

OHIO AUDITOR OF STATE  
KEITH FABER

## Excel/PowerBI Analytics Always More Ways to Excel

Presented by: James Crumpler  
DITA Data Team

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## Agenda

- **Stages and Types of Analysis** — Four Stages of Analysis
- **Tools** — Excel is an option, but what about...
- **Data Storage / Import**— Reproducibility; Will I ever see this again? Can I do this again without assistance?
- **Data Cleaning** — Integrate work across multiple MS tools; PowerBi, Forms, Power Automate, etc...
- **Power Query** — Your slightly older self will thank you
- **Data Analysis** — Aggregation to measure completeness, errors, and formatting
- **Workflows (First Effective, Then Efficient)** — How can I get from A -> Z with fewest number of manual inputs?

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## Stages of Analysis



1. Data Storage -> Import
2. Data Cleaning
3. Data Analytics
4. Data Communication

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**Ideal – One Tool for All Processes**

- **Specific Software** — Tableau, Power Automate, PowerBi
  - **Upside**, very good at designated tasks
    - Tableau - visualization, Power Automate - Automation, PowerBi - dashboards
  - **Downside**, limited ability to branch out into other areas
    - Reproducibility is generally harder
- **General Software** — Excel, Code (Python, R, etc...)
  - **Upside**, Increased flexibility allows users to do a lot
    - Lessons learned in one area generally carry forward to others; easier integration with other tools
  - **Downside**, harder to change to different software and skill base

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**Data Storage -> Import**

- Look at data
- Connect to source data
  - Connection vs. Working in Original File
    - Easier to work in original, but...
    - Risk Tolerance?
    - Type of Work?
- CSV and XLSX
  - Data storage formatting
  - FILE TYPES (pay attention to the extension; pdf; xls; xlsx, etc...)

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**Data Cleaning**

- Excel's appeal – low learning curve, long training period from Middle School and Up in many cases, costs are known
- Achilles Heel – Reproducibility and Data Cleaning
  - How well can I remember?
  - How good are my notes?
  - Can I give this to someone else, and, with a minimal amount of effort, can they generate the same results?

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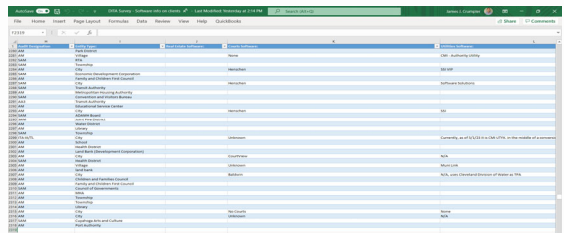
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## Tables



- Advantage of creating a 'Table'
- Build Out direct connection to Source!
- Can be linked to multiple other MS Tools – MS Forms, PowerBi, Access to Power Query, and other functionality

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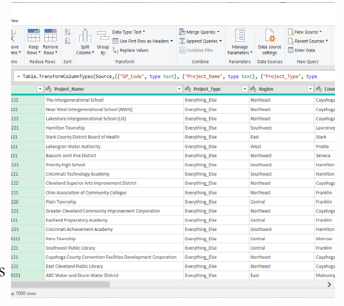
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## Power Query

- a. Opens Editor Window
- b. Tables coerce columns into types
- c. Saves a record of work!
- d. Connect to / from multiple data sources



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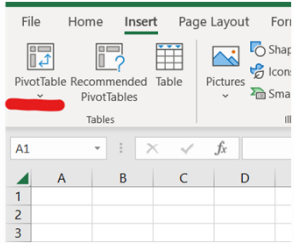
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## Data Analysis Answering the Questions Asked

1. Highlight Data
2. Create Pivot Table
3. Arrange data into desired aggregate structure
4. Review Data, ID patterns, oddities, and similarities... Multiple Pivot Tables can be used to cross-compare data as needed



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**Workflow...  
First Effective, Then Efficient**

<p><b>Manage a Workflow Project</b></p> <ul style="list-style-type: none"> <li>a. Reproducibility           <ul style="list-style-type: none"> <li>a. Create the same output per given input</li> </ul> </li> <li>b. Standardization           <ul style="list-style-type: none"> <li>a. Consistent data outputs across multiple inputs</li> </ul> </li> <li>c. Documentation           <ul style="list-style-type: none"> <li>a. Record of work performed, stored safely for easy reference</li> </ul> </li> <li>d. Production           <ul style="list-style-type: none"> <li>a. Generate outputs delivered to specified locations</li> </ul> </li> </ul>	<p><b>Perform a Workflow Project</b></p> <ol style="list-style-type: none"> <li>1. Connect to Sources       <ol style="list-style-type: none"> <li>1. Explore</li> <li>2. Find differences</li> <li>3. Ask ALL THE QUESTIONS</li> </ol> </li> <li>2. Data Cleaning       <ol style="list-style-type: none"> <li>1. Ask More Questions, preferably with data owner(s)</li> <li>2. Slowly Clean data to match desired output – iterative process</li> </ol> </li> <li>3. Data Analysis       <ol style="list-style-type: none"> <li>1. Start answering questions</li> </ol> </li> <li>4. Communication       <ol style="list-style-type: none"> <li>1. This requires knowing, where, when, and how to post meaningful results</li> </ol> </li> </ol>
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**Questions / Thoughts / Ideas?**



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**The Future of Excel**

- Python in Excel  
<https://www.microsoft.com/en-us/microsoft-365/python-in-excel>
- Copilot in Excel  
<https://www.youtube.com/watch?v=I-waFp6rLc0>

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