“Power” Tools for IR Reporting

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NCAIR Summer Drive-In 2014
• 10,107 students
• Master’s Comprehensive
• Mountain location
• Residential and Distance
Presentation Overview

- Pivot tables and their limitations
- Power Pivot and DAX Formulas
- Power Query
- Power Map
- Power View
Pivot Tables
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
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
Connecting to Data
Connecting to Data
Displaying Data – Pivot Tables
Connecting to Data
Connecting to Data

To build a report, choose fields from the PivotTable Field List:

- Academic year
- Acceptance status
- ACT - Composite
- Admittance status
- Admitted this term
- Age
- Applied this term
- Career level
- Citizenship
- Class level
- College...
### Displaying Data – Pivot Tables

#### PivotTable Fields

Choose fields to add to report:

- [ ] Academic year
- [ ] Term
- [ ] Semester
- [ ] Year
- [ ] ID
- [ ] Applied this term
- [ ] Admitted this term

Drag fields between areas below:

<table>
<thead>
<tr>
<th>FILTERS</th>
<th>COLUMNS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ROWS</th>
<th>VALUES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Displaying Data – Pivot Tables

Drag fields between areas below:

- FILTERS
- COLUMNS
- ROWS
- VALUES

Excel Pivot Table Example:

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Semester</td>
<td>Fall</td>
</tr>
<tr>
<td>2</td>
<td>Count of ID</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Row Labels</td>
<td>Column Labels</td>
</tr>
<tr>
<td>5</td>
<td>180</td>
<td>274</td>
</tr>
<tr>
<td>6</td>
<td>49</td>
<td>67</td>
</tr>
<tr>
<td>7</td>
<td>56</td>
<td>72</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Displaying Data – Pivot Tables

- Drag fields between areas below:
- Filters:
  - Semester
- Rows:
  - Program name

- Move to Beginning
- Move to End
- Move to Report Filter
- Move to Row Labels
- Move to Column Labels
- Move to Values
- Remove Field

Value Field Settings...

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

<table>
<thead>
<tr>
<th>ROWS</th>
</tr>
</thead>
<tbody>
<tr>
<td>College</td>
</tr>
<tr>
<td>Department</td>
</tr>
<tr>
<td>Program name</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Semester</td>
<td>Fall</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3: Row Labels</td>
<td>Column Labels</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4: College of Information Studies</td>
<td></td>
<td>150</td>
<td>197</td>
<td>182</td>
<td>181</td>
</tr>
<tr>
<td>5: Information Management</td>
<td></td>
<td>115</td>
<td>154</td>
<td>139</td>
<td>145</td>
</tr>
<tr>
<td>6: Information Management</td>
<td></td>
<td>115</td>
<td>154</td>
<td>139</td>
<td>145</td>
</tr>
<tr>
<td>7: Library Science</td>
<td></td>
<td>35</td>
<td>43</td>
<td>43</td>
<td>36</td>
</tr>
<tr>
<td>8: Library Science</td>
<td></td>
<td>35</td>
<td>43</td>
<td>43</td>
<td>36</td>
</tr>
</tbody>
</table>
Questions
Displaying Data – Power Pivot

New and improved Pivot Tables!
• Installed with Excel 2013
• Downloadable add-in for Excel 2010 ([http://goo.gl/3xEE0T](http://goo.gl/3xEE0T))
• Not available for Excel 2011, prior to 2010, or on Office Web Apps
• Best experience with Excel 2013 or Office 365 on Windows 64bit
• Best experience with Excel 2013 or Office 365 on Windows 64bit
Enabling Add-Ins – Power Pivot

- Right-click on ribbon
- **Customize the ribbon**
- Select **Developer**
Enabling Add-Ins – Power Pivot
Enabling Add-Ins – Power Pivot
Limitations — Power Pivot

• The Power Pivot environment
  – Number of tables per PowerPivot database \((2^{31}) - 1\)
    \(2,147,483,647\)
  – Number of rows in a table
    \(1,999,999,997\)
  – Number of calculated measures in a table
    \((2^{31}) - 1 = 2,147,483,647\)
  – String Length
    \(512\) MB
Getting Started – Power Pivot

• The Power Pivot environment

Open Power Pivot

Data Model
Getting Started – Power Pivot

• The Power Pivot environment
Importing Data – Power Pivot

- Import data

Table Import Wizard

Select Tables and Views
Select the tables and views that you want

Database: W:\Data\WorkshopData.accdb

Tables and Views:

Source Table | Friendly Name | Filter Details
--------------|--------------|------------------
WorkshopData  | WorkshopData |                  

Success. 35,288 rows transferred.
Importing Data – Power Pivot

- Import from another Power Pivot (SharePoint)
### Importing Data – Power Pivot

- **How the imported data will look**

```
<table>
<thead>
<tr>
<th>Academic year</th>
<th>Term</th>
<th>Semester</th>
<th>Year</th>
<th>ID</th>
<th>Applied this term</th>
<th>Admitted this term</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003-2004</td>
<td>Fall 2003</td>
<td>Fall</td>
<td>2003</td>
<td>10584</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>2003-2004</td>
<td>Spring ...</td>
<td>Spring</td>
<td>2004</td>
<td>10584</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>2004-2005</td>
<td>Fall 2004</td>
<td>Fall</td>
<td>2004</td>
<td>10518</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>2004-2005</td>
<td>Spring ...</td>
<td>Spring</td>
<td>2005</td>
<td>10380</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>2004-2005</td>
<td>Spring ...</td>
<td>Spring</td>
<td>2005</td>
<td>10518</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>2004-2005</td>
<td>Summ...</td>
<td>Summer</td>
<td>2005</td>
<td>10380</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>2005-2006</td>
<td>Summ...</td>
<td>Summer</td>
<td>2005</td>
<td>10380</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>2005-2006</td>
<td>Summ...</td>
<td>Summer</td>
<td>2005</td>
<td>10518</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>2006-2007</td>
<td>Fall 2006</td>
<td>Fall</td>
<td>2006</td>
<td>10076</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>2006-2007</td>
<td>Fall 2006</td>
<td>Fall</td>
<td>2006</td>
<td>10178</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

[WorkshopData]
```
Modeling Data — Power Pivot

• Joining Tables in Power Pivot (for SQL Lovers)
  – Basically, a LEFT OUTER JOIN
  – Can be used in a single Excel Pivot Table or chart
  – Only one-to-one and many-to-one relationships are supported
  – You can cheat with one-to-many-to-one
Modeling Data – Power Pivot

• Joining Power Pivot Tables
  – Use Diagram View to view and manage relationships
Modeling Data – Power Pivot

• Manually Joining Tables in Power Pivot

![Image of Power Pivot interface showing a create relationship window with 'Many' and 'One' relationships indicated]
Displaying Data — Power Pivot

- Bringing data into Excel
Displaying Data – Power Pivot

- **PivotTable vs. Power Pivot PivotTable**

```excel
=IF(ISNULL(Banner[Department]), "Unknown", Banner[Department])
```
Adding Calculations — Power Pivot

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

– Can use EARLIER() function to loop

```excel
=CALCULATE(
    DISTINCTCOUNT(Athletes[Name]),
    FILTER(Athletes,
        Athletes[Sport] = EARLIER(Athletes[Sport])
    )
)
```

<table>
<thead>
<tr>
<th>Name</th>
<th>Sport</th>
<th>Athletes On Team</th>
</tr>
</thead>
<tbody>
<tr>
<td>John</td>
<td>Football</td>
<td>5</td>
</tr>
<tr>
<td>Jimmy-John</td>
<td>Football</td>
<td>5</td>
</tr>
<tr>
<td>John-Jimmy</td>
<td>Golf</td>
<td>2</td>
</tr>
<tr>
<td>Jimmy-Jimmy</td>
<td>Football</td>
<td>5</td>
</tr>
<tr>
<td>Billy Bob</td>
<td>Football</td>
<td>5</td>
</tr>
<tr>
<td>Jimmy-John</td>
<td>Golf</td>
<td>2</td>
</tr>
<tr>
<td>Sebastian</td>
<td>Football</td>
<td>5</td>
</tr>
</tbody>
</table>
Calculated Columns – Power Pivot

• Adding a calculated column
Calculated Columns — Power Pivot

• Adding a calculated column

![Image of a calculated column window with options like WEEKDAY, WEEKNUM, WorkshopData, and more.](image)
Calculated Columns – Power Pivot

- Adding a calculated column

\[ f(x) = \text{WorkshopData[SAT - Critical reading]} + \text{WorkshopData[SAT - Math]} \]
Evaluation Contexts

• Row context

• Filter context
Evaluation Contexts

• **Row context**
  - The one row being evaluated
  - Automatic for calculated columns
  - Carries across related tables

• **Filter context**
Row Context

\[
 f(x) = \text{WorkshopData[SAT - Critical reading]} + \text{WorkshopData[SAT - Math]}
\]

<table>
<thead>
<tr>
<th>Name</th>
<th>GPA</th>
<th>SAT - Critical reading</th>
<th>SAT - Math</th>
<th>SAT - Total</th>
<th>AC</th>
</tr>
</thead>
<tbody>
<tr>
<td>John Doe</td>
<td>3.1380</td>
<td>540</td>
<td>390</td>
<td>930</td>
<td></td>
</tr>
<tr>
<td>Jane Smith</td>
<td>3.1749</td>
<td>540</td>
<td>390</td>
<td>930</td>
<td></td>
</tr>
<tr>
<td>Emily Brown</td>
<td>3.5369</td>
<td>520</td>
<td>740</td>
<td>1260</td>
<td></td>
</tr>
<tr>
<td>Michael Johnson</td>
<td>1.8289</td>
<td>510</td>
<td>430</td>
<td>940</td>
<td></td>
</tr>
<tr>
<td>Sarah Lee</td>
<td>3.5899</td>
<td>520</td>
<td>740</td>
<td>1260</td>
<td></td>
</tr>
<tr>
<td>Brian Davis</td>
<td>1.9490</td>
<td>510</td>
<td>430</td>
<td>940</td>
<td></td>
</tr>
</tbody>
</table>
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**
  - The filters being applied by the pivot table
  - Filters can be explicit or implicit
  - Can add additional filters only with CALCULATE
### Filter Context

<table>
<thead>
<tr>
<th>Semester</th>
<th>Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Column Labels</td>
<td>2003-2004</td>
</tr>
<tr>
<td>Row Labels</td>
<td>Count of ID</td>
</tr>
<tr>
<td>College of Information Studies</td>
<td>153</td>
</tr>
<tr>
<td>Information Management</td>
<td>116</td>
</tr>
<tr>
<td>Information Management</td>
<td>116</td>
</tr>
<tr>
<td>Library Science</td>
<td>37</td>
</tr>
<tr>
<td>Library Science</td>
<td>37</td>
</tr>
<tr>
<td>College of Journalism</td>
<td>67</td>
</tr>
</tbody>
</table>
Adding Calculations — Power Pivot

• Calculated Fields
  – Used to add a calculated Value
  – Aggregate function that applies to whole table, column, or range
  – Something that needs to be recalculated
  – Much faster than a Calculated Column

![Diagram of Power Pivot interface]
Calculated Fields – Power Pivot

• Adding a Calculated Field
Calculated Fields—Power Pivot

• Adding a Calculated Field

![Image of Calculated Field dialog box with table name 'WorkshopData', calculated field name 'Distinct Students', formula '=DISTINCTCOUNT(WorkshopData[ID])']
Calculated Fields – Power Pivot

- Calculated Field in Power Pivot

![Image of calculated field with distinct students count](image-url)

```
Distinct Students := DISTINCTCOUNT(WorkshopData[ID])
```

![Screenshot of Power Pivot interface with calculated field](screenshot-url)
Questions
DAX Example – Power Pivot
## DAX Example – Power Pivot

<table>
<thead>
<tr>
<th>Column Labels</th>
<th>2003-2004</th>
<th>% Above Average GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Row Labels</td>
<td>Distinct Enrolled Students</td>
<td>Enrolled Undergraduates</td>
</tr>
<tr>
<td>College of Information Studies</td>
<td>152</td>
<td>42.11 %</td>
</tr>
<tr>
<td>Information Management</td>
<td>116</td>
<td>44.83 %</td>
</tr>
<tr>
<td>Library Science</td>
<td>37</td>
<td>32.43 %</td>
</tr>
<tr>
<td>College of Journalism</td>
<td>66</td>
<td>45.45 %</td>
</tr>
<tr>
<td>Journalism</td>
<td>66</td>
<td>45.45 %</td>
</tr>
</tbody>
</table>

---

*Western Carolina University*
DAX Example – Power Pivot

• DISTINCTCOUNT

DISTINCTCOUNT(<column>)

– Counts unique values in column
– Works with both Strings (characters) and numbers
DAX Example — Power Pivot

- Adding a Calculated Field

<table>
<thead>
<tr>
<th>Column Labels</th>
<th>2003-2004</th>
<th>Distinct Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>College of Information Studies</td>
<td>153</td>
<td>152</td>
</tr>
<tr>
<td>Information Management</td>
<td>116</td>
<td>116</td>
</tr>
<tr>
<td>Information Management</td>
<td>116</td>
<td>116</td>
</tr>
<tr>
<td>Library Science</td>
<td>37</td>
<td>37</td>
</tr>
</tbody>
</table>
DAX Example—Power Pivot

• **CALCULATE**

CALCULATE( expression, <filter1>, <filter2>… )

  – Supercharged SUMIFS

  – Allows filtering (IFs) on any aggregate function (imagine “MAXIFS”, “MEDIANIFS”, etc.)

  – Operators for filters: =, <, >, <=, >=, <>

  – Can also use | | in filter on same column
First-time Freshmen Distinct Students:=

CALCULATE(

[Distinct Students],

WorkshopData[Class level]=“Freshman”,

WorkshopData[Is new student this term]=“Yes”

)
DAX Example — Power Pivot

• ALL

\( \text{ALL( table\_or\_column, <column1>, <column2>, \ldots) } \)

— Returns all the rows in a table, or all the values in a column, removing any filters that might have been applied
DAX Example— Power Pivot

All Distinct Enrolled Students :=

CALCULATE(
[Distinct Enrolled Students],
ALL( WorkshopData[Class level] )
)
### DAX Example—Power Pivot

<table>
<thead>
<tr>
<th>Row Labels</th>
<th>2009-2010</th>
<th>Distinct Enrolled Students</th>
<th>All Distinct Enrolled Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerospace Engine</td>
<td></td>
<td>107</td>
<td>107</td>
</tr>
<tr>
<td>Freshman</td>
<td></td>
<td>18</td>
<td>107</td>
</tr>
<tr>
<td>Sophomore</td>
<td></td>
<td>13</td>
<td>107</td>
</tr>
<tr>
<td>Junior</td>
<td></td>
<td>37</td>
<td>107</td>
</tr>
<tr>
<td>Senior</td>
<td></td>
<td>39</td>
<td>107</td>
</tr>
<tr>
<td>Architecture</td>
<td></td>
<td>276</td>
<td>276</td>
</tr>
<tr>
<td>Freshman</td>
<td></td>
<td>40</td>
<td>276</td>
</tr>
</tbody>
</table>
% of All Distinct Enrolled Students :=
DIVIDE([Distinct Enrolled Students],
[All Distinct Enrolled Students])
# DAX Example — Power Pivot

<table>
<thead>
<tr>
<th>Row Labels</th>
<th>2009-2010 Distinct Enrolled Students</th>
<th>% of All Distinct Enrolled Students</th>
<th>2010 Distinct Enrolled Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerospace Engineer</td>
<td>107</td>
<td>100.00 %</td>
<td>100.00 %</td>
</tr>
<tr>
<td>Freshman</td>
<td>18</td>
<td>16.82 %</td>
<td>16.82 %</td>
</tr>
<tr>
<td>Sophomore</td>
<td>13</td>
<td>12.15 %</td>
<td>12.15 %</td>
</tr>
<tr>
<td>Junior</td>
<td>37</td>
<td>34.58 %</td>
<td>34.58 %</td>
</tr>
<tr>
<td>Senior</td>
<td>39</td>
<td>36.45 %</td>
<td>36.45 %</td>
</tr>
<tr>
<td>Architecture</td>
<td>276</td>
<td>100.00 %</td>
<td>100.00 %</td>
</tr>
<tr>
<td>Freshman</td>
<td>40</td>
<td>14.49 %</td>
<td>14.49 %</td>
</tr>
</tbody>
</table>
DAX Example— Power Pivot

• FILTER

FILTER( TableToFilter, FilterExpression )

– Returns a table filtered by FilterExpression
DAX Example – Power Pivot

Above Average GPA Enrolled Undergraduates :=

\[
\text{CALCULATE(}
\]

[Distinct Enrolled Students],

\[
\text{FILTER(}
\]

WorkshopData,

\[
\text{WorkshopData[Institutional cumulative GPA] > [Average GPA Enrolled Undergraduates]}
\]

\[
\text{)}
\]

\[
\text{)}
\]
### DAX Example – Power Pivot

<table>
<thead>
<tr>
<th>Row Labels</th>
<th>Column Labels 2003-2004</th>
<th>% Above Average GPA</th>
<th>2004-2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>College of Information Studies</td>
<td>152</td>
<td>42.11 %</td>
<td></td>
</tr>
<tr>
<td>Information Management</td>
<td>116</td>
<td>44.83 %</td>
<td></td>
</tr>
<tr>
<td>Library Science</td>
<td>37</td>
<td>32.43 %</td>
<td></td>
</tr>
<tr>
<td>College of Journalism</td>
<td>66</td>
<td>45.45 %</td>
<td></td>
</tr>
<tr>
<td>Journalism</td>
<td>66</td>
<td>45.45 %</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Distinct Enrolled Students</th>
<th>Enrolled Undergraduates</th>
</tr>
</thead>
<tbody>
<tr>
<td>College of Information Studies</td>
<td>152</td>
</tr>
<tr>
<td>Information Management</td>
<td>116</td>
</tr>
<tr>
<td>Library Science</td>
<td>37</td>
</tr>
<tr>
<td>College of Journalism</td>
<td>66</td>
</tr>
<tr>
<td>Journalism</td>
<td>66</td>
</tr>
</tbody>
</table>
Displaying Data — Power Pivot

• Resources
  – DAX Formatter:
    http://www.daxformatter.com/
  – DAX Patterns:
    http://www.daxpatterns.com/

• Twitter
  – Christopher Webb @Technitrain
  – Marco Russo @marcorus
  – Alberto Ferrari @FerrariAlberto
  – Rob Collie @powerpivotpro
Questions
Power Query
Power Query data sources

- Retrieve data from a variety of external sources (web searches, webpages, files, databases, and more)
Power Query data sources

• Access to sources of data not readily available to Power Pivot
Power Query preview (Query Editor)
Power Query features

• Limit the data you bring into your model
  • Keep your model to a reasonable size (< 1M records) to prevent processing problems
  • Bring in only what you need
Power Query features

- Consolidate multiple tables into one
Power Query features

- Consolidate multiple tables into one
- In-line data transformations
Power Query features

• Consolidate multiple tables into one

• In-line data transformations

• **All transformation steps are listed, and reversible**
Power Query @ WCU

• Connect to online faculty database
  – Import active users from Digital Measures (from Web URL)
  – Merge with local data (Banner)
  – Export updated data to Digital Measures
Power Query @ WCU

<table>
<thead>
<tr>
<th></th>
<th>FirstName</th>
<th>MiddleName</th>
<th>LastName</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Millicent</td>
<td>H</td>
<td>Abel</td>
<td><a href="mailto:abel@email.wcu.edu">abel@email.wcu.edu</a></td>
</tr>
<tr>
<td>2</td>
<td>Yogita</td>
<td>null</td>
<td>Abichandani</td>
<td><a href="mailto:yabichandani@email.wcu.edu">yabichandani@email.wcu.edu</a></td>
</tr>
<tr>
<td>3</td>
<td>Susan</td>
<td>M</td>
<td>Abram</td>
<td><a href="mailto:smabram@email.wcu.edu">smabram@email.wcu.edu</a></td>
</tr>
<tr>
<td>4</td>
<td>J.</td>
<td>P</td>
<td>Acheson</td>
<td><a href="mailto:pacheson@email.wcu.edu">pacheson@email.wcu.edu</a></td>
</tr>
<tr>
<td>5</td>
<td>Michele</td>
<td>null</td>
<td>Acker-Hocevar</td>
<td><a href="mailto:ackerhoecevar@email.wcu.edu">ackerhoecevar@email.wcu.edu</a></td>
</tr>
<tr>
<td>6</td>
<td>Warren</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Andrew</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Erin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Mark</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Mary</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Mary</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Diagram showing relationships between tables with columns including FirstName, MiddleName, LastName, Email, and other attributes like ADMIN_DEP/DEP, ADMIN_DEP/COLLEGE, @username, URL_USERNAME, and userId.
Power Query demonstrations

- Data from an online search
- Data from websites
- Power Query Editor functions
  - Split columns, remove columns/rows, merge, insert calculated columns, etc.
- Data from Facebook
DEMO: Power Query Online Search

### Occupational Employment Statistics (2011)


The Occupational Employment Statistics (OES) program produces employment and wage estimates for over 800 occupations. These are estimates of the number of people employed in certain occupations, and estimates of the wages paid to them. Self-employed persons are not included in the estimates. These estimates are available for the nation as a whole, for individual States, and for metropolitan and nonmetropolitan areas; national occupational estimates for specific industries are also available.

<table>
<thead>
<tr>
<th>ID</th>
<th>AREA_NAME</th>
<th>AREA_TYPE</th>
<th>NAICS_TITLE</th>
<th>OWNERSHIP_CODE</th>
<th>OES_CODE_OCCUPATION</th>
<th>OCC_TITTLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>U.S.</td>
<td>U.S.</td>
<td>Cross-industry</td>
<td>All Employments</td>
<td>00-0000</td>
<td>All Occ.</td>
</tr>
<tr>
<td>2</td>
<td>U.S.</td>
<td>U.S.</td>
<td>Cross-industry</td>
<td>All Employments</td>
<td>11-1011</td>
<td>Manage</td>
</tr>
<tr>
<td>3</td>
<td>U.S.</td>
<td>U.S.</td>
<td>Cross-industry</td>
<td>All Employments</td>
<td>11-1021</td>
<td>Chief</td>
</tr>
<tr>
<td>4</td>
<td>U.S.</td>
<td>U.S.</td>
<td>Cross-industry</td>
<td>All Employments</td>
<td>11-1031</td>
<td>Gener</td>
</tr>
<tr>
<td>5</td>
<td>U.S.</td>
<td>U.S.</td>
<td>Cross-industry</td>
<td>All Employments</td>
<td>11-1031</td>
<td>Advent</td>
</tr>
<tr>
<td>6</td>
<td>U.S.</td>
<td>U.S.</td>
<td>Cross-industry</td>
<td>All Employments</td>
<td>11-2022</td>
<td>Marke</td>
</tr>
<tr>
<td>7</td>
<td>U.S.</td>
<td>U.S.</td>
<td>Cross-industry</td>
<td>All Employments</td>
<td>11-2022</td>
<td>Public</td>
</tr>
</tbody>
</table>

Columns [26]

- ID, AREA_NAME, AREA_TYPE, NAICS_TITLE, OWNERSHIP_CODE, OES_CODE_OCCUPATION, OCC_TITTLE,
- MAJOR TOTAL OCC_GROUP, TOTAL_EMPLOYMENT_EST, STD_ERROR_EPSNT, OCC_JOB_PERS_10000_OCC,
- OCC_SHARE_TO-US OCC_SHARE_RATIO, PRSNT_INDUSTRY_EMPLOYMENT, Mean_Hourly_Wage, Mean_Annual_Wage,

Documentation

http://www.bls.gov/oes

Data Sources [1]

http://www.bls.gov/oes/#data

---

Online Search

- Employment Search

**Occupational Employment Statistics (OES)**


The Occupational Employment Statistics (OES) program produces employment and...

**Growth, employment and...**


Employment - Wikipedia, the free encyclopedia

**Employment-to-population...**


Employment-to-population ratio - Wikipedia, the free encyclopedia

**Chairs of the EEOC - Equal Employment Opportunity...**


Equal Employment Opportunity
DEMO: Power Query Online Search

• Query Editor: Transform data as desired
DEMO: Power Query Online Search

- Load transformed data set into data model
DEMO: Power Query From Web


USA.com / Ranks / North Carolina Median Household Income County Rank / Based on ACS 2006-2010 data

Richest Counties by Income in NC

North Carolina Median Household Income County Rank
Based on ACS 2006-2010 data

A total of 100 results found. Show Results on Map.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Median Household Income</th>
<th>County / Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$63,770</td>
<td>Wake, NC / 850,546</td>
</tr>
<tr>
<td>2</td>
<td>$63,385</td>
<td>Union, NC / 190,346</td>
</tr>
<tr>
<td>3</td>
<td>$61,991</td>
<td>Cumberland, NC / 9,719</td>
</tr>
<tr>
<td>4</td>
<td>$60,030</td>
<td>Chatham, NC / 614,263</td>
</tr>
<tr>
<td>5</td>
<td>$56,375</td>
<td>Currituck, NC / 23,399</td>
</tr>
<tr>
<td>6</td>
<td>$55,294</td>
<td>Mecklenburg, NC / 882,761</td>
</tr>
<tr>
<td>7</td>
<td>$53,828</td>
<td>Cabarrus, NC / 169,990</td>
</tr>
<tr>
<td>8</td>
<td>$53,889</td>
<td>Dare, NC / 133,650</td>
</tr>
<tr>
<td>9</td>
<td>$52,981</td>
<td>Orange, NC / 129,562</td>
</tr>
<tr>
<td>10</td>
<td>$49,844</td>
<td>Durham, NC / 258,578</td>
</tr>
<tr>
<td>11</td>
<td>$49,740</td>
<td>Johnston, NC / 160,075</td>
</tr>
<tr>
<td>12</td>
<td>$49,727</td>
<td>Davie, NC / 40,581</td>
</tr>
<tr>
<td>13</td>
<td>$48,902</td>
<td>Iredell, NC / 154,632</td>
</tr>
<tr>
<td>14</td>
<td>$48,553</td>
<td>New Hanover, NC / 107,272</td>
</tr>
<tr>
<td>15</td>
<td>$48,319</td>
<td>Moore, NC / 85,914</td>
</tr>
<tr>
<td>16</td>
<td>$48,210</td>
<td>Granville, NC / 58,071</td>
</tr>
<tr>
<td>17</td>
<td>$47,450</td>
<td>Lincoln, NC / 75,687</td>
</tr>
</tbody>
</table>
DEMO: Power Query From Web
DEMO: Power Query From Web

• Transform data as needed (split column)
DEMO: Power Query Editor

- Queries can be re-edited, merged and appended as needed
DEMO: Power Query Editor

• Remove rows and/or columns
DEMO: Power Query Editor

- Transform first row of data into column headers
DEMO: Power Query Editor

- Rename column headers
DEMO: Power Query Editor

- Insert custom formula-based columns
DEMO: Power Query Editor

Insert Custom Column

New column name
%Black

Custom column formula:
= ["(Black")/Total]]

Available columns:
COUNTY
Total
White
%White
Other
(Black
%Black of Other

Learn about Power Query formulas

✓ No syntax errors have been detected.
DEMO: Power Query Editor

- Change data type (text, number, etc.)
DEMO: Power Query Editor

- Delete unwanted edits

Delete Step

Are you sure you want to delete this step? Deleting this step may affect subsequent steps, which could cause your query to break.

**Query Settings**

**PROPERTIES**

Name
Table 0

Description

**APPLIED STEPS**

Source
ChangedType
RemovedTopRows
FirstRowAsHeader
RenamedColumns

X InsertedCustom

ChangedType
DEMO: Power Query Merge

Select tables and matching columns to create a merged table.

Educational attainment - persons 25+

<table>
<thead>
<tr>
<th>County</th>
<th>%Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alamance</td>
<td>21.4</td>
</tr>
<tr>
<td>Alexander</td>
<td>11.8</td>
</tr>
<tr>
<td>Alleghany</td>
<td>16.1</td>
</tr>
<tr>
<td>Anson</td>
<td>8.4</td>
</tr>
<tr>
<td>Ashe</td>
<td>17.2</td>
</tr>
</tbody>
</table>

North Carolina Median Household Income

<table>
<thead>
<tr>
<th>County</th>
<th>Population</th>
<th>Median Household Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wake</td>
<td>850546</td>
<td>63770</td>
</tr>
<tr>
<td>Union</td>
<td>190346</td>
<td>63386</td>
</tr>
<tr>
<td>Camden</td>
<td>9719</td>
<td>61091</td>
</tr>
<tr>
<td>Chatham</td>
<td>61426</td>
<td>56038</td>
</tr>
<tr>
<td>Currituck</td>
<td>23299</td>
<td>55376</td>
</tr>
</tbody>
</table>

- Only include matching rows
- The selection has matched 99 out of the first 100 rows.
DEMO: Power Query Merge

- Select columns to include in the merge
DEMO: Power Query Merge

- Matching columns must *MATCH!*
DEMO: Data from Facebook

- Facebook pages and groups
DEM0: Data from Facebook

• Facebook pages and groups
DEMO: Data from Facebook

- 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.
Questions
Displaying Data – Power Map & Power View
Displaying Data — Power Map

• **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
  
  – Limited functionality. Office 365 integration will eventually allow for full functionality in future versions.
Displaying Data – Power Map
Displaying Data – Power Map
Displaying Data – Power Map
Displaying Data – Power Map
Displaying Data — Power Map
Displaying Data – Power Map
Displaying Data – Power Map
Displaying Data – Power View

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

Click here to add a title

To build a data visualization, select fields in the field list or drag them to the view.

Filters
VIEW

To filter the view, drag fields from the field list.

Power View Fields
ACTIVE ALL

Drag fields between areas below:
PANELS
Displaying Data – Power View

- filters:
  - Residence - county
  - Alamance
  - Alexander
  - Alleghany
  - Anson
  - Ashe
  - Avery
  - Beaufort
  - Bertie
  - Bladen
  - Brunswick
  - Buncombe
  - Burke
  - Cabarrus

- Power View Fields:
  - Active
  - All
  - ID
  - Institutional cumulative GPA
  - Is new student this term
  - Is transfer student
  - Program code
  - Program name
  - Race or ethnicity
  - Residence - country
  - Residence - state
  - SAT - Critical reading
  - SAT - Math
  - Semester
  - Term
  - Total degree credit hours earned at institution
  - Transfer hours applied to degree
  - UG GPA
Displaying Data – Power View
Displaying Data – Power View
Displaying Data – Power View

Zoom and reposition

Residence - county
Displaying Data – Power View

Add magnitude to the map by selecting ID (count)
Displaying Data – Power View

Count of ID by Residence - county, and Gender

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Displaying Data — Power View

• Add new elements
  – Click off of existing elements (so nothing is selected)
  – Choose new field from list
  – By default, listing
    • Add additional elements (i.e., ID Count) to construct a table
**Displaying Data — Power View**

<table>
<thead>
<tr>
<th>College</th>
<th>Count of ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>College of Information Studies</td>
<td>1,301</td>
</tr>
<tr>
<td>College of Journalism</td>
<td>516</td>
</tr>
<tr>
<td>College of Veterinary Medicine</td>
<td>3,061</td>
</tr>
<tr>
<td>No college</td>
<td>2,150</td>
</tr>
<tr>
<td>School of Architecture</td>
<td>1,783</td>
</tr>
<tr>
<td>School of Engineering</td>
<td>658</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5,332</strong></td>
</tr>
</tbody>
</table>
Displaying Data – Power View

Enrollment by County

Count of ID by Residence - county, and Gender

<table>
<thead>
<tr>
<th>Degree level</th>
<th>Count of ID</th>
<th>College</th>
<th>Count of ID</th>
<th>Is new student this term</th>
<th>Count of ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor</td>
<td>5,156</td>
<td>College of Information Studies</td>
<td>1,201</td>
<td>Yes</td>
<td>4,811</td>
</tr>
<tr>
<td>Doctorate</td>
<td>15</td>
<td>College of Journalism</td>
<td>516</td>
<td>No</td>
<td>5,050</td>
</tr>
<tr>
<td>Graduate</td>
<td>70</td>
<td>College of Veterinary Medicine</td>
<td>3,061</td>
<td>NA</td>
<td>763</td>
</tr>
<tr>
<td>Masters</td>
<td>553</td>
<td>No college</td>
<td>2,150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N/A</td>
<td>1</td>
<td>School of Architecture</td>
<td>1,783</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undergraduate</td>
<td>128</td>
<td>School of Engineering</td>
<td>658</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>5,332</td>
<td><strong>Total</strong></td>
<td>5,332</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Displaying Data — Power View

Filters

VIEW | MAP

- Academic year
  (All)
  - 2003-2004
  - 2004-2005
  - 2005-2006
  - 2006-2007
  - 2007-2008
  - 2008-2009
  - 2009-2010
  - 2010-2011
  - 2011-2012
  - 2012-2013
  - 2013-2014

- Program name
  (All)
  - Aerospace Engineering
  - Architecture
  - Biomedical Research
  - Ecosystem Health
  - Equine Health
  - Information Management
Displaying Data – Power View

Enrollment by County

Count of ID by Residence - county, and Gender

Gender
- Female
- Male

Degree level | Count of ID
---|---
Bachelors | 77
Masters | 12
Total | 89

College | Count of ID
---|---
College of Information Studies | 55
College of Journalism | 34
Total | 89

Is new student this term | Count of ID
---|---
Yes | 2
No | 87
Total | 89

Filters

- Academic year is 2013-2014
- Program name is Journalism or Library Science

Western Carolina University
Displaying Data – Power View

Enrollment by County

Count of ID by Residence - county, and Gender

<table>
<thead>
<tr>
<th>Degree Level</th>
<th>Count of ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelors</td>
<td>18</td>
</tr>
<tr>
<td>Total</td>
<td><strong>18</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>College</th>
<th>Count of ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>College of Information Studies</td>
<td>4</td>
</tr>
<tr>
<td>College of Veterinary Medicine</td>
<td>7</td>
</tr>
<tr>
<td>School of Architecture</td>
<td>5</td>
</tr>
<tr>
<td>School of Engineering</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td><strong>18</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Is new student this term</th>
<th>Count of ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>18</td>
</tr>
<tr>
<td>Total</td>
<td><strong>18</strong></td>
</tr>
</tbody>
</table>
Questions
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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