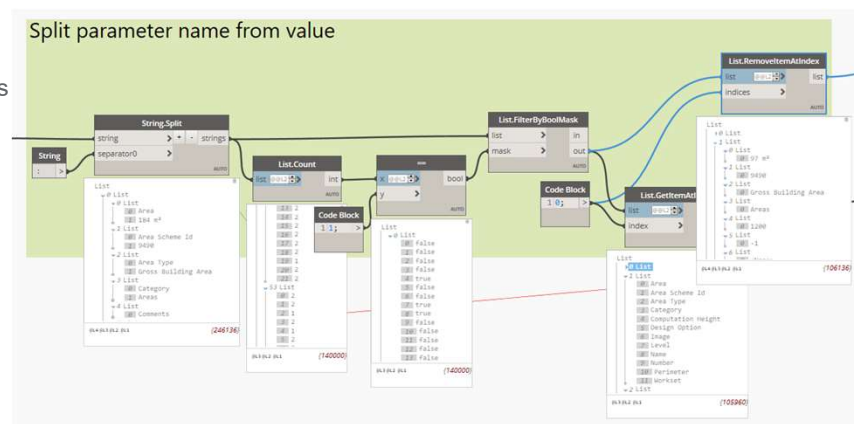
- Convert to string and remove duplicate items

15

15

SCRIPT 1 | ELEMENT DATA

- Split the parameter fields at the : to get the Parameter and the Value

- Using the count of elements in the list, empty values can be filtered out

- Both grabbing and removing the elements at index 0 will create the 2 lists (parameters and values)
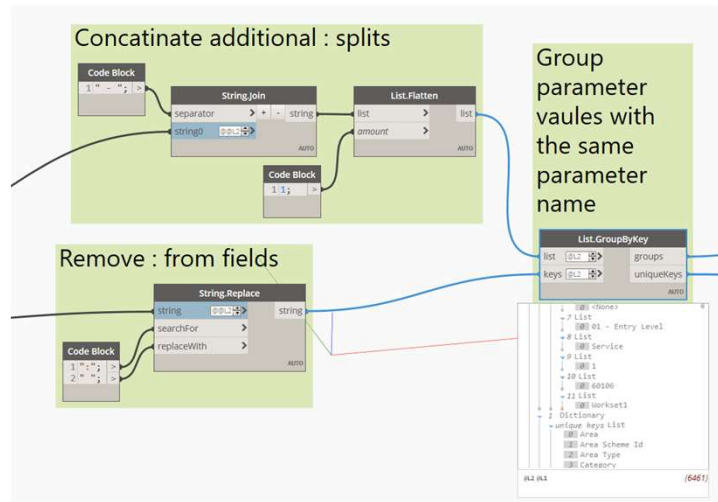
16

16

SCRIPT 1 | ELEMENT DATA

- Join any values that may have been split

- Remove any : left in the parameter name

- Group all the values by parameter name

17

SCRIPT 1 | ELEMENT DATA

- Join the values for parameters with the same name

- Add the element ID and GUID values to the front of each element

- Add the elements ID and GUID keys to each parameter list
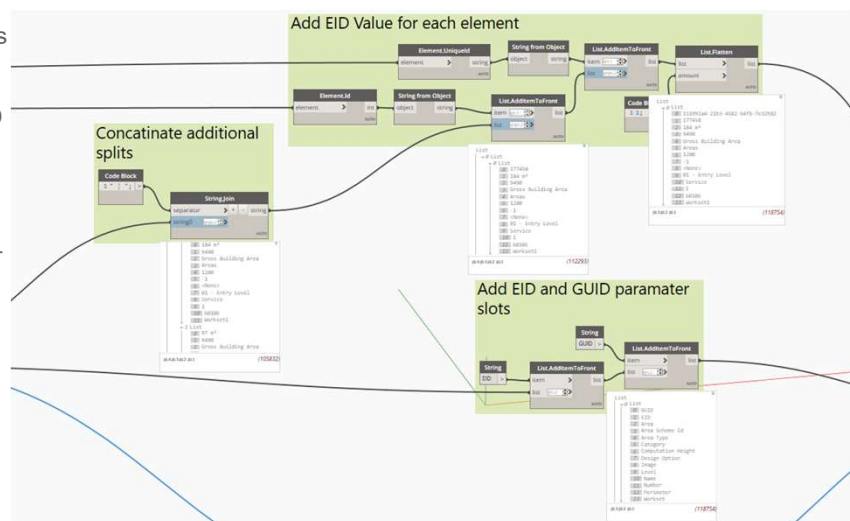
18

SCRIPT 1 | ELEMENT DATA

- Create a list of all parameters

- Create blank values for the list of parameters

- Add these to the front of the values and keys lists
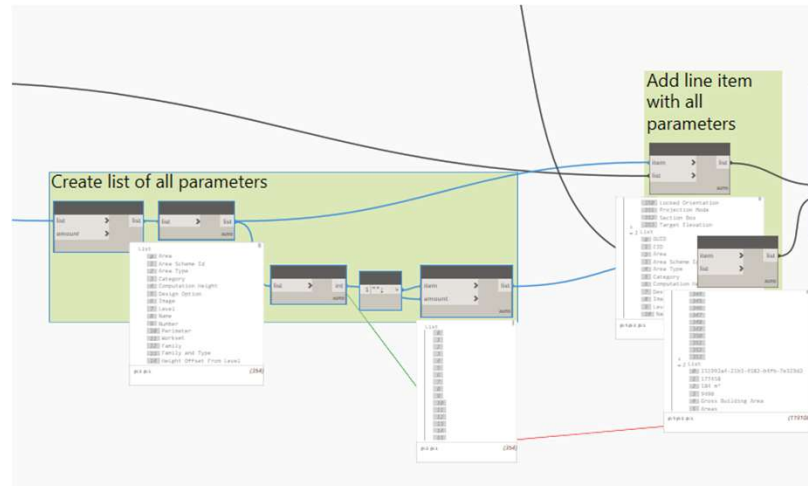
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19

19

SCRIPT 1 | ELEMENT DATA

- Create a dictionary with the parameter names and parameter values

- Grab the dictionary Keys and Values
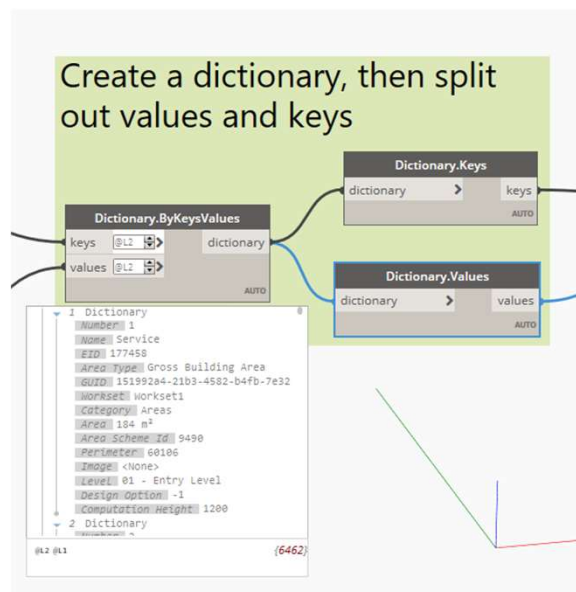
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20

20

SCRIPT 1 | ELEMENT DATA

- Create a file name and path string
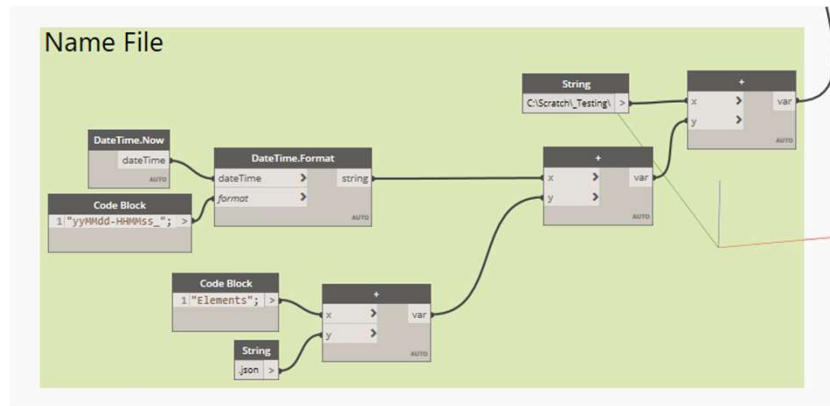
SCRIPT 1 | ELEMENT DATA

- Convert dictionary keys and values to a JSON object

- Write out the JSON

SCRIPT 2 | SHEET / VIEW

- Select by category for both views and sheets

- For views, filter our view templates
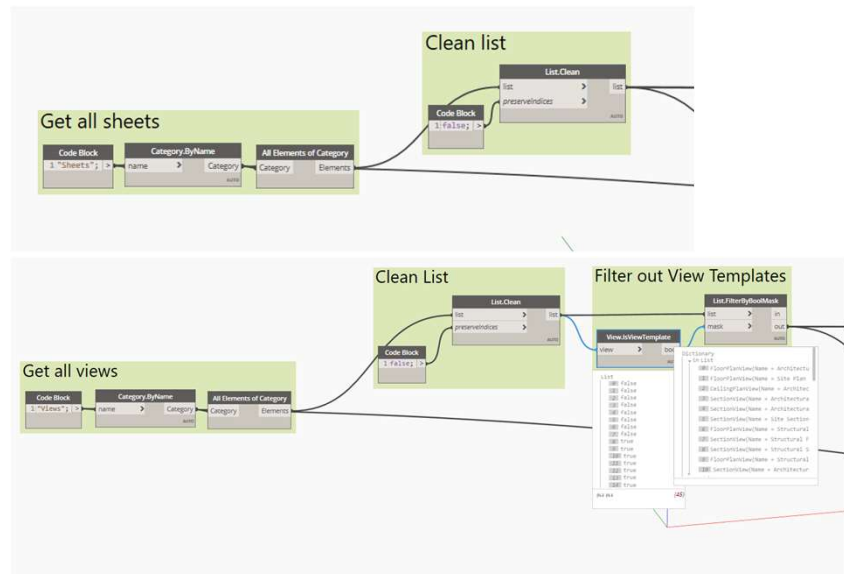
23

SCRIPT 2 | SHEET / VIEW

- Center of the graph is identical to the elements graph

24

SCRIPT 2 | SHEET / VIEW

- Create dictionary, create JSON and export are all the same from elements graph

- Connected category name to file name

25

SCRIPT 2 | LINKS

- Most of the links graph is the same as views/sheets

- Exceptions

  - Get links using archi-lab.net node

  - Add the link name and path to parameter list

26
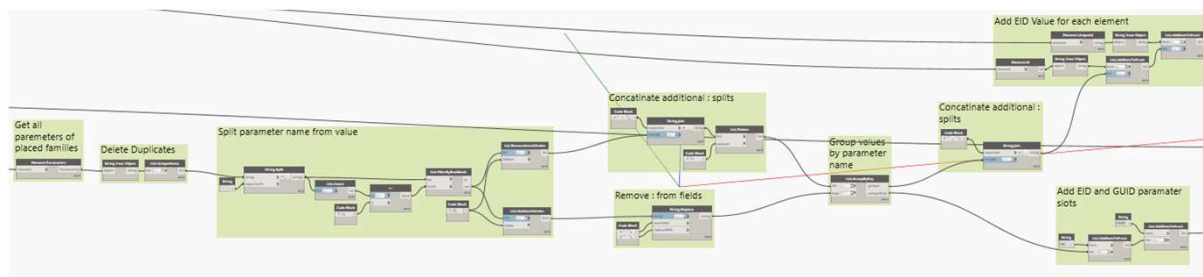
SCRIPT 2 | WARNINGS

- Use GetWarnings node to collect warnings

- Extract the severity and descriptions

- Reformat the list

- Creating dictionary, JSON format, and file export are the same

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27

27

SCRIPT 3 | ALL

- For ease of use all the scripts can be combined
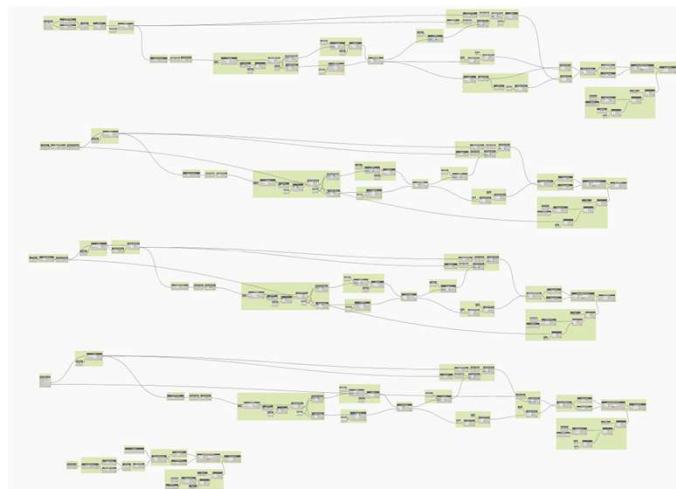
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28

28

SCRIPT 2 | CUSTOMIZING THE SCRIPT

- Speed
  - Limit the extraction to model or annotation elements
  - Limit the extraction by category

- Consistency
  - Limit the extraction to specific parameters
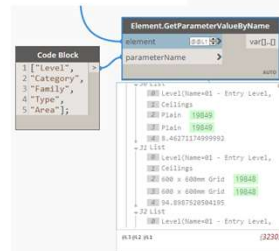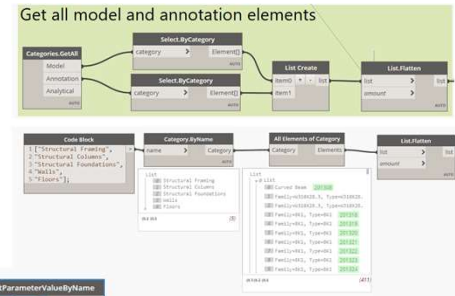
29

29

EXPANDING THE SCRIPT(S)

- Elements in view
- File/ Project level info
- Loaded, unplaced content
- Overlapping elements
- Geometry data

30

30

IMPORT DATA INTO POWER BI

...AS AN END-USER

31

WHY POWER BI?

TT delivers data via Power BI platform
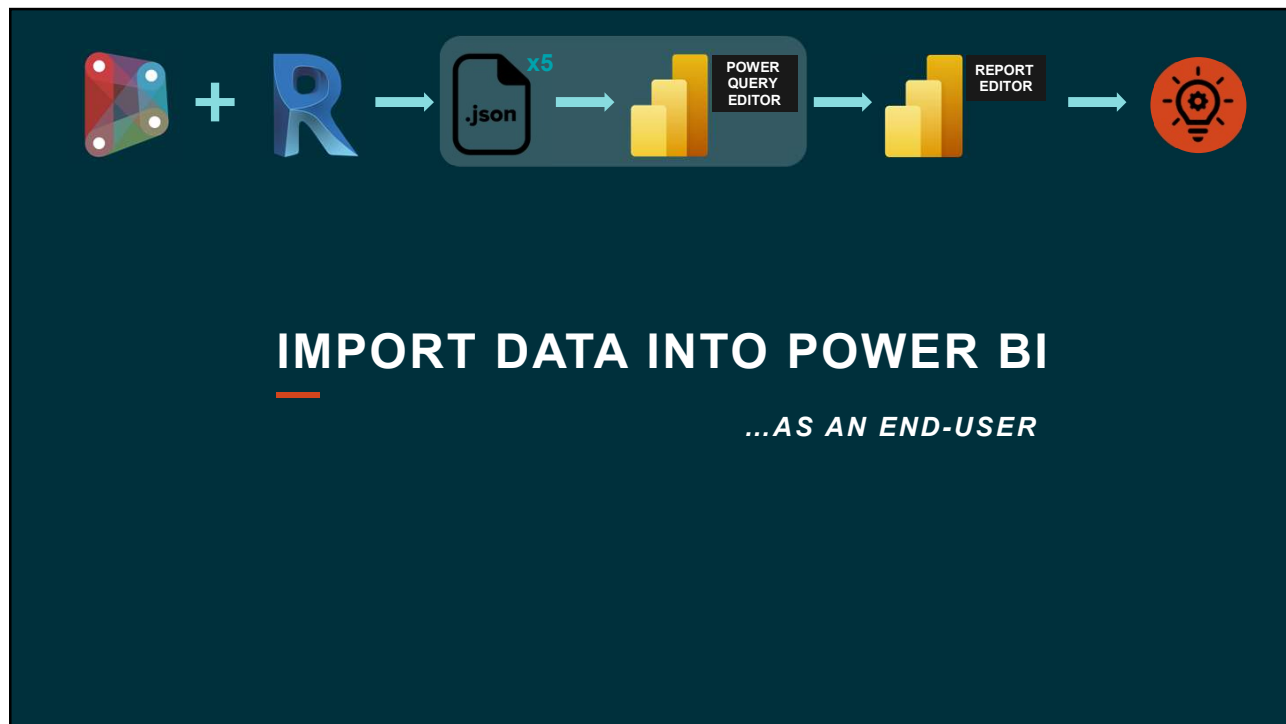
Shifts focus from processing to consuming / interpreting data

Desktop

- Consistently clean and process model data automatically

- Powerful beyond Excel…and Revit UI sucks for analysis

- Desktop App is free and comes with most features (try before buying Pro)

- Self-service tool empower users, does not require process ownership

Pro (and higher)

- Collaborative features - web-based and centralized access (single source of truth)

- Integrates well with Microsoft products, especially Teams and Sharepoint

- Scheduled data refreshes to optimize workflow for end-users

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32

32

PREPARATION CHECKLIST

When using Power BI template…

Check your version of Power BI
- Template made w/ May 2022 update
- Power BI not backwards compatible for this version, so must use this version or later

Organize JSON files into single folder

Turn off Auto-Detect Relationships
- Power BI frequently and incorrectly tries to relate tables
- Unexpected relationships can over constrain model and create refresh issues
- Turn this off (if not already turned off)

- **File > Options and setting > Options > Current File: Data Load**

Relationships
- ☑ Import relationships from data sources on first load ⓘ
- ☐ Update or delete relationships when refreshing data ⓘ
- ☐ Autodetect new relationships after data is loaded ⓘ

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33

ANATOMY OF POWER BI

What the developers sees (PQ) versus what the end user sees (report editor)

Roles	Developer	End-User / Consumer
Primary Sections in Power BI	**Power Query Editor** *Transform and optimize the flow of data that all users will consume*	**Report Editor** *Define the intended user experience, customize the display of information*
Intended purpose	*Process data so end users don't have to*	*Make reports useful and usable*
Subsections	Transform data ⌄	**Report View** *Create and format visuals* **Data View** *Available data as a table* **Model View** *Table relationships*

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34

34

LOAD JSON DATA INTO POWER BI

New users only need to load data; advanced users may further customize

New Users:	Point the tool to the 5 JSON files in Power Query. Done!
Advanced Users:	Load more data, perform additional data transformations (e.g. joins, merges, delete unused columns, change column formatting)

Put your JSON files in a folder…

In the Power BI template, there are 6 'Parameters' in Power Query editor you need to provide inputs for:

C:\Scratch\Power BI Demo

Name

- 220531-150535_Views.json
- 220525-140529_Links.json
- 220525-140545_Warnings.json
- 220525-140529_Sheets.json
- 220525-140556_Elements.json

path_JSON

file_Views

file_Links

file_Warnings

file_Sheets

file_Elements

Parameters [6]

- path_JSON (C:\Users\jferacor\Thornton Tomasetti, Inc\…
- file_Views (220531-150535_Views.json)
- file_Links (220525-140529_Links.json)
- file_Warnings (220525-140545_Warnings.json)
- file_Sheets (220525-140529_Sheets.json)
- file_Elements (220525-140556_Elements.json)

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35

35

LOAD JSON DATA INTO POWER BI (CONT.)

New users only need to load data; advanced users may further customize

New Users:	Point the tool to the 5 JSON files in Power Query. Done!
Advanced Users:	Load more data, perform additional data transformations (e.g. joins, merges, delete unused columns, change column formatting)

You will be prompted to enter these parameters when you open the template for the first time

TT-D2_Revit Model Diagnostics (Template)

Revit Model Diagnostics is a Power BI report template developed by Digital Design at Thornton Tomasetti. Originally demonstrated at the DBWA Conference in Anaheim, CA in June 2022. To ingest data into the template, please specify the name of each JSON file (5 files) and the file path they are stored.

C:\Scratch\Power BI Demo

Name

- 220531-150535_Views.json
- 220525-140529_Links.json
- 220525-140545_Warnings.json
- 220525-140529_Sheets.json
- 220525-140556_Elements.json

file_Views

file_Elements

file_Links

file_Warnings

file_Sheets

path_JSON

file_Views

file_Elements

file_Links

file_Warnings

file_Sheets

path_JSON
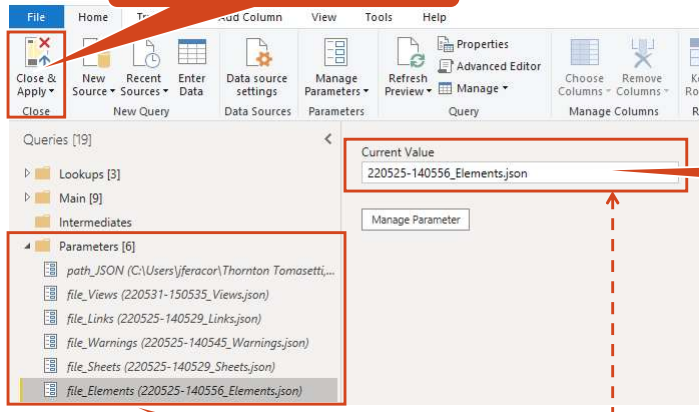
Edit the values to match the name of your JSON file + folder path

Press 'Load' when done

Load   Cancel

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36

36

LOAD JSON DATA INTO POWER BI (CONT)

LOAD JSON DATA INTO POWER BI (CONT)

37

38

JSON DATA CONTENTS

Mapping JSON to Tables
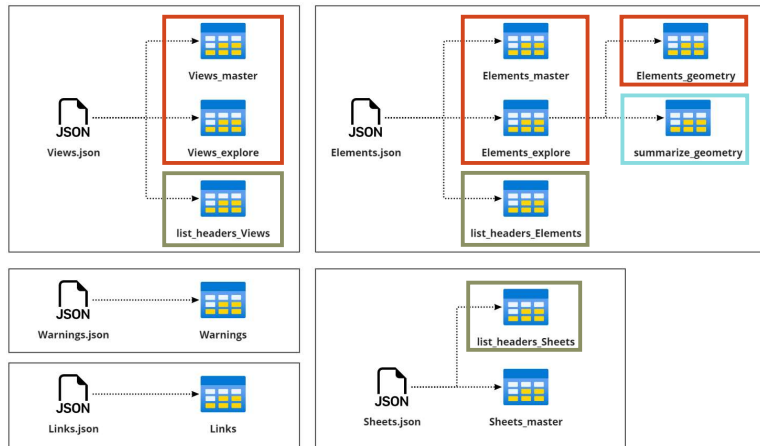
Data Cleaning Steps

- Split large tables into components

- Clean data for formatting
  - truncate multi-values cells
  - consistent values
  - consistent column headers
  - separate units from quantities

- Summarize tables for visuals

Optional (but helpful)

- Generate lists of column headers to assist with development

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39

39

WHY DO WE NEED TO TRANSFORM DATA?

Transformations pre-programmed in the template make data tables modular

Steps for Elements_master
1. Load raw data

2. Create duplicate for Elements_explore

3. Remove all other columns except GUID or EID and any columns to be used as slicers for Views

4. Filter any rows not needed

Steps for Elements_explore
1. Remove all columns used in Elements_master except for GUID or EID

2. (optional) Reformat columns (e.g. change formats to numbers, separate units from quantities, split, etc.)

3. (optional) Filter any rows not needed

4. (optional) replace values for consistency (handle blanks, nulls, white spaces)
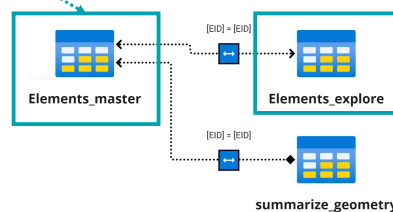
All tables based on Elements should be connected to Elements_master via [EID]

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40

40

CUSTOMIZE POWER BI

41

CUSTOMIZE POWER BI REPORT

Use Report Editor to align report content to specific needs of intended end users

- Use Power BI Report editor to

- Two areas of customization to focus on: **perceived usefulness, perceived usability**

  - **Perceived Usefulness:** How useful is data model + data visualizations?

  - **Perceived Usability:** Can users navigate it on their own?

Model Considerations
- Additional / alternative visualizations (details)
- Additional measures, calculated columns, or tables
- Key performance metrics
- Table relationships (cardinality and direction)

Usability Considerations
- Slider syncing / Interactivity features
- Tooltips and on-screen guidance
- Links to company-specific resources / guidance
- Buttons and bookmarks

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42

42

IDEAS FOR CUSTOMIZATIONS

Add branding and customize aesthetics

Branding and Aesthetics

- Users will find report more useful if it feels relevant to specific needs of company

- Display information in manner that end users expect (standard metrics?)

- Add tooltips that help users interpret what they see

Report Versioning + Control Complexity

- Create alternative versions of pages or reports with different levels of detail

- Hide details for casual users, but data available on demand

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43

43

ADVANCED TOPIC

DATA MODEL

For developers who want to expand on the template model
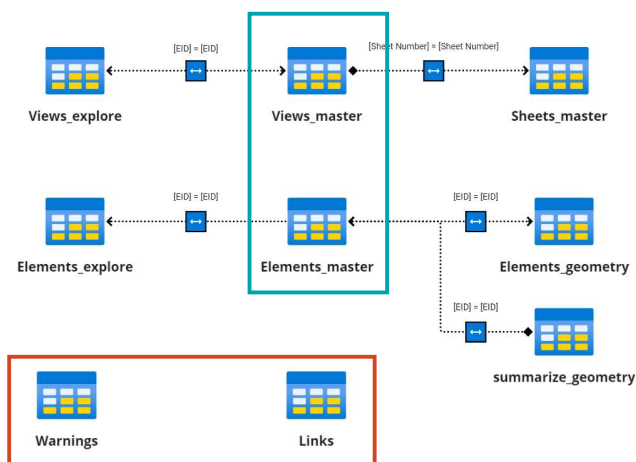
Data Model as it exists in the Power BI template

- Note that Links and Warnings tables are not connected to the model

- Future development could link elements to views and sheets they belong to

- New tables based on Elements or Views should be related to their corresponding 'master' table
  - When creating slicers for views or elements, use the 'master' table columns
  - This ensures slicers are synced across pages

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44

44

EXAMPLE CUSTOMIZATION #1

Add a calculated table + relate to existing model

Query: Which element types have over 200 elements in the model?

Solution: Create calculated table to filter elements table by the number of elements per category, then use as slicer.

1. Add Calculated Table w/ DAX

2. In Model View, relate summary table to master table on [Type] field (both directions)

```
summarize_type =
SUMMARIZE(Elements_master,[Type],
    "Elements", COUNT(Elements_master[EID])
)
```

[Type] = [Type]

Elements_master   summarize_type
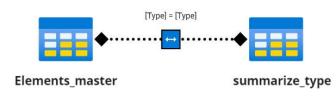
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45

45

EXAMPLE CUSTOMIZATION #1

Add a calculated table + relate to existing model

Query: Which element types have over 200 elements in the model?

Solution: Create calculated table to filter elements table by the number of elements per category, then use as slicer.

ANSWER:
108 types w/ <200 elements
3 types w/ 200+ elements

Element Breakdown by Type and Level

Level ● (Blank) ● 01 - Entry Level ● 02 - Floor ● 03 - Floor ● Parapet

Type			
300mm	55	54	55
Solid	159		
Interior - 138mm Partition (1-hr)	122		
30mm Square	120		
M_Door Tag	100		
Room Tag	91		
L Mullion 1	78		
0915 x 2134mm	22	23	24
600 x 600mm Grid	17	24	19
M_Chair-Breuer	60		
SHADE SUPPORT	40		
Standard	40		
2440mm - 277V	14	16	
5480 x 2740mm - 90 deg	27		
M_Area Tag	25		
0915 x 1220mm	6	9	
8K1	23		
65mm Bubble	19		
Exterior Curtain Wall	18		
0915mm Diameter	15		
25mm Arial	15		

0   50   100   150   200

Number of Elements by Type

1   200

108   111
Selected Types   All Types

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46

46

23

47

48

DEVELOP YOUR ROADMAP

49

ADVANTAGES AND LIMITATIONS

Consider the opportunity costs of your deployment

	Advantages	Limitations
General Points	• Scripts are self-service, on demand • Small footprint (JSON files) • Engaging interactive reports, rapid turn-around • Ability to add company-specific user guidance • Minimal focus on data processing	• Cannot fully automate execution of Dynamo yet • Single model snapshot only; no comparison features
Power BI Desktop (Free Only)	• Automatic, consistent, repeatable transformations • Source data unmodified by process • Allow users to export filtered data as needed • Incremental development	• No publishing, collaboration features • Does not leverage best features of Sharepoint • Sub-optimal workflow for end users, who must refresh data each time (takes time to re-calculate)
Power BI Pro (or higher) *ADVANCED TOPICS*	• Web-based platform, centralized sharing • Dataflows + scheduled refreshes • Collaboration: Publishing, Teams integration • Row-based security, incremental refresh	• Complex merges cannot be done without Premium level (but there are workarounds!) • JSON files are not centrally managed (no tracking)

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50

50

STRUCTURE YOUR FILES AND FOLDERS

How to repeat this analysis consistently, improve workflow automation

Why do this?
Stronger naming / structure conventions enables tools like Power BI to locate and distinguish JSON files intelligently

- **Develop folder structure and naming system**

  - Allows Power BI to programmatically find JSON files by version, project, model based on path and file name

  - Date stamp older data (YYYYMMDD)

  - Separate data from dashboards

  - Make most current file name consistent

  - Allows for future expansion

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{RootPath} = .../A1984/Model Diagnostics

A1984_model diagnostics.pbix — put Power BI report file here

{RootPath}/**JSON data**
{Identifier}_**elements.json**
{Identifier}_**sheets.json**
{Identifier}_**views.json**
{Identifier}_**links.json**
{Identifier}_**warnings.json**

put newest JSON files here

{RootPath}/**JSON data**/_**archive**
{Archive Date}_{Identifier}_**elements.json**
{Archive Date}_{Identifier}_**sheets.json**
{Archive Date}_{Identifier}_**views.json**
{Archive Date}_{Identifier}_**links.json**
{Archive Date}_{Identifier}_**warnings.json**

put older JSON files here, prefix with date of archive

{identifier} should uniquely identify model and project corresponding to JSON file

51

51

PUBLISH AND SHARE

This template is a good example of where the cost of Power BI Pro is justifiable!

How to repeat this analysis consistently, improve workflow automation

Why do this?
Publishing and refresh automation are among the most useful features of Pro in terms of workflow efficiency and optimizing the end user experience

- **Publish your Dashboard to a workspace**
  - Provide users access to workspace
  - Provide users persistent link to report (or just have users log in to web platform)
  - Pin Power BI report to Microsoft teams

- **Use dataflows, schedule refreshes**
  - Pre-calculates data for dashboards to reduce load time for end users (more efficient)

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52

LEVERAGE POWER AUTOMATE

How to repeat this analysis consistently, improve workflow automation

Why do this?
Save time and reduce clerical reduce errors by automating data transfer and file renaming tasks

- **Use Power Automate for File Management**

  - Comes with Office 365 if you have it

  - Now allows connections to offline source (with proper credentials)

  - Move and rename files based on logic

  - Could also be done with Task Scheduler and PowerShell if you have the skills!

  - Can be combined with Microsoft Forms to further automatic intake process

1. **Create an 'Incoming' Folder**

2. **Establish a new connection to your folder in Power Automate + validate credentials**

3. **Create flow logic (not covered in this slide deck):**

```
•   Trigger if new file added to Incoming folder
•   Check if files exist in destination folder
        •   If files exist
            •   prefix file name with current date in ISO format (YYYYMMDD)
            •   Move renamed files to _archive folder
        •   Otherwise
            •   Move new files from Incoming to destination folder
```

4. **Test flow by dropping off JSON files in Incoming Folder**

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53

53

FURTHER DEVELOPMENT

What features would be universally beneficial to all users?

- **Allow report to handle multiple snapshots, models**

  - You need more data columns that distinguish which model, which snapshot, and which project

  - See folder structure recommendations

- **Key Performance Indices (KPI)** – can we summarize a model's quality with a single number?

  - Define thresholds that should cause concern to modeler or BIM manager (e.g. too many line styles? Too many views not on sheets?)

  - Metric allows you to track model health over time and across projects/models on demand

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54

54

YOUR HOMEWORK

55

YOUR HOMEWORK

Getting started on your own

- **Download file from GitHub Repo (see QR code)**
  - Power BI Template
  - Dynamo Scripts
  - Additional Resources for Devs

- **Do the Preparation Checklist**

- **Run Dynamo on a model**
  - Save JSON files in a folder

- **Configure Template**
  - Update parameters to JSON files + path

- **Refresh Data!**

- **Optional Next Steps**
  - Customize Template
  - Develop Roadmap
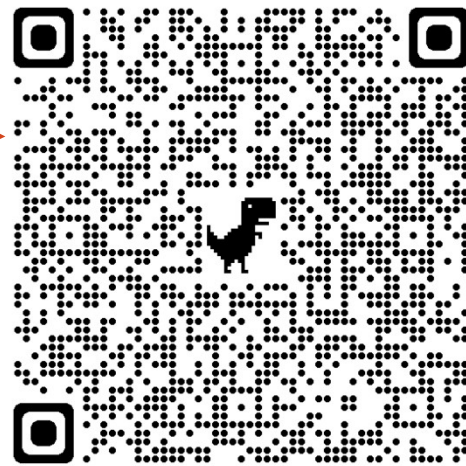
GitHub Repo
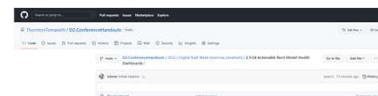
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56

56

WHAT'S IN THE GITHUB REPO?

Table of Contents

- **Power BI reports** (where Power BI template is stored)
- **Power BI Data**
    - Where you should put your JSON files
    - Includes a sample set to help you start
- **Sample Models** (Revit model used in demo)
- **Dynamo Scripts** (Dynamo scripts to be run on Revit models)
- **Resources**
    - Handouts / Notes
    - This slide deck

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57

57

THANK YOU

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58

JSON DATA CONTENTS

How/why split big tables into smaller ones?

May need to apply 2 sets of filters to get different results simultaneously	Master table allows for centralized slicing of two related tables	Separate data by formatting (quantitative vs qualitative)	Easiest way to invite users to create custom tables

JSON file as table

Elements_master

Elements_explore

Custom Table = Elements_master + Elements_explore

create new report tables containing only the columns you need from Elements_explore

Elements_master

Elements_geometry

Custom Table = Elements_master + Elements_geometry

can also perform aggregation to sum blue columns along unique combinations of values in master table (yellow)

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59

59

DATA LOADING ISSUES

Issue	*Elements_geometry, Elements_explore, or summarize_geometry tables are loading data incorrectly*
Explanation	*Template tries to generalize steps, but your model contains attributes not included in template (particularly quantitative values)*

Query Settings ✕

▲ **PROPERTIES**
Name
Elements_geometry
All Properties

▲ **APPLIED STEPS**
Source
Reordered Columns
Removed Columns
Split Column by Delimiter ⚙
Renamed Columns
Split Column by Delimiter1 ⚙
Renamed Columns1
✕ Changed Type2

To fix Elements_geometry…
In the step, 'Removed Columns', make sure that the column you are looking for was not removed

If the column has both units and value in the cell, you will need to split this column by a delimiter (usually a space), then rename the columns…

ABC 123 Area	
● Valid	100%
● Error	0%
● Empty	0%

56 distinct, 33 unique

1	184 m²
2	97 m²

ABC Area_c			ABC Area_units	
● Valid	100%		● Valid	100%
● Error	0%		● Error	0%
● Empty	0%		● Empty	0%

56 distinct, 33 unique   1 distinct, 0 unique
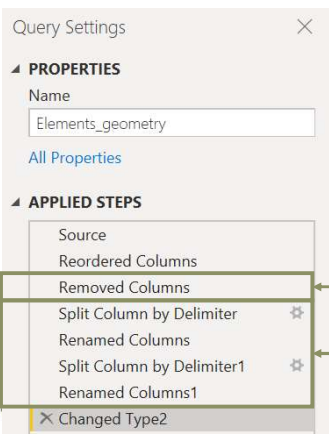
1	184	m²
2	97	m²

60

DATA LOADING ISSUES (CONT.)

Issue	Elements_geometry, Elements_explore, or summarize_geometry tables are loading data incorrectly

PROPERTIES
Name
summarize_geometry
All Properties

APPLIED STEPS
Source
Filtered Rows
Demoted Headers
Transposed Table
Filtered Rows1
Transposed Table1
Promoted Headers
Reordered Columns1
Reordered Columns
Unpivoted Columns
Split Column by Delimiter
Changed Type1
Renamed Columns
× Removed Other Columns

To fix Summarize_geometry
Insert step after the 'Filtered Rows' step to remove any rows that you do not want to appear in the summary list

Add a new 'Unpivot Columns' step and unpivot only the columns you want to be summarized, then delete the old 'Unpivot Columns' step

Split the columns as needed to separate units from the value (cannot do math otherwise) + remove any remaining unwanted columns or rows

Area		Gross Floor Area		Gross Volume		Gross Surface Area		Volume	
Valid	100%	Valid	100%	Valid	100%	Valid	100%	Valid	
Error	0%	Error	0%	Error	0%	Error	0%	Error	
Empty	0%	Empty	0%	Empty	0%	Empty	0%	Empty	
1659 m²		4977 m²		2057293 m³		6783 m²		2057293 m³	
41 m²		41 m²		27158 m³		252 m²		27158 m³	

Copy
Remove Columns
Remove Other Columns
Add Column From Examples...
Remove Duplicates
Remove Errors
Replace Values...
Fill
Change Type
Transform
Merge Columns
Group By...
Unpivot Columns
Unpivot Other Columns
Unpivot Only Selected Columns
Move

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61

DATA LOADING ISSUES (CONT.)

Issue	Power BI is looking for a column that does not exist in the JSON files
Explanation	Power BI is trying to generalize steps from the template to your specific data, but certain columns are missing from the JSON file

220528-070523_Views.json

```
1 [
2   {
3     "New Column": "",
4     "View Template": "None",
5     "View Purpose": "Coordination",
6     "PA-VIEWSERIES": "S02 SERIES - PARTIAL PLANS  1/8\" = 1'-0\"",
7     "Parts Visibility": "Show Original",
8     "Range  Base Level": "None",
9     "Referencing Detail": "2",
```

How to Fix?

(Recommended) add a new column to the JSON file; this will allow Power BI to continue, but the column values will be all empty

Better than trying to find every instance of it in Power BI…

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62

DATA LOADING ISSUES (CONT.)

Issue	*Dyanmo files updated to add new data, but Power BI doesn't recognize new columns in Element-related tables*
Explanation	*Template does not include the new columns, so it will simply skip importing them.*

Advanced Editor

Elements_master

Display Options

```
1  let
2      Source = Json.Document(File.Contents(path_JSON&"\"&file_Elements)),
3      #"Converted to Table" = Table.FromList(Source, Splitter.SplitByNothing(), null, null, ExtraValues.Error),
4      #"Expanded Column1" = Table.ExpandRecordColumn(#"Converted to Table", "Column1", {"EID", "GUID", "View Template",
           "Workset", "Category", "Family", "Type", "Type Id", "Family and Type", "Sheet Name", "Sheet Number", "Design

                                   . . .

           "Volume", "Wall Join Display", "Width", "Work Plane", "y Justification", "y Offset Value", "Young modulus",
           "Young modulus X", "Young modulus Y", "Young modulus Z", "yz Justification", "z Justification", "z Offset Value"}
           ),
5      #"Removed Other Columns" = Table.SelectColumns(#"Expanded Column1",{"EID", "GUID", "View Template", "Workset",
           "Category", "Family", "Type", "Type Id", "Family and Type", "Sheet Name", "Sheet Number", "Design Option",
           "Dependency", "Description", "Discipline", "Base Level", "Level"}),
```

Add/remove rows or columns as necessary

How to fix:
Edit all table queries prefixed with Elements_ in PQ Editor. In the Advanced Editor within PQE:

In Advanced Editor within the 'Expanded Column' step, add the new column name at the end of the comma-separated list

(add column name at the end, e.g.

… "z Offset Value", "NewColumnName"}

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63

EXAMPLE CUSTOMIZATION #3

Add a new measures and calculated columns

Query: How many views appear in sheets?

Solution: 3 different ways of getting this, but different use cases!

Option 1: 'Lazy* Solution'
1. Use Views_master table
2. Count distinct sheet numbers and view names
3. Use filter to remove "---" from results. Done!

Why is this 'lazy'?
- For this calc to work, we manually set the filter to remove "---"
- What if the user wants to see all the views but also see the number of Views on Sheets? Too bad.
- What if we just want a single button to quickly filter to views on a sheet (all of them)? Also, too bad.

4
Unique Sheets

11
Unique Views

Sheet Number
- Select all
- ---
- ☑ A1
- ☑ A2
- ☑ A4
- ☑ A5

View Name	Sheet Number
Typical Wall Section	A2
Section Through Main Stair Copy 1	A5
Section Through Main Stair	A2
Roofing Termination Detail	A2
From Parking Area_3pm	A4
Detail At Parapet	A2
Detail At Grade	A2
Detail 0	A5
03 - Floor Public - Night Rendering	A4
03 - Floor Public - Day Rendering	A4
01 - Entry Level	A1

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64

EXAMPLE CUSTOMIZATION #3

Add a new measures and calculated columns

Query: How many views appear in sheets?

Solution: 3 different ways of getting this, but different use cases!

Option 2: Column Calc + Measure
1. Create a calculated column in View_master that indicates Yes/No if a view is on a sheet
2. Create a measure in View_master that counts rows where [Category] = "Views" and [Sheet Number] is NOT "---"

```
IsViewOnSheet = IF(
    Views_master[Sheet Number] <> "---",
    "Yes", "No"
)
```

Do we need both?
Yes, if you want to calculate the total views on sheets REGARDLESS of what filters are selected.

For example, if you filter out Sheet A2, you may want to know the SELECTED number of sheets on views versus the TOTAL number of sheets on views.

```
num_views_on_sheets = CALCULATE(
    COUNTROWS(Views_master),
    FILTER(ALL(Views_master),
        Views_master[Category] = "Views" &&
        Views_master[Sheet Number] <> "---"
        )
    )
```

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65

EXAMPLE CUSTOMIZATION #3

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Query: How many views appear in sheets?

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Option 2: Column Calc + Measure
1. Create a calculated column in View_master that indicates Yes/No if a view is on a sheet
2. Create a measure in View_master that counts rows where [Category] = "Views" and [Sheet Number] is NOT "---"

Are there other ways?
Yep! Can create a calculated column in Sheets_master to find the total number of views per sheet (rather than Views_master) table, then add these numbers.

Advantageous b/c it gives you the views PER sheet as a filterable column, rather than a dynamic calculation (which cannot be used as a slicer).

YES/NO Column allows us to select ALL views on sheets (rather than individually)

No	22
17	Unique Views
Views	

11
num_views_on_sheets

IsViewOnSheet
- ☑ Select all
- ☑ No
- ☑ Yes

Yes	
6	
Views	

View Name	Sheet Number	IsViewOnSheet
{3D - Sean_McDonald}	---	No
{3D}	---	No
01 - Entry Level	---	No
01 - Entry Level	A1	Yes
01 - Entry Level - Furniture Layout	---	No
02 - Floor	---	No
03 - Floor	---	No
03 - Floor Public - Day Rendering	A4	Yes
03 - Floor Public - Night Rendering	A4	Yes
Balcony View	---	No
Building Courtyard	---	No
Courtyard Elevation - South Wing	---	No
Detail 0	A5	Yes
East	---	No

Sheet Number
- ☐ Select all
- ☑ ---
- ☑ A1
- ☐ A2
- ☑ A4
- ☑ A5

Sheet Number	Count of View Name
---	17
A1	1
A4	3
A5	2
Total	**22**

When A2 is filtered out, only 6/11 views on sheets remain

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66

66