TRACE Data Visualization Requirements Guide

Reference Guide for Licensing Options of Microsoft Power BI
for Data Visualization
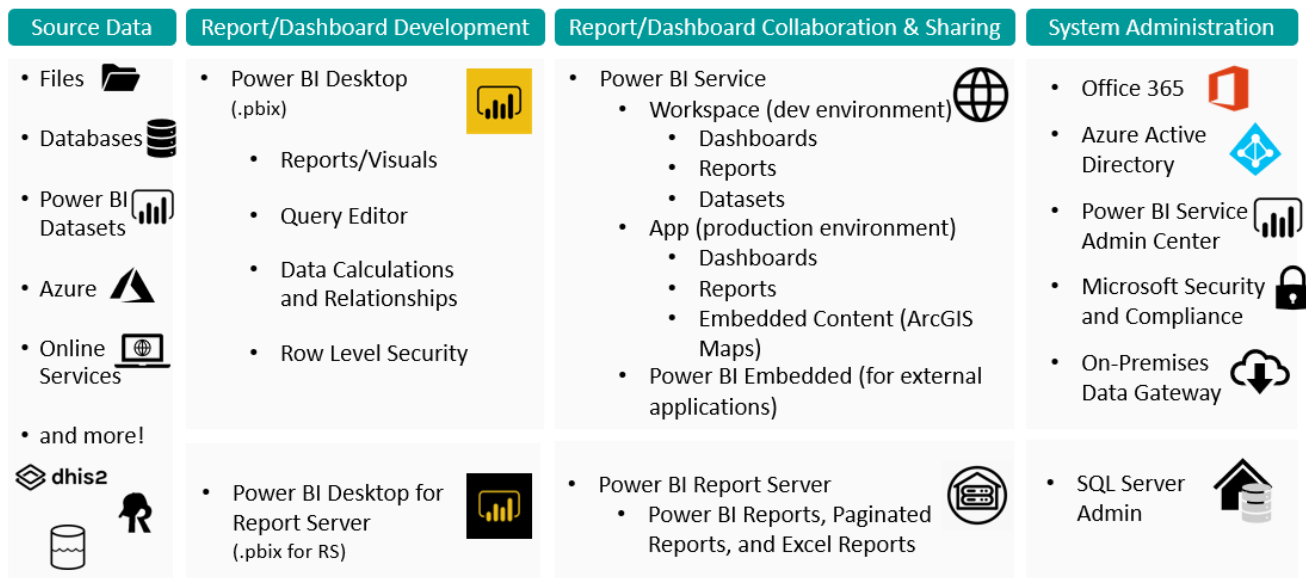
Updated: May 2020

Power BI Deployment | IT System Requirements, Licensing Options and Process

Implementation of Power BI as a data visualization and reporting platform requires both hardware and software prerequisites or system requirements.

The first step in understanding IT system requirements and licensing options is to determine how Power BI reports and dashboards will be consumed. Power BI was designed for consumption in the secure Power BI service (on the web), but for circumstances in which data transfer through the web is not an option, there is also an on-premises deployment option. IT system requirements and licensing vary depending on the decision to deploy via the web (using the Power BI service) or on-premises (via the Power BI report server). Both deployment strategies require specific Microsoft licensing, which is detailed in the licensing section below.

The diagram below gives a general overview of the end-to-end components of Power BI. When considering deployment and licensing options, items with a ⊕ icon indicate deployment via the web (Power BI service), and items with a 🖥 icon indicate an on-premises deployment via the Power BI report server.

Source Data	Report/Dashboard Development	Report/Dashboard Collaboration & Sharing	System Administration

• Files 📁
• Databases 🗄
• Power BI Datasets 📊
• Azure 🔺
• Online Services 💻
• and more!
 	
◈ dhis2
	• Power BI Desktop (.pbix) 📊
	  • Reports/Visuals
	  • Query Editor
	  • Data Calculations and Relationships
	  • Row Level Security
		• Power BI Service ⊕
		  • Workspace (dev environment)
		    • Dashboards
		    • Reports
		    • Datasets
		  • App (production environment)
		    • Dashboards
		    • Reports
		    • Embedded Content (ArcGIS Maps)
		  • Power BI Embedded (for external applications)
			• Office 365 📘
			• Azure Active Directory 🔷
			• Power BI Service Admin Center 📊
			• Microsoft Security and Compliance 🔒
			• On-Premises Data Gateway ☁

	• Power BI Desktop for Report Server (.pbix for RS) 📊	• Power BI Report Server 🖥 • Power BI Reports, Paginated Reports, and Excel Reports	• SQL Server Admin 🏠

Power BI Deployment | IT System Requirements

While the underlying system requirements for the deployment of Power BI vary depending on the architecture/licensing chosen, all options require a Power BI program installed on the desktop as a first step for building any report.

Power BI desktop is the platform that developers connect to, ingest, transform, and visualize data. There are two versions, Power BI Desktop and Power BI Desktop RS. Both are compatible with the Power BI service but only Power BI Desktop RS is compatible with the Power BI report server used for on-premise deployments of Power BI.

Both versions of Power BI desktop are free to download and have the same common underlying system requirements.

Common requirements for Power BI Desktop platform:

- Operating system: Windows 10, Windows Server 2012 R2, Windows Server 2008 R2, Windows Server 2012, Windows 7, Windows 8, Windows 8.1,
- Internet Explorer 10 or later,
- Memory (RAM): At least 1 GB available, 1.5 GB or more recommended,
- CPU: 1 gigahertz (GHz) or faster x86- or x64-bit processor recommended,
- Display: At least 1440x900 or 1600x900 (16:9) recommended. Lower resolutions such as 1024x768 or 1280x800 are not recommended, as certain controls (such as closing the startup screen) display beyond those resolutions
- Windows Display settings: If your display settings are set to change the size of text, apps, and other items to more than 100%, you may not be able to see certain dialogs that must be closed or responded to in order to proceed using Power BI desktop. If you encounter this issue, check your Display settings by going to Settings > System > Display in Windows, and use the slider to return display settings to 100%.

Additional requirements for Power BI Desktop RS:

- .NET Framework 4.5.2 or later,
- SQL Server Database Engine (2008 or later), to store the report server database,
- SQL Server Analysis Services (2012 SP1 CU4 or later), to store your data models.

Power BI Deployment | Licensing Options

In order to share Power BI report contents with end-users, Power BI licensing must be considered. Building reports in Power BI desktop is only effective if those reports can be shared, and it is the sharing part of Power BI that is associated with a cost. See the Power BI for TRACE: System Administration Guide for more information on Power BI licensing.

The purpose of this section is to provide an overview of the minimum requirements to deploy Power BI under the following licensing types: 1) **Power BI Pro**, 2) **Power BI Premium**, 3) **Power BI Embedded**, and 4) **SQL Server Enterprise Edition**.

Power BI licensing (Pro, Premium, and Embedded) is allocated and billed on a per-month basis, allowing organizations to shift between licensing options to accommodate shifting requirements/priorities. Migrating from an on-premises deployment using SQL Server Enterprise Edition to a web-based deployment is more complicated as SQL and Power BI licensing are separate entities. This type of a transition would require the establishment of O365 licensing for all users in addition to optimizing Power BI reports for the web.

1. Power BI Pro ⊕

Power BI Pro licensing enables sharing and consumption of dashboards and reports in Power BI service, the online, cloud environment at powerbi.com. Users log-in to a secure, organizational based website with their Office 365 credentials (username and password).

Requirements for deploying Power BI using Pro licensing:

- Desktop machine capable of running Power BI desktop (see above),
- Office 365 licenses for everyone: Power BI administrators, developers, and end-users,
- Power BI Pro licenses for everyone: Power BI administrators, developers, and end-users,
- Reliable high-speed internet service with two separate providers needed for business continuity (10Mbps upload and download).

With Power BI Pro, users are licensed individually and participate fully in the use of Power BI – both the creation of content and the consumption. All users with Power BI Pro licenses can connect to hundreds of data sources on-premises and in the cloud, create interactive reports and 360-degree dashboards, share that content with other users with Power BI Pro licenses, and consume content shared by others.

There are no hardware requirements for deploying Power BI Pro beyond what is listed above.

Power BI Pro is an ideal licensing solution for organizations with a relatively small number of end-users (less than 250) and for those with limited IT infrastructure and/or capacity.

2. Power BI Premium ⊕/▤

Power BI Premium licensing enables sharing and consumption of dashboards and reports in Power BI service at powerbi.com *or* via the on-premises Power BI Report Server.

Requirements for deploying Power BI using Premium licensing via powerbi.com:

- Desktop machine capable of running Power BI desktop (see above),
- Office 365 licenses for everyone: Power BI administrators, developers, and end-users,

- Power BI Pro licenses for Power BI Administrators and Developers only. End-users do not need Pro licenses,
- Reliable high-speed internet service with two separate providers needed for business continuity (10Mbps upload and download).

There are no hardware requirements for deploying Power BI Premium via powerbi.com beyond what is listed above.

Additional requirements for deploying Power BI Premium using Power BI Report Server:

- All requirements or Power BI Premium,
- Hardware and security of an existing system,
- See section 4 below for infrastructure requirements for the Power BI Report Server.

Power BI Premium is an enterprise license, meaning that you are licensing capacity for your content rather than licensing all users of that content. This licensing option should be considered an organizational license, meaning that report consumers do not need individual licenses. Content (datasets, dashboards, and reports) is stored in Premium and can then be viewed by as many users as you want, without additional per-user costs. These users can only view content, not create it. Viewing includes looking at dashboards and reports on the web, in our mobile apps, or embedded in your organization's portals or apps. The creators of content in Premium still need their own Pro licenses (this includes creation and sharing of content). Because Premium licensing is handled at the enterprise level, if the expected number of end-users exceeds 250, it is more cost effective to purchase Premium rather than individual Pro licenses.

Power BI Premium is an ideal licensing solution for organizations with a large number of end users (250+) and large volumes of data.

3. Power BI Embedded 🌐

Requirements for deploying Power BI using Embedded licensing differ from those for Power BI Pro and Premium licensing. End-users will be accessing Power BI reports via an existing website rather than in Power BI service.

Requirements for deploying Power BI Embedded are:

- Desktop machine capable of running Power BI desktop (see above),
- Office 365 licenses for Power BI Administrators and Developers only. End-users do not need Office 365 licenses,
- Power BI Pro licenses for Power BI Administrators and Developers only. In this scenario (embedding reports in an existing website), end-user authentication is handled by the website itself, and as such, each end user does not need an individual Power BI Pro license,
- Existing website with:

- o Adequate password and user authorization procedures to ensure access only by authorized users
- o Relevant data encryption mechanisms (e.g., SSL Certificates) for sending sensitive data over the network
- o Adequate network security to reduce the risk of unauthorized users accessing secure content
- o Firewall protected servers in separate and secure, designated zones that limit accessibility and protects unauthorized access to internal network servers
- o Underlying web infrastructure must be built using .net framework with IIS and Microsoft packages
- o Reputable and responsive web hosting service provider,
- Qualified web developers able to provide full-time support that have been trained with relevant network and security certifications,
- Access: web developers and Power BI developers must have access to relevant servers, both the web server and the source-data server. Web developers and Power BI developers work hand-in-hand on this deployment method, and typically work at the same organization (implementing partner and/or MOH).

Power BI Embedded is an ideal licensing and deployment solution in a scenario where end-users come from more than one organization and/or for users that do not have any existing Office 365 affiliation. Unlike the Power BI Service that utilizes Office 365 credentials, the Power BI Embedded solution handles user authentication to Power BI reports via the existing website. Because of this, skilled web developers must be on staff, which is a technical requirement that may be difficult for some organizations to meet.

4. SQL Server Enterprise Edition (using the Power BI Report Server) 🏛

Microsoft SQL Server is a scalable, high-performance database management system. The Power BI Report Server can be used at no additional cost if you are already running SQL Server Enterprise Edition. As mentioned above, the Power BI Report Server can be used with two licensing agreements: 1) Power BI Premium and 2) SQL Server Enterprise Edition. The Power BI Report Server is an on-premises deployment solution.

In order to deploy the Power BI Report Server on your existing SQL server, you must have <u>Enterprise Edition</u> with <u>Software Assurance</u>. Software Assurance is a Microsoft maintenance program designed to give users the ability to spread payments over several years, while offering "free" upgrades to newer versions of SQL during that time period.

Power BI Report Server

Requirements for deploying Power BI using the Power BI Report Server differ from deployment mechanisms via the web. End-users will be accessing Power BI reports via an <u>existing</u> intranet or server.

This is the most technically involved Power BI deployment method, as it requires an existing IT infrastructure that meets national or institutional security standards.

Power BI Report Server must be deployed with either the purchase of either Power BI Premium (option 2 above) or SQL Server Enterprise Edition (option 4 above) licensing. A hybrid deployment solution with both web-based Power BI Service and on-premises option is possible via Power BI Premium but it not recommended as it requires full installation of all listed requirements and cloud functionality are not required if Power BI is managed through on-premised architecture and licensing.

Requirements for deploying Power BI Report Server:

- Desktop machine capable of running Power BI desktop (the version compatible with the Power BI Report Server)
- SQL Server Enterprise Edition with Software Assurance
    - If your organization already has SQL Server Enterprise Edition with Software Assurance, Power BI Report Server is included at no additional cost
    - SQL Server Developer Edition will not be able to deploy Power BI Report Server
- System requirements to deploy Power BI Report Server to meet hardware and security requirements:
    - Physical:
        - Servers located in physically and environmentally secure places
        - Redundant air conditioning units to prevent overheating
        - Separate non-water-based fire detection and suppression capability
        - Access-restrictions and recordings for all personnel
        - Reliable electricity with uninterruptable power supply (battery) and backup generator source to achieve >90% availability
    - Hardware:
        - Data protection hardware with redundant data storage (e.g., RAID) with battery-backed primary elements
        - Uninterruptable power supply (UPS) with power failure sensing circuit to gracefully shut down server when power goes out
        - Sufficient primary memory capacity to facilitate data export (64 GB)
        - An IP-managed remote power switch per each server
    - Storage:
        - Backup server to maintain business continuity under failure
        - Storage space for off-site backups
    - Security:
        - Actively managed Microsoft Exchange for user management
        - Adequate network security to reduce the risk of unauthorized access
        - Firewall protected servers in separate and secure, designated zones that limit accessibility and protects unauthorized access to internal network servers

- Full administrative permissions
  - o Staffing:
    - Qualified IT and Database managers providing full-time server maintenance and troubleshooting
    - Staff trained with appropriate network and security certifications. Certifications will correspond with source systems. In the case of SQL Server and Power BI Report Server, relevant certifications are SQL Database Development, SQL Database Administration, and/or SQL Business Intelligence Development.

Power BI Deployment | Process

Deployment/implementation steps are similar regardless of which deployment type and strategy your organization selects.

Requirements Gathering → Determine Architecture / Licensing → Training → Establish Content Organization → Build and Deploy → Set Adoption Targets → Maintain, Review and Amend
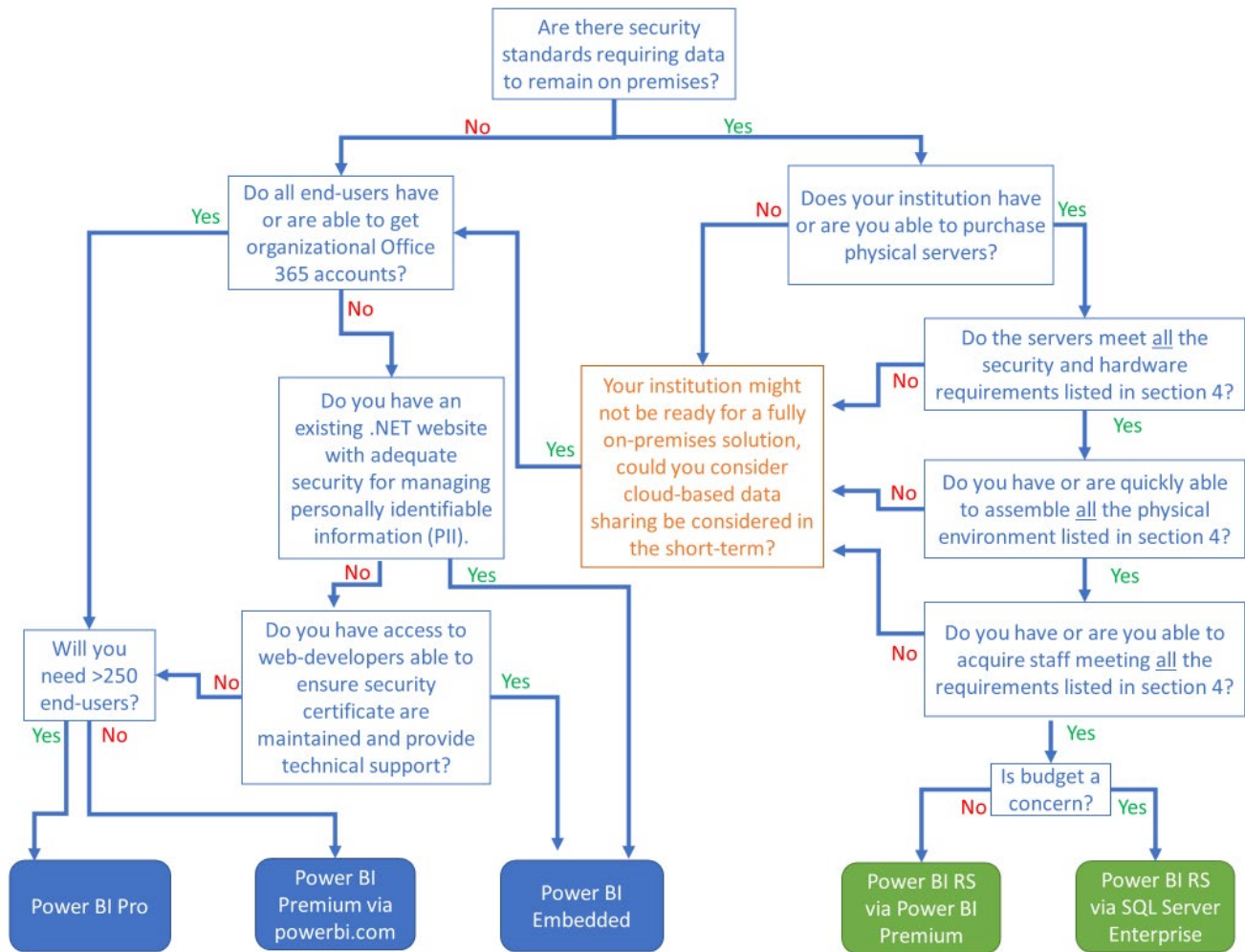
1. Requirements Gathering

Prior to the implementation of Power BI, country teams should discuss a few key questions that will help them inform deployment, architecture, and licensing decisions. This list is not exhaustive and is meant to serve as a primer for deployment discussions within your organization.

Key questions to ask when planning your deployment:

- Does your organization have existing Office 365 licenses?
- Where is source data stored?
- Who are your report developers, end-users, and system administrators?
- How do end-users want to consume this data?
  - o Options: cloud based or on-premises deployment
- Approximately how many end-users will there be?
- How frequently will data be updated (in the source)?
- What is the existing IT infrastructure? Does it meet the requirements to support an on-premises deployment of Power BI using Premium of SQL Server Enterprise Edition licensing?
- Are there security standards requiring data to remain on premises?
- Are data coming from a structured or unstructured data source? Will there be requirements for certain users to see only certain data?

2. Determine Architecture and Licensing

Determining architecture and licensing requirements is critical to getting started with Power BI, and the answers to the questions above will inform said decisions. There are a few different options to choose from, depending on your budget, your needs, and how you want to deploy the software. This decision tree is intended to assist you in coming to the right decision based on your needs and institutional capabilities.

Are there security standards requiring data to remain on premises?

No → Do all end-users have or are able to get organizational Office 365 accounts?

Yes → Does your institution have or are you able to purchase physical servers?

Do all end-users have or are able to get organizational Office 365 accounts?
- Yes →
- No → Do you have an existing .NET website with adequate security for managing personally identifiable information (PII).

Does your institution have or are you able to purchase physical servers?
- No → Your institution might not be ready for a fully on-premises solution, could you consider cloud-based data sharing be considered in the short-term?
- Yes → Do the servers meet all the security and hardware requirements listed in section 4?

Do the servers meet all the security and hardware requirements listed in section 4?
- No → Do you have or are quickly able to assemble all the physical environment listed in section 4?
- Yes → Do you have or are quickly able to assemble all the physical environment listed in section 4?

Do you have or are quickly able to assemble all the physical environment listed in section 4?
- No → Your institution might not be ready... (cloud-based data sharing)
- Yes → Do you have or are you able to acquire staff meeting all the requirements listed in section 4?

Do you have or are you able to acquire staff meeting all the requirements listed in section 4?
- No → Your institution might not be ready... (cloud-based data sharing)
- Yes → Is budget a concern?

Is budget a concern?
- No → Power BI RS via Power BI Premium
- Yes → Power BI RS via SQL Server Enterprise

Do you have an existing .NET website with adequate security for managing personally identifiable information (PII).
- No → Do you have access to web-developers able to ensure security certificate are maintained and provide technical support?
- Yes → (→ cloud-based data sharing consideration)

Do you have access to web-developers able to ensure security certificate are maintained and provide technical support?
- No → Will you need >250 end-users?
- Yes → Power BI Embedded

Will you need >250 end-users?
- Yes → Power BI Pro
- No → Power BI Premium via powerbi.com

Outcomes:
- Power BI Pro
- Power BI Premium via powerbi.com
- Power BI Embedded
- Power BI RS via Power BI Premium
- Power BI RS via SQL Server Enterprise

The matrix below provides a summary overview of licensing options. Additional details on Power BI licensing including considerations and associated costs can be found in the [Power BI for TRACE: System Administration Guide](#) and in the official [Microsoft documentation](#).

Consideration	Pro	Premium	Embedded	Report Server
Number of End-Users	< 250	> 250	any	any
Deployment	Cloud	Cloud/ on-premises	Cloud via existing website	on-premises
Technical Capacity (IT) needed	Low	Medium / High	High	High
Licensed by	User	Capacity	Capacity	Core (SQL), Capacity (Premium)
Refresh Frequency	8 times/day	48 times/day	8 times/day	dependent on source data

3. Training

Training is an essential component of a strong deployment strategy. Users of all types and levels need both introductory and ongoing training opportunities. Training content differs based upon the type of Power BI user: end-users vs. developers vs. administrators.

Introductory training should focus on:

- End-users: shaping research questions, communicating with developers, navigating around Power BI in the service
- Developers: report development, collaboration, and sharing in the service (or report server)
- Administrators: management and set up of users, shared workspaces and apps, determination of shared storage for desktop files, reporting standards

4. Establish Content Organization (Workspaces and Apps)

A Power BI workspace is a shared environment for a group of people to collaborate on the development of collections of Power BI dashboards and reports, and an App is the corresponding distribution mechanism for sharing that content to end-users. The establishment of core workspaces for collaboration and sharing is essential prior to building any Power BI reports, as this is the backbone of any Power BI solution. Administrators and developers should discuss how content will be stored and distributed with end-users and decision makers. This critical step will ensure that deployment is well managed and organized, and that more complex issues are considered (such as access, developer roles and levels, and row-level security). For a complete list of considerations related to content organization and access levels, please see the TRACE Data Governance and Sharing Plan. Note that distribution of content via Power BI Embedded and the Power BI Report Server is managed differently, as there is no "development" and "production" space inside of Power BI for these deployment mechanisms. The same issues do need to be understood and considered, but implementation will be led and managed by a designated IT team (rather than by developers in the Power BI service).

Key questions to ask when establishing how to organize the content distributed with end-users:

- Who should have access to what reports in the development space and/or production environment? Which developers should be working together, accessing, and collaborating on reports? Are there restrictions for end-users as to who is able to see what reports and/or what kinds of data?
- What is the sign-off/review process between development (by Power BI developers) and production, where end-users see/consume data?
- Are there end-users that need read-only access to Power BI reports in the development space before they are distributed in the production environment?
- Should the content be organized by subject matter or by related data sets?

5. Build and Deploy

The next step in the process is to have developers build, deploy, and maintain Power BI reports for consumption by end-users. The TRACE team has done extensive requirements gathering and developed a Power BI template file, which is intended to set teams up with the key program metrics for monitoring recent HIV infections for surveillance purposes. This template file should be adapted to suit country needs and context, and can then be deployed according to the decided upon architecture and licensing. It is recommended that the underlying key

program metrics and calculated measures not be modified without prior approval from the TRACE Initiative HQ support team. Visuals and additional indicators can be added to adapt to country-specific needs.

One of the most critical elements of implementing any new technology is that end-users need to trust the data they are seeing in the system. To foster this, it is critical that all reports are critically reviewed and signed-off on prior to being distributed to a larger audience. Each team should have a documented review process and one single person should be responsible for pushing content from development to production.

If reports are being deployed via the Power BI service, the workspace is the development environment and the app is the production environment, and one developer should be responsible for updating the app with the latest report versions. Other deployment mechanisms will require more thoughtful and documented review and approval processes. If reports are being deployed on-premises using the Power BI Report Server or using Power BI Embedded, the development and production process and workflow will vary and must be discussed and agreed upon prior to building and deploying Power BI reports. See appendix A for the Power BI report publication checklist.

6. Set Adoption Targets

Setting adoption targets helps Power BI administrators set a measurable goal and helps monitor the success of deployment. Adoption targets and the monitoring of usage metrics help IT/Informatics staff understand if reports are helping end-users make decisions. There are a number of issues that may influence adoption, including access, report layout, and report content.

The ultimate goal of deploying Power BI is to enable decision makers to have the right data, at the right levels, and at the right time. While measuring the proportion of decisions that are made using data from Power BI may be difficult, it is not difficult to monitor how often Power BI reports are being accessed and used. For example, if your organization has 10 District Coordinators that are responsible for identifying recent HIV cases in their respective districts and ensuring that the associated health facilities receive enhanced support, it is critical that all 10 District Coordinators are accessing and using the Power BI report associated with that data. By monitoring Power BI report metrics, administrators and developers can see who is accessing reports and what report pages they are using. Setting adoption targets up-front will assist your team in monitoring the success of: Power BI adoption, data use, and timely decision making.

In this example, a reasonable adoption goal might be to have each of the 10 District Coordinators accessing reports at least once a week, which would mean that in the first month of deployment, the report of interest would have at least 40 views. Each organization should set a threshold for adoption, meaning, that the deployment of a particular report can be deemed successful if it is referenced *x* number of times per day/week/month/quarter. This threshold will depend on a number of different factors, including: the purpose of the report, how frequently each end user references that particular data to make decisions, and if end-users have more than one location to access the same data. Setting adoption targets and usage threshold metrics are a key component of successful adoption of Power BI.

Power BI has inbuilt monitoring capabilities for dashboards and reports that assist administrators and developers to ensure that their content is useful, which will result in a successful Power BI deployment. Note that this type of monitoring is built into the Power BI service. Organizations deploying Power BI using the Report Server and Power BI Embedded should also plan to monitor report usage metrics, but it will look slightly different. If deploying via the Power BI Report Server, report views can be monitored using the Report Server Execution Log.

This is completed on the server, outside of Power BI. If deploying via Power BI Embedded, distinct report usage can be tracked via user management of the website itself. The figure below shows an example of inbuilt report usage metrics in the Power BI service.
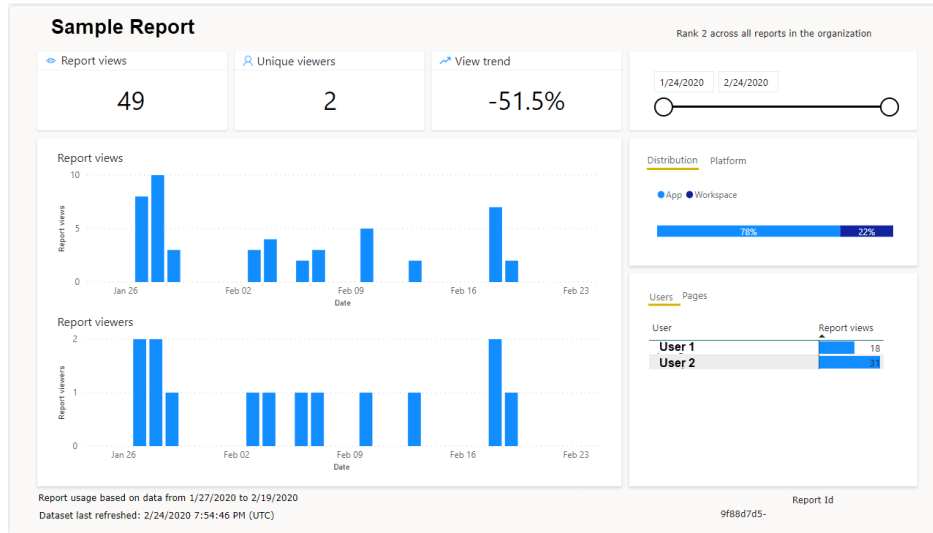
7. Maintain, Review, and Amend

Country teams will need to establish a process for updating and maintaining reports, as well as responding to user needs. This process should include a shared space that end-users, developers, and administrators are able to access where requested changes can be documented. In addition to having a space for documentation, a process for approval of requested changes needs to be put in place. It is very easy for the number of requested changes to balloon beyond the capabilities of one developer, so there must be a management or review process in place that determines which changes are top priority and which are perhaps unnecessary.

Items to be considered in a request change form are:

In this shared space, there should also be space for developers to make notes and ask questions.

It is of critical importance that all users understand that simply having a space to request changes is not a process in and of itself. Regular meetings will need to be held along with check-ins with management on the prioritization and progress of requested changes.

In addition to the changes that are requested by end-users, Power BI developers must keep an eye on usage metrics (see adoption targets above) to understand if the published reports are meeting user needs.

In the example above, if all 10 of the District Coordinators accessed the reports in the first month they were deployed, but they have not checked them at all in the second month, developers need to start asking some questions. Are all 10 individuals:

- Able to access the reports? Is anyone having issues with logging in?
- Is the data in the reports as up to date as they need?
- Is there an alternate data source that they find more useful?
- Are the graphs and charts that are displayed in the report difficult to interpret/use?

The process of maintenance, review, and amendment of Power BI reports is critical to the success of the product, and ultimately of data use.

Appendix A:

Power BI Report Publication Checklist

Prior to publication in the <u>development space</u>, developers to double check:

Back-end data model settings:

- ☐ Are tables, fields, and calculated measures named consistently?
- ☐ Are calculated measures located in the table that makes the most sense?
- ☐ If using static excel or csv files as a source, are parameters set to easily allow changing the file path?
- ☐ Does your Power BI report include a date table? And is that date table linked to the correct field in your fact table?
- ☐ If using row-level security, have the views been set properly?
- ☐ Are relationships functioning as you would expect? Sort and filter items in your report to double check.

Front-end report settings:

- ☐ Are all visuals appearing as they should? (eg, does anything look broken?)
- ☐ Are all of the report and page level filters set according to user preference?
  - ☐ Consistent
  - ☐ Hidden/visible
  - ☐ Locked
- ☐ Are visual headers turned on (for charts/graphs/tables/anything interactive) and turned off (for textboxes/headers)
- ☐ Do all visuals appear to be sorted in a manner that makes sense? Particularly considering when slicers/filters are used?
- ☐ Are all bookmarks/buttons functioning properly?
- ☐ Are all of the visual layers set properly? Is anything hidden that should not be?
- ☐ Is the tab order set properly?

Prior to publication from the development space to the <u>production environment</u>, developers to double check:

Report(s) have gone through a Quality Assurance/Review process with written sign off that checks:

- ☐ Report figures – are they accurate? Are they consistent between report tabs? Is data missing that is expected?
- ☐ Timeliness of data – is report as up-to date as expected?
- ☐ Report visuals – are visuals presented in an easy to interpret manner?

Administration settings:

- ☐ Is the ability to export summarized/underlying data turned on/off?
- ☐ If deploying via the Power BI Service, is the "App" set to automatically install?