Power BI – Everything you need to know to begin

2021

SULAVA

Introduction

In the Summer 2015 Microsoft published its Power BI reporting and analysis service, which enables data visualization and combination of data from organizations' own systems, files, intranets, cloud services or different open data services. There are over 140 data sources available already and more are constantly been added.

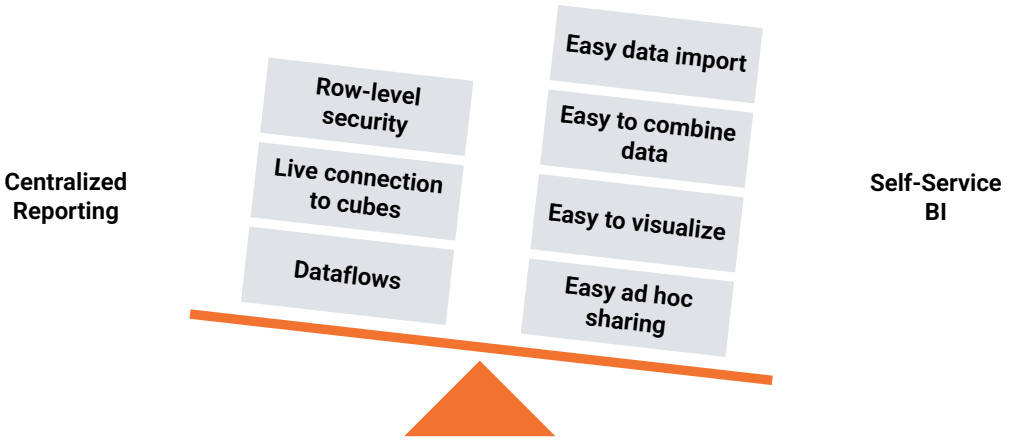
This article was originally published in April 2017, but it has been fully updated 2019 and 2021 to cover the current Power BI product.

Enjoy the guide!

Contents:

Introduction

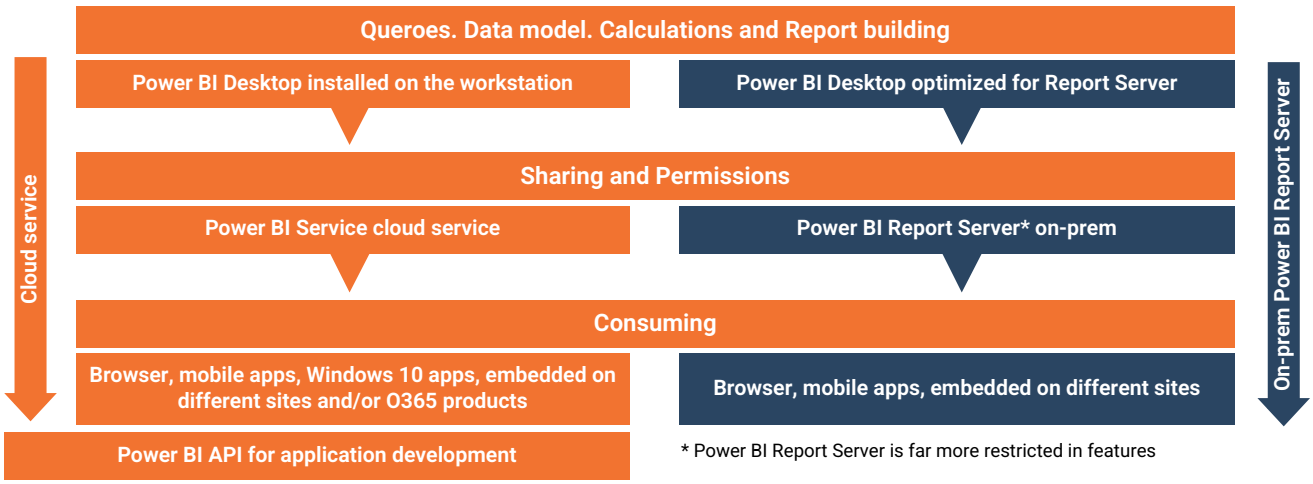
Power BI suits well for both fast ad hoc type self-service reporting and more centralized and IT managed organization level reporting. For this reason, ways to exploit Power BI vary between organizations. People with varying backgrounds from the front-line of the business to BI experts can build reports and larger reporting solutions.



Reports are created with **Power BI Desktop** and end-users can explore the reports in **Power BI Service** in a browser, **Mobile apps**, embedded in products such as intra or Office365, such as SharePoint, Teams, Dynamics, or PowerApps. Visualizations can also be embedded to public websites.

Application developer is needed in the case if you want to embed reports in custom applications. Instead of using cloud service to share reports, it can be done with on-prem **Power BI Report Server** instead.

What does Poer BI consist of



You can explore Power BI reports with visuals, made based on open data. In addition, here you can find the list collected of Finnish public organizations' public Power BI reports.

Power BI is surrounded by active community with its conversation groups. Users can share their own visualizations to Data Stories Gallery website, which is a great place to get new visualization ideas for your own reports. You are also more than welcome to join Finnish MSBI & Power BI User Group Finland (a user club).

Microsoft develops Power BI actively and listens users' voice and preferences. Development work is open by its nature and hence everybody are free to suggest new ideas, vote for them and follow their progress on idea forum.

Self-Service BI

With Power BI, data can be presented visually using a variety of metrics as well as interactive visualizations and it is ideal solution for the self-service reporting.

Report building is hence possible to conduct closer to the business or even by business users themselves. Because of its user friendliness and affordable pricing, Power BI has become an essential reporting and analysis tool for controllers and analysts, for example.

After short instruction anybody can create new visualized reports based on premade data models, since the creation process is easier and more intuitive than, for example, making pivot tables in Excel. At best report page is made in few minutes, and because visualizations interact with each other, data can be examined from different perspectives and it can be drilled multiple ways.

However, it is good to note that self-service BI can mean different things in different organizations and required Power BI skillset varies lot depending on the model:

1. **Business Led Self-Service BI**

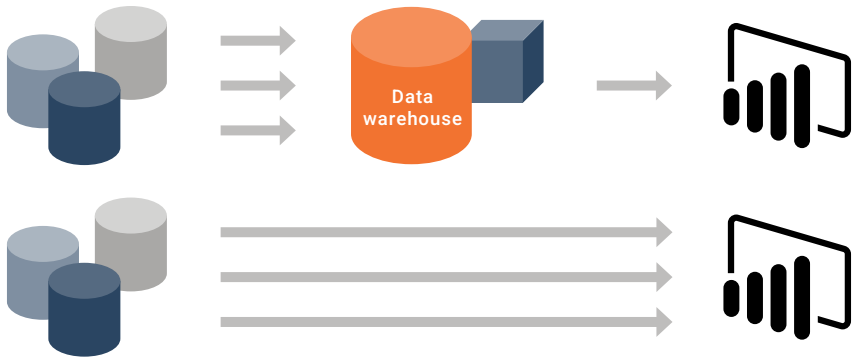
   Self-service BI can mean, for instance, reporting that controller or financial officer has conducted herself without assistance from IT department. In that case data sources could be Excel files or CSV files that are exported from different systems, nor is the report maker herself able to shape the structures of the data obtained from source systems, but data is shaped and transformed to reportable form with queries in PBI Desktop. This kind of usage requires versatile knowledge of Power BI Desktop, especially, if reports are built by combining data from multiple sources. When Power BI was first introduced back in 2015 users were mainly self-service users, since initially Power BI did not offer means for centralized IT managed reporting.

2. **IT Managed Self-Service BI**

   Self-service Power BI reporting can on the other hand mean pure data visualization and report building. In that case IT takes care and maintains data storages, so called Power BI models and/or SQL Analysis Services cubes, nor self-service users do not have to implement data model or measures. Then lesser or thinner technical skillset will be sufficient.

3. Self-Service BI can also be **a combination of the two previous approaches and include elements from both**. Then organization utilizes both self-service reporting and centralized IT managed data models.

IT Managed, Self-service or Managed Self-Service?



IT managed centralized reporting

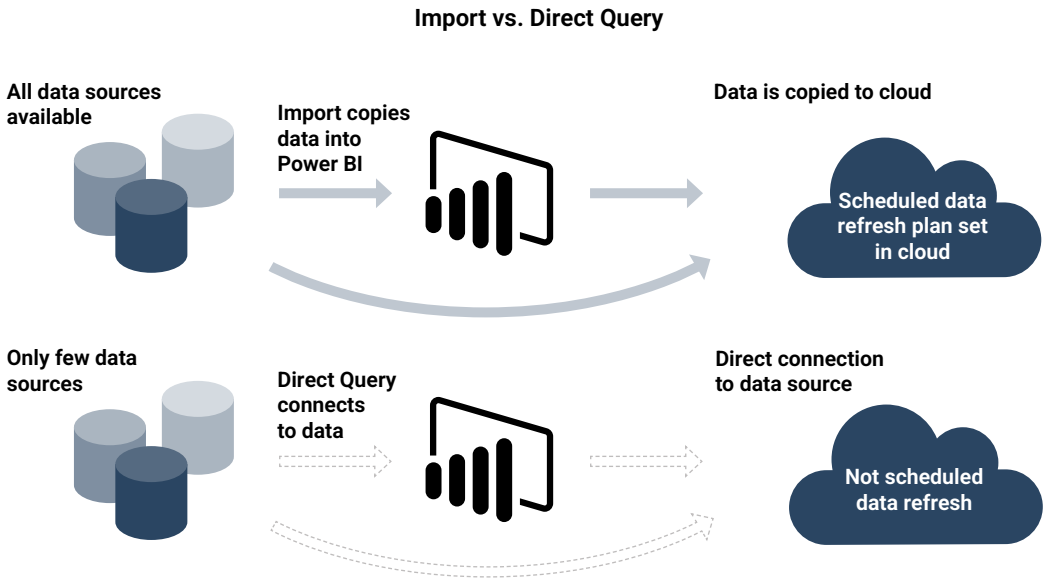
Power BI's role as a sole implementation tool or being a part of more comprehensive toolbox for big, centralized solutions has grown remarkably since 2018, as Microsoft has made considerable efforts to develop and enhance so called enterprise features of Power BI.

In more comprehensive reporting solution Power BI might serve as a pure visualization tool if SQL Server Analysis Server's Tabular model or OLAP cube serves as a backend. On the other hand, Power BI can also implement solutions similar to the Tabular model of Analysis Server, as technically both use the same Vertipaq engine and technique.

Larger organizations should design its Power BI practices and governance well, so that solutions built in it will become robust and maintainable. However, there are still some shortcomings in Power BI Service, which might produce some challenges and compromises for the report sharing, for instance.

Comprehensive Power BI solutions require several architectural decisions to be made such as are we going to either import the data and set scheduled refresh or use a real-time connection to databases and cubes (Direct Query, Live Connection).

The decisions are influenced by several factors including the amount of data and the level of need for real-time reports. Product development should be actively followed, since lot of new updates are published frequently, such as the composite model published in October 2018, in which the above-mentioned techniques can be combined, when a part of the data of the data model is copied and some parts use the direct connection.



In winter 2018 Power BI Service introduced Dataflows technique that enables centralized implementation of queries and combination of data with common data model entities.

Additional technical information is available in Microsoft's comprehensive white paper documents.

User roles

There are four Power BI user roles.

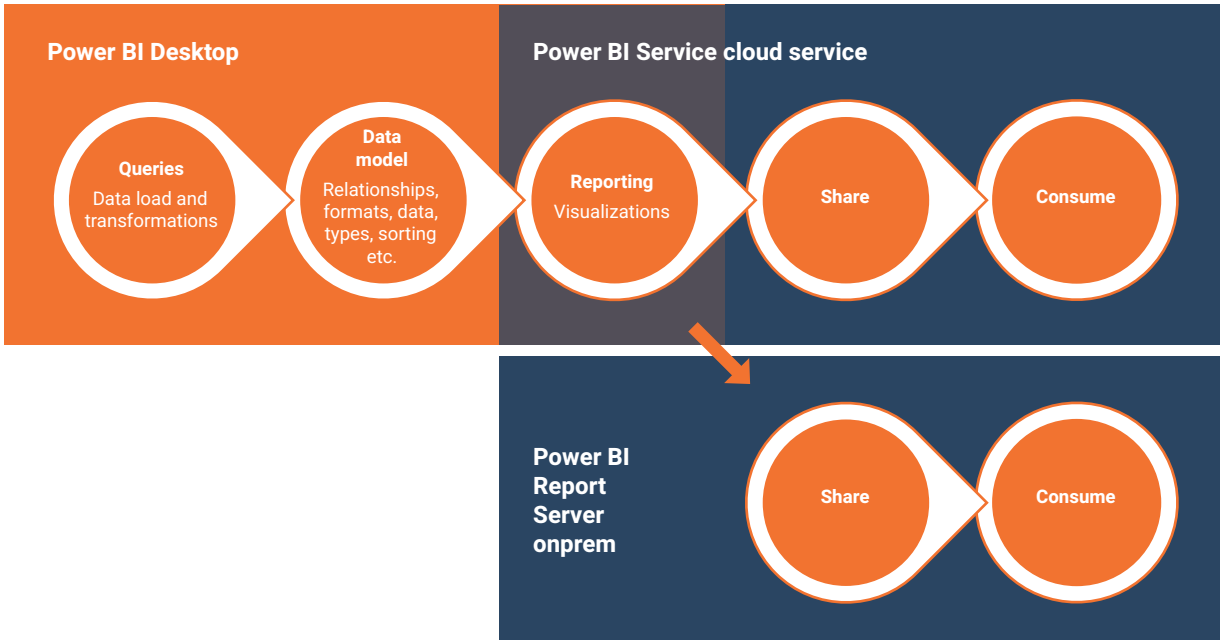
1. **BI developers,** who usually implement solutions with other tools as well, such as SQL Server Analysis Services, SQL Server Reporting Services, Cognos, etc.
2. **Technically oriented users,** who are also implementing Power BI solutions by writing queries, comprising data models based on several tables and composing functions with DAX language. These people work as business controllers or in similar positions.

3. **Report and dashboard builders,** who know data well enough, but do not make queries or data modeling by themselves.
4. **End users,** who consume reports and dashboards during decision making process.

Tools and workflows

Queries, data modeling and calculation logic as well as visualizations are made in Power BI Desktop.

Resulting files are published either to Power BI Service or to Power BI Report Server that runs on local server room and shared to end users who can then consume them.



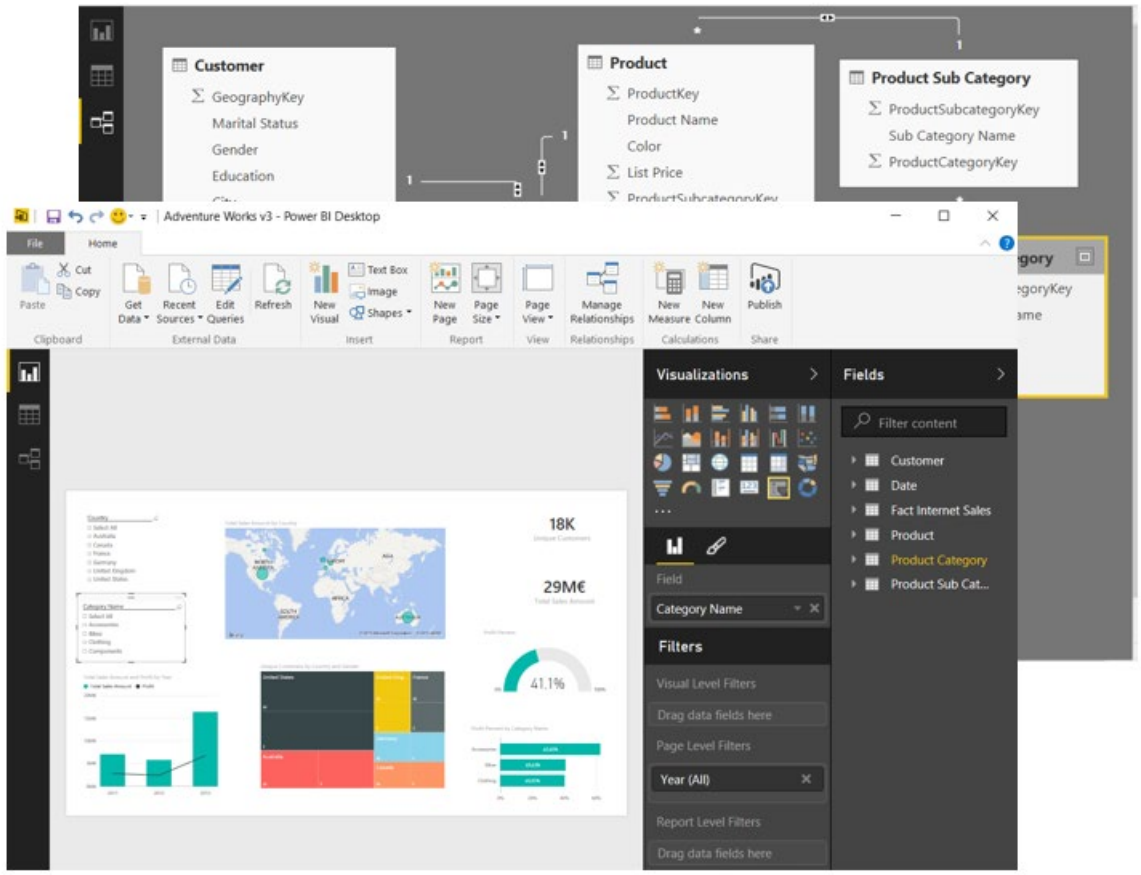
Power BI Desktop

Queries and data model are usually done by a person, who knows company's information systems and data structures and contents well enough, such as BI expert, controller, or analyst.

Anyone who knows, for instance, Excel's VLOOKUP function or basic idea behind relational databases, can learn to do simple data models based on few tables. Skills are needed even less, if there is only a list, like a certain view that has been loaded from the database or single .CSV file.

The implementations of more comprehensive solutions require sufficient relational database and dimensional modeling knowledge and resources to study basics of DAX language that is used in calculations.

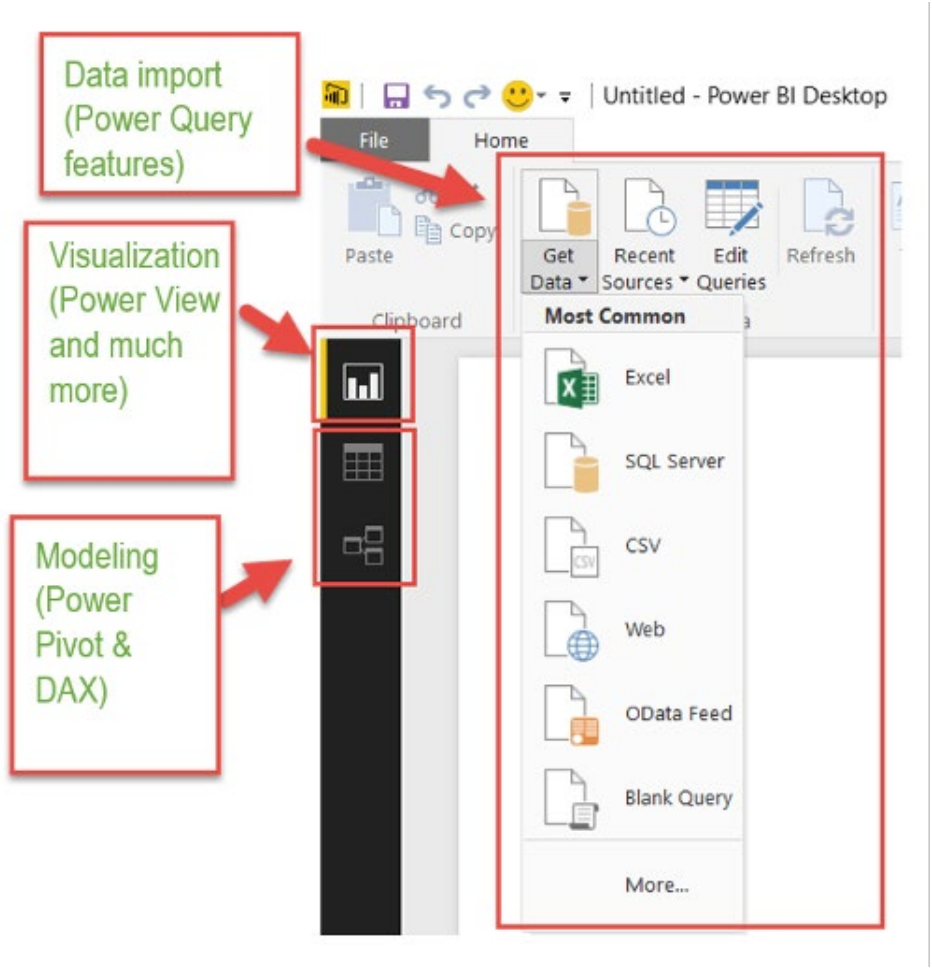
- **Queries or in other words data loading and transformations** are made with **Power Query** program in PBI Desktop. Power Query has over 300 different data shaping and transformation features. You can use it to replace decimal points with commas, split columns, replace text, reverse data, or group it differently etc. Query editor's data transformation feature set is versatile. So called M language works behind Power Query scenes, but only a few need to study it more thoroughly. If desired, SQL, R or Python languages can also be used in Power Query.
  I have written Power Query guide for basic users.
- **Creating a data model** means connecting loaded tables based on some unique id information, such as customer number. The creation of data model also involves, for example, formatting of columns, deciding sorting orders and classification of fields into, for instance, geographical data, so that the data can be visualized as maps. Maintainability and expandability, and the best possible support of DAX language, require that the model is implemented as a dimensional star model: Why data modeling is important in Power BI
- **Data model usually includes calculation logic** based on DAX functions which are called measures or calculated columns. DAX can also be used to create new tables. It has several familiar functions from Excel, like SUM or COUNT, but also a lot of totally new functions, one of the most important being CALCULATE. DAX is famous for its time intelligence, since it has numerous functions for time-based calculation, such as TOTALYTD or SAMEPERIODLASTYEAR.
- **Visualization and reporting** are about making report files and pages. Visualizations are easy to create and report pages are automatically interactive, so that clicking one of the bars in a bar chart on a report page, affects what is displayed in other visualizations on the same report page. In addition to Power BI's default out-of-the-box visualizations, custom visualizations can be loaded into report files, and application developers can create and modify them based on different needs. Each report page can be optimized for mobile use.



If you are familiar with Excel's so-called Power tools, you can compare the different parts of PBI Desktop with them, as PBI has been built by combining add-ins that have been in use in Excel for a long time. Though many users are unfamiliar with these add-ins, since they had to be installed separately into older Excel versions.

- **Power Query** is used to implement queries, that is, to first load and then shape and transform it to a suitable form.
- **Power Pivot** is used for data modeling, or in other words, to connect tables and to add calculation logic as DAX functions.
- **Power View charts** have enabled the creation of interactive charts in Excel, but their support is in practices ended. Visualizations in PBI Desktop have developed remarkably, and hence nowadays they can hardly be compared with Power View visualizations apart from that they both enabled interactiveness.

Same background technology and, for instance, calculation language DAX are used in SQL Server Analysis Server too, when creating so called Tabular models.



Even though PBI Desktop has its roots in Excel, it has also been heavily influenced by other reporting tools like Tableau and Qlik. However, for several years now, Gartner has ranked Microsoft ahead of Tableau and Qlik in its own assessments.

To get started with PBI Desktop, download and install it from here or from Microsoft Store, and read these instructions: Start using Power BI Desktop

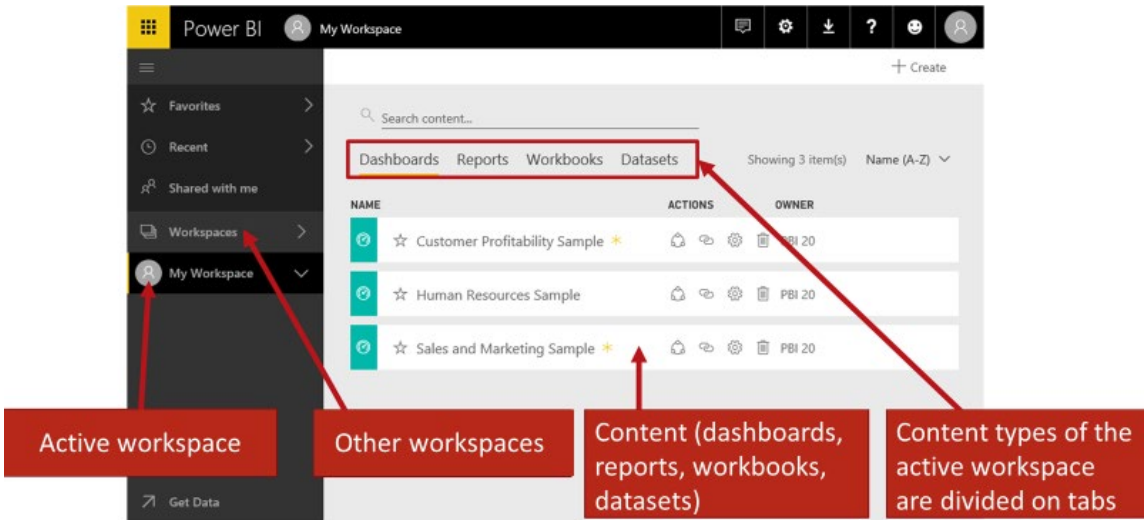
Or watch this video on Youtube

After you have glanced basic instructions, you can for example try to analyze your own Outlook calendar items with the help of these instructions or examine government's open purchase invoices with the help of these instructions.

You will find instructions and guides of PBI Desktop's query features also from HExcelligent's Power Query guide, which is written in Finnish.

Power BI Service – a Cloud Service

If Power BI Service cloud service is used as a method of distributing reports, the models and/or reports implemented with Power BI Desktop will be published to so called **workspaces**, where the most important metrics and visualizations of reports are compiled to make so called **dashboards**.



Workspaces are meant for report builders and developers, and hence workspace members are usually people who make reports. They share dashboards and reports that are created in or published to workspaces to other users either individually or bundled into larger solutions i.e. apps. End users can also be members of workspaces, but the user interface is not so end user friendly.

When cloud service is used, a single Power BI solution can be divided into two parts, if desired:

1. into technical part or “golden dataset”, which contains queries and data model, and
2. into separate visualization files that are connected by so called live connection to technical model files.

This way solutions’ implementation responsibilities can be allocated to different people and based on the centralized datasets people are able to create variety of different reporting solutions that meet the needs of different user groups.

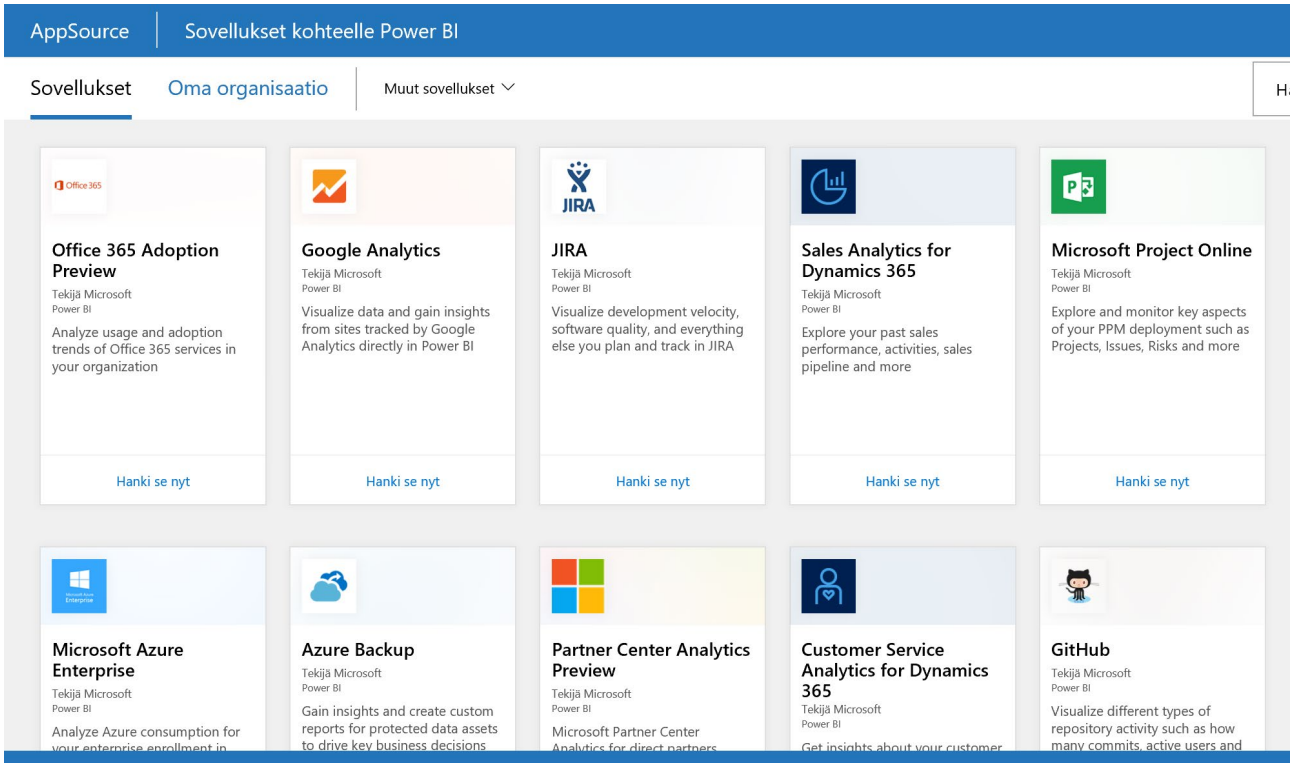
PBI Service enables among other things scheduling of automatic data refresh. Other essential cloud service features are listed bit later in this same guide.

Data loading and report building are also possible in Power BI Service, but feature set is more limited than in PBI Desktop. Queries and data models including calculations, that are created in PBI Desktop, cannot be modified in PBI Service. In practice models and most reports are usually built in PBI Desktop.

Apps in Power BI Service

Power BI Service has plenty of different **template apps**, previously known as content packs, that helped users to analyze data from various cloud services like Google Analytics, Salesforce, MailChimp, Dynamics CRM, Microsoft Project Online, etc.

These applications contain ready-made data model with necessary functions, reports, dashboards, so that user will only need credentials to that cloud application she wants to use to generate reports. With content packs user generate ready-made reports in few minutes.



Some of the applications can be used only in PBI Service, and hence they cannot be modified in PBI Desktop, which unfortunately means that reports can be added to them, but there is no options to modify things in back end.

Some applications that are related to Microsoft's own products are also available as PBI Desktop files and therefore you can build more comprehensive models based on them and add your own calculation and additional data sources. Good examples are Dynamics CRM packages, that you can download for you own use as PBI Desktop files.

The main features of Power BI Service

The following list illustrates the most essential features of Power BI Service.

- Scheduled data refresh
- Workspaces and collaboration with other developers
- Dashboard creation, that is, compiling important visualizations from different reports to a single view
- Simple ad hoc style sharing of dashboards and reports
- Packaging of organization's own comprehensive reporting solutions into apps and app sharing
- Visualization of real-time streaming data available with dashboards
- Mobile use of reports and dashboards
- Publishing and embedding of reports in web sites
- Embed reports in SharePoint Online and other O365 applications, like Teams, Dynamics CRM or Power Apps
- Embed reports in other than SharePoint Online sites
- Centralized utilization of published datasets and implementation of reporting files in PBI Desktop
- Pivot report implementation in Excel based on Power BI dataset
- Natural language queries in English, such as "Sales by salesperson in 2019"
- Set alerts to send you email notification when data gets refreshed or some threshold is exceeded
- Launch Power Automate workflows when data gets refreshed
- Centralized execution of queries aka Dataflows

Recently PBI Service has got some new features that require premium license, such as deployment pipelines that will help application lifecycle management (i.e. automation of the development – testing – production process).

Additional information about PBI Service:
Start using Power BI Service

Power BI Report Server – a reporting server

In the summer of 2017 Power BI Report Server was introduced alongside Power BI Service, so that Power BI content can be shared straight from organization's own server room without need to use the cloud service. Report Server has narrower feature set than PBI Service. For example, dashboards are not available and Power BI solution cannot be divided into two parts (technical part and visualizations).

When organization uses Report Server, then it must use PBI Desktop version that is optimized for the Report Server.

Additional information: What is Power BI Report Server?

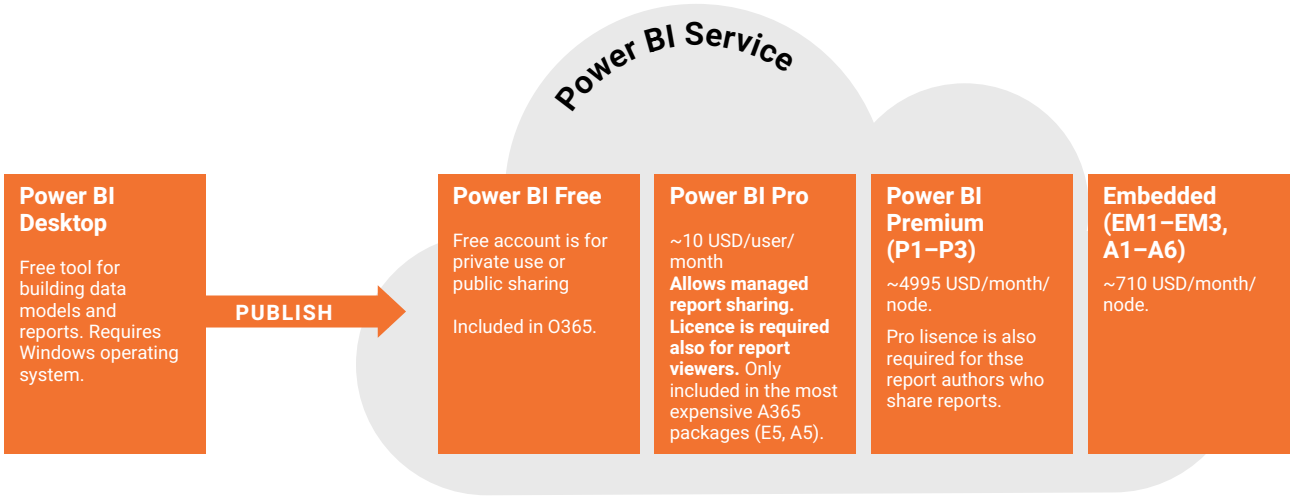
Pricing and licenses

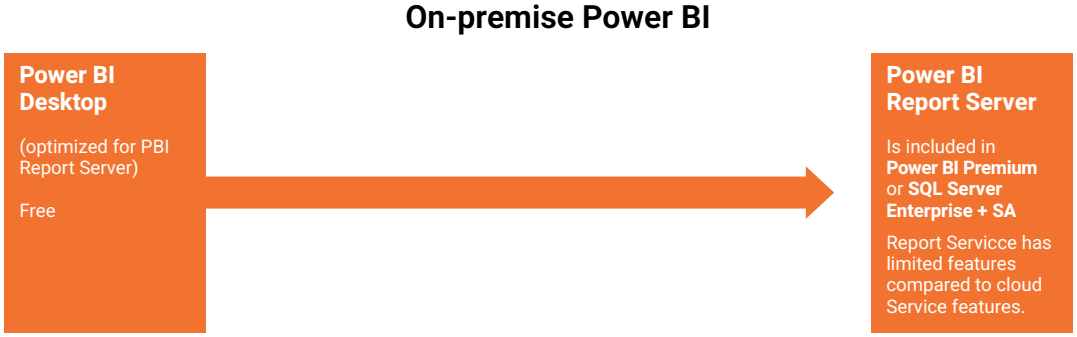
PBI Desktop is free and it can be installed on any Windows working machine. Power BI Desktop is not, however, intended for report end users, and hence proper content consuming requires either Power BI Service and cloud service licenses or alternatively PBI Report Server.

There are four types of cloud service licenses available:

- Power BI **Free**
- Power BI **Pro**
- Power BI **Premium** (P1 – P3)
- Power BI **Embedded** (EM1-EM3, A1-A6)

You can check current pricing on Microsoft's website.



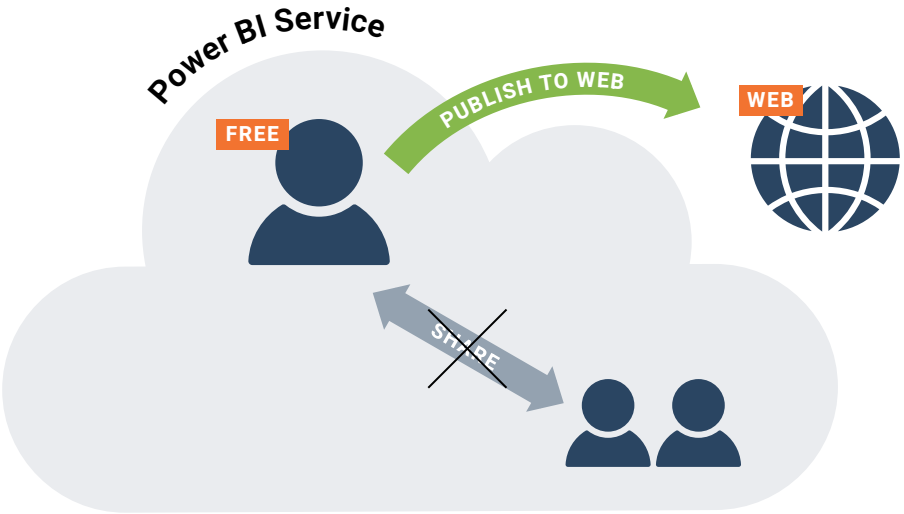


Power BI Free

Power BI Free account or free license is available through simple registration. Registration requires work or school email address, and hence free consumer email addresses like gmail.com or live.com will not work.

Free account is meant for personal use only, and consequently you are not able to share reports with colleagues or read reports others have made and shared (unless organization has acquired Premium license, which is based on dedicated capacity). However, public sharing is possible with free account meaning that you can create and share a link to your report so that anybody with the link can see it. Free account can therefore be used to implement completely public statistics.

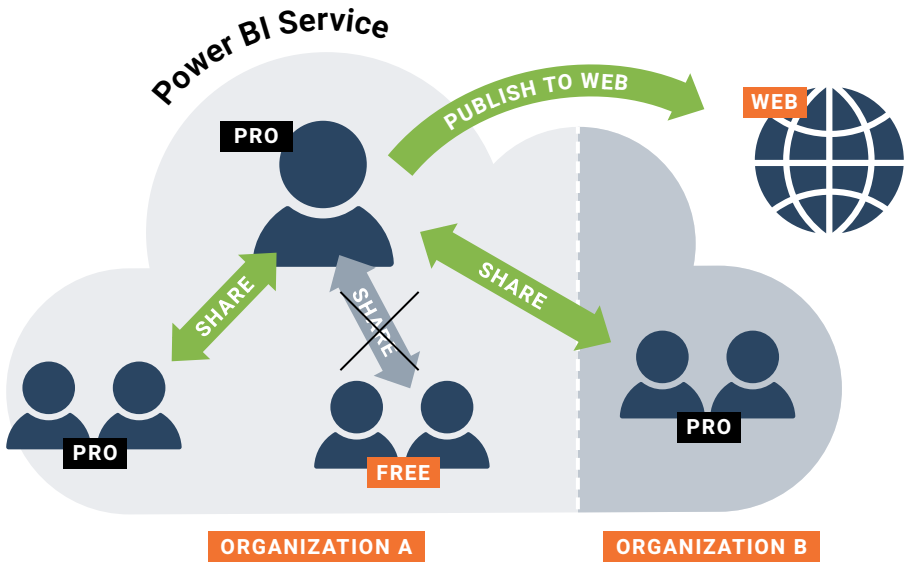
It is good to note, that almost all O365 bundles contain PBI Free license, but it does not enable sharing of reports inside the organization. Power BI icon in O365 gets people often falsely believe that all features and functionalities would be available automatically even with Free license. However, report sharing and examining always requires paid licenses, which are covered next.



Power BI Pro

Power BI Pro licenses enable report sharing for other people with Power BI Pro license. This license model requires thus that end users have also Pro licenses. Organization's admin can specifically determine if sharing is also possible with Pro-licensed users outside the organization.

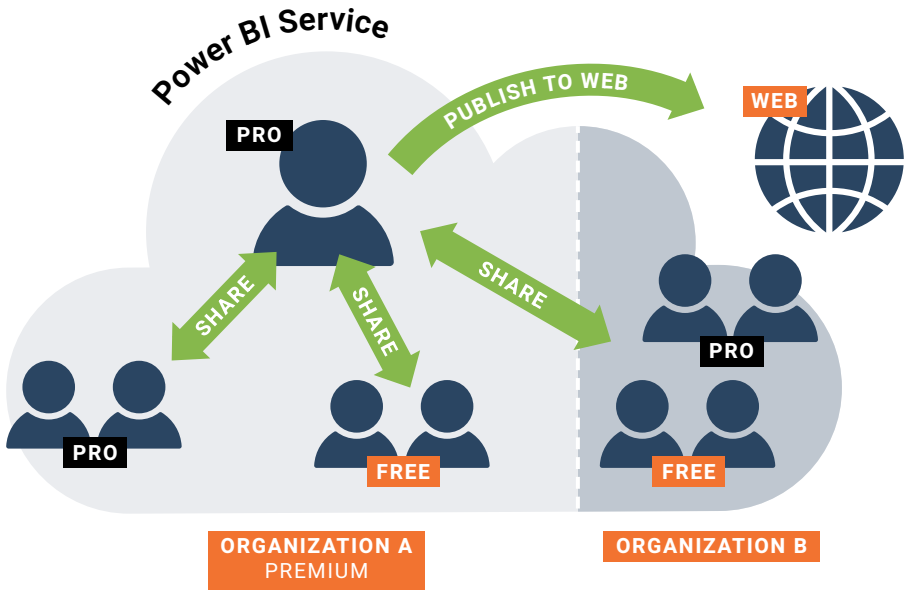
PBI Pro in only included to most extensive O365 E5 bundle or to A5 bundle targeted for educational institutions, in which case organization does not have to buy it separately for individual users. Otherwise Pro licenses must be purchased separately, which is possible even if organization does not have O365. Pro license costs about 8.40€ per month per user.



Power BI Premium

Power BI Premium capacity-based license is intended for larger organizations of over 500 people, for whom user based Pro license model would become expensive. Premium capacity is purchased as so-called nodes and one costs approximately 4200 € per month.

In Premium license model requires personal Pro licenses to be purchased only for those, who built and share reports with other users. Price calculator helps you to estimate price of the Premium license in your own organization.



Power BI Embedded

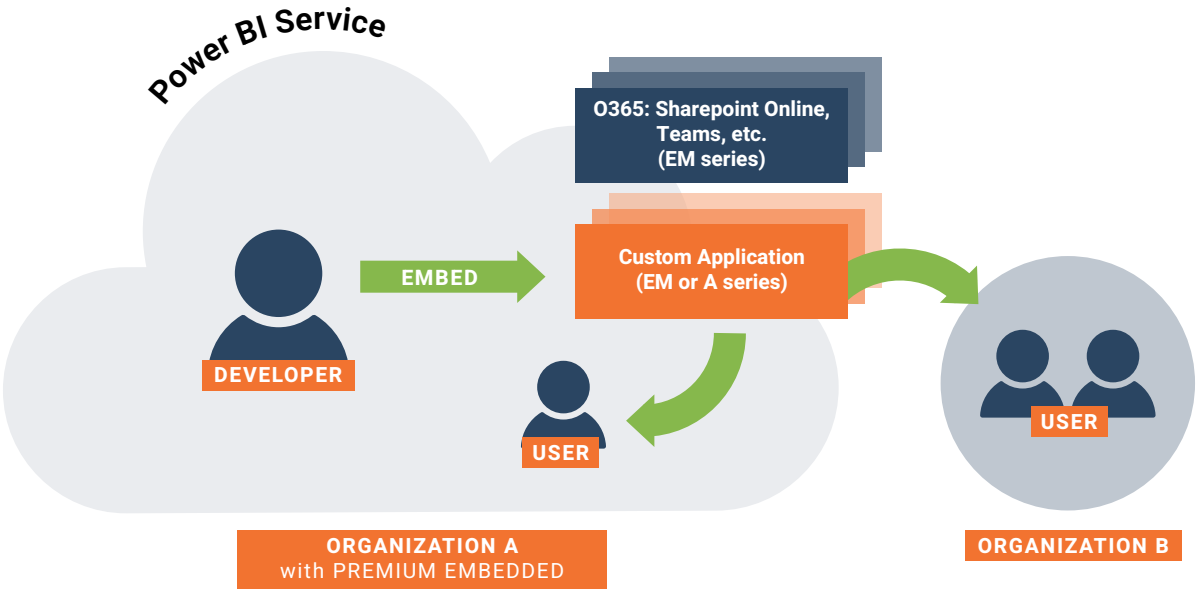
With Pro and Premium licenses Power BI reports can be embedded in variety of intra-pages and O365 products (SharePoint Online, Dynamics, Teams, Power Apps), but in some scenarios license costs of Pro and Premium would rise too high.

If the goal is to be able to implement reporting through a customer portal for **large number of customers** with **reasonable costs**, then organization should consider purchasing separate embedding license.

Power BI Embedded licenses (A or EM series) enable sharing of reports by embedding them in self-coded applications. With PBI Embedded A-series (A1-A6) licenses Premium capacity is available from around 600€ per month or even on minute basis, as the service can be closed and started when needed. A-series licenses allow embedding only in custom applications (not O365 apps), since A-series requires that authentication is handled by the application.

In addition, there is also PBI Embedded EM license series (EM1-EM3), which allows reports to be embedded in O365 products (Power Apps, Teams, SharePoint Online, Dynamics), as O365 authentication is available for EM licenses. EM licenses are available for Microsoft's volume license customers, and thus not every organization can acquire them. Pricing for EM-series starts from 600€ per month, just like with A-series, but EM licenses cannot be used on minute basis by stopping and starting the service whenever needed.

Neither license series (A or EM) allows report consumption in PBI Service or mobile apps, and so they are meant for embedding only.



Power BI Report Server

Reporting server is not separate license choice per se, since it is included in other licenses, and consequently it is accessed either

- “for free” if the organization has SQL Server Enterprise license and Microsoft’s SA or
- by purchasing previously mentioned Power BI Premium capacity license, which also allows using PBI Service

Where can I find more information?

Sulava arrange both public and customized trainings on the Power BI related topics. These trainings get excellent feedback year after year:

- Power BI perusteet (basics) workshop
- Power BI jatko (advanced) workshop
- Power BI raportit ja visualisoinnit (reports and visualizations) workshop
- DAX perusteet (basics)
- Power Query kyselyt (queries)
- Power BI arkkitehtuuri ja hallinta (architecture and management)

In addition to previous ones, we also offer coursers on other Power BI themes. Yet we build and implement or help you to build Power BI solutions that you can maintain and develop yourself in future.

Some "good to know" history

When you start studying Power BI, there is some history things you should know, so that you do not end up reading completely outdated guides or articles.

Earlier version of the product was called Power BI for Office 365 and it can essentially be considered as a kind of pre-release. During its existence in 2014–2015 it never generalized in Finland and since the old and new service differ considerably of each other, articles or guides related to Power BI for Office 365 are no longer worth reading.

Old Power BI for Office 365 product's reports were based on Power Pivot data models made in Excel and reports were made either as Pivot tables or Power View charts, and they were published to Office 365. **With new Power BI Excel is no longer needed and even Office 365 license is no longer mandatory.** Reports are in build in Power BI Desktop and published to the Power BI Service, of which license is available for purchase even without existing Office 365 license.

Even though Excel does not play the main role in the core of the Power BI anymore, it can still be an important part of the reporting process in the organization, as

- Excel files can be used as data sources
- Excel Power Pivot models can be converted to Power BI Desktop data models
- Excel files can be displayed as they are in Power BI Service with other reports
- Excel can do Pivot reports based on datasets published to Power BI Service.

Power BI is based on the same technology that was originally used in Excel 2010 PowerPivot version called Vertipaq. It was later renamed xVelocity (in-memory analytics engine) and along with Excel technology was in 2012 also adopted into Tabular models of SQL Server Analysis Services. Power BI uses the same DAX language as Power Pivot and SSAS Tabular models.

This article has been published previously in HExcelligent.

Power BI sharing and embedding features

Sharing of Power BI reports and dashboards with end users and embedding them into different locations for examination are, right after building, the most essential phases in the reporting process.

There are several sharing and embedding options available containing many issues and limitations that need consideration. Read Heidi Enho's comprehensive text that discusses different options from the perspective of both licenses and internal and external sharing.

Sulava – Creating better working life

Sulava's mission is to provide our customers with solutions that make life easier - in accordance with our logo in English "Creating Better Worklife". As our customers navigate between work, home, family and other important things, Sulava makes the experience as flexible, carefree and seamless as possible. We carry our customers' work into the future. We enable the utilisation of the competence capital of the entire organisation and build new innovations on a foundation of existing knowledge. We offer company-specific multi-channel work life architectures based on the customer's unique employee journeys, needs and touchpoints. We take care of the conceptualization and technical implementation of working life experience, and we support its adoption into employees' daily life.

Sulava Services

Sulava offers consulting and training services for modern work, business productivity, Microsoft cloud platforms, and security. We ensure our customers the best possible benefit and competitive advantage from the investments made. Sulava Services

Training Services And Test Center

Sulava is Microsoft's official training partner and our trainers are Microsoft Certified Trainers (MCT). In addition to traditional class-based training, we also offer surveys, tests, lectures, online training and training materials. Our courses

The official Pearson VUE test center is located at our training facilities at Kaisaniemi, Helsinki, where it is possible to conduct certification tests such as Microsoft and Adobe.

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