NATIONAL LABORATORY OF THE ROCKIES

What Is Data Analysis?

A quick guide to understand your data and use it to tell compelling stories

Francisco Trejo Morales

Overview

Data analysis helps develop insights for research projects, planning interventions, or systematic information gathering. The analyst is responsible for carefully reviewing the data to better understand the problem, situation, or event under investigation. This guide highlights important aspects of the data analysis process.

Finding Connections That Matter

Data analysis is about finding meaningful patterns and connections in your collected data. There are a few **Key Questions** to consider while doing this analysis.

What are you looking for?

This might seem obvious, but data analysis can be overwhelming. Know your goal. Analysts can get tangled within their data and attempt to find connections that are not in the information collected. Always keep the overarching objective of your project in mind when doing data analysis.

A good trick is to write down your questions or project goals. If you are part of a team, ensure everyone is aware of the research or project objectives and what you are trying to achieve.

What is the data telling you in relation to the thing in the world you are investigating?

This process—formulating a question, collecting data, analyzing it, and developing insights—should be a feedback loop. Approach your work as a continuous process. Your initial question guides the data you collect, and the data shapes the way you analyze and report your findings. Your understanding of the problem you're investigating will evolve as you progress. This is what research is supposed to do.

Imagine you want to determine whether your neighbors will likely ride their bike to work based on age. You create a question, gather data, and analyze it. During the analysis phase, you realize that age is likely not the factor determining whether people decide to ride their bike to work. Your analysis reveals that protected bike paths significantly affect people's willingness to bike to work, regardless of age. Initially, you might feel like you overlooked something in your research design or collected the wrong data. However, this new insight enhances your understanding of the original issue. You can now use this new understanding, build upon your original questions, and return to the field to collect more data.

How do you know when to stop?

It is important to be conscious of time. It is your job as the analyst to decide when to stop and move on to the write-up and presentation phase of your process. When identifying a good point to stop, you can refer to your data analysis plan (mentioned below) and your research question. You can also ask yourself the following questions:

- With my analysis, can I further understand the space I am working in?
- Are the developed insights sufficient to make an informed decision regarding the project or intervention?
- Can I make a case for the project or intervention with the understanding I have produced through my data analysis?
- If your answer is "yes" to any previous questions, you might be at a good stopping point.

Before You Begin: Know Your Data

The data you have collected may come from different sources, such as surveys or questionnaires, notes from listening sessions, social events, meetings with local organizations, and demographic information from the census. Therefore, to begin with the analysis phase of your project, it is essential to (1) know what types of data you will be using to develop insights about your project and (2) properly store the data you have collected for your project.

Types of Data: Broadly speaking, there are two common categorizations when determining the type of data you have gathered. The method of analysis will depend on the category your data falls into. The categories are **(A) quantitative data** and **(B) qualitative data**.

A. Quantitative Data: Numerical information about the situation, event, or population you are investigating. This type of data includes counts, measurements, frequencies, scales, and any other information that can be quantified and represented as a number, ratio, or percentage. Additionally, this type of data is commonly captured through predefined concepts and categories such as age, race, nationality, or gender.

***Example:** We mostly get quantitative information when we gather demographic data from a survey. This means we can produce numbers or percentages to show things like the number of people who identified as white Hispanic compared to those who identified as nonwhite Hispanic. One of its major advantages is that it can be represented in compelling ways, such as graphs, charts, and diagrams.*

B. Qualitative Data: A type of information that carries with it multiple levels of meaning and cannot be easily placed into predefined categories. It is usually associated with open-ended questions, in-depth interviews, listening sessions, focus groups, and other activities where different information is exchanged within a specific context. It is important to remember that qualitative data provides insights into the uniqueness and complexity that characterizes social action. Analysis helps us situate this type of data within a useful framework to understand more general trends.

***Example:** As part of a research project related to the renovation of a neighborhood park, you interview a man who tells you that he hates going to the park because it's too loud. He insists there are too many children playing around and shouting. When you visit the park as part of your investigation, you notice that the man chooses to sit right next to the play area. Also, you discover that the man takes his grandson to play in the park. All this information is qualitative data that you need to document to understand the underlying motives for the man's contradictory behavior and how the park renovation might improve his experience as a user of the park's facilities.*

Data Storage: Here are some key considerations about data storage:

A. Security: Depending on the data collection process, you might want to transcribe the information you have gathered to a password-protected location. The data you have collected might contain personal and sensitive information, so it is important to keep track of who has access to it.

***Example:** If you are working with the transcription of an interview, make sure to save your annotations and comments as a separate file. This ensures that other team members can manipulate the same unaltered data without creating conflicting versions of the same file.*

B. Data Access: The data must be retrievable. You and your team members should be able to easily access all the data you have collected. Easy access to the data will greatly simplify the analysis phase by virtue of having all the information you need at hand. Also, make sure to preserve an unmodified copy of the original data.

***Example:** Decide as a team where the data will be stored and establish clear protocols to access, download, upload, and delete any files related to the research. Establishing clear protocols to access the data will ensure that it is kept organized throughout the duration of the research.*

C. Accountability: Data retrievability is also a matter of accountability. The data you have collected will determine your findings, and your findings can impact the community you are collaborating with. Therefore, it is crucial that you can retrieve and return to the data you have collected to support your claims and whatever intervention these might result in.

***Example:** The findings of your research lead to the implementation of a program in a local community. However, certain people within the community want to know how you arrived at the findings that informed the design of the program that will be implemented. You should be able to explain how you collected the data for your research, detail the procedures and methods you used to analyze it, and show how you arrived at specific conclusions. By doing so, you are corroborating that your research was based on sound and robust empirical methods, and that the data you collected is retrievable and accessible.*

D. Data Organization: Keep distinct files for your data. Try to name the files with recognizable tags so you can easily identify what is in them without opening them. It is also a good idea to keep track of different versions of documents by chronologically tagging them with the date you modified the file.

- Establish "best practices" with your collaborators, such as a standard system for file naming and sharing documents related to the research.

***Example:** You could name the file where your original, unaltered data is stored as "Dataset_V1_01_01_24," where V1 stands for Version 1, and the numbers after that represent the date. Once you have manipulated the data in this file, you could create a new version and name it "Dataset_V2_01_02_24."*

Researchers discuss data insights in the 2D visualization laboratory at the National Laboratory of the Rockies' Energy Systems Integration Facility. *Photo by Agata Bogucka, NLR 99124*

How To Understand Data Analysis

In a broad sense, data analysis is about finding patterns and relationships within the information you have gathered (Boellstroff et al. 2012, 164). These patterns relate back to your initial research prompt; they tell you something about the problem or situation you are attempting to investigate. How you analyze your data will depend on the type of information you have gathered (e.g., questionnaire data versus listening session data). The goal of data analysis is the same: to build an understanding of what is happening in a given context. The understanding you will build through your analysis might not reflect everything you gathered during the data collection phase.

Finding Patterns and Relationships in the Data

Analysis involves linking different data elements together and seeing how these linkages build upon one another. To find these links, you might want to start by looking at all the data you have gathered and developing a "big picture" understanding of its contents. Begin by poring over a few surveys and rereading your interview notes. Make sure to tag the things that stand out so you can return to them. By doing so, you can begin strategizing about how to approach your data.

Creating a Data Analysis Plan

After this initial immersion into your data, devise a coherent and systematized strategy to begin analyzing it. You can refer to this strategy as a data analysis plan or schedule. A data analysis plan can help you organize your time regarding the amount of data you have collected, especially if you are working within a team. The data analysis plan will help you focus on what you need to do to get the insights you need for your project in a timely manner.

A. Identify Team Capabilities: An important advantage of creating a data analysis plan is that it can allow you to identify your team's capabilities.

- Consider assigning team members with statistical analysis skills to analyze surveys and quantitative data, while those proficient in coding can handle qualitative data from interviews and listening sessions.

B. Accountability: Importantly, the data analysis plan will also help you keep track of who in your team is dealing with specific datasets, which will increase accountability among team members.

Presenting Your Data: How To Tell a Compelling Story

Data requires interpretation; it needs to be placed in context, and it needs to say something about the problem you are investigating. Data analysis will allow you to develop empirically grounded insights regarding your project, but it is up to you to develop a narrative through which your findings make sense to a wider audience. Think of this activity as developing an argument or building a case using your findings.

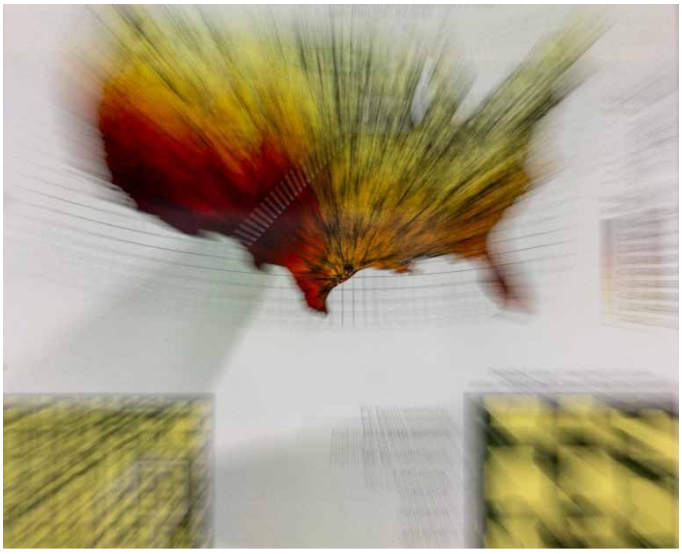
A. Knowing Your Audience: Distinguish between a presentation for government experts and an info session for community members. With the experts, you can use more technical language and details. For the community, it's better to explain complicated ideas in simpler terms. Also, the type of document you create may vary; for example, a public report is different from a peer-reviewed journal article.

B. Media and Modes of Dissemination: Consider the advantages and limitations of different media and modes of dissemination.

- PowerPoint presentations, peer-reviewed journals, YouTube videos, panel discussions, reports, pamphlets, social media posts, etc. all represent different modes of presenting your data with their own unique advantages and disadvantages. Be mindful of what each medium offers.

- Ask yourself how different media reach the different populations that are related to your research. However you want to approach your storytelling, it must articulate a coherent and convincing argument based on the evidence you collected. Your data analysis will help you determine how to piece together a comprehensive account of the insights you developed. While constructing your narrative, think about the elements you want your audience to understand and focus on building a story around them.

C. Time and Space: Be mindful of time and space and remember that both these resources are limited when it comes to presenting your findings, whether it is in written, verbal, or multimedia format.



An in-camera zoom image of data maps developed by researchers. *Photo by Gregory Cooper, NLR 97408*

Bibliography

- Boellstroff, Tom, Bonnie Nardi, Celia Pearce, and T.L. Taylor. 2012. *Ethnography and Virtual Worlds: A Handbook of Method*. Princeton, NJ: Princeton University Press.
- Bourdieu, Pierre. 1977. *Outline of a Theory of Practice*. Translated by Richard Nice. Cambridge University Press.
- Geertz, Clifford. 1973. *The Interpretation of Culture*. Basic Books.
- Haraway, Donna J. 1988. "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective." *Feminist Studies 14 (3)*: 575–99. https://doi.org/10.2307/3178066.
- Haraway, Donna. 2016. "The Cyborg Manifesto." In *Manifestly Haraway*. University of Minnesota Press.
- Hymes, Dell. 1990. "Toward Ethnographies of Communication: The Analysis of Communicative Events." *In Language and Social Context*, 21–45. Penguin Books.
- Rabinow, Paul. 2016. *Reflections on Fieldwork in Morocco*. Thirtieth Anniversary Edition. University of California Press.
- Ricoeur, Paul. n.d. *Hermeneutics and the Human Sciences*. Translated by John B. Thompson.
- Weber, Max. 2005. "The Nature of Social Action." In *Selections in Translation*, 7–33. Cambridge University Press.

Cover image: Researchers analyze a word cloud in the 2D visualization laboratory at the National Laboratory of the Rockies' Energy Systems Integration Facility. *Photo by Agata Bogucka, NLR 99134*

NATIONAL LABORATORY OF THE ROCKIES

15013 Denver West Parkway
Golden, CO 80401
303-275-3000 • www.nlr.gov

National Laboratory of the Rockies prints on paper that contains recycled content.

National Laboratory of the Rockies is a national laboratory of the U.S. Department of Energy, Office of Critical Minerals and Energy Innovation, operated under Contract No. DE-AC36-08GO28308.

NLR/FS-5400-92573 • February 2026