

Beyond Usability and Performance: A Review of User Experience-focused Evaluations in Visualization

Bahador Saket, Alex Endert, and John Stasko

 @Bahador10

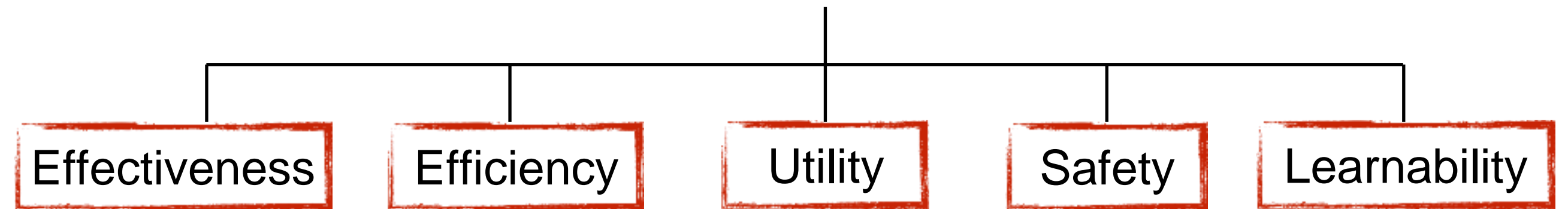
 @AlexAlexATL

 @johntstasko

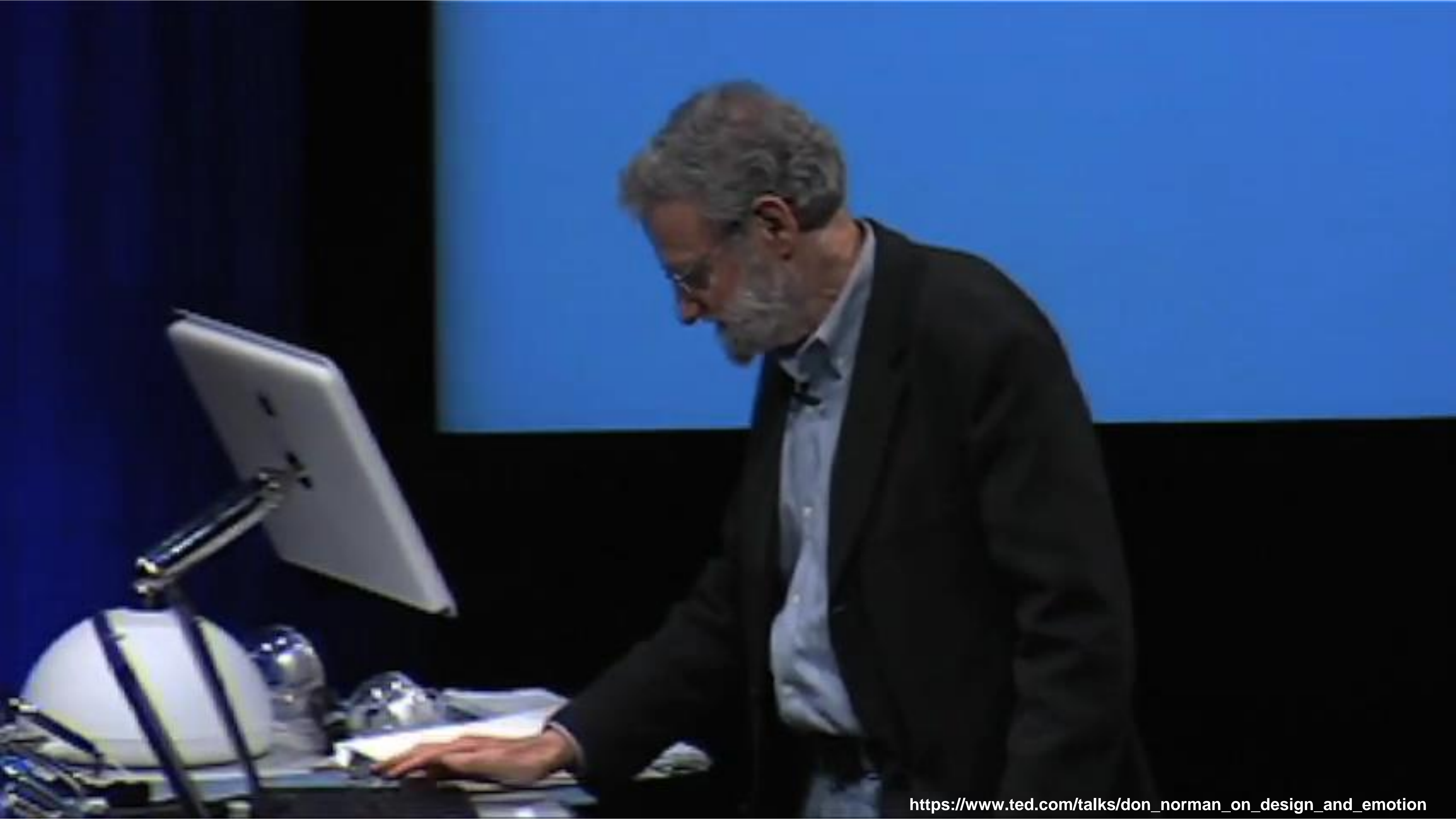


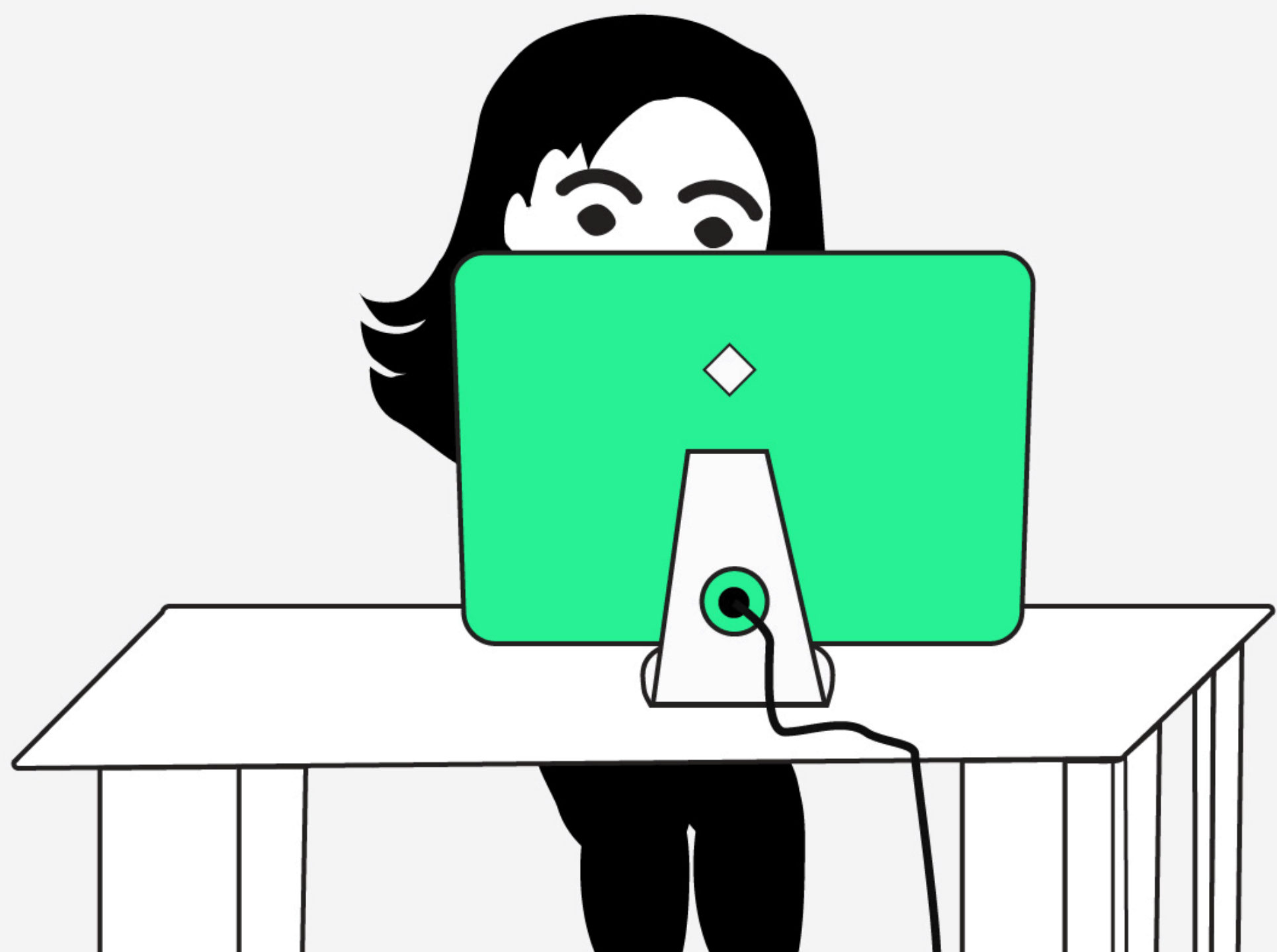
“Successful” Design = Meeting Usability Goals

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Moving beyond usability-driven objectives





Human-computer Interaction

Bateman et al. 2010

Malone 1982

Shneiderman 2004

Sweetsere et al. 2005

Norman 2004

Sharp et al. 2008



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Norman 2004

Sharp et al. 2008



**What?
Did you say Memorability?**

Stephen Few

Storytelling in Information Visualization Does it Engage Users to Explore

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ABSTRACT
We present the results of three web-based field experiments, in which we evaluate the impact of using initial narrative visualization techniques and storytelling on user-engagement

make exploratory graphs important, be truly empower people, t appropriate tools to gain

Is “chart junk” useful? An extended examination of visual embellishment

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Although many well-cited theories or guidelines for visualization design advocate ‘minimalism’, designers tend to include a wide variety of visual embellishments in their charts. Researchers have examined the effects of visual embellishment on comprehension and memorability of charts under specific conditions, such as charts with a small number of data points that were viewed with no time limit (Bateman et al., 2010). This paper extends previous studies and investigates the effects of visual embellishment under different time limits for viewing these charts. Similar to the Bateman et al. (2010) study, we compared the effects of embellished charts (selected from the work of Nigel Holmes) and plain, grayscale charts, but we limited our selection to those that consisted of larger data sets (10 or more data points). Results showed that the presence of a time limit affected comprehension and short-term recall performance, while the type of chart significantly affected short-term recall. In addition, the type of chart affected the time needed to review the

Beyond Memorability: Visualization Recognition and Recall

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EXPERIMENT DESIGN

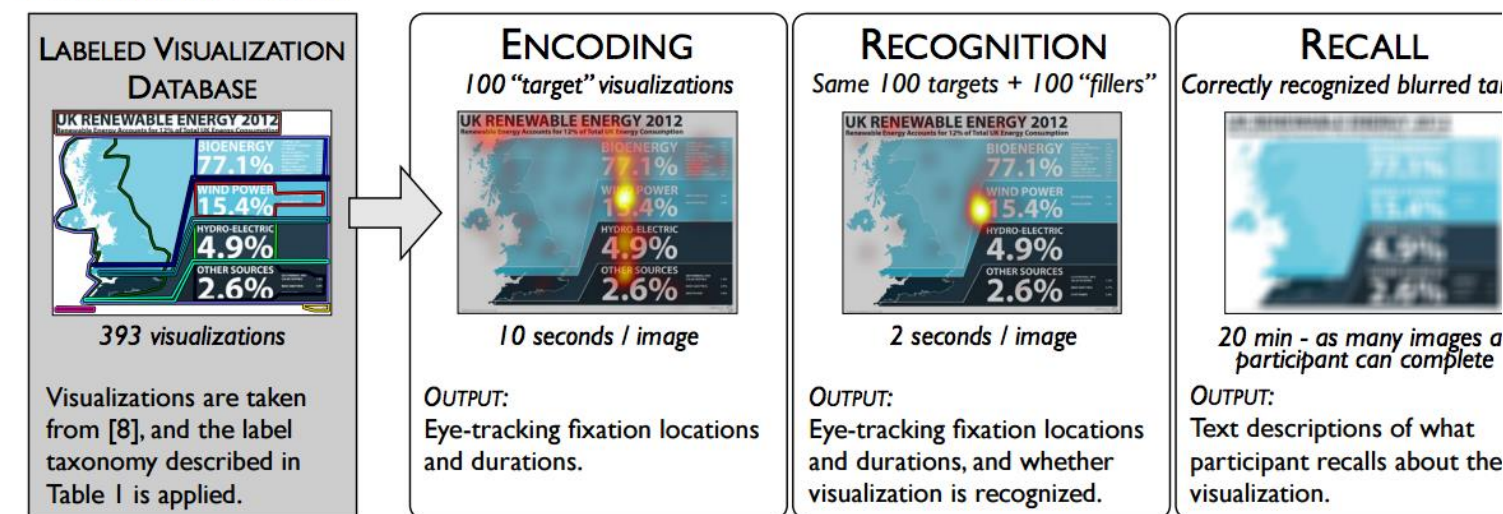


Fig. 1. Illustrative diagram of the experiment design. From left to right: the elements of the visualizations are labeled and categorized, eye-tracking fixations are gathered for 10 seconds of “encoding”, eye-tracking fixations are gathered while visualization recognition is measured, and finally participants provide text descriptions of the visualizations based on blurred representations to gauge

An Empirical Study on Using Visual Embellishments in Visualization

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Abstract—In written and spoken communications, figures of speech (e.g., metaphors and synecdoche) are often used as an aid to convey abstract or less tangible concepts. However, the benefits of using rhetorical illustrations or embellishments in visualization have far been inconclusive. In this work, we report an empirical study to evaluate hypotheses that visual embellishments may aid memory, visual search and concept comprehension. One major departure from related experiments in the literature is that we make use of a task methodology in our experiment. This design offers an abstraction of typical situations where viewers do not have their full attention focused on visualization (e.g., in meetings and lectures). The secondary task introduces “divided attention”, and makes the effects of visual embellishments more observable. In addition, it also serves as additional masking in memory-based trials. The results of this study show that visual embellishments can help participants better remember the information depicted in visualization. On the other hand, embellishments can have a negative impact on the speed of visual search. The results show a complex pattern as to the benefits of embellishments in helping participants grasp key concepts from visualization.

Index Terms—Visual embellishments, metaphors, icons, cognition, working memory, long-term memory, visual search, evaluation.

Useful Junk? The Effects of Visual Embellishment on Comprehension and Memorability of Charts

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ABSTRACT—Guidelines for designing information charts often state that “data-ink” – or the ink in the chart used to represent data.

Map-based Visualizations Increase Recall Accuracy of Data

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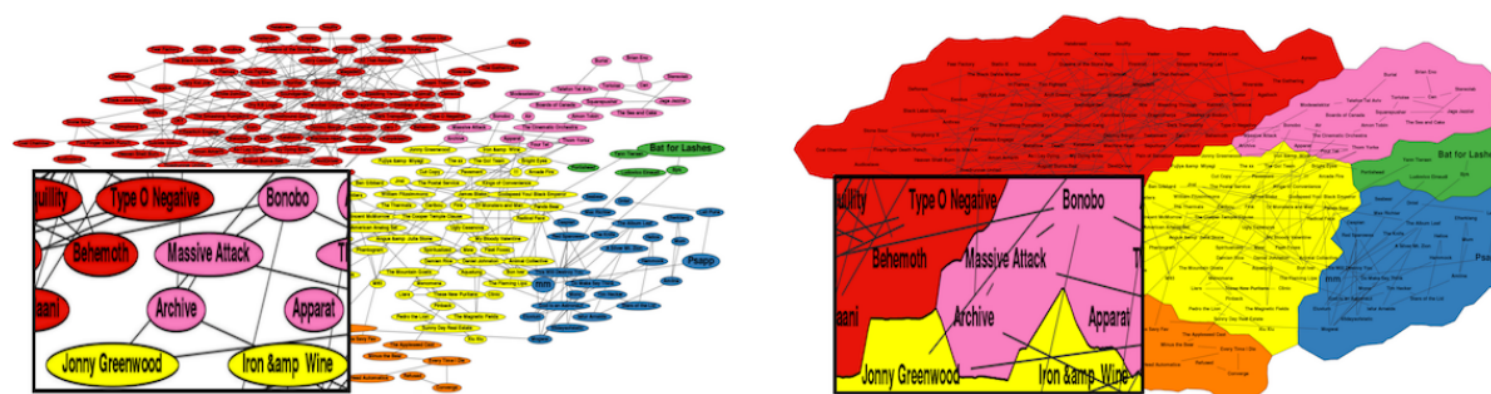


Figure 1: We investigate the memorability of relational data represented with node-link (left-side) and map-based (right-side) visualizations; shown are a node-link and a map-based visualization with 200 nodes and 500 links from the LastFM dataset.

Abstract

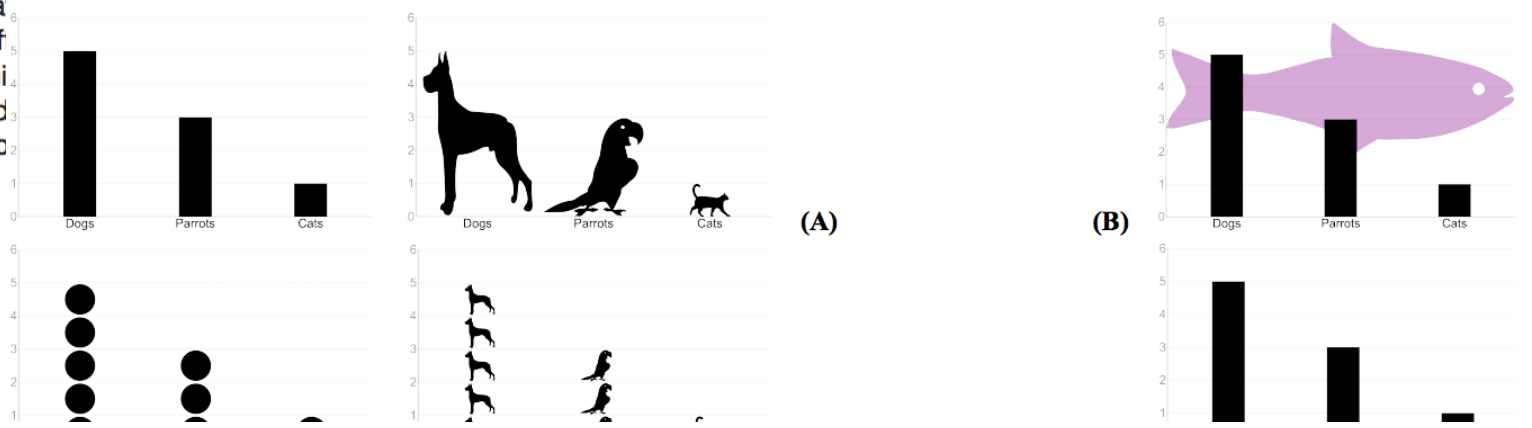
We investigate the memorability of data represented in two different visualization designs. In contrast to recent studies that examine which types of visual information make visualizations memorable, we examine the effect of different visualizations on time and accuracy of recall of the displayed data, minutes and days after interaction

ISOTYPE Visualization – Working Memory, Performance, and Engagement with Pictographs

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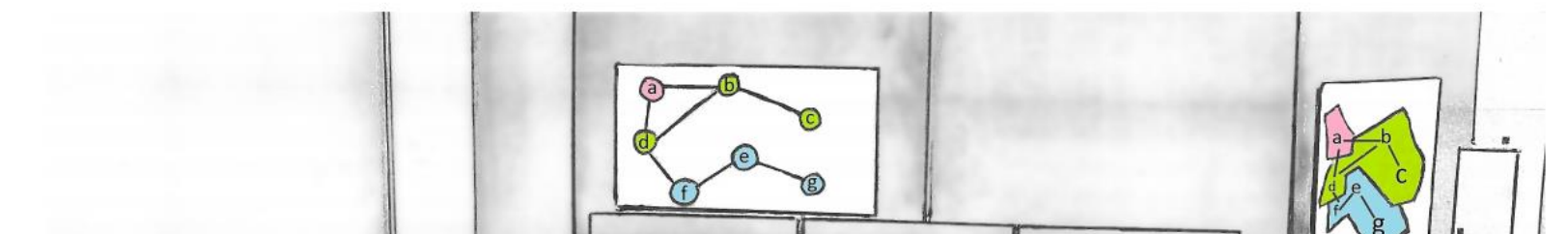
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Comparing Node-Link and Node-Link-Group Visualizations From An Enjoyment Perspective

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What Makes a Visualization Memorable?

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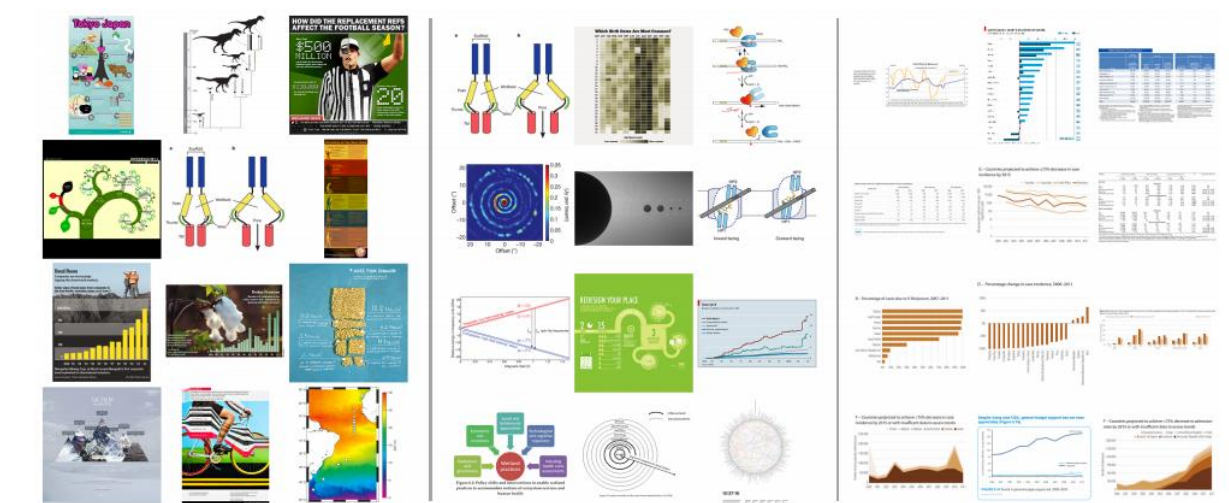


Fig. 1. Left: The top twelve overall most memorable visualizations from our experiment (most to least memorable from top left to bottom right). Middle: The top twelve most memorable visualizations from our experiment when visualizations containing human recognizable cartoons or images are removed (most to least memorable from top left to bottom right). Right: The twelve least memorable visualizations from our experiment (most to least memorable from top left to bottom right).

Qualitative Methods

Quantitative Methods

Qualitative + Quantitative

Beyond Usability and Performance: A Review of User Experience-focused Evaluations in Visualization

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ABSTRACT

Traditionally, studies of data visualization techniques and systems have evaluated visualizations with respect to *usability goals* such

engaging experiences [41]. Multiple HCI researchers have emphasized the importance of emotion, enjoyment and fun, memorability, and engagement in their work [5, 19, 37, 55, 56]. As Rogers et al.

Memorability



Enjoyment

Engagement

Memorability, Engagement, and Enjoyment

| REFERENCES | WHAT? | HOW? | WHEN? | HOW MANY? | WHICH VISUALIZATIONS? |
|--------------------|---------------------------------------|---|--|-----------------|--------------------------------------|
| Bateman et al. [5] | Immediate memory Long-term memory | Immediate Memory: Asked participants to recall as many visualizations as possible. Long-term Memory: Asked participants to recall as many visualizations as possible. | Immediate Memory: Five minutes after performing tasks using those visualizations. Long-term Memory: Two to three weeks after performing tasks using those visualizations. | 20 participants | Bar chart, line chart, and pie chart |
| Li et al. [34] | Short-term memory Long-term memory | Short-term Memory: Asked participants to recall as many visualizations as possible. Long-term Memory: Asked participants to recall as many visualizations as possible. | Short-term Memory: Five minutes after performing tasks using those visualizations. Long-term Memory: Four days after performing tasks using those visualizations. | 15 participants | Bar chart, line chart, and pie chart |



What do you think ?

Thank You

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