Google business intelligence notes

Module 1: Foundations of Business Intelligence

**Business intelligence drives change**

As you have been learning, a business’s ability to identify issues before they become problems or act on opportunities before their competition is key to intelligent decision-making. Now more than ever, we have access to data about our marketplace, organizations, customers, competitors, and employees. But in order to turn that data into rapid results, we need business intelligence. Business intelligence involves automating processes and information channels in order to transform relevant data into actionable insights that are easily available to decision-makers.

In this reading, you’re going to explore two examples of how BI has helped real businesses gain insights, access the right data, and find ways to grow and improve their processes to put those insights to work.

**Restaurants reducing waste**

Consider a fictitious scenario about a fast-food restaurant chain. Leaders at this company have huge amounts of data to manage, such as:

* customer transactions
* marketing data related to promotions
* customer satisfaction
* employee information

And so much more! But on top of all of that, the company also has to consider the logistics for individual restaurants. That’s where the problem comes in.

**The problem**

The restaurants need to have ingredients to cook and serve customers, but if they have too much, that extra stock often goes to waste. Company leadership consults with their BI team to consider how to approach two concerns:

* How to ensure the restaurants’ numerous locations have enough ingredients to meet customer demand
* How to reduce food waste

However, these stakeholders currently don’t have metrics in place to specifically measure food waste or strategies to reduce it. This is exactly where the BI team will need to start.

**The solution**

In order to address the stakeholder’s needs, the BI team spends time gathering information about current metrics and processes. They first use this information to determine what data they have and how it’s being used. They discover that there are already useful metrics being applied in other ways by various teams in the company, including:

* How many ingredients are delivered to each location
* How much of each menu item is made each day
* How much of each menu item is actually being ordered each day

By comparing these existing metrics, the company can better understand how much food is going to waste. Thus, the BI analysts are able to gather the necessary information on incoming food delivery, customer orders, and food consumption in the form of a dashboard for stakeholders to monitor food waste. The BI analysts then organize this data within the database systems and deliver it to new tables that report the results for stakeholders to consider as they strategize how to reduce food waste.

**The results**

Knowing how much food is actually going to waste now enables stakeholders to better achieve their goals. The restaurant chain discovers that the largest source of food waste is the French fries. Across their locations, 10–20% of French fries are left over at the end of the month. With this information, the company’s central operations team sends out a memo to all branches recommending they reduce their incoming French fry delivery by 10%. In this way, the BI analysts are able to help the business identify an area for improvement and reduce waste.

**Hospitals promoting patient care**

Hospitals also have to manage a lot of different kinds of data — especially patient information. They also have a variety of data sources that they need to access and share to ensure that other connected users — such as doctors working outside of the hospital — can get patients the treatment they need without wasting time or resources.

**The problem**

For this scenario, consider a hospital system that’s challenged to communicate effectively with doctors who don’t work within the same hospital system. Administrators have noticed that this creates a few different problems:

* Doctors outside of the system can’t access test results from the hospital
* Patients are being tested multiple times

This is expensive and inefficient, both for the hospital and patients. So, decision-makers choose to work with a team of BI specialists to create database systems that get data in the hands of doctors who need it.

**The solution**

Basically, this hospital system is experiencing a problem related to inaccessible patient data. There is a lot of data streaming in from multiple source systems that needs to be consolidated into one destination that can be used by doctors, including information about:

* Previous visits
* Tests
* Allergies

And other relevant medical information. So, the BI team develops a pipeline system that ingests data from all key sources, processes and transforms it so that it is consistent, and delivers it to a database system where doctors are able to access all the information they need.

**The results**

By streamlining the hospital’s many data sources into one consolidated database, the BI team helps save the hospital money and resources by eliminating duplicate tests. Now, doctors are better able to treat patients, patients save money on redundant tests and procedures, and the hospital can run more efficiently. This is all thanks to the tools built by the BI team!

**Key takeaways**

No matter what industry you’re working in, BI can automate processes and information channels to empower the people who need that data to answer questions and make decisions. From restaurants reducing waste to hospitals advancing patient care, BI analysts create systems and tools to anticipate needs and enable organizations to reach their objectives.

# Collaboration with business intelligence partners

Previously, you learned about the many different partners a business intelligence professional might team up with to create systems and tools for an organization to improve processes and provide stakeholders with ongoing insights. These partners could include:

* API professionals
* Data warehousing specialists
* Data governance professionals
* Data analysts
* IT professionals
* Project managers
* And many more!

Complex business problems require collaboration and cross-team cooperation. These partners have unique knowledge, experience, skills, and perspectives to bring to the table. Brainstorming and building together, pooling knowledge, and fleshing out issues is essential to the BI process.

Tackling complex problems is related to a concept you might already be familiar with if you completed the Google Data Analytics Certificate: structured thinking. Structured thinking is the process of recognizing the current problem or situation, organizing available information, revealing gaps and opportunities, and identifying the options. Basically, structured thinking allows you to break a problem down into manageable pieces.

The same is true for BI. Often, you have a complex problem with a lot of pieces to consider; by using a structured approach and breaking down the problem to manageable pieces, the process to solve the issue and get results is much easier. And your partners in the organization are a great resource along the way.

Now, let’s explore some examples of BI professionals collaborating with their partners to solve problems and provide insights to stakeholders that empower decision-making.

### Managing membership data

The marketing team for a retail store was looking for ways to increase memberships for its loyalty program. Leaders wanted to encourage repeat customers to enroll. However, they didn’t have a system in place that allows analysts to explore both member and nonmember sales data. This requires ingesting data from a variety of systems, including the store’s online membership form and sales data. So, in addition to building a tool that moves and transforms key data, the BI team also needed to make the data from different systems align with the destination system.

In this case, they collaborated with several teams:

* **The marketing team**: The marketing team was the primary stakeholder for this initiative. They worked with the BI team to determine project requirements, timelines, and deliverables.
* **The API team**: Next, the BI team collaborated with the API professionals in order to integrate the data into the internal company database. The API team also helped build the reporting tools and dashboards.
* **Data warehousing specialists**: Then they teamed up with data warehousing specialists to create a storage and organization system for the newly acquired data.

In the end, the marketing team was empowered with a system that allowed them to access the data they needed to explore customer trends and strategize ways to increase membership for their loyalty program.

### Securing sensitive data

Another BI professional was working at a tech company that creates health-monitoring tools such as smart watches. The data analysts on their team were interested in exploring user data to find out how customers are using their products. Because some personally identifiable information was included, it was critical that all data be anonymized and secured.

The BI team partnered with the data warehousing specialists and data governance team in order to make sure that the storage systems protected the users while allowing data analysts to draw insights. In the end, the data analysts were able to use the smart watch data to explore trends and provide insights while still maintaining the privacy of users.

## Key takeaways

Collaborating with the people on your team who have different skills and perspectives is an important part of a structured approach to BI. As a BI professional, you will collaborate with a variety of partners to create systems that empower stakeholders with data to advance and succeed.

If you earned the Google Data Analytics Certificate or have experience working with data, you probably know that data analytics and business intelligence have both similarities and differences. In many ways, BI builds on tasks that data analysts perform. Often, data analysts are the stakeholders for whom BI professionals develop systems. In this reading, you’ll compare and contrast DA and BI to explore more about these similarities and differences.

| **Data tasks** | **DA** | **BI** |
| --- | --- | --- |
| Involvement | The first step of the data analysis cycle is to define the business problem and establish stakeholder expectations. | In addition to defining business problems and asking questions to establish expectations, BI professionals observe current processes to determine how they can be improved to align more with stakeholder needs. |
| Answering questions | Data analysts are often tasked with deciding what data they need to answer their stakeholders’ questions and gathering that data for use. | BI professionals evaluate the data needs of their stakeholders, identify necessary sources, and design pipeline systems that automatically and continuously gather that data for stakeholders to access. |
| Gathering data | Once data has been gathered, data analysts must ensure that it is clean and ready for use. They also perform transformations on the data to prepare it for analysis. | BI professionals build tools that clean and transform data automatically within a pipeline so that these processes occur to all data being ingested by the pipeline process. |
| Storage systems | Data analysts must adhere to organization conventions and store historical data for analysis. | BI professionals develop storage systems that allow intake from multiple source systems into a destination database, while governing the database schema and optimizing the system. |
| Descriptive and predictive analytics | Data analysis focuses on descriptive analysis that describes historical trends. | BI uses analysis of historical trends to perform predictive analytics that enable organizations to determine likely future trends and act accordingly. |
| Presenting insights | After analysis, data analysts present their findings to inform the stakeholders’ ultimate decision. | BI analysts create tables, reports, and dashboards that empower stakeholders with access to the data they need to inform their whole decision-making process. |
| Iteration | After the initial analysis, data analysts may repeat their analysis based on their findings or new information. | BI analysts continue to iterate on processes to improve and optimize the systems and tools they have built to ensure they continue to be useful for stakeholders. |

DA and BI share a lot of common ground: They are both fields in which professionals use data to create insights that inform decision-making. But BI is more focused on creating processes and information channels that transform relevant data into actionable insights that are easily available to decision-makers on a continual basis.

**Key business intelligence documents**

Previously, you learned about business intelligence strategy, which is the management of the people, processes, and tools used in the business intelligence process. BI projects are complicated, and finding ways to stay organized from the beginning of a project to the end is key to success. One way to ensure that you capture the big-picture project requirements, stay organized, and make an impact at your organization is to create comprehensive BI documents. In this reading, you’ll learn about three types of documents: the Stakeholder Requirements Document, Project Requirements Document, and Strategy Document.

Each of these documents builds on the previous one. Instead of three separate documents, think about them as three phases of your project planning process. Later on, you will have an opportunity to create your own BI documents to guide your end-of-course project, so this is a great resource to get you started!

**Stakeholder Requirements Document**

The Stakeholder Requirements Document enables you to capture stakeholder requests and requirements so you understand their needs before planning the rest of the project details or strategy. It should answer the following questions:

* Business problem: What is the primary question to be answered or problem to be solved?
* Stakeholders: Who are the major stakeholders of this project, and what are their job titles?
* Stakeholder usage details: How will the stakeholders use the BI tool?
* Primary requirements: What requirements must be met by this BI tool in order for this project to be successful?

Here are some questions BI professionals ask in order to successfully complete this document:

* What questions must be answered before starting this project?
* What does the BI team need to know before starting this project?
* What are the questions that must be answered/problems that must be solved by this project?
* What datasets are considered important to this project?
* Who should have access to the dashboard? Will the entire dashboard be visible to all stakeholders?

Typically, the Stakeholder Requirements Document is a one-pager with notes, but it can be longer and more detailed for complex projects.

Click the link to access the stakeholder requirements document template, or download the file directly from the attachment below. [Stakeholder Requirements Document template](https://docs.google.com/document/d/11K4eqc_rhZql__yg9sqDYFP5GnV1dAkHr36NqIUyG5I/template/preview)

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**Project Requirements Document**

Once you have established the stakeholder requirements, you can start thinking about the project requirements that need to be met to achieve the stakeholder requirements. The Project Requirements Document contains the following details:

* Purpose: Briefly describe why this project is happening and explanation of why the company should invest its resources in it.
* Key dependencies: Detail the major elements of this project. Include the team, primary contacts, and expected deliverables. Are there any inter-team deliverables required?
* Stakeholder requirements: List the established stakeholder requirements, based on the Stakeholder Requirements Document. Prioritize the requirements as: R - required, D - desired, or N - nice to have.
* Success criteria: Clarify what success looks like for this project. Include explicit statements about how to measure success. Use SMART criteria.
* User journeys: Document the current user experience and the ideal future experience.
* Assumptions: Explicitly and clearly state any assumptions you are making.
* Compliance and privacy: Include compliance, privacy, or legal dimensions to consider.
* Accessibility: List key considerations for creating accessible reports for all users. Who needs to access this feature? How are they viewing and interacting with it?
* Roll-out plan: Briefly describe the expected scope, priorities and timeline. Consider at what points during the rollout will measurements be made to determine whether the feature is performing as expected? Is there a rollback plan and timeline if this feature does not meet its intended goals?

In addition, some companies will ask you to include a list of references. If so, it’s a best practice to be liberal in citing references; you can never have too many. References might include:

* Documents or websites you read and researched while working on this project
* Laws and policies: Any regulations driving the project requirements
* Project tracking: A link to tracking spreadsheet, bug hotlist, etc.
* Similar projects: A description of anything similar that has been attempted in the past or any parallel efforts.

Similar to the Stakeholder Requirements Document, the Project Requirements Document will vary depending on the complexity of the project. It might just be an email sent out to stakeholders to keep them updated on expectations and check-in points, or it could be a multi-page document with a spreadsheet that outlines the project plan and key tasks.

Click the link to access the project requirements document template, or download the file directly from the attachment below. [Project Requirements Document template](https://docs.google.com/document/d/1Vq9G_MAQRz4V6iZF_Z-v_u0AcwloB96lc6wwYzz9EDg/template/preview)

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**Strategy Document**

Finally, you will create a Strategy Document for your project. This is the final phase of the planning process. The Strategy Document is a collaborative place to align with stakeholders about project deliverables. You will work together to establish information about dashboard functionality and associated metrics and charts.

This is a time to flesh out what metrics will be required, how metrics are calculated, and any limitations or assumptions that exist about the data. Stakeholders think through these details and help the BI professional make final project decisions. Then, the BI professional provides stakeholders with a dashboard mockup to get valuable feedback.

Generally, the BI professional will create the document and request review and sign-off from important stakeholders. Then they can begin working on the project with all of the details they need.

Click the link to access the strategy document template, or download the file directly from the attachment below. [Strategy Document template](https://docs.google.com/document/d/13v9_pOAHbcv2dhEMZtPFJ6sgvZaY-9tVp1op32owAdE/template/preview)

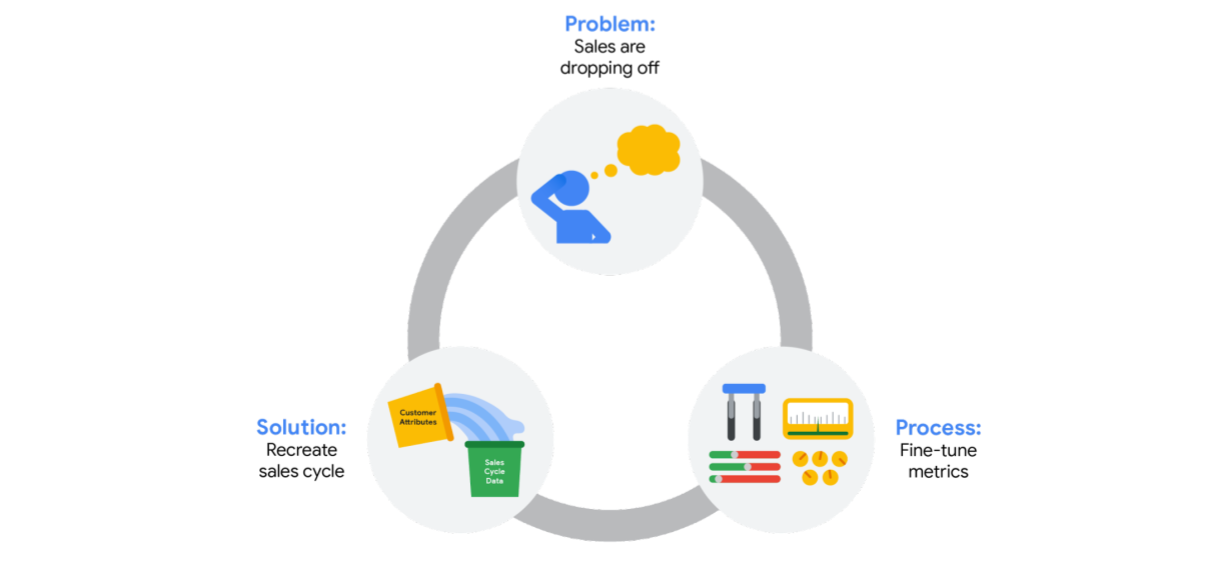
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Staying organized and aligned with stakeholders is an important part of the BI process. Creating documents early on in a project to outline stakeholder and project requirements as well as project strategies can be an important tool for a BI professional aligning with stakeholders and planning ahead. Soon, you’ll have an opportunity to create your own documents to align with stakeholders and plan your end-of-course project!

# Case study: FeatureBase, Part 1: Fine tuning metrics for data collection

In this course, you've been thinking about the stages of the business intelligence process. This case study with FeatureBase will focus on the Capture stage of the BI process, where you examine static, backward-facing data and plan for the next two phases of the project. In two follow-up case studies, you’ll learn about how FeatureBase addressed the Analyze and Monitor stages of this project. But first, you’ll need to understand the problem, process, and solutions for this first stage of the project.



As a BI professional, you will add value to the organizations you work with. Your expertise will help organizations access the right data, use data to find ways to grow and improve, and put those insights into action. Throughout this certificate program, you will have the opportunity to explore how different businesses handled real challenges they faced using business intelligence. In this reading, you will be introduced to [FeatureBase](https://www.featurebase.com/), an Operational AI company in Austin, Texas. Across the three courses, you will encounter three case studies that follow the FeatureBase team’s approach to an actual problem they faced. This is a great example of how a real company solved a BI problem and completed an entire project–Starting with identifying a problem and preparing to tackle it!



## Company background

FeatureBase builds technologies that unlock the value of data as soon as it is created. Based in Austin Texas, the team and community consist of database, distributed systems, and cloud engineers, as well as leading researchers on bitmap innovation. FeatureBase’s CEO, H.O. Maycotte, and founding engineers have worked for nearly 20 years to solve a gap in the database market and develop a new data format that is built specifically to enable faster computation.

Their core technology, FeatureBase, is the first OLAP Database built entirely on bitmaps that power real-time analytics and machine learning applications by simultaneously executing low latency, high throughput, and highly concurrent workloads.

## The challenge

The sales team noticed that a significant portion of potential customers were falling off during the sales cycle. Once they discovered this pattern, they realized that they didn’t have the data they needed to really discover when customers were falling off. And if they couldn’t determine when customers were falling off, then they couldn’t find out why. And finding out why was key for creating solutions to address this problem.

## The approach

The initial question was, “Why did we fall short on our quarterly revenue target?” To answer that question, the FeatureBase team needed to know why people dropped off and when drop-off happened. But they didn’t have the metrics built into their database to actually measure that. In order to build this question into their data collection, they had to experiment with what data was actually useful, add new attributes, and refine their metrics. For this particular project, the solution was clear: recreate their existing sales funnel with key attributes about each potential customer at every stage of the project.

To do this, the Sales leader, Marketing leader, and CEO collaborated to decide on new metrics and how to implement them within the system. It required some experimentation– the team was committed to iterating and fine tuning their data collection process in order to optimize this solution. Tuning is often a really necessary part of creating forward looking solutions; the first model is usually not the best one. It’s a first draft; you have to revise it in order to achieve the most ideal version of the solution! As a BI professional, the reality is that you might have to iterate a few times to get your model where you need it.

## The next step

As a BI professional, there will be times when you are asked a question that you don’t have sufficient data to actually answer. Sometimes, you have to keep digging, keep researching, and keep thinking about how to provide an insightful answer your team can actually use. In this case, the FeatureBase team realized they had observed that there was a trend, but they couldn’t determine what it was and how to act on it with the data they had. The first step was deciding what metrics they could implement to actually capture useful observations. As a team, they collaborated and fine tuned their data collection processes. Coming up in the next course, you’ll learn more about how they actually imposed these new processes on their database systems, what tools they used, and how that set them up for success.

If you’re interested in reading more about FeatureBase’s approach to answering this question, you can find more in the FeatureBase [part two](https://www.coursera.org/learn/the-path-to-insights-data-models-and-pipelines/supplement/kq602/) and [part three](https://www.coursera.org/learn/decisions-decisions-dashboards-and-reports/supplement/7E7D5/case-study-featurebase-part-three-exploring-the-trends-with-visualizations) readings featured in upcoming courses.

# Review technologies and best practices

As you continue through this program, you will be introduced to a variety of business intelligence tools that will help you create systems and processes and provide stakeholders with insights they can use to guide business decisions. Depending on the organization, you might end up using different tools over time. Luckily, the skills you are learning now can be transferred between tools. In this reading, you’ll be given some best practices for creating pipeline tools, data visualizations, and dashboards that you’ll be able to apply no matter what programs or tools your organization uses.

## Optimal pipeline processes

Developing tools to optimize and automate certain data processes is a large part of a BI professional’s job. Being able to automate processes such as moving and transforming data saves users from having to do that work manually and empowers them with the ability to get answers quickly for themselves. There are a variety of tools that BI professionals use to create pipelines; and although there are some key differences between them, these are many best practices that apply no matter what tool you use.

### Modular design

As you have learned, a data pipeline is a series of processes that transport data from different sources to their final destination for storage and analysis. A pipeline takes multiple processes and combines them into a system that automatically handles the data. Modular design principles can enable the development of individual pieces of a pipeline system so they can be treated as unique building blocks. Modular design also makes it possible to optimize and change individual components of a system without disrupting the rest of the pipeline. In addition, it helps users isolate and troubleshoot errors quickly.

Other best practices related to modular design include using version control to track changes over time and undo any as needed. Also, BI professionals can create a separate development environment to test and review changes before implementing them.

Other general software development best practices are also applicable to data pipelines.

### Verify data accuracy and integrity

The BI processes that move, transform, and report data findings for analysis are only useful if the data itself is accurate. Stakeholders need to be able to depend on the data they are accessing in order to make key business decisions. It’s also possible that incomplete or inaccurate data can cause errors within a pipeline system. Because of this, it’s necessary to ensure the accuracy and integrity of the data, no matter what tools you are using to construct the system. Some important things to consider about the data in your pipelines are:

* **Completeness**: Is the data complete?
* **Consistency**: Are data values consistent across datasets?
* **Conformity**: Do data values conform to the required format?
* **Accuracy**: Do data values accurately represent actual values?
* **Redundancy**: Are data values redundant within the same dataset?
* **Integrity**: Are data values missing important relationships?
* **Timeliness**: Is the data current?

Creating checkpoints in your pipeline system to address any of these issues before the data is delivered to the destination will save time and effort later on in the process! For example, you can add SQL scripts that test each stage for duplicates and will send an error alert if any are found.

### Creating a testing environment

Building the pipeline processes is only one aspect of creating data pipelines; it’s an iterative process that might require you to make updates and changes depending on how technology or business needs change. Because you will want to continue making improvements to the system, you need to create ways to test any changes before they’re implemented to avoid disrupting users’ access to the data. This could include creating a separate staging environment for data where you can run tests or including a stable dataset that you can make changes to and compare to current processes without interrupting the current flow.

## Dynamic dashboards

Dashboards are powerful visual tools that help BI professionals empower stakeholders with data insights they can access and use when they need them. Dashboards track, analyze, and visualize data in order to answer questions and solve problems. The following table summarizes how BI professionals approach dashboards and how it differs from their stakeholders:

| **Element of the dashboard** | **BI professional tenets** | **Stakeholder tenets** |
| --- | --- | --- |
| **Centralization** | Creating a single source of data for all stakeholders | Working with a comprehensive view of data that tracks their initiatives, objectives, projects, processes, and more |
| **Visualization** | Showing data in near-real time | Spotting changing trends and patterns more quickly |
| **Insightfulness** | Determining relevant information to include | Understanding a more holistic story behind the numbers to keep track of goals and make data-driven decisions |
| **Customization** | Creating custom views dedicated to a specific team or project | Drilling down to more specific areas of specialized interest or concern |

Note that new data is pulled into dashboards automatically only if the data structure remains the same. If the data structure is different or altered, you will have to update the dashboard design before the data is automatically updated in your dashboard.

### Dashboards are part of a business journey

Just like how the dashboard on an airplane shows the pilot their flight path, your dashboard does the same for your stakeholders. It helps them navigate the path of the project inside the data. If you add clear markers and highlight important points on your dashboard, users will understand where your data story is headed. Then, you can work together to make sure the business gets where it needs to go. To learn more about designing dashboards, check out this reading from the Google Data Analytics Certificate: [Designing compelling dashboards](https://www.coursera.org/learn/ask-questions-make-decisions/supplement/Jvsne/designing-compelling-dashboards).

## Effective visualizations

Data visualizations are a key part of most dashboards, so you’ll want to ensure that you are creating effective visualizations. This requires organizing your thoughts using frameworks, incorporating key design principles, and ensuring you are avoiding misleading or inaccurate data visualizations by following best practices.

### Frameworks for organizing your thoughts about visualization

Frameworks can help you organize your thoughts about data visualization and give you a useful checklist to reference. Here are two frameworks that may be useful for you as you create your own data visualizations:

1. [**The McCandless Method**](https://www.informationisbeautiful.net/visualizations/what-makes-a-good-data-visualization/)
2. [**Kaiser Fung’s Junk Charts Trifecta Checkup**](https://junkcharts.typepad.com/junk_charts/junk-charts-trifecta-checkup-the-definitive-guide.html)

### Pre-attentive attributes: marks and channels

Creating effective visuals involves considering how the brain works, then using specific visual elements to communicate the information effectively. Pre-attentive attributes are the elements of a data visualization that people recognize automatically without conscious effort. The essential, basic building blocks that make visuals immediately understandable are called marks and channels.

### Design principles

Once you understand the pre-attentive attributes of data visualization, you can go on to design principles for creating effective visuals. These design principles are vital to your work as a data analyst because they help you make sure that you are creating visualizations that convey your data effectively to your audience. By keeping these rules in mind, you can plan and evaluate your data visualizations to decide if they are working for you and your goals. And, if they aren’t, you can adjust them!

### Avoiding misleading or deceptive charts

As you have been learning, BI provides people with insights and knowledge they can use to make decisions. So, it’s important that the visualizations you create are communicating your data accurately and truthfully. To learn more about effective visualizations, check out this reading from the Google Data Analytics Certificate: [Effective data visualizations.](https://www.coursera.org/learn/visualize-data/supplement/9xEjx/effective-data-visualizations)

Make your visualizations accessible and useful to everyone in your audience by keeping in mind the following:

* Labeling
* Text alternatives
* Text-based format
* Distinguishing
* Simplifying

To learn more about accessible visualizations, check out this video from the Google Data Analytics Certificate: [Making Data Visualizations Accessible.](https://www.coursera.org/lecture/visualize-data/accessible-visualizations-yVjKD)

## Conclusion

As a BI professional, you will encounter a variety of tools for creating pipeline systems, developing dashboards to share with stakeholders, and creating effective visualizations to demonstrate your findings. Those tools require different skills, which take time and effort to learn. But often, you can apply your knowledge to numerous processes and systems.

# Glossary terms from module 1

**Application programming interface (API):** A set of functions and procedures that integrate computer programs, forming a connection that enables them to communicate

**Business intelligence (BI):** Automating processes and information channels in order to transform relevant data into actionable insights that are easily available to decision-makers

**Business intelligence governance:** A process for defining and implementing business intelligence systems and frameworks within an organization

**Business intelligence stages:** The sequence of stages that determine both BI business value and organizational data maturity, which are capture, analyze, and monitor

**Business intelligence strategy:** The management of the people, processes, and tools used in the business intelligence process

**Data analysts:** People who collect, transform, and organize data

**Data governance professionals:** People who are responsible for the formal management of an organization’s data assets

**Data maturity:** The extent to which an organization is able to effectively use its data in order to extract actionable insights

**Data model:** A tool for organizing data elements and how they relate to one another

**Data pipeline:** A series of processes that transports data from different sources to their final destination for storage and analysis

**Data warehousing specialists:** People who develop processes and procedures to effectively store and organize data

**ETL (extract, transform, and load):** A type of data pipeline that enables data to be gathered from source systems, converted into a useful format, and brought into a data warehouse or other unified destination system

**Information technology professionals:** People who test, install, repair, upgrade, and maintain hardware and software solutions

**Iteration:** Repeating a procedure over and over again in order to keep getting closer to the desired result

**Key performance indicator (KPI):** A quantifiable value, closely linked to business strategy, which is used to track progress toward a goal

**Portfolio:** A collection of materials that can be shared with potential employers

**Project manager:** A person who handles a project’s day-to-day steps, scope, schedule, budget, and resources

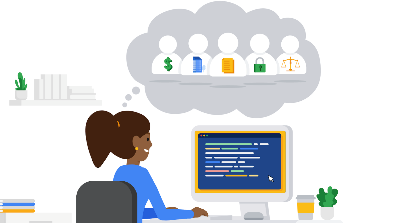
Module 2

# Know your stakeholders and their goals

Previously, you learned about the four different types of stakeholders you might encounter as a business intelligence professional:

* **Project sponsor:** A person who provides support and resources for a project and is accountable for enabling its success.
* **Developer**: A person who uses programming languages to create, execute, test, and troubleshoot software applications. This includes application software developers and systems software developers.
* **Systems analyst:** A person who identifies ways to design, implement, and advance information systems in order to ensure that they help make it possible to achieve business goals.
* **Business stakeholders:** Business stakeholders can include one or more of the following groups of people:
  + **The executive team:** The executive team provides strategic and operational leadership to the company. They set goals, develop strategy, and make sure that strategy is executed effectively. The executive team might include vice presidents, the chief marketing officer, and senior-level professionals who help plan and direct the company’s work.
  + **The customer-facing team:** The customer-facing team includes anyone in an organization who has some level of interaction with customers and potential customers. Typically they compile information, set expectations, and communicate customer feedback to other parts of the internal organization.
  + **The data science team**: The data science team explores the data that’s already out there and finds patterns and insights that data scientists can use to uncover future trends with machine learning. This includes data analysts, data scientists, and data engineers.

Now that you’re more familiar with these different types of stakeholders, explore how they function in an actual business context.



## The business

In this scenario, you are a BI professional working with an e-book retail company. The customer-facing team is interested in using customer data collected from the company’s e-reading app in order to better understand user reading habits, then optimize the app accordingly. They have asked you to create a system that will ingest customer data about purchases and reading time on the app so that the data is accessible to their analysts. But before you can get started, you need to understand all of your stakeholders’ needs and goals to help them achieve them.

### The stakeholders and their goals

#### Project sponsor

A project sponsor is the person who provides support and resources for a project and is accountable for enabling its success. In this case, the project sponsor is the team lead for the customer-facing team. You know from your discussions with this team that they are interested in optimizing the e-reading app. In order to do so, they need a system that will deliver customer data about purchases and reading time to a database for their analysts to work with. The analysts can then use this data to gain insights about purchasing habits and reading times in order to find out what genres are most popular, how long readers are using the app, and how often they are buying new books to make recommendations to the UI design team.

#### Developers

The developers are the people who use programming languages to create, execute, test, and troubleshoot software applications. This includes application software developers and systems software developers. If your new BI workflow includes software applications and tools, or you are going to need to create new tools, then you’ll need to collaborate with the developers. Their goal is to create and manage your business’s software tools, so they need to understand what tools you plan to use and what you need those tools to do. For this example, the developers you work with will be the ones responsible for managing the data captured on the e-reading app.

#### Systems analyst

The systems analyst identifies ways to design, implement, and advance information systems in order to ensure that they help make it possible to achieve business goals. Their primary goal is to understand how the business is using its computer hardware and software, cloud services, and related technologies, then they figure out how to improve these tools. So the system analyst will be ensuring that the data captured by the developers can be accessed internally as raw data.

#### Business stakeholders

In addition to the customer-facing team, who is the project sponsor for this project, there may also be other business stakeholders for this project such as project managers, senior-level professionals, and other executives. These stakeholders are interested in guiding business strategy for the entire business; their goal is to continue to improve business processes, increase revenue, and reach company goals. So your work may even reach the chief technology officer! These are generally people who need bigger-picture insights that will help them make larger scale decisions as opposed to detail-oriented insights about software tools or data systems.

## Conclusion

Often, BI projects encompass a lot of teams and stakeholders who have different goals depending on their function within the organization. Understanding their perspectives is important because it enables you to consider a variety of use cases for your BI tools. And the more useful your tools, the more impactful they will be!

**Best practices for communicating with stakeholders**

As you have been learning, being able to communicate effectively with stakeholders and project partners is key to your success as a business intelligence professional. This field isn’t just about building BI tools; it’s about making those tools accessible to users to empower them with the data they need to make decisions. In this reading, you will review key communication strategies and discover new best practices that will help you in the future. You will also explore the importance of fairness and avoiding bias in BI.

**Make BI accessible to stakeholders**

So far, you have learned three key strategies for communication:

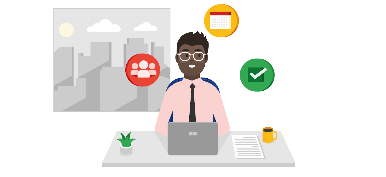
* Ask the right questions
* Define project deliverables
* Effectively share business intelligence

Sharing business intelligence can be complicated; you have to be able to simplify technical processes to make them feel straightforward and accessible to a variety of users who might not already understand the terms or concepts. Being able to present intelligence clearly and concisely is critical to making sure that stakeholders can actually use the systems you have created and act on those insights.

There are a few questions you can keep in mind to help guide your communications with stakeholders and partners:

* **Who is your audience?** When communicating with stakeholders and project partners, it’s important to consider who you’re working with. Consider all of the people who need to understand the BI tools and processes you build when communicating. The sales or marketing team has different goals and expertise than the data science team, for example.
* **What do they already know?** Because different users have different levels of knowledge and expertise, it can be useful to consider what they already know before communicating with them. This provides a baseline for your communications and prevents you from overexplaining yourself or skipping over any information they need to know.
* **What do they need to know?** Different stakeholders need different kinds of information. For instance, a user might want to understand how to access and use the data or any dashboards you create, but they probably aren’t as interested in the nitty-gritty details about how the data was cleaned.
* **How can you best communicate what they need to know?** After you have considered your audience, what they already know, and what they need to know, you need to choose the best way to communicate that information to them. This might be an email report, a small meeting, or a cross-team presentation with a Q&A section.

In addition to these questions, there are a few other best practices for communicating with stakeholders.



**Create realistic deadlines.** Before you start a project, make a list of dependencies and potential roadblocks so you can assess how much extra time to give yourself when you discuss project expectations and timelines with your stakeholders.

**Know your project.** When you have a good understanding about why you are building a new BI tool, it can help you connect your work with larger initiatives and add meaning to the project. Keep track of your discussions about the project over email or meeting notes, and be ready to answer questions about how certain aspects are important for your organization. In short, it should be easy to understand and explain the value the project is bringing to the company.

**Communicate often.** Your stakeholders will want regular updates. Keep track of key project milestones, setbacks, and changes. Another great resource to use is a changelog, which can provide a chronologically ordered list of modifications. Then, use your notes to create a report in a document that you share with your stakeholders.

**Prioritize fairness and avoid biased insights**

Providing stakeholders with the data and tools they need to make informed, intelligent business decisions is what BI is all about. Part of that is making sure you are helping them make fair and inclusive decisions. Fairness in data analytics means that the analysis doesn’t create or reinforce bias (a conscious or subconscious preference in favor of or against a person, group of people, or thing). In other words, you want to help create systems that are fair and inclusive to everyone.

As a BI professional, it’s your responsibility to remain as objective as possible and try to recognize the many sides of an argument before drawing conclusions. The best thing you can do for the fairness and accuracy of your data is to make sure you start with data that has been collected in the most appropriate, and objective way. Then you’ll have facts that you can pass on to your team.

A big part of your job will be putting data into context. Context is the condition in which something exists or happens; basically, this is who, what, where, when, how, and why of the data. When presenting data, you’ll want to make sure that you’re providing information that answers these questions:

* WHO collected the data?
* WHAT is it about? What does the data represent in the world and how does it relate to other data?
* WHEN was the data collected?
* WHERE did the data come from?
* HOW was it collected? And how was it transformed for the destination?
* WHY was this data collected? Why is it useful or relevant to the business task?

One way to do this is by clarifying that any findings you share pertain to a specific dataset. This can help prevent unfair or inaccurate generalizations stakeholders might want to make based on your insights. For example, imagine you are analyzing a dataset of people’s favorite activities from a particular city in Canada. The dataset was collected via phone surveys made to house phone numbers during daytime business hours. Immediately there is a bias here. Not everyone has a home phone, and not everyone is home during the day. Therefore, insights from this dataset cannot be generalized to represent the opinion of the entire population of that city. More research should be done to determine the demographic make-up of these individuals.

You also have to ensure that the way you present your data—whether in the form of visualizations, dashboards, or reports—promotes fair interpretations by stakeholders. For instance, you’ve learned about using color schemes that are accessible to individuals who are colorblind. Otherwise, your insights may be difficult to understand for these stakeholders

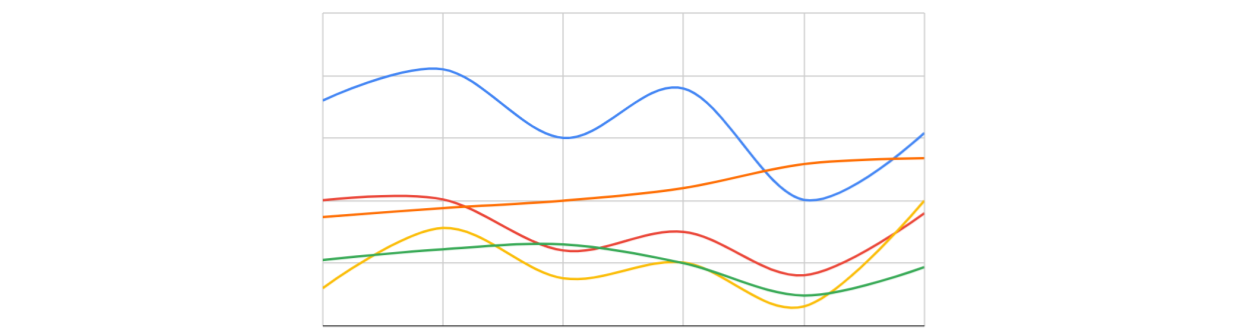
**Key takeaways**

Being able to provide stakeholders with tools that will empower them to access data whenever they need it and the knowledge they need to use those tools is important for a BI professional. Your primary goal should always be to give stakeholders fair, contextualized insights about business processes and trends. Communicating effectively is how you can make sure that happens.

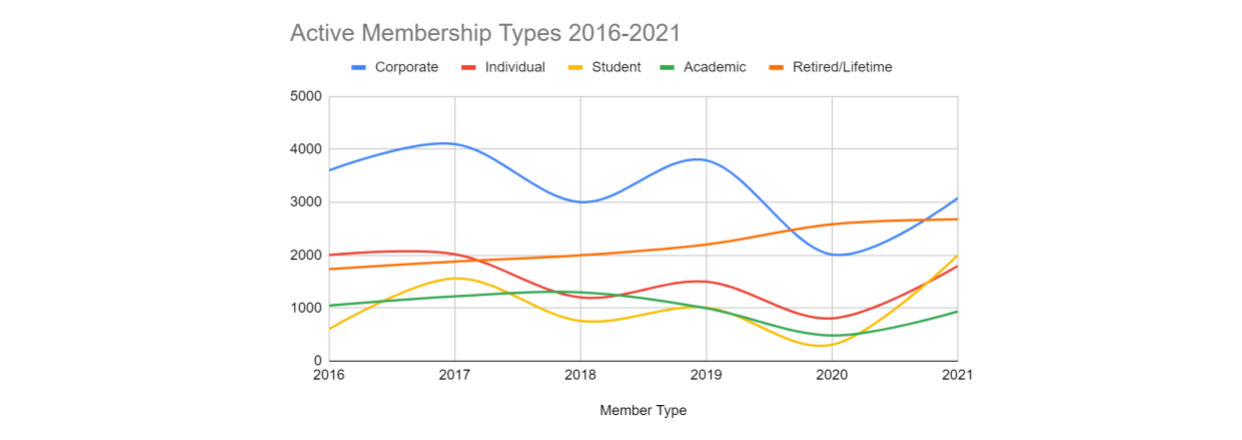
Module 3

# Why context is critical

In this lesson, you have been learning about the importance of context in business intelligence. As a refresher, context is the condition in which something exists or happens. For example, in a previous video you considered this data visualization:



This line graph just shows five different lines on a grid, but we don’t have any information about what the lines of the graph represent, how they’re being measured, or what the significance of this visualization is. That’s because this visualization is missing context. Check out the completed version of this visualization:



This visualization has all of the information needed to interpret it. It has a clear title, a legend indicating what the lines on the graph mean, a scale along the y axis, and the range of dates being presented along the x axis. Contextualizing data helps make it more meaningful and useful to your stakeholders and prevents any misinterpretations of the data that might impact their decision-making. And this is true for more than just visualization! In this reading, you’ll explore a business case where context was key to a BI project’s success.

## The scenario

The CloudIsCool Support team provides support for users of their cloud products. A customer support ticket is created every time a user reaches out for support. A first response team is in charge of addressing these customer support tickets. However, if there is a particularly complex ticket, a member of the first response team can request help from the second response team. This is categorized as a consult within the ticketing system. The analytics team analyzes the ticket and consults data to help improve customer support processes.

Usually, the consultation request is fulfilled successfully and the first response team is able to resolve the customer’s ticket, using guidance from the second response team. However, sometimes even the second response team isn’t able to fully answer the question or new details about the case require additional insight. In that case, the first response team might ask for another consultation, which is labeled as a reconsult.

This is all important context for a BI professional working with stakeholders who are interested in how well current support processes are working and how they might be improved. If they build reporting tables and dashboards that only track consults and not reconsults, they might miss key insights about how effective the consultation system truly is. For example, a high reconsult rate would mean that more cases aren’t being resolved in the first or second attempts. This could lead to customers waiting longer for their issues to be resolved. The leadership would want to evaluate these processes.

Knowing this context, the BI professional working on this project is able to build out appropriate metrics, reporting tables, and the dashboard that tracks that metric in a way that helps stakeholders make informed decisions about this process. By understanding the business context, BI professionals can create more meaningful reports.

## Conclusion

Context is the who, what, where, when, and why surrounding data that makes it meaningful. Knowing this background information helps us interpret data correctly and visualize useful business intelligence insights for stakeholders. When BI professionals understand the context, choose the right data, and build contextualized visuals to share with stakeholders, they can empower businesses and leadership to make successful decisions.

**Data ethics and the importance of data privacy**

Recently, you’ve been learning about the importance of context in business intelligence. You discovered that, when you contextualize, you put something into perspective by considering its origin and other relevant background information; the motivation behind it; the larger setting in which it exists, such as a particular time period; and what it might have an impact on. Contextualization also supports fairness and reduces the chance of bias when your users seek to gain useful insights from the data you’re presenting.

Likewise, as a BI professional, you have a responsibility to treat data ethically. Data ethics refers to well-founded standards of right and wrong that dictate how data is collected, shared, and used. Throughout your career you will work with a lot of data. This sometimes includes PII, or **personally identifiable information,** which can be used by itself or with other data to track down a person's identity. One element of treating that data ethically is ensuring that the privacy and security of that data is maintained throughout its lifetime. In this reading, you will learn more about the importance of data privacy and some strategies for protecting the privacy of data subjects.

**Privacy matters**

Data privacy means preserving a data subject’s information and activity any time a data transaction occurs. This is also called information privacy or data protection. Data privacy is concerned with the access, use, and collection of personal data. For the people whose data is being collected, this means they have the right to:

* Protection from unauthorized access to their private data
* Freedom from inappropriate use of their data
* The right to inspect, update, or correct their data
* Ability to give consent to data collection
* Legal right to access the data

In order to maintain these rights, businesses and organizations have to put privacy measures in place to protect individuals’ data. This is also a matter of trust. The public’s ability to trust companies with personal data is important. It’s what makes people want to use a company’s product, share their information, and more. Trust is a really big responsibility that can’t be taken lightly.

**Protecting privacy with data anonymization**



Organizations use a lot of different measures to protect the privacy of their data subjects, like incorporating access permissions to ensure that only the people who are supposed to access that information can do so. Another key strategy to maintaining privacy is data anonymization.

Data anonymization is the process of protecting people's private or sensitive data by eliminating PII. Typically, data anonymization involves blanking, hashing, or masking personal information, often by using fixed-length codes to represent data columns, or hiding data with altered values.

Data anonymization is used in just about every industry. As a BI professional, you probably won’t personally be performing anonymization, but it’s useful to understand what kinds of data are often anonymized before you start working with it. This data might include:

* Telephone numbers
* Names
* License plates and license numbers
* Social security numbers
* IP addresses
* Medical records
* Email addresses
* Photographs
* Account numbers

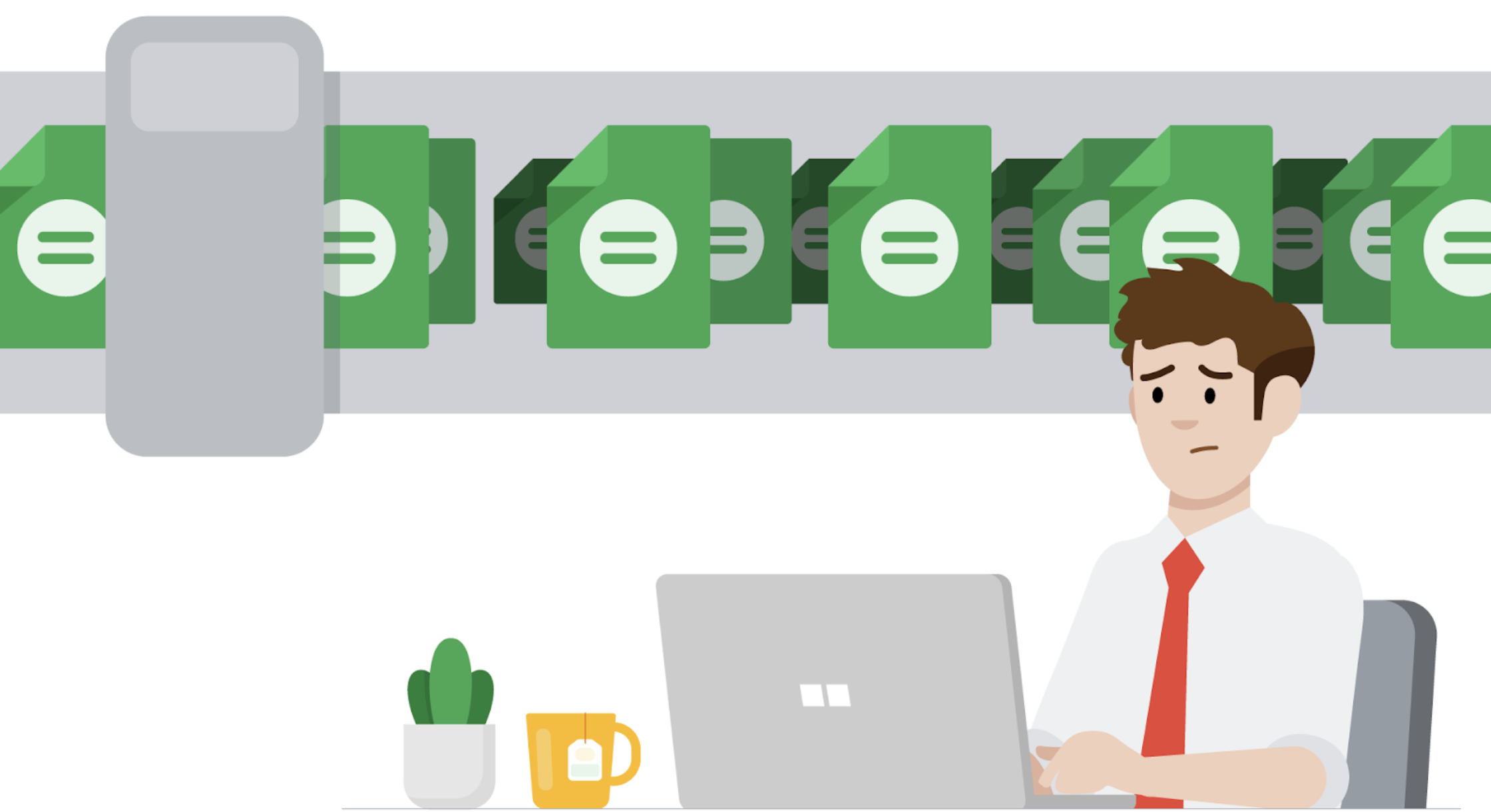
Imagine a world where we all had access to each other’s addresses, account numbers, and other identifiable information. That would invade a lot of people’s privacy and make the world less safe. Data anonymization is one of the ways we can keep data private and secure!

**Key takeaways**

For any professional working with data about actual people, it’s important to consider the safety and privacy of those individuals. That’s why understanding the importance of data privacy and how data that contains PII can be made secure for analysis is so important. We have a responsibility to protect people’s data and the personal information that data might contain.

**Anticipate data limitations**

We live in a world where data is constantly being generated. There is so much information out there to learn from. But we also live in a world that is constantly changing, and often the data that we encounter has certain limitations we need to consider as we analyze data and draw insights from it.



**Factors of data availability**

Previously, you learned about the importance of data availability, which is the degree or extent to which timely and relevant information is readily accessible and able to be put to use. The factors that influence data availability are:

* Data integrity: The accuracy, completeness, consistency, and trustworthiness of data throughout its life cycle.
* Data visibility: The degree or extent to which information can be identified, monitored, and integrated from disparate internal and external sources.
* Update frequency: How often disparate data sources are being refreshed with new information.
* Change: The process of altering data, either through internal processes or external influence.

Next, you are going to consider the limitations of data that might change the availability and how you can anticipate those limitations as a BI professional.

**Missing data**

If you have incomplete or nonexistent data, you might not have enough data to reach a conclusion. Or, you might even be exploring data about a totally different business problem! Understanding what data is available, identifying potential other sources, and filling in the gaps is an important part of the BI process.

**Misaligned data**

As a BI professional, you will often use data from different sources. Some of these might be internal sources to the business you’re working with, but they might also include external sources. These sources might define and measure things in completely different ways. In cases like these, establishing how to measure things early on standardizes the data across the board for greater reliability and accuracy. This will make sure comparisons between sources are meaningful and insightful.

**Dirty data**

Dirty data refers to data that contains errors. Dirty data can cause errors in your system, inaccurate reports, and poor decision-making. Implementing processes for cleaning data by fixing or removing incorrect, corrupted, incorrectly formatted, duplicate, or incomplete data within a dataset is one way you can prepare for this limitation.

**Conclusion**

As a BI professional, you’ll need to understand that sometimes the data you work with will have limitations. This could mean that it doesn’t fit within a certain time range, or it only applies to specific situations, or there are challenges identifying the data you need. Being able to anticipate those issues and consider them when you build tools and systems for your business will allow you to ensure that those limitations don’t stop your stakeholders from getting the data they need to make great decisions and ensure project success!

**How to identify key metrics for a project**

**Choosing your metrics**

In a previous video, you learned how business intelligence professionals determine which metrics to include in their dashboards to deliver relevant and actionable data to their stakeholders. In this reading, you’re going to consider how choosing the right metrics can determine the success of a project. You’ll do this by exploring an example of a BI professional identifying key metrics for their project.

There are five key points BI professionals take into account when choosing metrics:

1. **The number of metrics:** More information is not always better. BI professionals limit the number of metrics on dashboards to focus specifically on the ones that are key to a project’s success. Key metrics are relevant and actionable. For instance, if metric X drops, is this good or bad? What action would a user take if it dropped that would be different if it rose instead? Too many metrics that aren’t relevant to the project can be confusing and make your dashboard less effective. The goal isn’t to overload the dashboard to account for every single use case, but 80% of the common use cases.
2. **Alignment with business objectives:** Understanding the business objectives can help you narrow down which metrics will support those goals and measure their success. For example, if the business objective is to increase sales, include revenue in your dashboard. You will most likely not want to include a metric such as customer satisfaction because that is not directly related to the business objective of increasing sales.
3. **The necessary technologies and processes:** It’s important to confirm that the necessary technologies and processes are in place for the metrics you’re choosing. If you can’t obtain and analyze the necessary data, then those metrics aren’t going to be very useful.
4. **The cadence of data:** You have to consider how frequently the data becomes available. If a lot of metrics are delivered at a different cadence and frequency, it becomes difficult to schedule a review.
5. **Use SMART methodology:** If you earned your Google Data Analytics Certificate, you know the SMART methodology is a useful tool for creating effective questions to ask stakeholders. It can also be used to identify and refine key metrics by ensuring that they are specific, measurable, action-oriented, relevant, and time-bound. This can help you avoid vague or super-high-level metrics that aren’t useful to stakeholders, and instead create metrics that are precise and informative.

**An integrated view**

In the BI world, data requires a dynamic and thoughtful approach to detect and respond to events as they happen. An integrated view of the whole business is required. In some cases, metrics can be straightforward. For example, revenue is fairly unambiguous: Revenue goes up, and things are going well! But other metrics are a little more complicated.

In an earlier reading, you discovered the importance of context for the CloudIsCool Support team when measuring their ability to effectively answer customer support questions. As a refresher, a customer support ticket was created every time a customer reached out for support. These tickets were addressed by the first response team at CloudIsCool. Sometimes the first response team needed help answering more complex tickets. They would then reach out to the second response team. This was marked as a consult on the support ticket.

Imagine that the BI professionals working with this team now are trying to decide which metrics are useful in a dashboard designed to increase customer satisfaction ratings for support tickets. Perhaps their stakeholders are interested in monitoring consults to ensure that customers are getting the help they need in a timely manner. So the BI team considers adding consult rate, which is the rate at which customer support agents are asking for help from internal experts, as a metric in their dashboard.

Note that an increasing consult rate could be good or bad. It might mean that customer support agents are being more customer-centric and trying to ensure each customer gets the best answer. But it could also mean that agents are being overwhelmed with complaints and having to offload them onto internal experts in order to keep up. Therefore, consult rate is a metric that doesn’t have a clear direction; nor does it have an obvious influence on the decision-making process on its own. So, it’s not a useful metric for this dashboard. Instead, the BI professionals select metrics that indicate success or failure in a more meaningful way. For instance, they might decide to include a metric that tracks when a support agent experiences missing support documentation. This will help leaders decide whether to create more documentation for agents to reference. Notice how this metric has a clear line of action that we can take based on how high or low it is!

**Conclusion**

The ability to choose metrics that inform decision-making and support project success is a key skill for your career as a BI professional. Remember to consider the number of metrics, how they align with your business objectives, the technologies and processes necessary to measure them, and how they adhere to SMART methodology. It’s also important to maintain an integrated view of the entire business and how the information your metrics deliver is used to guide stakeholder action.

# North star metrics

So far, you have been learning about how BI professionals choose the right metrics to measure the success of their projects. BI professionals also use another specific kind of metric to measure the long-term success of the entire business or team; this metric is often referred to as a north star metric. In this reading, you will learn more about north star metrics, how BI professionals choose them, and how they can help a business’s growth over time.

## The guiding star

A company’s north star metric goes beyond short-term goals– it’s intended to capture the core measurable value of a business’s product or services over its entire lifetime. These metrics are a guiding light that drive a business forward. That’s why it’s called a north star metric– like the north star can be used to navigate the wilderness, these metrics can be used to navigate business decisions and lead a business to growth.

Having this metric as the guiding light for the entire business is useful in three primary ways:

1. **Cross-team alignment:** Different teams have different specialties and focuses that help a business function. They aren’t always working on the same projects or with the same metrics, which can make it difficult to align across the entire business. A north star metric allows all of the teams to have a consistent goal to focus on, even as they work on different things.
2. **Tracking growth:** It can be difficult to understand and track the growth of an entire organization over time without understanding the driving metrics that determine growth. A north star metric provides a long-term measurable data point that stakeholders can focus on when discussing overall performance and growth in a business.
3. **Focusing values:** A north star metric is primarily a guiding principle for a business– it determines what is important to the organization and stakeholders. This means that choosing the right metric to guide a business can help keep the values in check– whether that’s customer satisfaction, number of customers completing the sales cycle, or customer retention.

## Choosing a north star metric

Because north star metrics are so key to a business’s ongoing success, choosing the right metric is a foundational part of a business intelligence strategy. The north star metric has to measure the most essential part or mission of the business. And because every business is different, every business’s north star metric is going to be unique. In order to determine what the most useful north star metric might be, there are a few questions you can ask:

* What is essential to this business’s processes?
* What are the most important KPIs being measured?
* Out of those KPIs, what captures all of the necessary information about this business?
* How can the other metrics be structured around that primary metric?

## Real north star metrics

Because more businesses have begun using north star metrics to guide their business strategies, there are a lot of examples of north star metrics in different industries:

E-commerce:

* + Weekly number of customers completing the sales cycle
  + Value of daily purchases

Social media:

* + Number of daily active users
  + Messages sent per day

Streaming and media services:

* + Number of new sign-ups
  + Total reading time
  + Total watching time
  + Monthly subscription revenue

Hospitality:

* + Number of nights booked
  + Number of repeat customers

These are just a few examples– there are a lot of potential north star metrics for businesses to choose from across a variety of industries, from tech to finance!

## Key takeaways

As a BI professional, one of your responsibilities will be to empower stakeholders to make business decisions that will promote growth and success over the long term. North star metrics are a great way to measure and guide a business into the future because they allow you to actually measure the success of the entire business, align teams with a single goal, and keep the business’s values at the forefront of their strategy.

# Bridge the gap from current state to ideal state

# Bridge the gap

Business intelligence professionals continually monitor processes and systems to determine if it’s necessary to make updates for greater efficiency and optimization. These professionals explore ways to bring the current state closer to the ideal state. They do this through a process called gap analysis, which is a method for examining and evaluating the current state of a process in order to identify opportunities for improvement in the future.

Gap analysis involves understanding where you currently are compared to where you want to be so that you can bridge the gap. BI uses gap analysis to do all kinds of things, such as improve data delivery systems or create dashboard reports.

For example, perhaps a sales team uses a dashboard to track sales pipeline progress that has a six-hour data lag. They use this dashboard to gather the most up-to-date information as they prepare for important meetings. The six-hour lag is preventing them from accessing and sharing near-real-time insights in stakeholder meetings. Ideally, the delay should be one hour or less.

## Setting direction with stakeholders

The first step in bridging the gap is to work with stakeholders to determine the right direction for this BI project. Establishing stakeholder needs and understanding how users are interacting with the data are important for assessing what the ideal state of a system actually is. What needs do stakeholders have that aren’t being met or could be addressed more efficiently? What data is necessary for their decision-making processes? Working closely with stakeholders is necessary to understand what they actually need their BI tools to do.

The BI professionals collect information and learn that, as the company grew, it opened offices across the country. So, the sales teams are now more dispersed. Currently, if a team member from one office updates information about a prospective client, team members from other offices won't get this update until the workday is almost over. So, their goal is to reduce the data delay to enable better cross-team coordination.

## Context and data quality

In addition to identifying stakeholder needs, it’s also important for the BI professional to understand the context of the data they interact with and present. As you know, context is the condition in which something exists or happens; it turns raw data into meaningful information by providing the data perspective. This involves defining who collected it or funded its collection; the motivation behind that action; where the data came from; when; the method used to collect it; and what the data could have an impact on. BI professionals also need to consider context when creating tools for users to ensure that stakeholders are able to interpret findings correctly and act on them.

It’s also critical that BI professionals ensure the quality and integrity of the data stakeholders are accessing. If the data is incorrect, the reporting tools won’t be accurate, and stakeholders won’t be able to make appropriate decisions — no matter how much context they have been given.

Now, the sales team's BI professional needs to identify data sources and the update frequency for each source. They discover that most of the key data sources update every 15 minutes. There are a few nonessential data sources that rarely get updated, but the team doesn’t actually have to wait until those data sources are updated to use the pipeline. They’re also able to confirm that the data warehouse team will verify these data sources as being clean and containing no duplicates or null fields that might cause issues.

## Building structures and systems

A large part of a BI professional’s job is building structures and systems. This means designing database storage systems, organizing the data, and working with database governance specialists to maintain those systems. It also involves creating pipeline tools that move and transform data automatically throughout the system to get data where it needs to go to be useful.

These structures and systems can keep data organized, accessible, and useful for stakeholders during their decision-making process. This empowers users to access the data they need when they need it — an ideal system should be organized and structured to do just that. To address the sales team’s needs, the BI analyst in this case designs a new workflow through which data sources can be processed simultaneously, cutting down processing time from 6 hours to less than an hour.

## Sharing findings

If you are coming to this course from the Google Data Analytics Certificate, you may already be familiar with the [share stage of the data analysis process](https://www.coursera.org/learn/visualize-data). This is the point at which a data analyst creates data visualizations and reports and presents them to stakeholders. BI professionals also need to share findings, but there are some key differences in how they do so. As you have been learning, creating ways for users to access and explore data when they need it is a key part of an ideal BI system. A BI professional creates automated systems to deliver findings to stakeholders or dashboards that monitor incoming data and provide current updates that users can navigate on their own.

In the sales team dashboard example, the final output is a dashboard that sales teams across the country use to track progress in near-real time. In order to make sure the teams are aware of the updates, the team’s BI analyst shares information about these backend improvements, encouraging all sales teams to check the data at the top of the hour before each meeting.

## Acting on insights

BI focuses on automating processes and information channels in order to transform relevant data into actionable insights that are easily available to decision-makers. These insights guide business decisions and development. But the BI process doesn’t stop there: BI professionals continue to measure those results, monitor data, and make adjustments to the system in order to account for changes or new requests from stakeholders.

After implementing the backend improvements, the sales team also creates system alerts to automatically notify them when data processes lag behind so they're prepared for a data delay. That way, they could know exactly how well the system is working and if it needs to be updated again in the future.

## Conclusion

A large part of a BI professional's work revolves around identifying how current systems and processes operate, evaluating potential improvements, and implementing them so that the current system is closer to the ideal system state. Throughout this course, you’ll learn how to do that by collaborating with stakeholders, understanding context, maintaining data quality, sharing findings, and acting on insights.

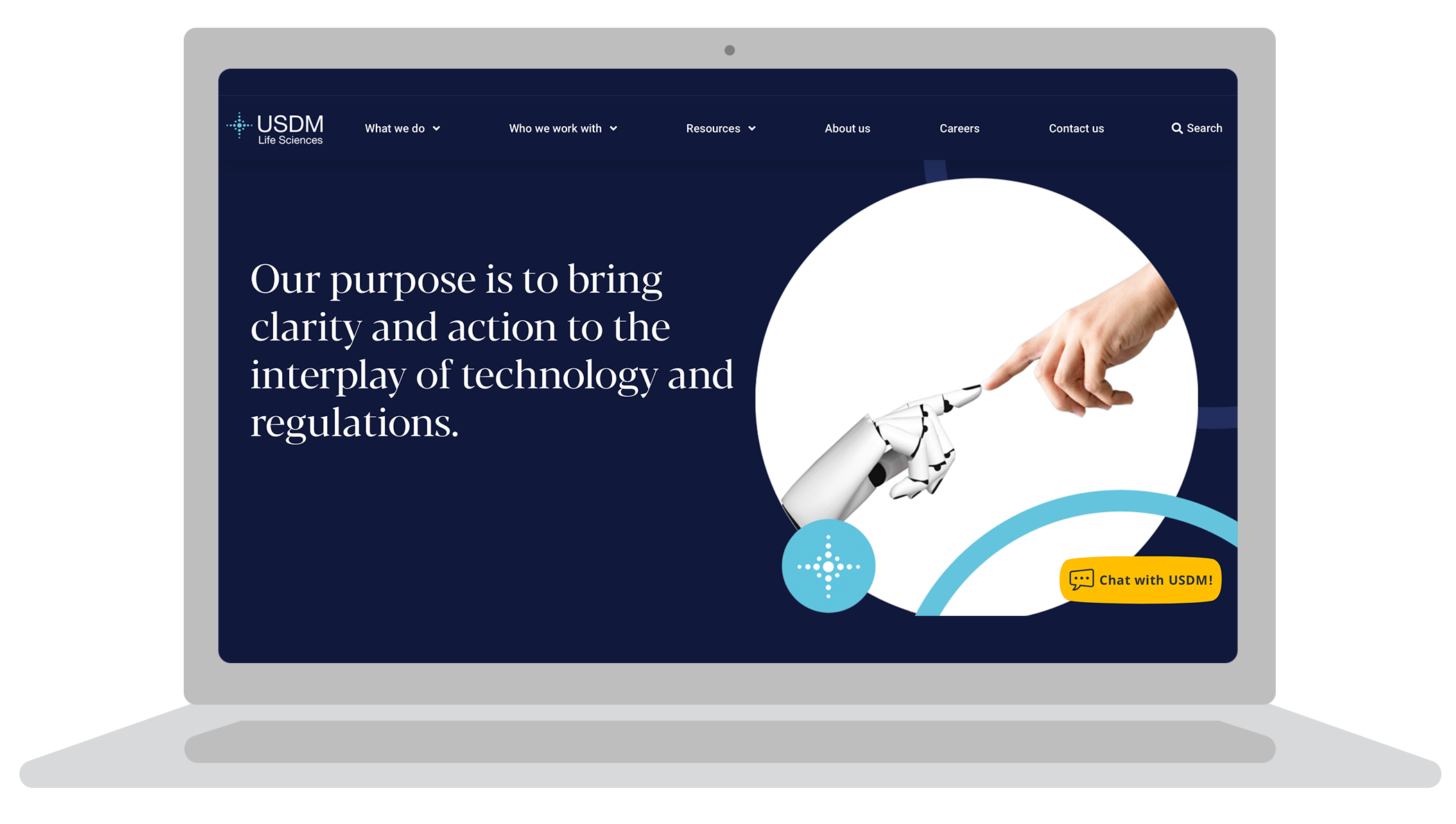
# Case study: USDM - Selecting key project metrics

In this part of the course, you have been focusing on how business intelligence professionals identify effective metrics for a project. A key part of this process is working with stakeholders to understand their data needs and how those interests can be measured and represented with the data. In this case study, you will have the opportunity to explore an example of how the BI team at [USDM](https://usdm.com/) worked with stakeholders to develop metrics.



## Company background

USDM, headquartered in Santa Barbara, California, collaborates with life science companies across a variety of industries, including biotechnology, pharmaceutical, medical device technology, and clinical. USDM helps its customers, from large-scale companies to small businesses, ensure that their database systems are compliant with industry standards and regulations, and work effectively to meet their needs. USDM’s vision is to bring life sciences and healthcare solutions to the world better and faster—starting with its own company values: customer delight, accountability, integrity, respect, collaboration, and innovation.



## The challenge

In this case study, you’re going to explore an example of USDM’s work with one of their clients. The client for this project researches and develops antibody treatments for cancer patients. The client needs analytics that measure the effectiveness and efficiency of their products. However, with the client’s existing database, to get the types of reports they need, they have to access many systems, including facility data, licensing information, and sales and marketing data. All of this data exists in various places, and as a result, developing analysis reports creates issues for the client’s stakeholders. Also, it makes it harder to compare key metrics because so many KPIs needed to be brought together in one place.

To help better understand how effective their product is and forecast demand, the client asked USDM to help architect a data storage system that could address their specific needs. They needed a system that could bring the data their team needs together, follow industry regulations, and allow them to easily create reports based on key metrics that can be used to measure product effectiveness and market trends. A significant part of this initiative started with the basics: what were the actual key metrics for the client’s team and what data systems did they come from?

## The approach

To identify which metrics were most important for the client’s business needs, the USDM team needed to get input from a variety of different people from across the organization. For example, they needed to know what charts the sales and marketing teams who used this data for their reports needed, what their existing processes were, and how to address these needs in the new system. But, they also needed to know what data the product development team used in order to measure efficacy.



USDM worked closely with different teams to determine what charts they needed for reports, how they were accessing and using the database system currently, and what they were hoping to achieve with the new system. As a result, the team was able to determine a selection of key metrics that represented their client’s business needs. These metrics included:

* Sales performance
* Product performance
* Insurance claims
* Physician information
* Facility data

To enact a business intelligence solution there must be both the business interaction with stakeholders and the technical interaction with the architects of other team’s systems. Once these metrics were identified by the client, the USDM team collaborated with other members of the client’s team to begin building a new solution that could capture these measurements.

But, almost every project comes with unexpected challenges; the database tool the team was using to develop the new system didn’t have all of the features the team needed to capture their must-have metrics. In this case, the USDM team collaborated with leadership to develop a list of requests from the tool vendor, who was able to address their team’s unique needs.

## The results

By the end of the project, the USDM BI team architected a data storage system that consolidated all of the data their team needed from across a variety of sources. The system captured the key metrics the client needed to understand their product’s effectiveness, forecast sales demand, and evaluate marketing strategies. The reporting dashboards created with this data storage system included everything the stakeholders needed. By consolidating all of the KPIs in one place, the system could provide faster insights and save the client time and improve efficiency without having to run reports from every individual system. The solution was more automated and efficient—and importantly, designed specifically with their team’s most useful metrics in mind.

## Conclusion

Collaborating with users and stakeholders to select metrics early on can help determine the long-term direction of a project, the specific needs stakeholders have, and how to design BI tools to best address unique business needs. As a BI professional, a key part of your role will be considering key metrics and how to tailor the tools and systems you create to capture those measurements efficiently for reporting use

# Glossary terms from module 3

**Data availability:** The degree or extent to which timely and relevant information is readily accessible and able to be put to use

**Data integrity:** The accuracy, completeness, consistency, and trustworthiness of data throughout its life cycle

**Data visibility:** The degree or extent to which information can be identified, monitored, and integrated from disparate internal and external sources

**Vanity metric:** Data points that are intended to impress others, but are not indicative of actual performance and, therefore, cannot reveal any meaningful business insights

### ****Terms and their definitions from previous modules****

### A

**Application programming interface (API):** A set of functions and procedures that integrate computer programs, forming a connection that enables them to communicate

**Applications software developer:** A person who designs computer or mobile applications, generally for consumers

### B

**Business intelligence (BI):** Automating processes and information channels in order to transform relevant data into actionable insights that are easily available to decision-makers

**Business intelligence governance:** A process for defining and implementing business intelligence systems and frameworks within an organization

**Business intelligence monitoring:** Building and using hardware and software tools to easily and rapidly analyze data and enable stakeholders to make impactful business decisions

**Business intelligence stages:** The sequence of stages that determine both BI business value and organizational data maturity, which are capture, analyze, and monitor

**Business intelligence strategy:** The management of the people, processes, and tools used in the business intelligence process

### D

**Data analysts:** People who collect, transform, and organize data

**Data governance professionals:** People who are responsible for the formal management of an organization’s data assets

**Data maturity:** The extent to which an organization is able to effectively use its data in order to extract actionable insights

**Data model:** A tool for organizing data elements and how they relate to one another

**Data pipeline:** A series of processes that transports data from different sources to their final destination for storage and analysis

**Data warehousing specialists:** People who develop processes and procedures to effectively store and organize data

**Deliverable:** Any product, service, or result that must be achieved in order to complete a project

**Developer:** A person who uses programming languages to create, execute, test, and troubleshoot software applications

### E

**ETL (extract, transform, and load):** A type of data pipeline that enables data to be gathered from source systems, converted into a useful format, and brought into a data warehouse or other unified destination system

### I

**Information technology professionals:** People who test, install, repair, upgrade, and maintain hardware and software solutions

**Iteration:** Repeating a procedure over and over again in order to keep getting closer to the desired result

### K

**Key performance indicator (KPI):** A quantifiable value, closely linked to business strategy, which is used to track progress toward a goal

### M

**Metric:** A single, quantifiable data point that is used to evaluate performance

### P

**Portfolio:** A collection of materials that can be shared with potential employers

**Project manager:** A person who handles a project’s day-to-day steps, scope, schedule, budget, and resources

**Project sponsor:** A person who has overall accountability for a project and establishes the criteria for its success

### S

**Strategy:** A plan for achieving a goal or arriving at a desired future state

**Systems analyst:** A person who identifies ways to design, implement, and advance information systems in order to ensure that they help make it possible to achieve business goals

**Systems software developer:** A person who develops applications and programs for the backend processing systems used in organizations

### T

**Tactic:** A method used to enable an accomplishment

**[Optional] Review Google Data Analytics Certificate content about context**

**Context** is the condition in which something exists or happens. Context is important in data analytics because it helps you sift through huge amounts of disorganized data and turn it into something meaningful. The fact is, data has little value if it is not paired with context.



Understanding the context behind the data can help us make it more meaningful at every stage of the data analysis process. For example, you might be able to make a few guesses about what you're looking at in the following table, but you couldn't be certain without more context.

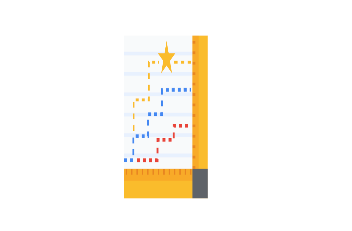
|  |  |
| --- | --- |
| 2010 | 28000 |
| 2005 | 18000 |
| 2000 | 23000 |
| 1995 | 10000 |

On the other hand, if the first column was labeled to represent the years when a survey was conducted, and the second column showed the number of people who responded to that survey, then the table would start to make a lot more sense. Take this a step further, and you might notice that the survey is conducted every 5 years. This added context helps you understand why there are five-year gaps in the table.

| **Years (Collected every 5 years)** | **Respondents** |
| --- | --- |
| 2010 | 28000 |
| 2005 | 18000 |
| 2000 | 23000 |
| 1995 | 10000 |

**Context can turn raw data into meaningful information.** It is very important for data analysts to contextualize their data. This means giving the data perspective by defining it. To do this, you need to identify:

* Who: The person or organization that created, collected, and/or funded the data collection
* What: The things in the world that data could have an impact on
* Where: The origin of the data
* When: The time when the data was created or collected
* Why: The motivation behind the creation or collection
* How: The method used to create or collect it



Understanding and including the context is important during each step of your analysis process, so it is a good idea to get comfortable with it early in your career. For example, when you collect data, you’ll also want to ask questions about the context to make sure that you understand the business and business process. During organization, the context is important for your naming conventions, how you choose to show relationships between variables, and what you choose to keep or leave out. And finally, when you present, it is important to include contextual information so that your stakeholders understand your analysis.

# Design effective executive summaries

Business intelligence professionals need ways to share and communicate plans, updates, and summaries about projects. A common document called an executive summary is used to update decision makers who may not be directly involved in the tasks of a project. In your role as a BI professional, you will often be involved in creating executive summaries.

Additionally, an executive summary can be a useful way to describe your end-of-course project to potential employers. This document can give interviewers exploring your portfolio an easy-to-understand explanation of your projects and be a useful way to reference your projects during the actual interview.

In this reading, you will learn more about executive summaries and how to prepare them for stakeholders. At the end of your project, you will fill out an executive summary about the work you completed– so it will be useful to start thinking about how to approach that document now.

## Executive summaries

Executive summaries are documents that collect the most important points contained in a longer plan or report. These summaries are common across a wide variety of businesses, giving decision makers a brief overview of the most relevant information. They can also be used to help new team members become acquainted with the details of a project quickly. The format is designed to respect the responsibilities of decision makers and/or executives who may not have time to read and understand an entire report. There are many ways to present information within an executive summary, including software options built specifically for that purpose. In this program, you will be focusing primarily on a one page format within a presentation slide. Regardless of how they are created, there are some items that are commonly included.

### Elements of an executive summary

The provided sample executive summary deals with an imagined wildfire predictability project. The intended audience of this summary is a group of decision makers from many different departments within teams that service a variety of parks. The purpose of this summary is to share the insights gained through data analysis of wildfires in the US. Each section delivers a short statement without embellishment. This allows decision makers who are often short on time the ability to quickly grasp the most relevant points about a project. Reference this document as you review each of the following sections.

Below you will find a sample executive summary for an imagined project on wildfire predictability.

To access the sample executive summary, click the link below and select “Use Template.”

Link to sample executive summary: [Wildfire prediction project executive summary](https://docs.google.com/presentation/d/1FCEK660dRJ3aLm7P0mOBaiUTeZ9kopPDx2P-LOGdWt4/template/preview?resourcekey=0-peLLpo6s5dU8RLGAeZkr8g#slide=id.g146c7616c4c_0_24)

OR

If you don’t have a Google account, you can download the file directly from the attachment below.

[Wildfire prediction project executive summary](https://d3c33hcgiwev3.cloudfront.net/jWvuXSpjQryXCcXwZ4EFWw_6436dc99a2064f2e85d0e25d66886bf1_Wildfire-prediction-project-executive-summary.pptx?Expires=1719100800&Signature=j6Z6lRSd0Xnx8STsspGT3ytUysEWLobpNORsUdvx28xyvo6lMuADfKvKcd8n1kjCj6q~Fu0XNaS-ru0wj3-rq1wawVZ5pbJ63PTLlfZ0ee01U3U5yASAK3bZdTJlpXC~8rxxTqCJctzLM1tD52qP2z4w3Zc1HC9hWmAHbgbvIhU_&Key-Pair-Id=APKAJLTNE6QMUY6HBC5A" \t "_blank)

[PPTX File](https://d3c33hcgiwev3.cloudfront.net/jWvuXSpjQryXCcXwZ4EFWw_6436dc99a2064f2e85d0e25d66886bf1_Wildfire-prediction-project-executive-summary.pptx?Expires=1719100800&Signature=j6Z6lRSd0Xnx8STsspGT3ytUysEWLobpNORsUdvx28xyvo6lMuADfKvKcd8n1kjCj6q~Fu0XNaS-ru0wj3-rq1wawVZ5pbJ63PTLlfZ0ee01U3U5yASAK3bZdTJlpXC~8rxxTqCJctzLM1tD52qP2z4w3Zc1HC9hWmAHbgbvIhU_&Key-Pair-Id=APKAJLTNE6QMUY6HBC5A" \t "_blank)

**Project title:** A project's theme is incorporated into the executive summary title to create an immediate connection with the target audience.

**The problem:** A statement that focuses on the need or concern being targeted or addressed by the project. Note, also, that the problem can also be referred to as the hypothesis that you’re trying to prove through analysis.

**The solution:** This statement summarizes a project’s main goal. In this section, actions are described that are intended to address the concerns outlined in the problem statement.

**Details/Key insights:** The purpose of this section is to provide any additional background and information that may assist the target audience in understanding the project's objectives. Determining what details to include depends heavily on the intended audience. It may also be the case that you choose to include some project reflections.

## Key takeaways

Executive summaries are important ways to share information with decision makers, clients, and executives. These documents include a summarized version of the most important information within a project or plan of action. The executive summary is usually broader in scope, not focusing on specific responsibilities or tasks. The executive summary summarizes the status of a project and its discoveries, describing a problem and proposing a solution.

Glossary from course 1

**Experiential learning:** Understanding through doing

**Transferable skill:** A capability or proficiency that can be applied from one job to another

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