Power BI Playbook

Contents

Introduction

This document is a set of practices and resources for use by Microsoft Cloud Solution Architects to help ensure the success of their Power BI Customer engagements. For more detailed information about the items listed in this document and other information please review the Power BI guidance documentation, https://docs.microsoft.com/en-us/power-bi/guidance/.

CSAs can use the Power BI Playbook to:

- Help ensure customer success by proactively following the guidelines and using the tools and resources included in the playbook.
- Prioritize and guide customer escalations and troubleshooting engagements to identify places where best practices are not being followed.
- Increase their deep knowledge of successful Power BI implementations and reduce their reliance on external teams and resources for typical Power BI engagements.

Power BI Resources

There are many websites, blog posts, whitepapers and tools available that can assist when developing Power BI content. This section provides an abbreviated list of those items.

Knowledge

- Power BI Whitepapers
- Power BI Guidance Documents
- SQLBI
- RADACAD

Tools

- DAX Studio
- Vertipaq Analyzer
- Tabular Editor
- BISM Normalizer
- Power BI Tips
- Power BI Helper

Transform and Shape Data

With Power BI Desktop, you can connect to many different types of data sources, then shape the data to meet your needs, enabling you to create visual reports that you can share with others. **Shaping data means transforming the data** – such as renaming columns or tables, changing text to numbers, removing rows, setting the first row as headers, and so on.

	Topic	How To	Description
☐	Push Transformations to Source	• Views • Source (Excel, csv, etc..) • Native Queries	Excessive data preparation in the query editor can possibly slow down refreshes and have other adverse effects on the Power BI report. Try, when possible to push calculations and other data prep operations to the sources. **For more information see:** 1. Where to create your columns
☐	Optimize Query Folding	Power Query Editor	Power Query allows you to manipulate data in many ways. In some cases, those manipulations cannot be pushed back to the source. Ensure that all transformations that can are done first. **For more information see:** 1. Where to create your columns 2. The importance of query folding
☐	Remove Useless Columns	Power Query Editor	Including columns that are not used in the model is a waste of memory. Ensure that you have removed any and all columns that are not used by the model or reports. 1. Reduce data model size
☐	Develop a naming standard for Tables and Columns	Power Query Editor	Use human readable names and correct business terminology and apply it consistently across your organization. It is important for usability for developers and consumers. **For more information see:** 1. Naming Objects 2. Optimizing Tabular Development

	Topic	How To	Description
☐	Avoid Excel as a Source when possible	• Get Data • Power Query Editor	In general, a relational database is always a better idea than a file. If you do need to use a file you should avoid using Excel files – reading from Excel is much, much slower than reading from csv. Reading from files stored in SharePoint also has problems.
☐	Use dataflows to speed up slow data sources	• Get Data • Power Query Editor • Power BI Service	In general, if you have a slow data source (eg Excel) I recommend using a dataflow to stage the data, then loading into Power BI from the dataflow instead. Also, if you have Premium, putting the dataflow in Premium means you can take advantage of the new compute engine. **For more information see:** 1. BI Polar 2. Dataflows best practice

Data Modeling and Relationships

The data model is key to any power bi deployment. A poorly designed data model can affect performance, but also can slow down or deter consumers from using Power BI artifacts. Ensuring that the model adheres to the below guidance can assist enhancing the data model.

Guidance

	Topic	How To	Description
☐	Is there a Star-Schema?	• Power BI Desktop > Data Model View	A mature data model that consists of Dimensions and Facts, which is optimized for reporting. **For more information see:** 1. What is a Star Schema?
☐	Check the model size	• View the file size • Vertipaq Analyzer •	Import models are loaded with data and stored to disk by the Vertipaq storage engine. Often, unnecessary columns and/or rows are imported. Identify possible optimization opportunities can quickly be identified by using the Vertipaq Analyzer and the Reduce data model size guidance document. **For more information see:** 1. Reduce data model size 2. Reduce Dataset Size
☐	Modeling for Scalability	• DAX Studio • Vertipaq Analyzer	Not just a dimensional model, but also model to take full advantage of the AS Engine, so that you can hold as much data/history as possible (while also modeling for query speed): 1. Modeling for scalability WP
☐	Don't overuse Calculated Columns	• Power BI Desktop • Vertipaq Analyzer •	Calculated columns can overuse memory will building. In some cases, they can cause extreme spikes during processing and can negatively affect the performance of the report. Use the vertipaq analyzer you can quickly identify the calculated columns that are included in a model. **For more information see:**

			1. High memory Usage and Calculated Columns 2. Where to create your column
☐	Identify useless Columns	• Vertipaq Analyzer • PBI Field Finder	Always try to expose only the columns that are necessary. By reducing the number of columns, you reduce the amount of data loaded into memory. **For more information see:** Best Practice Analyzer rule within Tabular Editor: (IsHidden or Table.IsHidden) and ReferencedBy.Count = 0 and (not UsedInRelationships.Any()) and (not UsedInSortBy.Any()) and (not UsedInHierarchies.Any()) and (not Table.RowLevelSecurity.Any(it <> null and it.IndexOf("[" + current.Name + "]", "OrdinalIgnoreCase") >= 0)) and (not Model.Roles.Any(RowLevelSecurity.Any(it <> null and (it.IndexOf(current.Table.Name + "[" + current.Name + "]", "OrdinalIgnoreCase") >= 0 or it.IndexOf("'" + current.Table.Name + "'[" + current.Name + "]", "OrdinalIgnoreCase") >= 0))))

DAX

Data Analytic Expression (DAX) is a collection of functions, operators, and constants that can be used in a formula, or expression, to calculate and return one or more values. Stated more simply, DAX helps you create new information from data already in your model.

	Topic	How To	Description
☐	Use variables	• DAX Editor	Variables store the results of an expression that can reused within the context of that expression. Overall, because of the reusability performance and readability of the DAX code is improved by using variables. **For more information see:** 1. VAR Function 2. Variables in DAX 3. Use variables to improve your formulas
☐	Use DIVIDE instead of (/)	• DAX Editor	The DIVIDE function has been designed to automatically handle division by zero cases. If an alternate result is not passed in, and the denominator is zero or BLANK, the function returns BLANK. If an alternate result is passed in, it's returned instead of BLANK. The DIVIDE function is convenient because it saves your expression from having to first test the denominator value. The function is also better optimized for testing the denominator value than the IF function. The performance gain is significant since checking for division by zero is expensive. Using DIVIDE also results in a more concise and elegant expression. **For more information see:** 1. DIVIDE Function 2. DIVIDE vs (/)
☐	Filter on column instead of table	• DAX Editor	Identifying the right granularity for filtering is important to control the result and the performance. A common mistake

			is filtering on an entire table, when filtering on a column is more efficient. **For more information see:** 1. Filter Function 2. Filter Arguments in CALCULATE 3. Filtering Tables in DAX
☐	Avoid Intermediate Calculated columns	• DAX Editor	In some cases, calculated columns are necessary and can't be avoided. These calculated columns often result in an overuse of CPU or memory. This can be avoided by replacing the calculated column with a single measure. **For more information see:** 1. Calculated Columns and Measures 2. High Memory Usage and Calculated Columns 3. Create Calculated columns in Power BI
☐	Use COUNTROWS instead of COUNT	• DAX Editor	If the intention of a DAX calculation is simply count the number of rows in a table to identify the instances of an entity, the COUNTROWS() function provides a more efficient and performant approach to derive the correct result. **For more information see:** 1. COUNTROWS Function 2. COUNT Function 3. Use COUNTROWS instead of COUNT

Security

	Topic	How To	Description
☐	Disable Publish to Web	• Admin Portal > Tenant Settings	With Power BI's **Publish to web** option, you can easily embed interactive Power BI visualizations online, such as in blog posts, websites, through emails or social media, from any device. You can also easily edit, update, refresh, or unshare your published visuals. **For more information see:** 1. Publish to Web
☐	Understand Workspace Roles	• Power BI Service	To grant access to a new workspace, add user groups or individuals to one of the workspace roles: viewers, members, contributors, or admins. Everyone in a user group gets the role you've defined. If an individual is in several user groups, they get the highest level of permission provided by the roles they are assigned. **For more information see:** 1. Roles in Workspace
☐	Dynamic Row-level security	• Power BI Desktop • Power BI Service	Row-level security (RLS) with Power BI can be used to restrict data access for given users. Filters restrict data access at the row level, and you can define filters within roles. Be aware that in the Power BI service, members of a workspace have access to datasets in the workspace. RLS doesn't restrict this data access. **For more information see:** 1. Row-level security 2. Dynamic Row-level security cheat sheet
☐	Share Content with Apps	• Power BI Service	In Power BI, you can create official packaged content, then distribute it to a broad audience as an *app*. You create apps in *workspaces*, where you can collaborate on Power BI

			content with your colleagues. Then you can publish the finished apps to large groups of people in your organization. **For more information see:** 1. Publish an app in Power BI 2. Distribute Report to large audiences

Large Scale Models

When creating larger Power BI or Tabular data modes it is important to use the best practices to design the model. While you can use many modelling techniques to make it work you can use the following checklist to understand

	Topic	How To	Description
☐	Is there a Star-Schema?	Use the diagram view to determine what the model looks like.	Using a traditional star schema has many benefits in Power BI \ Tabular models, it helps: - end users understand the data model for any potential self-service report building - loading data in a star schema often means data is normalized in dimensions, which can lead to faster loading of the data - Calculations often work better in a star schema, here it can filter data on a small dimension table and use the relationships in the model to filter the larger fact tables. Also, when using a star schema DAX expressions will be easier to write in a performant manner. **For more information see:** 1. The data model section that covers this in more details. 2. Modeling for scalability WP 3. What is a Star schema?
☐	DAX		**For more information see:** 1. DAX in a large enterprise model is similar as DAX for Power BI, so please refer to the DAX section of this document. 2. As modeler you can control if your end users can create their own measure or drag in any numerical column as implicit measures, this might cause performance problems. This can be controlled by setting the "DiscourageImplicitMeasures" property as described here: https://docs.microsoft.com/en-us/analysis-services/tabular-models/calculation-groups#limitations

☐	Does your model have large fact tables?	Use the diagram view to determine what the model looks like.	If your model has large fact tables, it might be beneficial to use aggregations to optimize the model to manage these large tables. By providing pre-aggregated tables, you can highly improve the performance of a Tabular data model. Both in query and processing performance. **For more information see:** 1. https://docs.microsoft.com/en-us/power-bi/desktop-aggregations 2. https://www.sqlbi.com/tv/aggregations-in-power-bi/
☐	Incremental refresh	Management studio	When you load more data into your data model refreshing data will become more complicated. Power BI by default loads all data while tabular models allow you to partition data and load them incrementally. **For more information see:** 1. Partitions allow you to load data incrementally or even partially, this : https://docs.microsoft.com/en-us/analysis-services/tabular-models/partitions-ssas-tabular 2. When columns are used for MDX clients they use more memory and take longer to load. This can be controlled by setting "IsAvailableForMDX": https://blogs.msdn.microsoft.com/analysisservices/2018/06/08/new-memory-options-for-analysis-services/
☐	Are there relationships with Bidirectional cross filtering?	Use the diagram view to determine if there are relationships that have Bidirectional cross filtering turned on. For them determine if they are needed.	Bidirectional cross filtering allows modelers to change how filters are being applied to the data. When enabling Bidirectional cross filtering on many relationships you could have performance issues due to more many tables being filtered. **For more information see:** 1. The general guidance is to not have Bidirectional cross turned on your relationship unless it is really needed. You can also turn it on for just specific measures using CROSSFILTER: https://docs.microsoft.com/en-us/dax/crossfilter-function. This

			keeps you the modeler in control of where he wants cross filtering to occur and not everywhere. 2. Another common use for using bidirectional cross filtering is to filter slicers, this can now be solved by filtering slicers using a measure as is described here: https://www.kasperonbi.com/showing-only-slicer-data-that-have-facts-in-power-bi-and-other-fun-tricks/ 3. For more information on how cross filtering works see: https://docs.microsoft.com/en-us/analysis-services/tabular-models/bi-directional-cross-filters-tabular-models-analysis-services
☐	Inefficient RLS	SSDT or Power BI desktop	Row level security is a feature that is getting used in 99% of the enterprise models. For best performance it is recommended to use a dimensional model for your tables and to make sure that the table you want to define your security rule on is as small as possible (normalized). This will make it fast to filter, the relationships to the other tables will make they are getting filtered as well as RLS in the engine propagates over relationships. **For more information see:** 1. https://www.sqlbi.com/articles/security-cost-in-analysis-services-tabular/
☐	Do not use for low level granular reports	Client tools	Often reports are recreated from Excel or SSRS to Power BI. When these are handled as lift and shift this leads to performance issues. Large granular and detailed visuals (often a matrix) that retrieves a lot of data from the model can lead to performance issues. Especially if this on the frontpage of every report and opened by all users. The advise is to redesign the report optimized for Power BI and either keep these types of visuals in SSRS and/or put them behind a drill through.

Premium Capacity

	Topic	How To	Description
☐	Install Premium Capacity App	Power BI Service	Monitoring your capacities is essential to making informed decisions on how best to utilize your Premium capacity resources. You can monitor capacities in the Admin portal or with the Power BI Premium Capacity Metrics app. This article describes using the Premium Capacity Metrics app. **For more information see:** 1. Premium Capacity Metrics App 2. Monitor Premium Capacities
☐	Understand Capacity Resources	Power BI Enterprise Deployment Whitepaper	Metrics should be monitored to establish a baseline understanding of resource usage and workload activity. If the capacity becomes slow, it is important to understand which metrics to monitor, and the conclusions you can make. Ideally, queries should complete within a second to deliver responsive experiences to report users and enable higher query throughput. It is usually of lesser concern when background processes - including refreshes - take longer times to complete. **For more information see:** 1. Deploying and Managing Power BI Premium Capacities
☐	Optimizing Refreshes		Slow refreshes can hinder the overall usage and performance of a Power BI deployment. Understanding how refreshes work and how to optimize refreshes is critical. **For more information see:** 1. Configure Scheduled Refresh 2. Data Refresh in Power BI

			3. Incremental Refresh
☐	Identify Slow Queries	Performance Analyzer DAX Studio SQL Server Profiler	Slow reports refreshes can hinder the overall usage and performance of a Power BI deployment. Identifying which elements of your reports is critical to a successful deployment. Use the following resources to where to start. **For more information see:** 1. Why is my report slow? 2. Use Performance Analyzer

Admin and Deployment

	Topic	How To	Description
☐	Review tenant settings for Organization appropriateness	• Power BI Service > Tenant Settings	The **Tenant settings** tab enables fine-grained control over the features that are made available to your organization. If you have concerns around sensitive data, some of our features may not be right for your organization, or you may only want a particular feature to be available to a specific group. **For more information see:** 1. Tenant Settings 2. Power BI Admin Portal 3. Understanding the Power BI Admin Role
☐	Export/Archive Audit log data	• Power BI Service > Audit Logs • Office 365 Portal	Knowing who is taking what action on which item in your Power BI tenant can be critical in helping your organization fulfill its requirements, like meeting regulatory compliance and records management. Use Power BI auditing to audit actions done by users, like "View Report" and "View Dashboard". You can't use auditing to audit permissions. **For more information see:** 1. Use auditing within your organization

The Gateway

	Topic	How To	Description
☐	Properly Size Gateway		An undersized gateway environment can negatively affect your Power BI deployment. Understanding the minimum hardware and software requirements are critical to a successful gateway deployment. **For more information see:** 1. Gateway requirements 2. Guidance for deploying a data gateway for Power BI
☐	High Availability and Clustering the Gateway	• Power BI Service • Gateway Installation	You can use an on-premises data gateway cluster to avoid single points of failure and to load balance traffic across gateways in a cluster. **For more information see:** 1. Gateway High Availability and Clustering 2. Add another gateway to create a cluster
☐	Proactively Monitor Gateway	• Server where gateway resides • Gateway Template File	**For more information see:** 1. Monitor and Optimize on-premises data gateway performance 2. Gateway Performance Template 3. Troubleshoot the on-premises gateway
☐	Update Gateway		Just like many other aspects of Power BI, the gateway is updated monthly. Each of these updates includes new features along with the latest Mashup Engine. As a result, it is critical to keep the gateway updated to ensure that your Power BI deployment is not affected. **For more information see:** 1. Update an on-premises gateway
☐	Migrate, restore or take over gateway	• Gateway installer	In some cases, the gateway may need to move or be restored. Use the following documentation for those activities.

			For more information see: 1. Migrate or Restore gateway

Report Creation

	Topic	How To	Description
☐	Use report tooltips to enhance report	• Power BI Desktop	Report page tooltips can enhance the experience for your report users. Page tooltips allow your report users to quickly and efficiently gain deeper insights from a visual. **For more information see:** 1. Report Page Tooltips 2. Extending Visuals with report page tooltips
☐	Use report page drill-through	• Power BI Desktop	If a customer is adopting Azure for the first time it is essential for customer to know the Azure Fundamentals and various component integration points like Azure Active Dir, Network etc well. Onboarding workshop helps customer onboard faster and better. **For more information see:** 1. Configure report page drill-through 2. Report page drill-through

Pre / Post Sales Condition of Success

	Topic	How To	Description
☐	Customer Dev Readiness	• DiaD • Advanced Modeling in PBI • Videos • Docs • Blogs	Identify the developers / fans who can help use and boast Power BI and ensure they undergo the right set of trainings to help them use PBI in an effective way
☐	Customer Admin and other team's Azure Onboarding	• Azure Onboarding Workshop	If a customer is adopting Azure for the first time it is essential for customer to know the Azure Fundamentals and various component integration points like Azure Active Dir, Network etc well. Onboarding workshop helps customer onboard faster and better.
☐	Is partner / MCS attached to Engagement in Validate / show value (Proof of Concept) phase	• MSX engagement details	It is essential that Partner or MCS consultant is attached to the engagement in early stages. The POC implementations gives taste to a customer environment and possible future challenges. This also helps in setting things right from the first step by reviewing tenant setup, technical architecture, overall architecture.
☐	Do we have regular Cadence meetings with Executive sponsors from Customer, Partner and MS?	• Engagement Progress	It is essential for CSAs to arrange regular calls with Exec Sponsors. This helps keep everyone informed and aware of the challenges during implementations and reduce slippage.
☐	Regular 3-way meetings	• Issue tracking excel	CSAs to a lead and arrange regular cadence meetings to follow up on dev progress during the implementation phase between customer, Partner / MCS and an Account / CSA team. This will help to take actions well in time and make appropriate changes in time if required
☐	Is the customer aware of where to log a support ticket or how and whom to involve in case of issues?	• In case of Pro the support center contact details • For Premier contact details of TAM, support center with their required support contract ID	It is essential for a customer's BI / Admin team to know where and how to log a ticket in case of an issue

☐	For Large deals is Dedicated Support Engineer, with deeper understanding of Data Platform and Power BI, assigned to the customer with a proper planned post sales engagement model and clear roles and responsibilities	• TAM • PFE Services involvement	It is always a good idea to involve DSE from the implementation stage based on whether Support agreement is in place etc. This helps them involve in automation of administration, testing, monitoring and optimization right from the beginning
☐	What is plan for end-user Adoption for customer?	• End-user trainings • Videos • Release notes etc.	Ensure there is plan for end user Adoption of developed reports / dashboards for customer. Do they have end-user trainings, videos, release notes etc. internally
☐	Configure Auto Notifications on Customer Tenant downtime / incidents	• Azure	As a Proactive engagement it is essential for CSA / DSE to know about customer's tenant outages in Azure so they can readily get engaged with them proactively.
☐	Help customer's right contact to be configured for Customer Notifications through Azure Health Notification tool		It is important that right contact is set for notification of tenant outages so that the right person from customer team gets notified and s/he can react to it to take appropriate actions.