Excel Power Tools

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NCAIR 2015 Conference
• 10,382 students
• Master’s Comprehensive
• Mountain location
• Residential and Distance
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
Displaying Data – Pivot Tables
Connecting to Data

![Excel screenshot showing the Import Data dialog box and Excel sheet with a green border in cell A1.]
Connecting to Data

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

PivotTable Fields

Choose fields to add to report:

- 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:

FILTERS

COLUMNS

ROWS

VALUES
Displaying Data – Pivot Tables
Displaying Data — Pivot Tables

<table>
<thead>
<tr>
<th>Drag fields between areas below:</th>
<th>Move to Beginning</th>
</tr>
</thead>
<tbody>
<tr>
<td>FILTERS</td>
<td>Move to End</td>
</tr>
<tr>
<td>Semester</td>
<td>Move to Report Filter</td>
</tr>
<tr>
<td></td>
<td>Move to Row Labels</td>
</tr>
<tr>
<td>ROWS</td>
<td>Move to Column Labels</td>
</tr>
<tr>
<td>Program name</td>
<td>Move to Values</td>
</tr>
<tr>
<td></td>
<td>Remove Field</td>
</tr>
<tr>
<td></td>
<td>Value Field Settings...</td>
</tr>
</tbody>
</table>

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

### Rows
- College
- Department
- Program name

### Column Labels
- 2003-2004
- 2004-2005
- 2005-2006
- 2006-2007

### Row Labels
- College of Information Studies
  - Information Management
    - Information Management
  - Library Science
- Library Science

<table>
<thead>
<tr>
<th>Semester</th>
<th>Fall</th>
<th>Count of ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003-2004</td>
<td>150</td>
<td>197</td>
</tr>
<tr>
<td>2004-2005</td>
<td>115</td>
<td>154</td>
</tr>
<tr>
<td>2005-2006</td>
<td>115</td>
<td>154</td>
</tr>
<tr>
<td>2006-2007</td>
<td>35</td>
<td>43</td>
</tr>
</tbody>
</table>
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

• The Power Pivot environment

Open Power Pivot
Displaying Data – Power Pivot

- The Power Pivot environment
Displaying Data — Power Pivot

- Import data
Displaying Data — Power Pivot

• How the imported data look

![Table of data](image-url)
Displaying Data – Power Pivot

• Bringing data into Excel
Displaying Data – Power Pivot

• **PivotTable vs. Power Pivot PivotTable**

<table>
<thead>
<tr>
<th>Semester</th>
<th>Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Count of ID</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Row Labels</strong></td>
<td></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>
</tbody>
</table>

**PivotTable Fields**

Choose fields to add to report:
- Academic year
- Acceptance status
- ACT - Composite
- Admittance status
- Admitted this term

<table>
<thead>
<tr>
<th>Semester</th>
<th>Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Count of ID</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Row Labels</strong></td>
<td></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>
</tbody>
</table>

**PivotTable Fields**

Choose fields to add to report:
- ACTIVE
- ALL
- WorkshopData
- Academic year
- Term
- Semester
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
Displaying Data – Power Pivot

- Adding a calculated column
Displaying Data – Power Pivot

- Adding a calculated column

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

![CalculatedColumn1 with values: 930, 930, 1260, 940, 1260]

![Dropdown menu with options: Create Relationship, Navigate to Related Table, Copy, Insert Column, Delete Columns, Rename Column, Freeze Columns, Unfreeze All Columns, Hide from Client Tools, Column Width, Filter, Description]
Displaying Data – Power Pivot

- Adding a calculated column to pivot table

![Pivot Table Example]

- Column Labels
  - 2003-2004
  - Average SAT
  - Count of ID

- Row Labels
  - College of Information Studies
    - Count of ID: 153
    - Average SAT: 1062.592593
  - Information Management
    - Count of ID: 116
    - Average SAT: 1081.188119
  - Library Science
    - Count of ID: 37
    - Average SAT: 1007.352941
  - College of Journalism
    - Count of ID: 67
    - Average SAT: 1045.5

[Image of the pivot table shown on the slide]
Evaluation Contexts

• Row context

• Filter context
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

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

<table>
<thead>
<tr>
<th>Cumulative GPA</th>
<th>HS GPA</th>
<th>SAT - Critical reading</th>
<th>SAT - Math</th>
<th>SAT - Total</th>
<th>AC</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.138000001144409</td>
<td>3.150000...</td>
<td>540</td>
<td>390</td>
<td>930</td>
<td></td>
</tr>
<tr>
<td>3.17499995231628</td>
<td>3.150000...</td>
<td>540</td>
<td>390</td>
<td>930</td>
<td></td>
</tr>
<tr>
<td>3.53699994087219</td>
<td>4.559999...</td>
<td>520</td>
<td>740</td>
<td>1260</td>
<td></td>
</tr>
<tr>
<td>1.8289999961853</td>
<td>3.25</td>
<td>510</td>
<td>430</td>
<td>940</td>
<td></td>
</tr>
<tr>
<td>3.5899999146931</td>
<td>4.559999...</td>
<td>520</td>
<td>740</td>
<td>1260</td>
<td></td>
</tr>
<tr>
<td>1.94900000095367</td>
<td>3.25</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><strong>Column Labels</strong></td>
<td>2003-2004</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Row Labels</th>
<th>Count of ID</th>
<th>Average SAT</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>College of Information Studies</td>
<td>153</td>
<td>1062.592593</td>
<td></td>
</tr>
<tr>
<td>Information Management</td>
<td>116</td>
<td>1081.188119</td>
<td></td>
</tr>
<tr>
<td>Information Management</td>
<td>116</td>
<td>1081.188119</td>
<td></td>
</tr>
<tr>
<td>Library Science</td>
<td>37</td>
<td>1007.352941</td>
<td></td>
</tr>
<tr>
<td>Library Science</td>
<td>37</td>
<td>1007.352941</td>
<td></td>
</tr>
<tr>
<td>College of Journalism</td>
<td>67</td>
<td>1045.5</td>
<td></td>
</tr>
</tbody>
</table>
Displaying Data – Power Pivot

- **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
Displaying Data – Power Pivot

• Adding a Calculated Field
Displaying Data – Power Pivot

• Adding a Calculated Field

![Calculated Field](image)

Table name: WorkshopData
Calculated field name: Distinct Students
Description: 
Formula: 
=DISTINCTCOUNT(WorkshopData[ID])
Displaying Data – Power Pivot

• Calculated Field in Power Pivot

![Image showing calculated field in Power Pivot]

Distinct Students: 5332
Displaying Data – Power Pivot

DAX

ALL, ALLEXCEPT, CALCULATE, DISTINCTCOUNT, DIVIDE, FILTER
• DISTINCTCOUNT

DISTINCTCOUNT( <column> )

– Counts unique values in column
Displaying Data – Power Pivot

• Adding a Calculated Field
Displaying Data — Power Pivot: DAX CALCULATE

• 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:=

\[
\text{CALCULATE(}
\text{Distinct Students},
\text{WorkshopData[Class level]="Freshman"},
\text{WorkshopData[Is new student this term]="Yes"}
\text{)}
\]
### Displaying Data – Power Pivot: DAX CALCULATE

<table>
<thead>
<tr>
<th>Column Labels: 2003-2004</th>
<th>Distinct Enrolled Students</th>
<th>First-time Freshmen Distinct Students</th>
<th>First-time Freshmen Total Students</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aerospace Engineering</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freshman</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>12</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Yes</td>
<td>2</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Sophomore</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>15</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Yes</td>
<td>12</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Junior</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>9</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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
All Distinct Enrolled Students :=

CALCULATE(

[Distinct Enrolled Students],

ALL( WorkshopData[Class level] )

)
## Displaying Data – Power Pivot: DAX ALL

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

• FILTER

FILTER( TableToFilter, FilterExpression )

— Returns a table filtered by FilterExpression
Displaying Data — Power Pivot: DAX CALCULATE

Above Average GPA Enrolled Undergraduates:=

CALCULATE(

[Distinct Enrolled Students],

FILTER(

WorkshopData,

WorkshopData[Institutional cumulative GPA] > 
[Average GPA Enrolled Undergraduates]

)

)
Displaying Data – Power Pivot: DAX FILTER

<table>
<thead>
<tr>
<th>Row Labels</th>
<th>2003-2004</th>
<th></th>
<th>2004-2005</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Students</td>
<td>% Above</td>
<td>Enrolled</td>
<td>Distinct</td>
</tr>
<tr>
<td></td>
<td>2003-2004</td>
<td>Average GPA</td>
<td>Undergraduates</td>
<td></td>
</tr>
<tr>
<td>College of Information Studies</td>
<td>152</td>
<td>42.11%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information Management</td>
<td>116</td>
<td>44.83%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information Management</td>
<td>116</td>
<td>44.83%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Library Science</td>
<td>37</td>
<td>32.43%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Library Science</td>
<td>37</td>
<td>32.43%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>College of Journalism</td>
<td>66</td>
<td>45.45%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Journalism</td>
<td>66</td>
<td>45.45%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Displaying Data — Power Pivot: DAX FILTER

• ALLEXCEPT

ALLEXCEPT( <table>, <column>[, <column>…])

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

• 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

• Consolidate multiple tables into one
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

• SharePoint Lists
Power Query – Advanced

- See all available lists
- Expand a particular list for fields
Power Query — Advanced

• Even get Active Directory names
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
Power Query – Advanced

- Microsoft SQL Server and Access

- An many other databases (e.g., Oracle, MySQL, PostgreSQL)
Power Query – Advanced
Power Query – Advanced
Power Query — Advanced

Load To

Select how you want to view this data in your workbook.

- Table
- Only Create Connection

Select where the data should be loaded.

- New worksheet
- Existing worksheet:

Add this data to the Data Model
Displaying Data – Power View
Displaying Data — Power View

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

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

Power View Fields

- DateLookup
- OIEIssueTracker
- AssignedTo
- Created
- CreatedBy
- DateCompleted
- DateDue
- DateReceived

Drag fields between areas below:

FIELDS
Displaying Data — Power View

Power View Fields

ACTIVE | ALL

- DateLookup
- OIPEIssueTracker
  - AssignedTo
  - Created
  - CreatedBy
  - DateCompleted
  - DateDue
  - DateReceived

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

- Drag fields from the field list into the view.

- Selected fields:
  - AssignedTo
  - Created

- Other fields available:
  - DateLookup
  - OIPEIssueTracker
  - CreatedBy
  - DateCompleted
  - DateDue
  - DateReceived
Displaying Data — Power View
Displaying Data – Power View

- Filters
  - VIEW
    - Month
      - Is February or January
  - (All)
  - (Blank)
  - January
  - February
  - March
  - April
  - May
  - June
  - July
  - August
  - September
  - October
  - November
  - December

- Power View Fields
  - ACTIVE
  - ALL
  - DateLookup
    - Academic Year
    - Academic_Years
    - Month
    - Semester
    - Semester (with separate summ
    - Term
    - Weekday

Drag fields between areas below:

FIELDS
Displaying Data – Power View

Unique requests by DateReceived

- Feb 08: 3
- Feb 15: 2
- Feb 22: 3

Open unique requests: 2
Late open unique requests: 2
Unique requests: 23

Status:
- Closed
- Late

AssignedTo & Count of Id:
- Alison Joseph: 13
- Billy Hutchings: 6
- Johnny Lail: 1
- Kay Turpin: 2
- Tim Metz: 5
- Total: 23

Unique requests by DateCompleted

- Feb 08: 3
- Feb 15: 1
- Feb 22: 5
- Mar 01: 1
- Mar 08: 1
Displaying Data – Power View

Count of ID by Residence - county, and Gender

<table>
<thead>
<tr>
<th>College</th>
<th>Count of ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>College of Information Studies</td>
<td>154</td>
</tr>
<tr>
<td>College of Journalism</td>
<td>34</td>
</tr>
<tr>
<td>College of Veterinary Medicine</td>
<td>611</td>
</tr>
<tr>
<td>No college</td>
<td>35</td>
</tr>
<tr>
<td>School of Architecture</td>
<td>181</td>
</tr>
<tr>
<td>School of Engineering</td>
<td>91</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,100</strong></td>
</tr>
</tbody>
</table>
Displaying Data – Power View
Displaying Data – Power Map
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
Displaying Data – Power Map
Displaying Data – Power Map
Displaying Data — Power Map

Layer 1

- **GEOGRAPHY**
  - Map by Residence - county (County)

- **Workshop Data**
  - Academic year
  - Acceptance status
  - ACT - Composite

- **HEIGHT**
  - Check or drag fields from above

- **CATEGORY**
  - Check or drag fields from above

- **TIME**
  - Check or drag fields from above
Displaying Data – Power Map
Displaying Data – Power Map
Displaying Data – Power Map
Displaying Data — Power Map
Displaying Data – Power Map
Resources

- Rob Collie ([http://powerpivotpro](http://powerpivotpro))
  - DAX Formulas for PowerPivot, 2013

- Bill Jelen ([http://mrexcel.com](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](http://cwebbbi.wordpress.com))

- Kasper de Jonge ([http://www.powerpivotblog.nl](http://www.powerpivotblog.nl))

- Purna Duggirala ([http://www.chandoo.org/](http://www.chandoo.org/))
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