Power BI Desktop: New Data Modeling & Analytics Features

# **Summary**

The purpose of this document is to serve as supporting reference to new data modeling and analysis features added to the Power BI Desktop application. Power BI Desktop is a free business intelligence design and development application containing rich capabilities in data connectivity, transformation, modeling, and report/dashboard development. Business intelligence artifacts created within Power BI Desktop such as datasets and reports can be published to the Power BI Service and consumed by Power BI users.

* New features and enhancements related to data connectivity, transformations, report authoring and general Power BI features are outside the scope of this document.
* Power BI Documentation Update Archive is maintained here: <http://bit.ly/2t6fRUE>
* No data modeling enhancements or new features were released in the months with red background formatting.

# **Monthly Update Links**

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# **Feature Updates**

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| **#** | **Feature or Improvement** | **Detail** | **Image(s)** | **Update Month** |
| 1 | Calculated Tables | * Like a calculated column, created via DAX based on other tables and relationships in model * Can be used just like other tables in the model – relationships, metrics * Top use: simplify DAX metrics (like a Temp Table via Join, Union) * Second use: help optimize performance of a metric such as banding or ranking   \*Calculated tables are not supported in Excel 2016 | \*Hit Enter and table expression will be created (persisted in model) | Sep-2015 |
| 2 | Relationships View | * Drag/Drop to create relationships between tables   + Columns for relationships will be detected   + Type of relationship (may to one) will be detected * Delete relationships via Delete key * Rename tables and columns * Delete tables and columns |  | Sep-2015 |
| 3 | Data View | * Copy table contents to clipboard   + Copy whole table or just selected column * Useful for easy analysis of model data in Excel or other applications (Outlook, Word) |  | Sep-2015 |
| 4 | Field Summarization | * Additional Operations in Fields Pane (Report View)   + Median   + Variance, Std Dev * Defaul Summarization   + Customize default summarization for any field in model |  | Sep-2015 |
| 5 | Semi-Select for DAX formulas in Data View | * When authoring in Table view you can click a column to include it in formula (rather than type) |  | Oct-2015 |
| 6 | Basic Time Intelligence | * By dragging a date column into the axis, PBI Desktop creates hierarchy Year, Quarter, Month, Day by default * Can use drill down mode and drill up/down all buttons * Can toggle back to just the date column via the dropdown |  | Nov-2015 |
| 7 | Relationships View | * Zooming Slider * Fit Zoom to Screen * Reset Layout button * Ability to Zoom in using Ctrl + Mouse selection | Zoom in and out at bottom right right of relationship view  Can return to default layout  Highlight rectangle and zoom in on only one area of the model | Dec-2015 |
| 8 | Suggested Relationships | * When trying to create visuals involving tables without relationships * Relationships can be created automatically from error window |  | Dec-2015 |
| 9 | Enhanced Hierarchy Support | * User can now specify levels within hierarchy to add to visual * Previously ‘all or nothing’ of hierarchy in visual |  | Jan-2016 |
| 10 | Define hierarchies | * Can define hierarchies in fields pane (report view) * Use hierarchies in visuals (drill down/updat * Right-click a field name, New Hierarchy * Can now right-click a different field and ‘add to the hierarchy’ * Can rename hierarchy | Adding a hierarchy to a visual will default to top level of hierarchy (can drill down)  In the future the hierarchy context (via concatenation) will be included in PBI desktop defined hierarchies | Feb-2016 |
| 11 | Performance improvmenet | * Faster to rename tables and columns in data view and report view |  | Feb-2016 |
| 12 | Change datatype of a column in DQ mode | * Modeling tab and select data column from the Fields Pane |  | Mar-2016 |
| 13 | Assume Ref Integrity on relationships in DQ mode | * Applies to imported and created relationships * Only enabled when connecting in DQ mode * Enables more efficient queries | 1. Home Tab 2. Manage Relationships 3. Select Relationship 4. Edit     Allows inner join queries to be sent to database rather than outer join queries  From column is never null and for every value of from column there is a corresponding value in To column | Mar-2016 |
| 14 | Modeling operations not blocked during visual refresh | * Performance improvement of authoring experience |  | Apr-2016 |
| 15 | Time intelligence functions with built-in date hierarchy fields | * Apply standard DAX time intelligence metrics for date hierarchy fields |  | Apr-2016 |
| 16 | Data model synonyms | * Enable use of Q&A on top of model by providing synonyms for different metrics and columns |  | Apr-2016 |
| 17 | Row Level Security | * Define roles and security filters for those role within the PBIX file * Assign members to the given Role in the PBI service * Available via the Modeling tab in ribbon |  | June-2016 |
| 18 | Q & A in Spanish | * Relationship view (Model Diagram window) |  | Apr-2017 |
| 19 | Bidirectional crossfiltering for DirectQuery models is now GA |  |  | Jul-2017 |
| 20 | New Quick Measures | Star Rating and Concatenated list of values |  | Jul-2017 |
| 21 | What if parameters | Currently limited to decimal number, fixed decimal number, and whole number | Can specify min, max, increment, and default value via UI  Creates a table with a single column via GENERATESERIES() DAX function  Creates a measure with the SELECTEDVALUE() DAX function | Aug-2017 |
| 22 | Scatter Chart Analytics | Symmetry Shading  Ratio Line | Helpful to understand which measure (X axis or Y axis) does a point favor | Aug-2017 |
| 23 | Quick Measure: Weighted Average |  |  | Aug-2017 |
| 24 | Quick Measures for SSAS Live Connections |  | Might see a different list of available quick measures depending on which version of SSAS you’re connected to | Oct-2017 |
| 25 | New Quick Measure: Sales from new customers quick measure |  |  | Oct-2017 |
| 26 | Cell-level formatting for multidimensional SSAS models |  | Cell level formatting will now flow through to Power BI tables, matrices, single value cards | Oct-2017 |
| 27 | Cell-level formatting for SSAS models | Will now support multi-row cards (unlike last month) |  | Nov-2017 |
| 28 | Mark custom date table | If you’re bringing in your own date table  Can now mark that in PbI Desktop direclty  can use time intelligence functions with table marked as a date table | Right click the table from the Fields list and mark as date table  Alternatively, use the Mark as Date Table feature in the Modeling tab | Feb-2018 |
| 29 | Quick measures are now GA | No longer need to turn on the preview switch |  | Feb-2018 |
| 30 | Update linguistic schema | Modeling tab  Export and import linguistic schema | 1. Export out schema 2. Edit in any text editor 3. Import the schema file back into PBIX   Changes will be reflected in Q & A experience | Apr-2018 |
| 31 | New DAX function: COMBINEVALUES() | Supports multi-part keys when using DirectQuery | The input columns are decomposed when sent to source to result in using the source columns of the data source. This usually results in more efficient SQL query. | Apr-2018 |
| 32 | Filtering and sorting in Data View | Basic and advanced filtering options | Status bar at bottom includes both total and filtered rows | Jun-2018 |
| 33 | Improved locale formatting | Better default locale formatting | Any format you specify for a column or measure will be respected | Jun-2018 |
| 34 | Composite Models (Preview) | * Can now have multiple DirectQuery sources in the same model as well as both DirectQuery and import sources * Can create relationships between the tables and fully utilize normal report authoring features (e.g. cross-highlight) * In Preview, only supporting relational DQ sources, not multidimensional * In Preview, can only work with model in PBI Desktop, not in the service | * Hovering over tables in fields list of composite model displays sources and/or last refresh of table depending on the source type * Relationships between tables of different source types are many-to-many by default   Machine generated alternative text: | Jul-2018 |
| 35 | Conditional formatting by values | * New conditional formatting option for table and matrix * Can format by the values of a field | Format by – Field value  Can define a measure which returns a specific color name “red” or hexcodes  Example: SWITCH….measure < 1000, “#b20000”, <15000, “#ffc04c”….)  Can also use a column such as Product Color to drive the formatting | Aug-2018 |
| 36 | Python integration | * Python connector for retrieving data * Python available in Query Editor for transformation * Create new visuals via Python | Get Data – Other category  Power Query Editor – Scripts – Ryn Python Script (next to Run R script)  Very similar experience to using R in Power BI  Python installed on PC…choose where to edit Python instead of default editor  Python visual will reflect filters from other visuals and data refresh but not be interactive itself | Aug-2018 |
| 37 | Q & A Improvements | * Q & A in PBI Desktop now GA * Better matching experience for PBI Desktop and PBI Premium | \*reports in PBI shared capacity will not take advantage of better matching experience | Aug-2018 |
| 38 | Data categories for measures | * Example: Generate Web URLs, Image URLs | Can create a measure which appends the selected value in a report to a URL with a filter parameter…creating a certain drillthrough/browse experience | Aug-2018 |
| 39 | Statistical DAX functions | * Several new functions now supported that match the behavior of Excel functions | * NORM.DIST, NORM.S.DIST, NORM.INV, NORM.S.INV, * T.DIST, T.DIST.RT, T.DIST.2, T.INV, T.INV.2T | Aug-2018 |
| 40 | Aggegations (Preview) | * Import only summarized values in memory into model. | * Will only have to go back to DirectQuery for certain details * Boost performance of report queries and reduce data refresh times * Limit the volume of queries sent to DirectQuery source to stay within concurrency limits of the high scale data source (e.g. Azure SQL DW) * The detailed (filter) queries that do get sent to DQ source are usually the kinds of queries that the source system can handle well * Example: all tables are DQ except the Agg Table     Aggs table has the most common grain – day, customer, product and aggs of columns  Properties for table – switched storage mode to Import  PBI automaticallly converted related tables to dual mode  If query use aggs table, use the tables in-memory,  If query uses DQ, use the source  Right-click table - Manage aggregations    Hide table from users  Like composite models, it’s not yet supported in the Power BI service… | Sep-2018 |
| 41 | DAX editor improvments | * New keyboard shortcuts * Line numbers * Indent lines | * Similar experience as VS Code | Oct-2018 |
| 42 | Composite models & aggregations support in the Power BI service (preview) | * You can now publish PBIX files that are using composite models or aggregations to the PBI service | * “we are getting very close to the point where can make composite models generally available.” | Oct-2018 |
| 43 | Explain the increase for non-additive measures | * ‘Explain the increase’ (or decrease) are now available on all measure types, not just sums and counts * It works the same way as it did for sum and count |  | Oct-2018 |
| 44 | Color saturation on visuals upgraded to use conditional formatting | * Same conditional formatting options for table and matrix (color by rules, by field, color scales) now available for charts | This includes:   * All forms of column and bar charts * Funnel chart * Bubble and filled maps * Shape map * Treemap * Scatter chart | Nov-2018 |
| 45 | Related questions in the Q & A explorer |  |  | Nov-2018 |
| 46 | New modeling view (preview) | * Many new features | * Faster performance on large models with many tables * Customize and save diagram view layouts * Multiple diagram layouts * Modeling options via the Field properties pane and field list * **Apply common settings to multiple fields at once** * **Display folder creation** | Nov-2018 |
| 47 | Composite models now GA |  |  | Nov-2018 |
| 48 | Modeling accessibility improvements | * Keyboard navigation, screen reader support, and high contrast setting support | * Manage relationships dialog * Edit relationships dialog * Manage roles dialog for RLS | Nov-2018 |
| 49 | New DAX functions | * Optional DrilldownFilter argument for the Rollup AddIsSubto * NonVisual function * IsInScope function | * IsInScope: better way to detect hierarchy level in a measure expression. Can use to calculate child % of parent subtotal or calc ranks of children under different parents | Nov-2018 |
| 50 | Live connect support for Q & A | * Currently limited to Analysis Services Tabular | * Ask a Question via button on home tab or double-click to ask a question with natural language * Not supported for live connections to PBI Service, Multidimensional, and Tabular models earlier than 2016 (1103 or earlier) | Dec-2018 |
| 51 | DAX formula bar updates | * Can now zoom on the formular bar * Much larger view of the DAX formula bar | * ctrl +/- keys or ctrl + mouse to zoom in/out * formula bar expands to almost the entire size of PBI Deskop | Dec-2018 |
| 52 | Data view accessibility support | * Can navigate around areas of the data view using Ctrl + F6 |  | Dec-2018 |
| 53 | Key Influencers Visual (preview) | * ML used by the visual * Visual determines which dimension has greatest impact on metric you want to analyze | * Choose a metric for the Analzye field well (e.g. net satisfication) * Add multiple attributes to the Explain By field well (e.g. product size, color, etc) * What influences net satisfactoin to be X value?? (must choose a value for metric) * X times the probably that value is * Will get a scatter chart when using a number as explain by whereas as column/bar chart when explaining by a text attribute | Feb-2019 |
| 54 | Insights Questions in Q & A | * Explain the increase/decrease now available in Q & A |  | Feb-2019 |
| 55 | Auto-generated questions | * Author can add questions but auto-populated other suggestions help users leverage Q & A |  | Feb-2019 |
| 56 | Improved python and R Script editor | * Both use the same script editor for DAX formula bar * Same features such as intellisense, line numbers, etc |  | Feb-2019 |
| 57 | Q & A recommendations for improving results |  |  | Mar-2019 |
| 58 | Show dates as hierarchy now GA | * For each date column, the entire hierarchy (year, quarter, month, day) is included in the field list * The entire hierarchy, or a specific selection from the hiearchy can be used in visuals |  | Mar-2019 |
| 59 | New Modeling view now GA |  | * Features include:   + Bulk editing of columns, measures, and tables   + Display folders on columns, measures, and hierarchies   + Dragging and dropping into display folders   + Multiple diagram layouts | Mar-2019 |
| 60 | New DAX Functions |  | * ContainsString, ContainsStringExact * DiscountCountNoBlank * Optional last parameter to avoid raising an error | Mar-2019 |
| 61 | Drillthrough across reports | Can use drillthrough action to other other reports in the same app (e.g. drill from summary report to detail report) | Target of drillthrough      Report Settings for the current file:  Mmust enable for source reports of drilltrough in same workspace as target of drillthrough | Apr-2019 |
| 62 | Key influencers visual now supports continuous analysis for numeric targets | * Can add numeric fields (not measures) to the Analyze bucket of the field well |  | Apr-2019 |
| 63 | Python support is now GA | Can be used like R for data mashup and visuals without needing to enable preview |  | Apr-2019 |
| 64 | Partial synonym matching for terms in Q &A |  | * When using Q & A, you can now complete terms even if you only know part of the term…if the term is part of a synonym for a field or table in the model | Apr-2019 |
| 65 | New DAX Function: ALLCROSSFILTERED() | Removes filters on a table from other tables across direct or indirect many to many relationships |  | Apr-2019 |
| 66 | Key Influencers Visual Improvements (Preview) | 1. Binning support 2. Formatting options 3. Mobile support | * Binning support: binning of numerical columns added to the Explain by bucket   + (e.g. unit cost field broken out into buckets of values * Formatting optoins: analysis visual colors and drill visual’s secondary color and reference line color * Mobile support: will be visible and interactive live other visuals when viewing in any of our mobile apps | May-2019 |
| 67 | Disable auto-date tables for new reports | Avoid automatically generating date tables for date columns in new PBI files |  | May-2019 |
| 68 | Update to the ALLSELECTED DAX function | ALLSELECTED() has been extended to support multiple arguments, just like the ALL() function |  | May-2019 |
| 69 | New DAX Comparision operator: == | New == is similar to existing = operator except it performs strict comparison to BLANK values | In DAX:  0 = BLANK() returns true  == 0 is true only when column value is 0  == BLANK() is equivalent to IsBlank([Column]) | Jun-2019 |
| 70 | Key influencers visual improvement | * Measures now supported * Counts for influencers | Can add measures to the Analyze bucket of the field well and find what drivers exist in your data model for that measure | Jul-2019 |
| 71 | Aggregations improvements | * Now Generally Available, no preview feature to turn on * RLS and aggregations are now supported in the same dataset |  | Jul-2019 |
| 72 | Key influencers improvements | * Measure support * General availability | You can now use measures in the Analyze bucket of the key influencers visual.  There’s also a new Expand by field well that can be used to refine the level that the measure in the Analyze bucket is evaluated at. For example, if you want it to be evaluated over all your data, you can an ID field to the Expand by bucket. | Aug-2019 |
| 73 | Custom Format Strings | * Applicable to numeric and date fields, not measures | Available in Modeling view | Sep-2019 |
| 74 | Conditional Formatting improvements | * Alt text * Border color * Gauge colors | Moving closer to the goal of everything within the formatting pane being conditionally formattable | Sep-2019 |
| 75 | Drill through discoverability improvement | * Text has been added to a tooltip to let user know that drill through is enabled |  | Sep-2019 |
| 76 | New DAX: REMOVEFILTERS and CONVERT | * REMOVEFILTERS * CONVERT | REMOVEFILTERS is the same as ALL when used inside CALCULATE to remove filters  CONVERT changes the expression to another data type | Sep-2019 |
| 77 | Performance improvement for modeling operations | * Operations such as adding measures, creating relationships, etc will be faster | Performance improvement applies when the following conditions are satisfied:   * Contains a lot of calculations * Uses USERELATIONSHIP or CROSSFILTER functions * Uses any of the TODAY, NOW, RANDOM, etc volatile functions | Oct-2019 |
| 78 | Support for SSAS and Azure AS including RLS for Q&A (Preview) | * Q & A to AS models via live connection from PBI | Preview feature: Enable Q & A Live Connect | Oct-2019 |
| 79 | New Q&A Visual | * Full visual experience to give Q&A functionality to end users * Can interact, cross filter, support bookmarks, be themed, etc | * Just click the Q&A icon from the visualization pane * Adds an input box for questions and suggestions | Oct-2019 |
| 80 | Q & A Tooling (Preview) | * See how people are using the Q&A visual and improve results they’re getting * Teach Q&A to understand questions and terms people might use * Manage terms you’ve added to Q&A |  | Oct-2019 |
| 81 | Conditional formatting for buttons | * Can now dynamically format properties of buttons * Three dots on hove are exposed like other conditional formatting properties |  | Nov-2019 |
| 82 | Load more for Analyze insights | * When you use the Analyze feature for visuals (e.g. explain the increase) you can continue to run the analysis after initial timeout |  | Dec-2019 |
| 83 | New DAX function: Quarter | * Function returns quarter corresponding to a specific date |  | Dec-2019 |
| 84 | Incremental refresh is now GA for datasets | * Now GA and is supported for Power BI Pro licensing (no longer a Premium only feature) | * Faster refreshes * More reliable refreshes * Resource consumption is reduced | Feb-2020 |
| 85 | New function: FirstNonBlankValue | * Similar to FirstNonBlank | Different from FirstNonBlank in that column is added to the filter context for the evaluation of expression. (FirstNonBlank is filtered by the current context) | Feb-2020 |
| 86 | New function: LastNonBlankValue | * Similar to LastNonBlank | Different from LastNonBlank in that the column is added to the filter context for the evaluation of expression | Feb-2020 |
| 87 | New function: COALESCE | * Return the first expression that does not evaluate to BLANK | COALESCE(<expression>, <expression>[, <expression>]…  If all expressions evaluate to BLANK, BLANK is returned  Parameters: any DAX expression that returns a scalar value  Can be used to replace blanks with zeroes:  COALESCE(SUM(FactInternetSales[SalesAmount]), 0) | Mar-2020 |
| 88 | DirectQuery support for AI Visuals | * Decomposition Tree and Key Influencers visuals will now work in DirectQuery mode | DQ query paremeters are not supported  Automatic page refresh is not supported | Apr-2020 |
| 89 | Q&A Updates | * Can now suggest your own questions to help end users * Teach Q&A now supports measures * Q&A is now supported in Power BI datasets | Can now use QA when connected to Power Bi dataset | Apr-2020 |
| 90 | Decomposition Tree support for Tooltips | * Can add measures to the Tooltips option in the field well and have them appear when users hover on the data bars |  | Apr-2020 |
| 91 | List Separator and decimal symbol now default to the standard DAX separators | * Comma as list separator and dot as decimal separator |  | May-2020 |
| 92 | Decomposition Tree is now GA | * Now supports conditional formatting by a second measure * Drill through support * Sort capabilities (alphabetically or by the measure) * Responsibe design |  | May-2020 |
| 93 | AI insights are now GA | * AI Insights in Power Query provide access to a collection of pre-training machine learning models that enhance data prep efforts | These models include:   * Text analytics functions   + Sentiment scoring   + Key phrase extraction   + Language detection * Image detection * Connectivity to Azure ML models | Jun-2020 |
| 94 | Enhancements to Q&A | * Field synonyms * Visual renames as suggested synonyms * Orange underlines for ambiguous terms * Updates to Q&A pop-out | Field synonym is an additions to Q & A setup GUI: | Jul-2020 |
| 95 | Support for Excel financial functions in DAX | * Common Excel functions for financial analysis including FV, PV, PMT, RATE, and many mores | Full list of financial functions:  <https://docs.microsoft.com/en-us/dax/financial-functions-dax> | Jul-2020 |
| 96 | Model view for live connect GA | * View the relationships between the tables in the source model of a live connect report |  | Jul-2020 |
| 97 | DirectQuery support for Q & A (preview) | * Q & A now supports SQL DirectQuery sources | Includes SQL Server 2019, Azure SQL Database, and Azure Synapse Analytics  Other DirectQuery sources are not supported for Q&A. | Aug-2020 |
| 98 | Smart narratives visual (preview) | * New visualization helps quickly summarize visuals and reports with dynamic text |  | Sep-2020 |
| 99 | Q&A now supports arithmetic operations | * Addition, subtraction, division, and multiplication supported. |  | Sep-2020 |
| 100 | Export data from Q&A visual | * Option to export from Q & A visuals is found under the context menu (…) of the visual header |  | Oct-2020 |
| 101 | Anomaly Detection (Preview) | * Enhance line chart visuals by detecting anomalies in time series data. |  | Nov-2020 |
| 102 | Q&A now supports partial data matching | * Previously only exact matches were supported. Example: “Azure” now matches value “Microsoft Azure” |  | Nov-2020 |
| 103 | DirectQuery for PBI datasets and Azure AS (preview) | * Builds on composite models * Allows you to use Azure AS and PBI dataset as another DirectQuery source as part of a composite model with potentially other data sources | Feature is ideal for scenarios in which data from both an enterprise semantic model needs to be combined with another source like an Excel file <https://powerbi.microsoft.com/en-us/blog/directquery-for-power-bi-datasets-and-azure-analysis-services-preview/> | Dec-2020 |
| 104 | Anomaly Detection now in ribbon | * Now have access to this feature under the Data/Drill tab * Min number of data points required for the analysis reduced to 4 |  | Feb-2021 |
| 105 | DQ for PBI Datasets and Analysis Services Enhancements | * Can now delete DirectQuery connections to Power BI datasets and Azure AS * Data source Settings * Have added support for calculated tables in this release |  | Feb-2021 |
| 106 | Model view updates | * Diagram tables will reflect report theme * Can expand/collapse all the table cards in your diagram at once via the more options menu of any table * Alternatively, right-click in the gray background and expand/collapse will appear |  | Feb-2021 |
| 107 | Model View UI (preview) | * Cardinality at endpoints of relationship and direction at center * Error icon tooltips for measures |  | Mar-2021 |
| 108 | IF.EAGER | * New function | Same behavior as IF function, but performance may be different  IF.EAGER uses EAGER evaluation where the two branches are evaluated regardless of the condition  In contrast, IF uses strict evaluation, meaning it only executes one of the two branch expressions, depending on the condition being true or false  IF.EAGER has performance benefits when the same calculation needs to be evaluated for both the branch and the condition expressions. | Mar-2021 |
| 109 | Easier Calculate filters | * Can now write simple OR condition for multiple columns on same table | SalesRedW := CALCULATE(Sales[Sales Amount], Product[Color] = "Red" || Product[Style] = "W")  Avoids the need to filter over an all function for the or condition | Mar-2021 |