MASTERS THESIS

Storytelling in InfoVis: Does it allow users to recall the data better?

Abhraneel Sarma

Advisor: Prof. Matthew Kay

OVERVIEW

Different strategies are adopted in visualization design: use of interactivity, narrative, a combination of the interactivity and narrative, or static (no-interactivity or non-narrative).

Previous research looked into how these strategies affect user engagement (measured through time spent and meaningful interactions with the vis)

OVERVIEW

The purpose of this study is to measure the effect of using different visualization strategies on:

1. **Recall:** operationalized through two variables: interactivity (static or interactive) and narrative (non-narrative or narrative)
2. **Engagement:** measured through time-spent and number of clicks to manipulate the data presented in the visualization

MOTIVATION

aka Why work on this?

Initially, thought all visualizations were highly interactive, dashboard-like exploratory tools.

Then I discovered the works in NYT graphics, and research on narrative visualizations by researchers like Jeffrey Heer, Jessica Hullman etc.

I thought, ***how does using narratives and storytelling in visualizations affect users?***

And hence, decided to do a Thesis during my 2nd year of Masters' on this topic.

LITERATURE REVIEW

aka How late am I to the party?

Started with an extensive literature review of all the research on narratives in visualizations, to identify potential research questions.

Prior research which studied the effect of narratives on viewers using metrics such as engagement, but not recall.

RESEARCH QUESTIONS

aka What can I bring to the party?

Although engagement with a visualization is important, we believe that the objective of a narrative is to help users connect with the data and retain the information better.

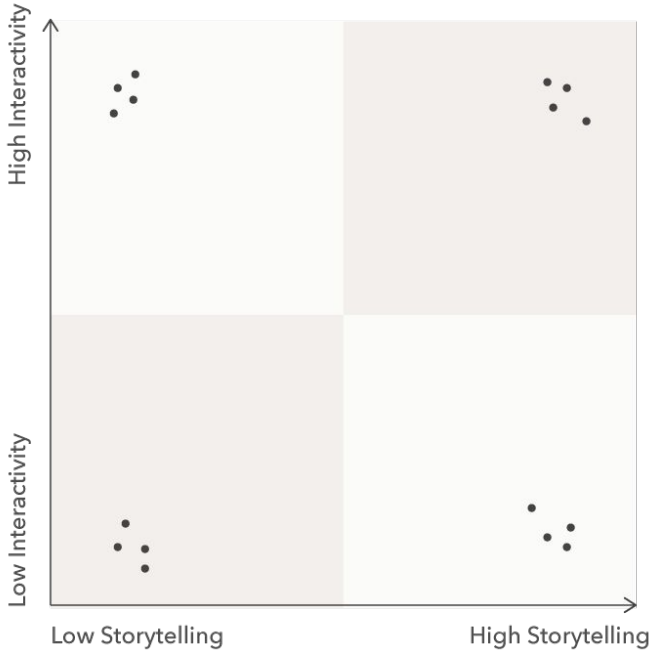
How does the use of storytelling (and interactivity) affect recall ?

METHODOLOGY

aka How did I plan to get to the finish line?

We first created a catalogue of professionally produced visualizations and identified **4 visualizations** and adapt each visualization to each of the conditions (different strategies for visualization design):

Interactive only, narrative only, both interactive and narrative, and static (non-interactive) and non-narrative



METHODOLOGY

aka How did I plan to get to the finish line?

Visualizations:

1. **Gun Deaths in America (fivethirtyeight)**
   https://fivethirtyeight.com/features/gun-deaths/

2. **Bloomberg Carbon Clock (Bloomberg)**
   https://www.bloomberg.com/graphics/carbon-clock/

3. **Measles Outbreak (The Guardian)**
   https://www.theguardian.com/society/ng-interactive/2015/feb/05/-sp-watch-how-measles-outbreak-spreads-when-kids-get-vaccinated

4. **Healthcare Spending (Bloomberg)**
   https://www.bloomberg.com/graphics/2017-health-care-spending/

METHODOLOGY

aka How did I plan to get to the finish line?

Adapted Visualizations:

1. Interactive + Narrative
2. Interactive Only
3. Narrative Only
4. Static and non-narrative

In total, there were 16 unique combinations of visualization and condition.

METHODOLOGY

aka How did I plan to get to the finish line?

Measuring recall and comprehension

We created an 11 item True / False questionnaire, of which one question was an attention check question.

Piloted the questionnaire with around 40 participants. This helped us identify poorly worded questions.

Pilot also provided preliminary data on the number of questions an average respondent will get correct (and determine how much to pay workers on MTurk).

STUDY DESIGN

aka The Master Plan

We planned to conduct the study on MTurk.

The study was a completely between-subjects design where each person saw one visualization in one of the conditions.

Prompted the participants to spend time (5-7 mins) with the visualization and then attempt the questionnaire.

Prevented the participant from returning to the questionnaire.

DATA COLLECTION

aka My experience with MTurk's terrible UX

To collect the data, I launched it as a single HIT on MTurk.

We recruited 416 participants (20 participants failed the attention check question) on Amazon's Mechanical Turk in a completely between subjects design - each participant saw one visualization, in one condition. On average each participant was paid $2.1 ($0.75 base + $0.2 reward for each correctly answered question).

Realization: There are **several challenges to running a study MTurk**.

DATA ANALYSIS

aka My attempt at sensemaking

For each participant, we have their responses to the questionnaire, the visualization that they saw and the condition they were placed in.

We also have the duration of time spent on the visualization and number of clicks.

DATA ANALYSIS

aka My attempt at sensemaking

I applied a bayesian mixed-effects logistic regression model.

The probability of getting an answer correct was the dependent variable.

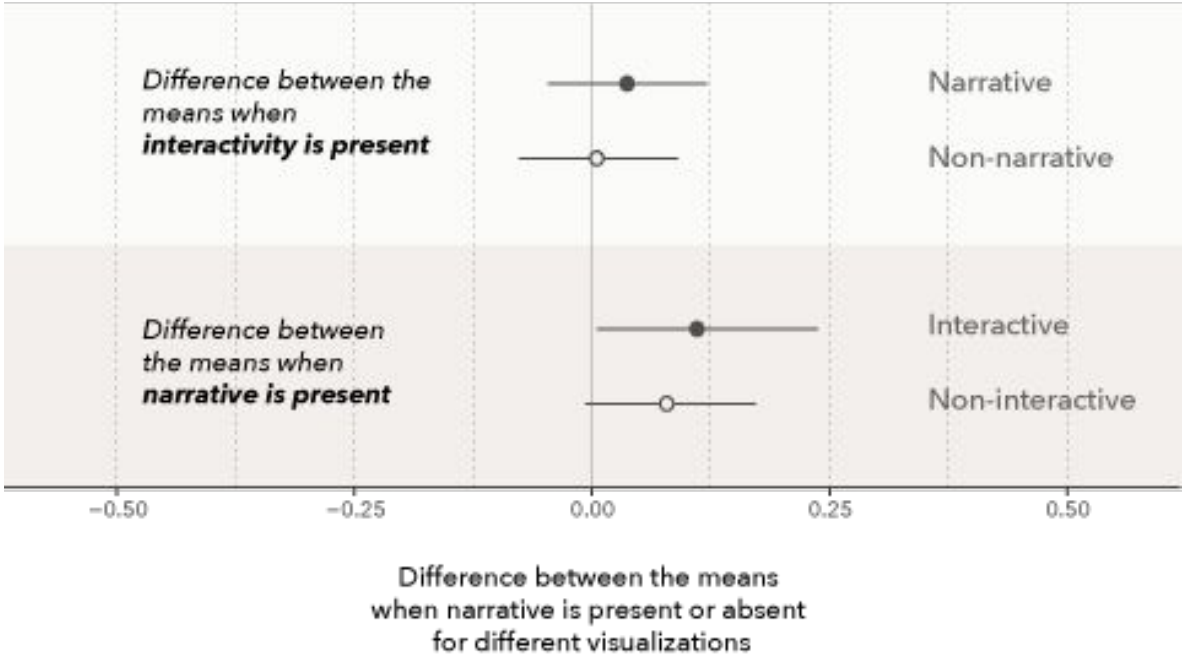
Interactivity, Narrative and their interaction were the independent variable.

Random effects from individual participants, visualization and question for each visualization.

RESULTS

aka The outcome of several sleepless nights

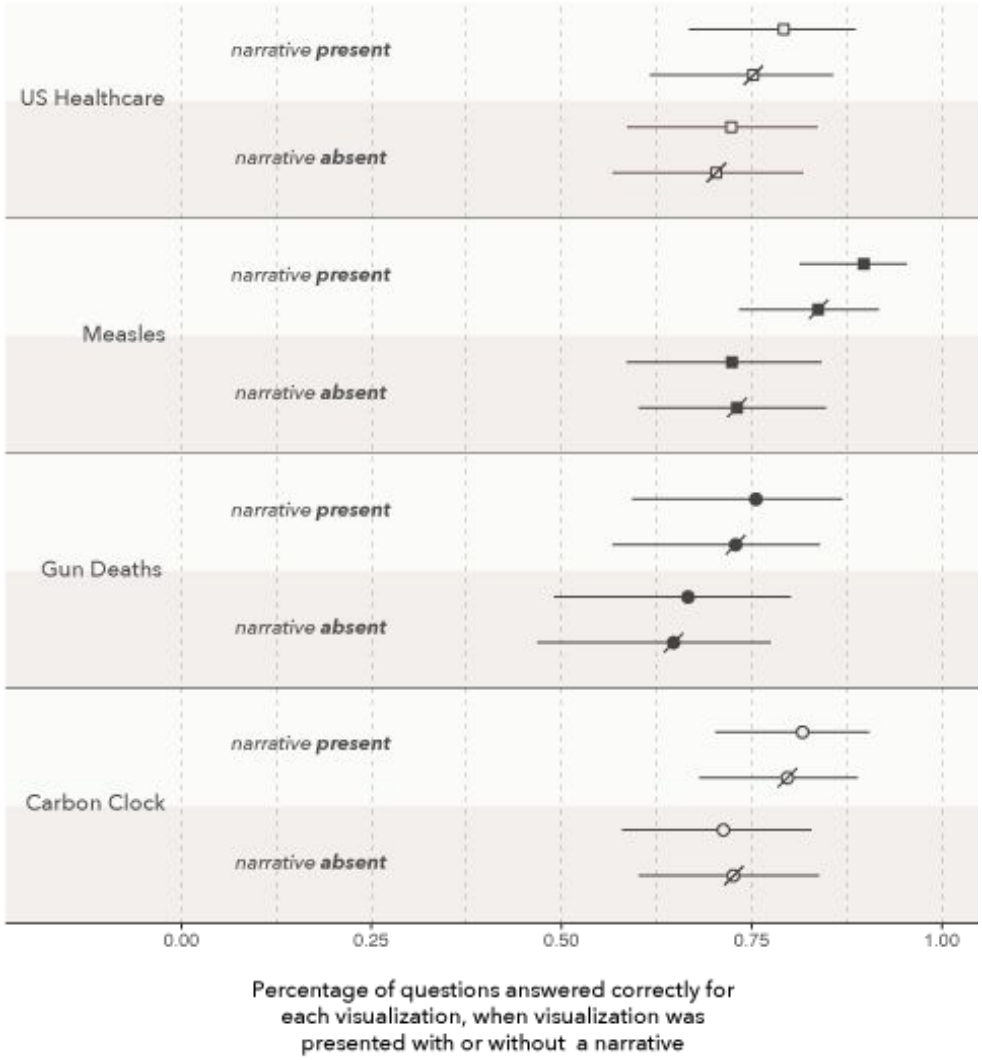
Storytelling seems to have a small positive effect on recall and comprehension, interactivity does not.



RESULTS

aka The outcome of several sleepless nights

Raw estimates for each visualization for the different conditions.



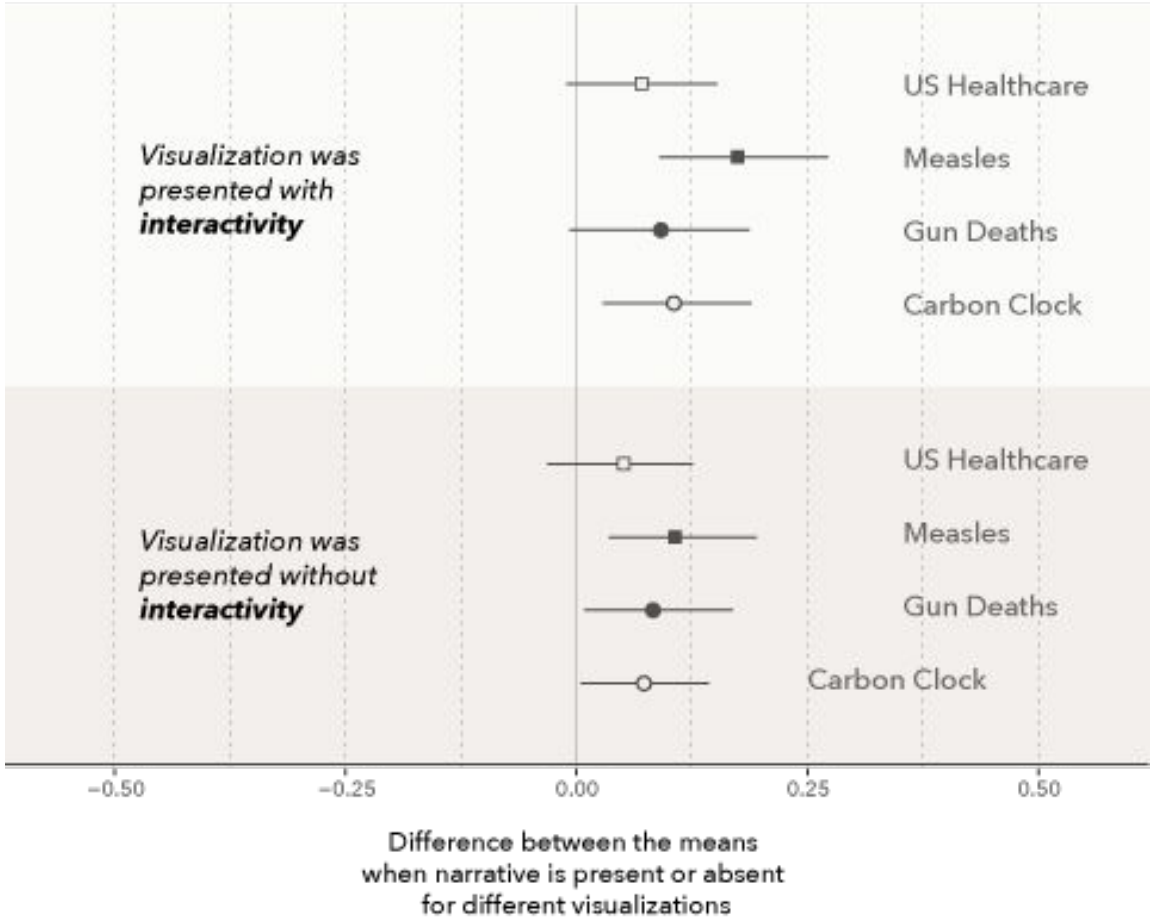
Interactivity **absent**

Interactivity **present**

RESULTS

aka The outcome of several sleepless nights

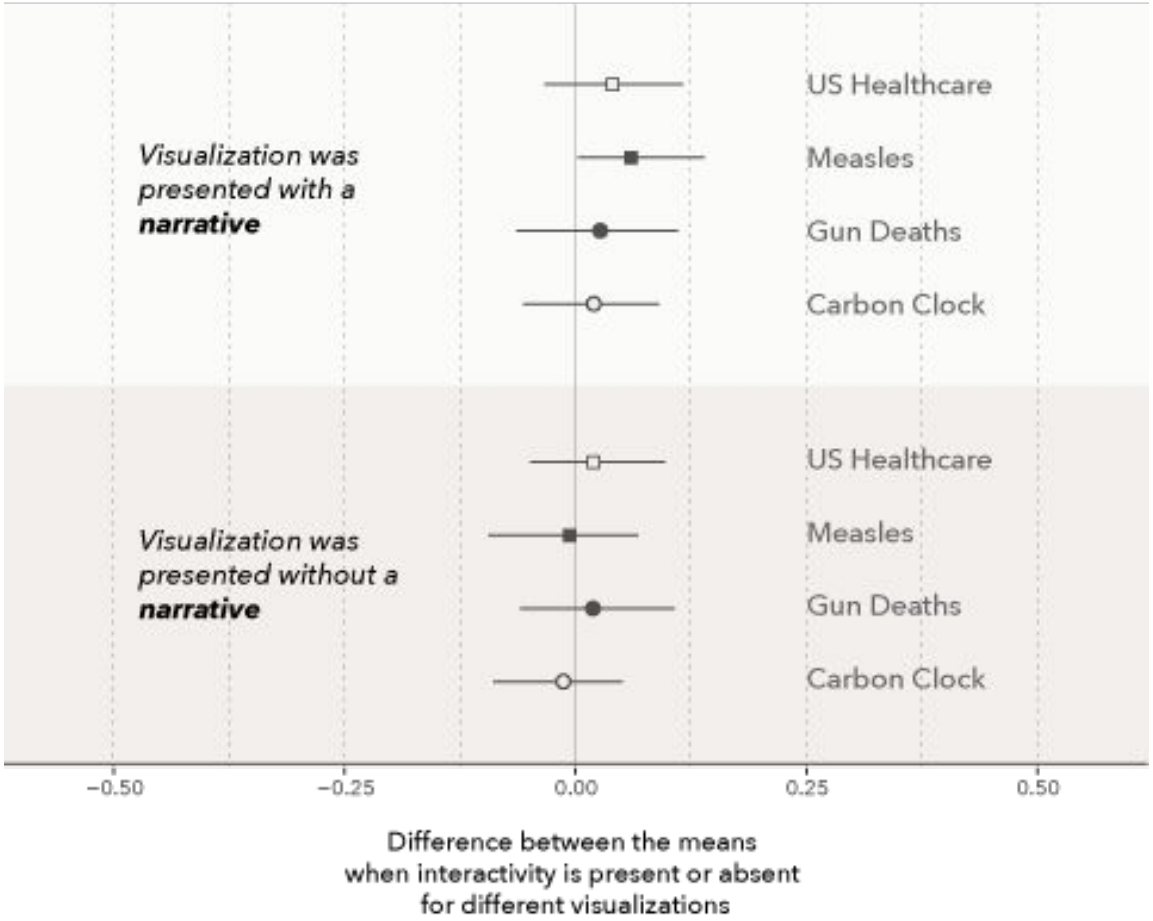
Storytelling seems to have a positive effect on recall and comprehension irrespective of interactivity being present or absent.



RESULTS

aka The outcome of several sleepless nights

Interactivity doesn't seem to have any effect on recall and comprehension.



FURTHER ANALYSIS

aka Life goes on...

There are more analysis yet to perform.

In the interactive conditions (*interactive only, and interactivity + narrative*), we measured the **amount of clicks**. In all the conditions, we measured the **total time** spent on the visualization.

The comprehension questions were derived so that they were suitable for either interactive or narrative visualizations.

aka Thanks!