

Assignment: Critique and Redesign (MakeoverMonday)

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Step One: Selection of Data Visualization

For this assignment, I selected **the Railroad Infrastructure Quality - Country Rankings** visualization from MakeoverMonday (2022/W47).

Original Visualization: [TheGlobalEconomy.com - Railroad Infrastructure Quality Rankings](#)

Why I Selected This Visualization:

I chose this visualization because it presents an interesting dataset about global infrastructure development, but the original bar chart format limits the viewer's ability to identify meaningful patterns and trends over time. The visualization shows only 2019 rankings, displaying the top 32 countries ranked by their railroad infrastructure quality scores on a scale from 1 (low) to 7 (high). While the bar chart effectively communicates the ranking order, it misses an opportunity to show the temporal dimension of the data specifically, how countries have improved or declined over the decade from 2009 to 2019.

As someone interested in policy analysis and infrastructure development, I was drawn to the potential of showing not just where countries stand, but how they've progressed. This seemed like an ideal candidate for redesign because the underlying dataset (sourced from the World Economic Forum) contains historical data that could reveal compelling stories about infrastructure investment and development trajectories. The original visualization also raised questions about regional patterns and whether certain geographic or economic clusters show similar infrastructure quality levels insights that could be made more apparent through alternative visualization approaches.

Original Visualization

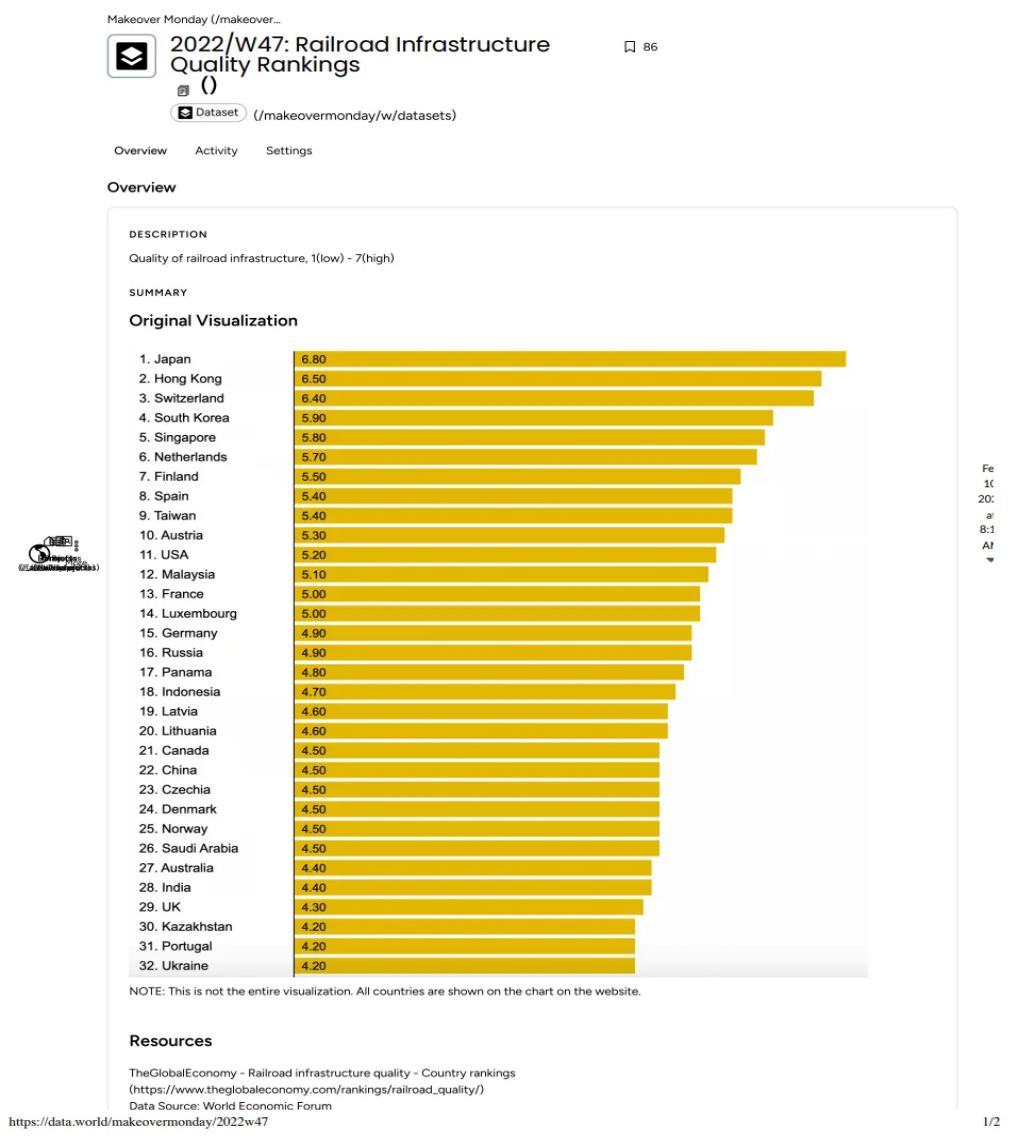


Figure 1: Original bar chart visualization from MakeoverMonday

Railroad infrastructure quality - Country rankings

* indicates monthly or quarterly data series

- Railroad infrastructure quality
 - ▷ Port infrastructure quality
 - ▷ Air transport infrastructure quality
- ▷ Energy and environment
- ▷ Industry: Oil, coal, and electricity
- ▷ Energy mix
- ▷ Agriculture sector
- ▷ Banking system access and depth
- ▷ Banking system efficiency and stability
- ▷ Stock market, insurance, pensions
- ▷ Financial development
- ▷ Innovation measures
- ▷ Economic freedom indexes
- ▷ Demographics
- ▷ Health spending and outcomes
- ▷ Covid pandemic
- ▷ Child and maternal mortality
- ▷ Healthcare resources
- ▷ Inequality and poverty
- ▷ Education spending and outcomes
- ▷ Globalization indexes
- ▷ Shares of world totals
- ▷ Economic structure

Quality of railroad infrastructure, 1(low) - 7(high), 2019: The average for 2019 based on 101 countries was 3.61 points. The highest value was in Japan: 6.8 points and the lowest value was in Albania: 1.2 points. The indicator is available from 2009 to 2019. Below is a chart for all countries where data are available.

Measure: points; Source: World Economic Forum

World

Countries ▲▼	Railroad infrastructure quality, 2019 ▲▼	Global rank ▲▼	Available data ▲▼
Japan	6.8	1	2009 - 2019
Hong Kong	6.5	2	2009 - 2019
Switzerland	6.4	3	2009 - 2019
South Korea	5.9	4	2009 - 2019
Singapore	5.8	5	2009 - 2019
Netherlands	5.7	6	2009 - 2019
Finland	5.5	7	2009 - 2019
Spain	5.4	8	2009 - 2019
Taiwan	5.4	9	2009 - 2019
Austria	5.3	10	2009 - 2019
USA	5.2	11	2009 - 2019
Malaysia	5.1	12	2009 - 2019
France	5	13	2009 - 2019
Luxembourg	5	14	2009 - 2019
Germany	4.9	15	2009 - 2019
Russia	4.9	16	2009 - 2019
Panama	4.8	17	2009 - 2019
Indonesia	4.7	18	2009 - 2019
Latvia	4.6	19	2009 - 2019

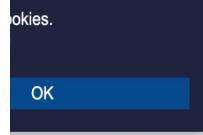


Figure 2: Data table from *TheGlobalEconomy.com*

Step Two: Critique of the Data Visualization

I completed a comprehensive critique using Stephen Few's Data Visualization Effectiveness Profile. Below are my key findings:

Critique Ratings Summary:

Data Visualization Effectiveness Profile

Reference

Few, Stephen. "Data Visualization Effectiveness Profile," 2017, 11.
http://www.perceptualedge.com/articles/visual_business_intelligence/data_visualization_effectiveness_profile.pdf

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Carnegie Mellon University Mail - Thanks for filling out this form: Data Visualization Effectiveness Profile

What visualization are you ranking? Provide the title and web-accessible URL. *

https://www.reddit.com/r/dataisbeautiful/comments/wzx70h/average_age_of_women_at_first_marriage_by_state/

Usefulness. Is it useful for the intended audience? Does it communicate valuable information?

1 2 3 4 5 6 7 8 9 10

Useless



Very useful

Completeness. Does the visualization have everything necessary to make it understandable?

Figure 3: Data Visualization Effectiveness Profile - Part 1

Completeness. Does the visualization have everything necessary to make it understandable?

1 2 3 4 5 6 7 8 9 10

No relevant data



All relevant data

Perceptibility. Can the reader understand the information with minimal effort? Is the visualization type appropriate? Does it use illogical comparisons?

1 2 3 4 5 6 7 8 9 10

Unclear and difficult



Clear and easy

Truthfulness. Is the visualization accurate, reliable and valid? Is it representing what it says it is, and in the most complete and truthful manner? Does it misrepresent the data or make comparisons that aren't correct?

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1 2 3 4 5 6 7 8 9 10

Inaccurate and / or invalid



Accurate and valid

Intuitiveness. Is it easy to understand and clearly communicates the information? If unfamiliar, does it include easy to understand instructions on how to interpret it?

1 2 3 4 5 6 7 8 9 10

Unfamiliar, difficult to understand



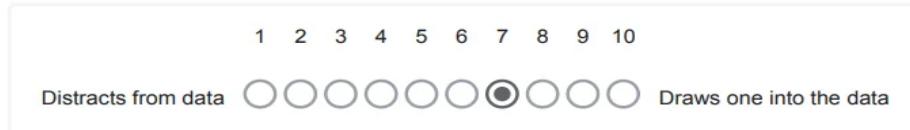
Familiar, easy to understand

Figure 4: Data Visualization Effectiveness Profile - Part 2

Aesthetics. It is interesting / enjoyable to look at? Is it a good example of what a beautiful data visualization might look like? Is it somewhere in the middle - pleasing but otherwise not distracting to look at?



Engagement. Does it lead the audience to learn more about the topic? Does it inspire the audience to talk about the data or share it with others?



Describe your overall observations about the data visualization here. What stood out to you? What did you find worked really well? What didn't work well? *

What stood out to me most was the intuitive yet counterintuitive story the data tells—rural, low-density states like Utah (outlier at ~24.6 years) correlate with earlier marriages, possibly due to cultural, religious, or economic factors (e.g., Mormon influence in Utah, as noted in comments), while urban-heavy states (~29.9 years) show delays, potentially linked to

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11:03 PM Carnegie Mellon University Mail - Thanks for filling out this form: Data Visualization Effectiveness Profile
career focus, education, or more partner options. The lack of state labels made it frustrating to identify specific points without cross-referencing the OP's data table in the comments, which highlights outliers effectively but isn't integrated into the viz. The plot's simplicity also sparked a lot of discussion in the comments about causation vs. correlation (e.g., urbanization, religion, cost of living).

Who is the primary audience for this tool? Do you think this visualization is effective for reaching that audience? Why or why not? *

- Even without a fitted line, the scatter points form a visible upward curve, making the relationship easy to grasp at a glance. It's "beautiful" in its minimalism, fitting the subreddit's vibe.
- The axes are clearly labeled with units, and the scales are appropriate (though the y-axis has a lot of empty space at the top due to New Jersey's extreme density).
- The OP smartly provided the full data table, top/bottom 10 lists, and sources in a comment, allowing for deeper exploration and verification.

Figure 5: Data Visualization Effectiveness Profile - Part 3

What Worked Well:

The original visualization successfully establishes a clear ranking hierarchy using a horizontal bar chart, which is an appropriate choice for comparing categorical data (countries) across a single quantitative measure.

The scale (1-7 points) is clearly labeled, and the visualization answers its primary question effectively: "Which countries have the highest quality railroad infrastructure in 2019?" The ranking format also makes it easy to identify leaders (Japan, Hong Kong, Switzerland) and compare their relative scores.

What Didn't Work Well:

The most significant limitation is the **absence of temporal context**. While the dataset includes data from 2009-2019, the visualization only shows a single year snapshot, missing the opportunity to illustrate which countries have made the most progress in infrastructure development over the decade. This is particularly problematic given that infrastructure development is inherently a long-term process where improvement trends are often more meaningful than static rankings.

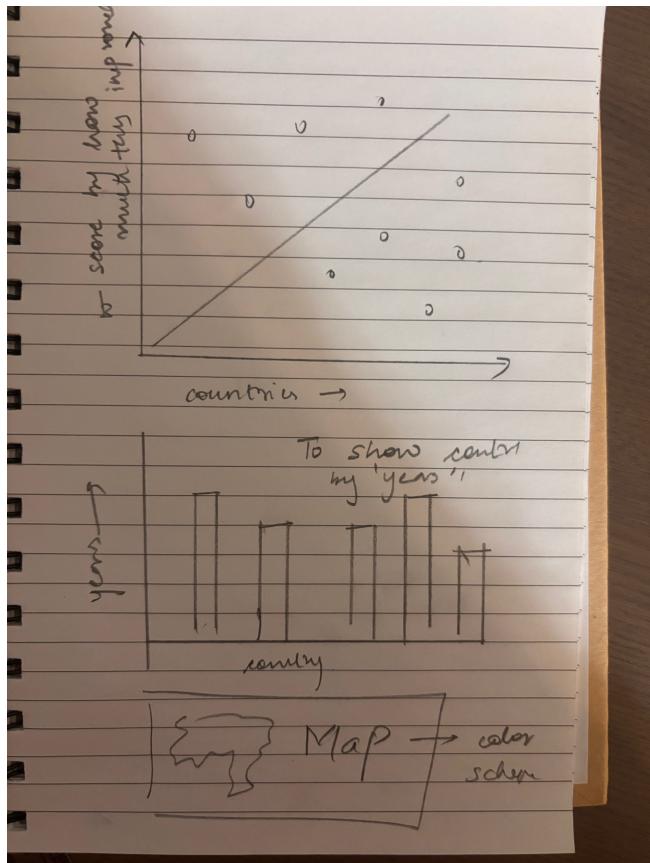
The **lack of geographic or regional grouping** makes it difficult to identify patterns among similar economies or regions.

The visualization also suffers from **limited interactivity and context**. There's no information about what the scores measure, viewers must navigate to external documentation to understand that these represent expert assessments of railroad infrastructure efficiency, quality, and extent.

Finally, the sheer **length of the bar chart** (showing 32+ countries) makes it challenging to process the information efficiently, especially for countries in the middle range where differences become minimal and less meaningful.

Step Three: Wireframing and Sketching Solutions

I developed potential redesign concepts:



Step Four: Testing the Solution

I conducted user testing with two peers from my program, sharing both wireframe sketches without extensive explanation to assess intuitiveness.

Feedback from Person 1 (Student, mid-20s):

Key Critique:

"Your chart is not clear. Don't use a scatter plot for countries as it's hard to understand which country without clicking on the dots."

Analysis: This feedback highlighted a critical usability issue with the scatter plot format. Person 1 found that the lack of direct country labels made the visualization difficult to interpret without hovering over individual data points. This suggested that while the scatter plot effectively showed patterns and trends at a macro level, it created friction for users wanting to quickly identify specific countries. The critique indicated a need for more prominent labeling of key countries or potentially adding an interactive legend that could highlight countries of interest.

Feedback from Person 2 (Student, MSPPM program):

Key Critique:

"You can divide the visualization into two in order to make it clearer. The timeline can be reduced to make it starker."

Analysis: Person 2 suggested separating the visualization into two distinct views to enhance clarity. They also recommended condensing the timeline to emphasize the magnitude of changes more dramatically. This feedback pointed toward creating separate visualizations for "improved" and "declined" countries or perhaps showing the 2009 and 2019 data in side-by-side comparisons. The suggestion to reduce the timeline implied that showing the full decade might dilute the impact a shorter, more recent time period might make improvements or declines appear more striking and actionable.

Step Five: Building the Solution

Using Tableau Public, I built the final redesigned visualization incorporating the user feedback and critique insights.

Final Design: Railroad Infrastructure Improvement Matrix

Visualization 1: Geographic Distribution Map

I made a **choropleth map** showing railroad infrastructure quality using color intensity to indicate scores. This would reveal:

- **Geographic clusters** of infrastructure quality
- **Regional patterns** (e.g., European vs. Asian vs. other regions)
- **Visual identification** of countries at a glance

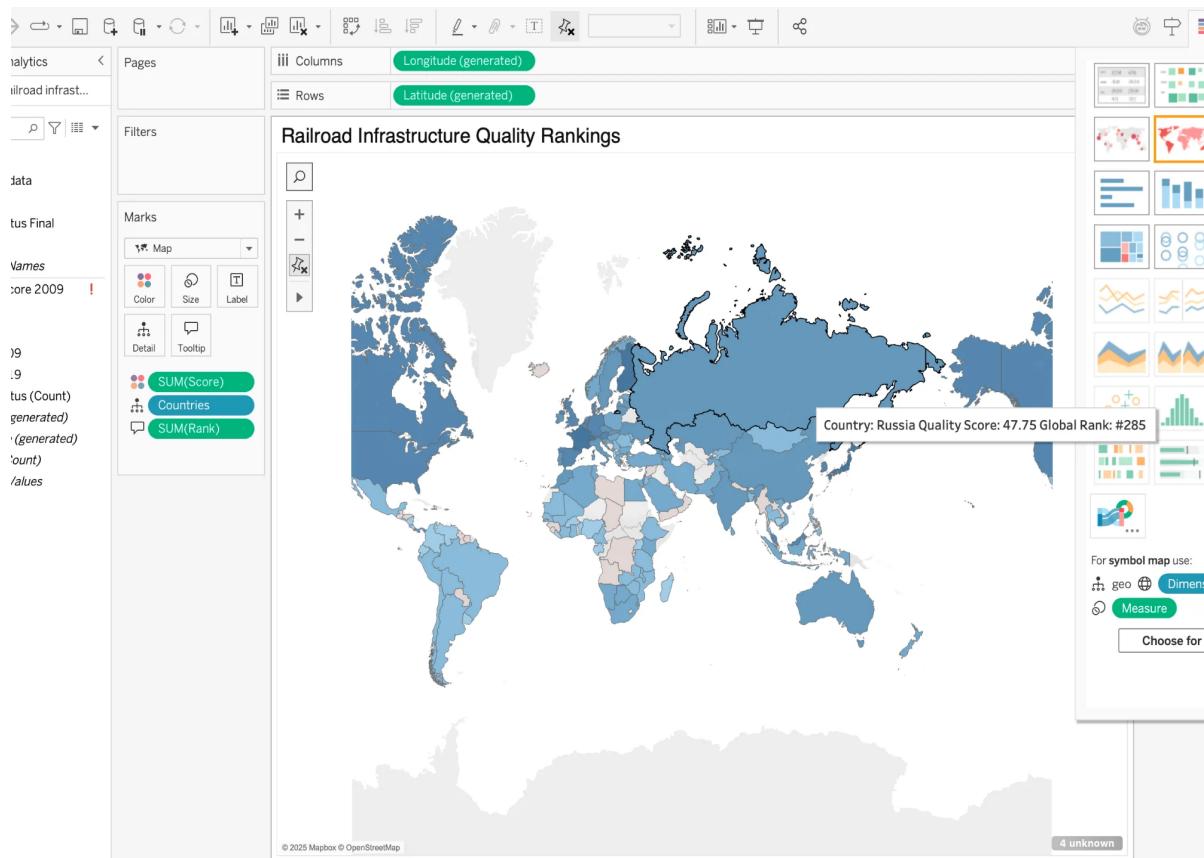


Figure 7: Alternative wireframe - Geographic distribution map

I decided to develop both concepts in Tableau to test their effectiveness, I decided to create both scatter plot and the map to show a complete visualization

Visualization 2: Improvement Matrix (Scatter Plot)

This visualization is a **scatter plot comparing 2009 scores (x-axis) against 2019 scores (y-axis)**, with reference lines showing the average values for each year. This approach would immediately visualize:

- **Countries that improved** (orange points above the diagonal)
- **Countries that declined** (red points below the diagonal)
- **High performers vs. emerging improvers** (quadrant analysis)
- **Magnitude of change** (distance from diagonal)

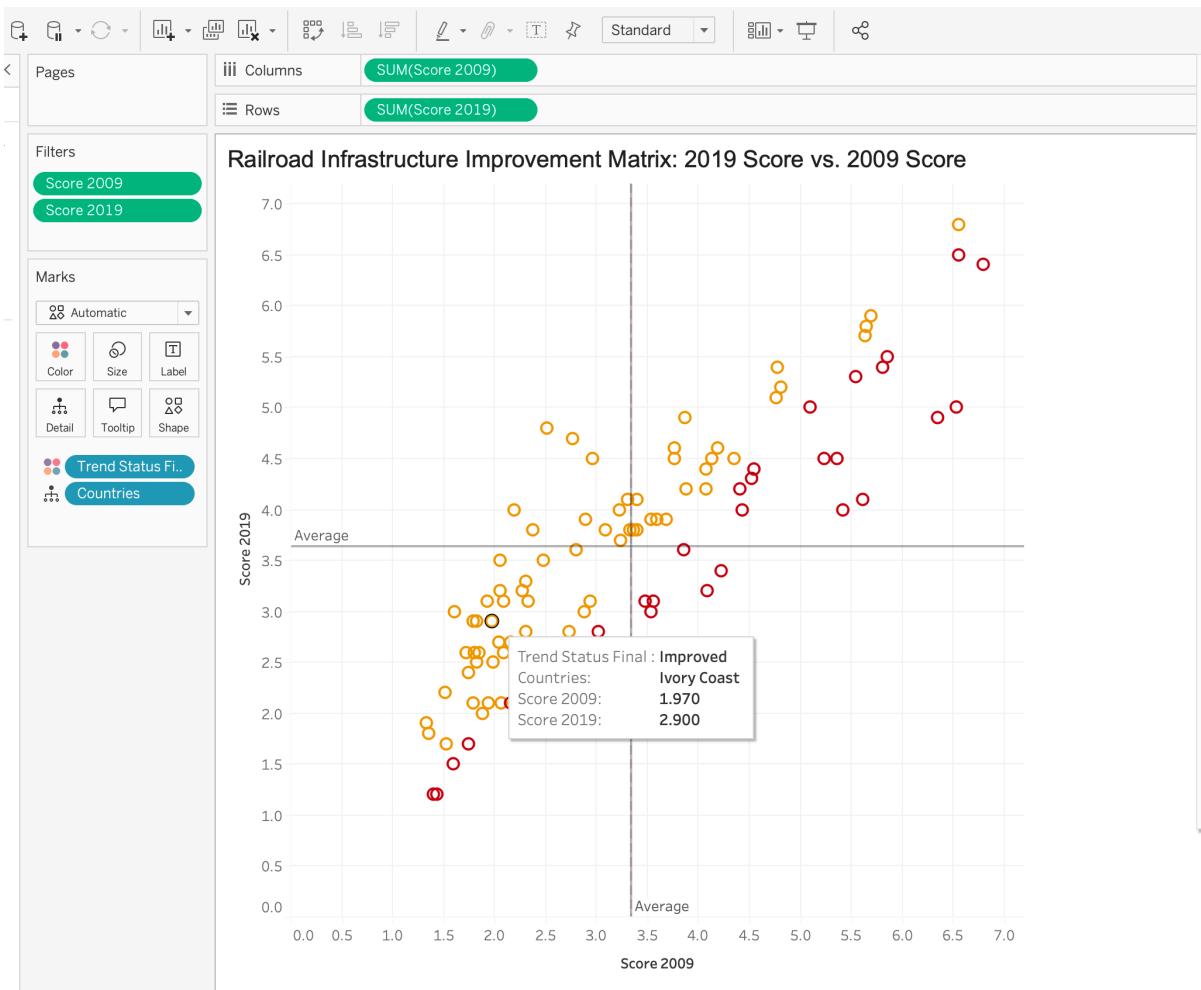


Figure 6: Improvement Matrix scatter plot

Reflection and Key Insights

This assignment reinforced several key principles about effective data visualization:

1. While the original bar chart precisely showed rankings, it lacked the temporal context that makes the data meaningful. The improvement matrix sacrifices some precision in exact ranking positions but gains tremendously in showing the story of progress over time.

- 2.** The feedback from peers revealed blind spots in my design that I hadn't considered, particularly around labeling clarity and the need to guide viewers toward the key insight.
- 3.** By choosing a scatter plot over a bar chart, I fundamentally changed the story from "who ranks highest" to "who has improved most," demonstrating how format decisions encode meaning.

The redesigned visualization successfully transforms static country rankings into a dynamic narrative about global infrastructure progress, making it easier for viewers to understand not just where countries stand today, but how they got there

AI and Tool Usage Disclosure

Zoom Notetaker for User Feedback Documentation

During the user testing phase, I turned on Notetaker AI while my peers were critiquing my wireframe designs. This transcription tool captured their verbal feedback in real-time, which significantly reduced the time required to document their exact thoughts and allowed me to focus more on the conversation itself rather than frantically taking notes. After the sessions, I reviewed the Otter AI transcripts to extract the key feedback points and quotes included in this document.

AI and transcription tools were used solely for documentation and articulation purposes, not for generating creative ideas or analytical conclusions.