

**Topic: Visualizing Seattle Traffic Accident Hotspots and Patterns**

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## **Part 1: Basic Evaluation Plan: 🚩**

Usability testing is a technique implemented in user-centered design to evaluate a product by testing it with users. It can provide insights into how actual users will interact with the product or visualization, allowing the designer to spot design flaws, uncover opportunities to improve, and learn about target user's behavior and preferences. It also provides an unbiased perspective from users not involved in the product's development. To conduct usability testing for this project, a low fidelity functional prototype of our visualization was created with the heatmap and accompanying bar graphs. Sliders were put in slots for the users to navigate the heatmap and directions were given for filtering bar graphs by year with a makeshift drop down menu. The goal was to assess if the visualization had an intuitive flow for the user while imparting all relevant information. Clear objectives were set about which features were to be tested and users were asked to explore the visualization and find answers to the following:

1. What are the accident patterns in Seattle in a particular year?
2. How do "time of the day" and "weather conditions" affect the number of accidents?
3. Under what conditions do most accidents happen?

Three classmates were encouraged to interact with our visualization in class. The visualization was also presented to three representative participants outside the classroom. Participants were observed as they interacted with the prototype to gauge if they could complete the main actions without confusion and if the overall experience was functional and efficient.

## Part 2: Simple Evaluation and results:

### Feedback from Peers:

1. Ayush Mall: Consider organizing the visualizations across different dashboards rather than placing them all on a single dashboard. This adjustment could enhance clarity and make the data easier to interpret by breaking down the information into focused sections.
2. Alicia Chuang: It might be a better approach to separate the visualizations across multiple dashboards for improved user experience.
3. Anurag Agarwal: The slider feature in the prototype is well-designed and adds a great deal of appeal. It's both intuitive and visually engaging, making it easy for users to interact with the data. Additionally, the entire heat map is a powerful visualization choice for the topic selected, as it effectively communicates complex information in an accessible and compelling way.

### Feedback from Target Users:

#### User # 1:

The user provided positive feedback on the sliders for "time of day" and "weather," noting that they are intuitive and work well together to display accident hotspots. They appreciated that the sliders interact in tandem, enhancing the user experience by revealing relevant insights. However, they raised a key question regarding the layout: if the heatmap does not change when selecting different years from the drop-down menu, it might be more effective to separate the bar graphs and the heatmap into different dashboards rather than combining them in one. They pointed out that the heatmap highlights accident hotspots, while the bar graphs illustrate accident patterns. Since each visualization tells a different story, placing them on separate dashboards could provide a clearer and more focused user experience.

#### User # 2:

One of the main suggestions the user gave is to revise the headings for better clarity. The current heading 'Patterns' could be confusing or too vague, so they said it might be more effective to change it to something like 'Visualization of Seattle Accident Hotspots and Patterns.'

This change would provide a clearer and more specific description of the content, helping users better understand the focus of the data. On a more positive note, they really enjoyed the slider feature, particularly for adjusting the time of day and weather conditions. It's both intuitive and engaging, requiring very little cognitive effort, which makes it easy for users to interact with and explore the data. They also found the heat map visualization to be an excellent choice. Given that it visualizes a geographical area, it provides a powerful and clear way to convey accident hotspots, making the data more accessible and insightful.

### **User # 3:**

This user found the sliders intuitive and had no issues navigating the heatmap. He asked if the sliders could be used in conjunction with each other (showing information for certain conditions at certain times of day) or would they just show individual settings on the heatmap (accidents during nighttime or accidents when snowing). The answer to this question is that the sliders will work in tandem with each other so that the user can pick a weather condition and use the other slider to view how accident frequency changes during the day under that specific condition or vice versa. This user also had no issues navigating the bar graphs, filtering for specific years and using the tooltip to get exact accident counts. Here, one question that arose was whether the bar graphs would be connected to the heatmap and change as the sliders are moved. Our group had discussed this in prior meetings and decided that this would unnecessarily increase the user's cognitive load so bar graphs would not be connected to the interactivity on the heat map. This user's feedback about the layout was that the visualization would make more impact if the heatmap and bar graphs are on the same page.

### **Suggestions for design refinement and what worked well**

**1. Intuitive Slider Functionality:** One of the strongest aspects of the current design is the intuitive and visually engaging slider feature for adjusting "time of day" and "weather" conditions. Feedback from multiple users highlighted the sliders as both appealing and easy to use, allowing users to interact with the data smoothly. The sliders work in tandem, enabling users to explore accident hotspots under specific conditions at different times, which enhances the overall user experience.

**2. Refining the Layout with Separate Dashboards:** Several users suggested restructuring the layout by separating the visualizations across different dashboards. This change would allow for

a more focused presentation, making it easier for users to interpret the data. Since the heatmap is effective in showing accident hotspots while the bar graphs illustrate patterns over time, placing these visualizations on separate dashboards could improve clarity and reduce cognitive load. This separation would also provide a cleaner, more organized user experience by allowing each visualization to tell its distinct story without overlap.

**3. Updating Headings for Clarity:** To enhance the dashboard's readability, users recommended revising the headings. For instance, changing the heading from "Patterns" to something more descriptive, like "Seattle Accident Hotspots and Patterns," could provide a clearer, more accurate overview of the content. Updated headings would help users understand the data's focus immediately, making the information easier to navigate and interpret.

These adjustments, based on user feedback, will refine the design by enhancing clarity, usability, and user experience, while maintaining the effective aspects of the current layout, such as the intuitive sliders and powerful heatmap visualization.

## Appendix:

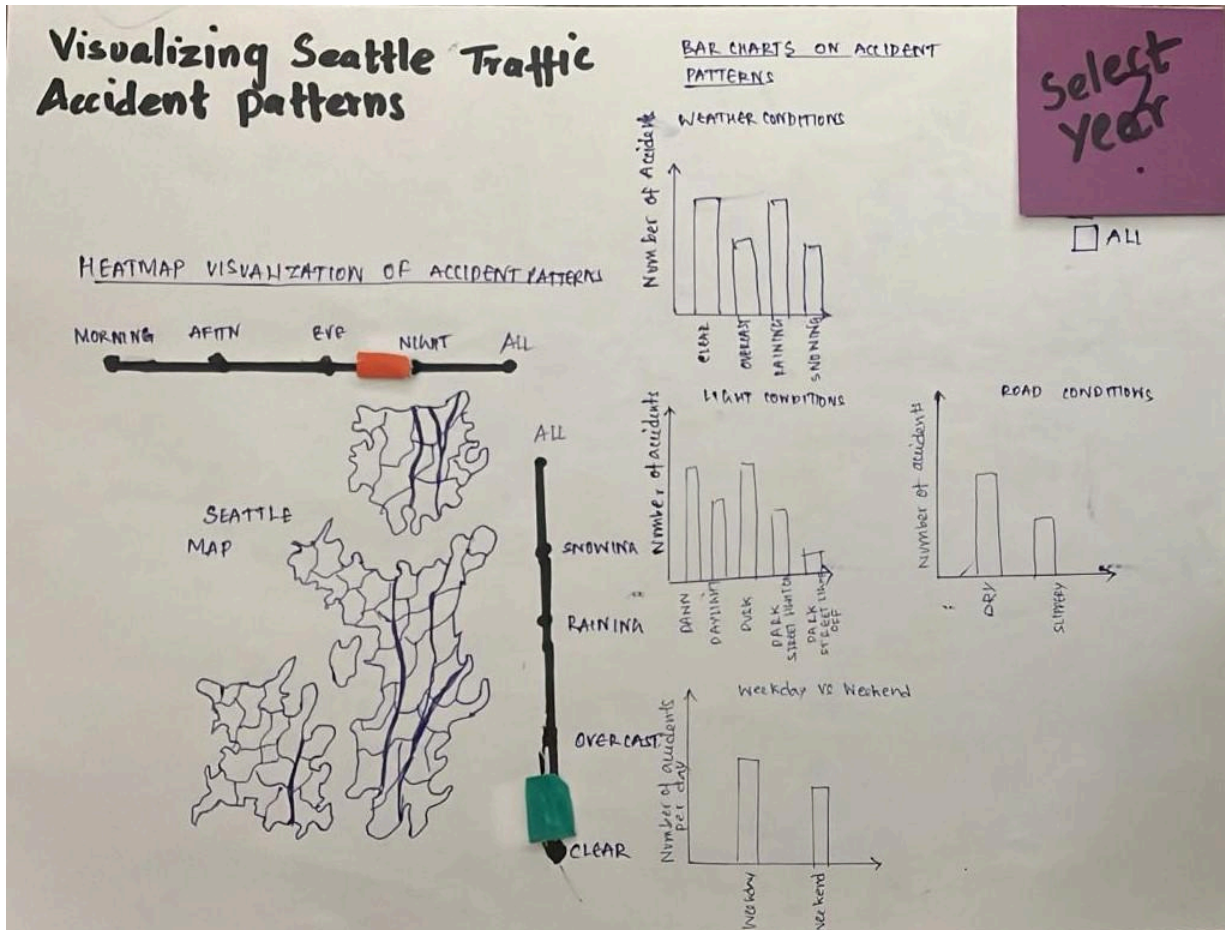


Fig: Dashboard showing accident hotspots and patterns in Seattle