“Power” Tools for IR Reporting

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Outcomes for workshop

You will:

• leave with a meaningful understanding of the capabilities of the “Power” tools from Microsoft
• learn basic techniques for leveraging multiple software systems to simplify and streamline reporting
• be able to apply basic techniques leveraging the power of Power Pivot, Power View, and Power Map
• have a roadmap for reproducing these concepts into their own offices
Assumptions for workshop

• Familiarity with Excel
• Comfortable with basic functions (SUM, IF, etc.)
• Desire to connect to “dynamic” data

Why Pivot Tables

• Summarize large datasets
• Quickly add, remove, rearrange elements
• (Little to) No formula-writing
• Can be a basis for self-service data
• Can connect to a refreshable data source

Limitations of Pivot Tables

• Connected to only 1 table
• Formatting not maintained
• Calculated fields need to be created for each Pivot Table
• Can’t count the way universities usually want to count
Connecting to Data

• Wide variety of data sources, including:
  – Access
  – SQL Server
  – Text files (csv)
  – XML
  – OLEDB
  – Etc.

Connecting to Data

• Connects to:
  – Tables
  – Queries
Connecting to Data

External Data Connections
Exercise 1.1
Connecting to Data

Data is connected

Now What?

Displaying Data – Pivot Tables

1. Get a data source ✓
2. Insert a pivot table ✓
3. Populate pivot table grid
Displaying Data – Pivot Tables

PivotTable Fields

1. Academic year
2. Term
3. Semester
4. Year
5. ID
6. Applied by term
7. Submitted this term

Displaying Data – Pivot Tables

Drag fields between areas below:

FILTERS | COLUMNS
---|---

ROWS | VALUES

Displaying Data – Pivot Tables

Semester

<table>
<thead>
<tr>
<th>Column Labels</th>
<th>Column Labels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>Fall</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Aerospace Engineering</th>
<th>44</th>
<th>66</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture</td>
<td>180</td>
<td>234</td>
</tr>
<tr>
<td>Biomedical Research</td>
<td>49</td>
<td>67</td>
</tr>
<tr>
<td>Ecosystem-Health</td>
<td>56</td>
<td>72</td>
</tr>
</tbody>
</table>

Displaying Data – Pivot Tables

Drag fields between areas below:

FILTERS

<table>
<thead>
<tr>
<th>Program name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sum of ID</td>
</tr>
</tbody>
</table>

Options:
- Sum
- Count
- Average
- Max
- Min
- Product
- Count Numbers
- StdDev
- StdDevp
- Var
- Varp
Displaying Data – Pivot Tables

Pivot Table Introduction
Exercise 2.1

Structure, Features, and Deficiencies of Pivot Tables
Exercise 2.2

Displaying Data – Power Pivot

New and improved Pivot Tables!
Displaying Data – Power Pivot

• Set-up
  • Installed with Excel 2013
  • Downloadable add-in for Excel 2010
  • Not available prior to Excel 2010

Displaying Data – Power Pivot

• Right-click on ribbon
• Customize the ribbon
• Select Developer
Displaying Data – Power Pivot

- The Power Pivot environment

Displaying Data – Power Pivot

- The Power Pivot environment
Displaying Data – Power Pivot

• Import data

[Image of Power Pivot interface for importing data]

Displaying Data – Power Pivot

• Import data

[Image of Power Pivot interface for importing data]

Displaying Data – Power Pivot

• Import data

[Image of Power Pivot interface for importing data]
Displaying Data – Power Pivot

• How the imported data look

Displaying Data – Power Pivot

• Bringing data into Excel

Displaying Data – Power Pivot

• PivotTable vs. Power Pivot PivotTable
Displaying Data – Power Pivot

Power Pivot Introduction
Exercise 3.1

Displaying Data – Power Pivot

• DAX
  – Data Analysis Expressions (DAX)
  – Formula language for Power Pivot
  – Used to create Calculated Columns and Calculated Fields

Displaying Data – Power Pivot

• Calculated Columns
  – Used to add an additional column to data table
  – Can be a column added from a related table (like a VLOOKUP) or new data, derived from existing data (sum to combined SAT, length of name, substring of longer string, etc.)
  – Column can be used in any area of the pivot
Displaying Data — Power Pivot

• Adding a calculated column

[Image of Excel interface showing ‘Add’ button and ‘Add Column’ dialog box]

Displaying Data — Power Pivot

• Adding a calculated column

[Image of Excel interface showing pivot table with data options]

Displaying Data — Power Pivot

• Adding a calculated column

[Image of Excel interface showing formula bar and selected data]
Displaying Data — Power Pivot

- Adding a calculated column to pivot table

![Pivot Table Example]

Evaluation Contexts

- Row context
  - The one row being evaluated
  - Automatic for calculated columns
  - Can be created in other ways as well (SUMX, AVERAGEX, etc.)

- Filter context
Row Context

- The filters being applied by the pivot table
- Filters can be explicit or implicit
- Can add additional filters only with CALCULATE

Evaluation Contexts

- Row context
  - The one row being evaluated
  - Automatic for calculated columns
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- Filter context
  - The filters being applied by the pivot table
  - Filters can be explicit or implicit
  - Can add additional filters only with CALCULATE

Filter Context

- Context of Information Studies
- Information Management
- Library Science
- College of Information Studies
Displaying Data – Power Pivot

DAX & Calculated Columns Introduction
Exercise 3.2

• Calculated Fields
  – Used to add a calculated element
  – Aggregate function that applies to whole table, column, or range
  – Something that needs to be recalculated
  – Fields can only be used in the VALUES section

• Adding a Calculated Field
Displaying Data – Power Pivot

- Adding a Calculated Field

- DISTINCTCOUNT

   DISTINCTCOUNT(<column> )

   - Counts unique values in column
Displaying Data – Power Pivot

• Adding a Calculated Field

DAX & Calculated Fields Introduction
Exercise 3.3
**Displaying Data** – Power Pivot

**DAX**

**CALCULATE, ALL, FILTER**

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**Displaying Data – Power Pivot: DAX CALCULATE**

• **CALCULATE**

  \[
  \text{CALCULATE}( \text{expression}, <\text{filter1}>, <\text{filter2}>\ldots )
  \]

  – Supercharged SUMIFS
  – Allows filtering (IFs) on any aggregate function (imagine “MAXIFS”, “MEDIANIFS”, etc.)
  – Operators for filters: =, <, <=, >, >=, <>
  – Can also use | | in filter on same column

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**Displaying Data – Power Pivot: DAX CALCULATE**

- **First-time Freshmen Distinct Students**:  
  \[
  \text{CALCULATE}( 
  \text{[Distinct Students]}, 
  \text{WorkshopData[Class level]}=\text{“Freshman”}, 
  \text{WorkshopData[Is new student this term]}=\text{“yes”} 
  )
  \]
**Displaying Data — Power Pivot: DAX CALCULATE**

DAX - CALCULATE

Exercise 3.4

**Displaying Data — Power Pivot: DAX ALL**

- **ALL**

  ALL( table_or_column, <column1>, <column2>, …)

  - Returns all the rows in a table, or all the values in a column, removing any filters that might have been applied
**Displaying Data – Power Pivot: DAX ALL**

All Distinct Enrolled Students:=

```
CALCULATE(
    [Distinct Enrolled Students],
    ALL( WorkshopData[Class level])
)
```

---

**Displaying Data – Power Pivot: DAX ALL**

% of All Distinct Enrolled Students:=

```
DIVIDE([Distinct Enrolled Students],
    [All Distinct Enrolled Students])
```

---

---
Displaying Data – Power Pivot

• DIVIDE
  
  DIVIDE( <num>, <den>, [<alt>] )
  
  – “Safe” divide
  – Can specify alternate result for divide by zero

Displaying Data – Power Pivot

<table>
<thead>
<tr>
<th>Field Labels</th>
<th>2009-2010</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerospace Engineering</td>
<td>107</td>
<td>100.00 %</td>
</tr>
<tr>
<td>Freshman</td>
<td>18</td>
<td>18.02 %</td>
</tr>
<tr>
<td>Sophomore</td>
<td>13</td>
<td>12.12 %</td>
</tr>
<tr>
<td>Junior</td>
<td>27</td>
<td>24.58 %</td>
</tr>
<tr>
<td>Senior</td>
<td>19</td>
<td>19.02 %</td>
</tr>
<tr>
<td>Architecture</td>
<td>136</td>
<td>100.00 %</td>
</tr>
<tr>
<td>Freshman</td>
<td>40</td>
<td>14.90 %</td>
</tr>
</tbody>
</table>

Displaying Data – Power Pivot: DAX ALL

DAX - ALL
Exercise 3.5
**Displaying Data – Power Pivot: DAX FILTER**

- **FILTER**

  \[ \text{FILTER( TableToFilter, FilterExpression )} \]

  - Returns a table filtered by FilterExpression

**Displaying Data – Power Pivot: DAX CALCULATE**

Above Average GPA Enrolled Undergraduates:=

\[ \text{CALCULATE( [Distinct Enrolled Students], FILTER( WorkshopData, WorkshopData[Institutional cumulative GPA] > [Average GPA Enrolled Undergraduates] ) )} \]
**Displaying Data – Power Pivot: DAX FILTER**

- **ALLEXCEPT**

  \[
  \text{ALLEXCEPT}(<\text{table}>, <\text{column}>, [ <\text{column}> ...])
  \]

  – Similar to ALL function, but excludes the column(s) specified from the ALL.

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**Displaying Data – Power Pivot: DAX FILTER**

\[
\text{=CALCULATE(}
  \text{AVERAGE(workshopData[Institutional cumulative GPA])},
  \text{ALLEXCEPT(workshopData, workshopData[Semester])},
  \text{workshopData[Career level]="Undergraduate"},
  \text{workshopData[Enrolled this term]="Yes"
}\]

---
Displaying Data – Power Pivot: DAX FILTER

DAX - FILTER
Exercise 3.6

Displaying Data – Power Map & Power View

• Power Map
  – Automated way to map geographic data
  – Doesn’t require geo-location information like longitude and latitude (just country, state, or county names)
  – Can add elements to look at aggregate function on variables across physical space
Displaying Data – Power Map and Power View

Power Map
Exercise 4.1

Displaying Data – Power Map and Power View

• Power View
  – Dashboard builder
  – Allows synchronized filtering
  – Bring together tables, graphs, maps
Displaying Data – Power Map and Power View

Displaying Data – Power Map and Power View

Displaying Data – Power Map and Power View
Displaying Data – Power Map and Power View

Count of ID by Residence county, and Gender

Displaying Data – Power Map and Power View

<table>
<thead>
<tr>
<th>College</th>
<th>Count of ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>College of Information Studies</td>
<td>1,801</td>
</tr>
<tr>
<td>College of Journalism</td>
<td>516</td>
</tr>
<tr>
<td>College of Veterinary Medicine</td>
<td>3,001</td>
</tr>
<tr>
<td>No college</td>
<td>2,130</td>
</tr>
<tr>
<td>School of Architecture</td>
<td>1,763</td>
</tr>
<tr>
<td>School of Engineering</td>
<td>658</td>
</tr>
<tr>
<td>Total</td>
<td>5,372</td>
</tr>
</tbody>
</table>

Displaying Data – Power Map and Power View

Displaying Data – Power Map and Power View
Displaying Data – Power Map and Power View

Power View
Exercise 4.2
Power Query – Advanced

- Retrieve data from a variety of external sources
  - Pull in external data from the Internet
- Limit the data you bring into your model (filter on rows and columns)
  - Keep you model to a reasonable size (< 1M records) to prevent processing problems
  - Bring in only what you need

Power Query – Advanced

- Consolidate multiple tables into one

![Diagram of Power Query interface]
Power Query – Advanced

• Consolidate multiple tables into one

• **In-line data transformations**


Power Query – Advanced

• Consolidate multiple tables into one

• **In-line data transformations**

• **All transformation steps are listed, and reversible**


Power Query – Advanced

• Consolidate multiple tables into one

• **In-line data transformations**

• **All transformation steps are listed, and reversible**

• **Access to sources of data not readily available to Power Pivot**
Power Query – Advanced

• Facebook pages and groups

Power Query – Advanced

• Drill down for additional data fields in Facebook records

• Availability of data fields depends on your personal status with the group/page, and Facebook data fields completed and available

Power Query – Advanced

• Employment data
Power Query – Advanced

• Connect to online faculty database
  – Import active users from Digital Measures
  – Merge with local data
  – Export updated data to Digital Measures

Power Query – Advanced

Microsoft SQL Server and Access
Power Query – Advanced

Power Query
Exercise 5.1

Resources

• Rob Collie (http://powerpivotpro)
  – DAX Formulas for PowerPivot, 2013

• Bill Jelen (http://mrexcel.com)
  – PowerPivot for the Data Analyst: Microsoft Excel 2010, 2010

• Alberto Ferrari and Marco Russo
  – Microsoft Excel 2013: Building Data Models with PowerPivot

• Chris Webb (http://cwebbbi.wordpress.com)
• Kasper de Jonge (http://www.powerpivotblog.nl)
• Purna Duggirala (http://www.chandoo.org/)

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