



Unveiling How Examples Shape Visualization Design Outcomes

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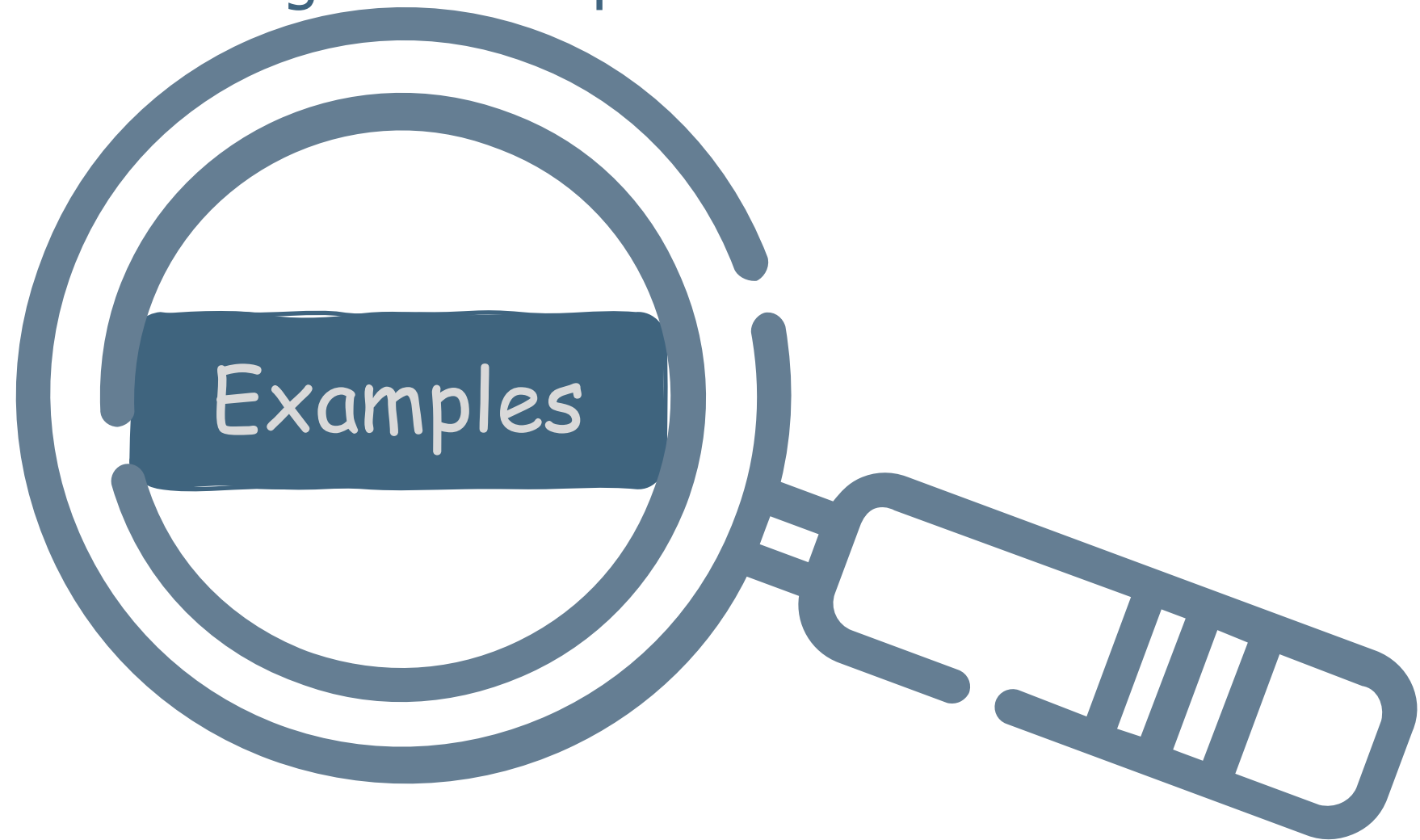


Motivation



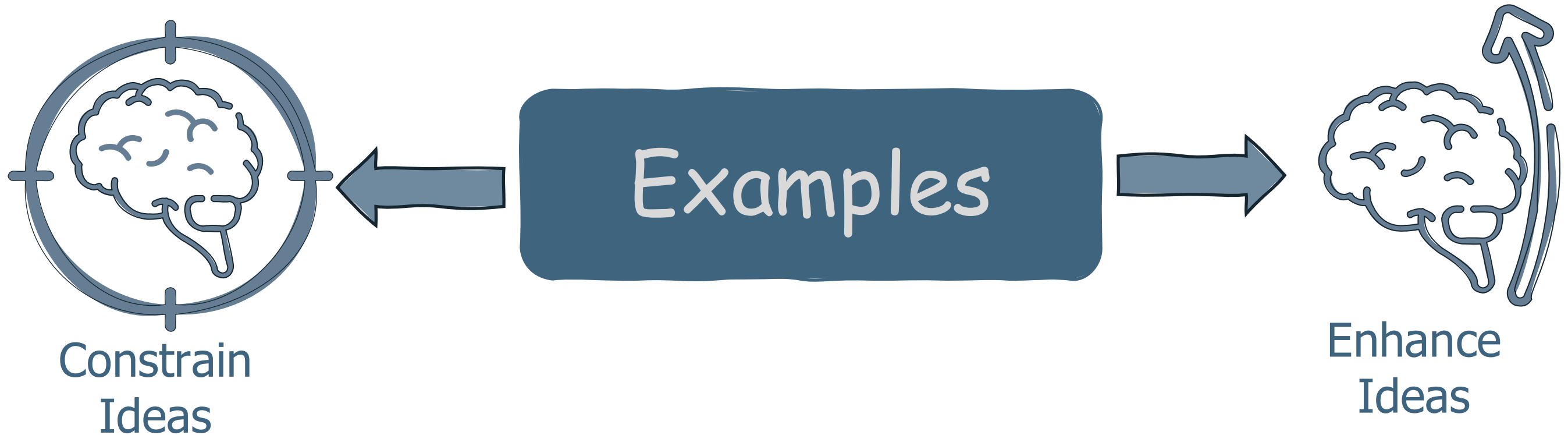
Motivation

Designers are always searching for examples



Motivation

Examples have the power to enhance or constrain design ideas.



Motivation

The influence of examples on creativity has been studied in other fields.



Timing of an example's introduction



Quantity of examples



Quality of examples



Diversity of examples

Motivation

Results from prior studies do not readily transfer to visualization contexts.



Timing of an example's introduction

Mixed results



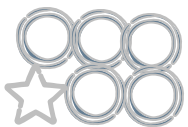
Quantity of examples

Inconclusive results

Conflicting results in prior work.



Quality of examples



Diversity of examples

Motivation

Results from prior studies do not readily transfer to visualization contexts.



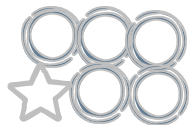
Timing of an example's introduction



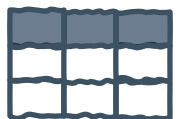
Quantity of examples



Quality of examples



Diversity of examples



Visualization-specific properties have not been evaluated.

We contribute an exploratory study with 32 visualization designers to understand the influence of examples on data visualization design outcomes.

Research Questions

RQ1: How do the factors identified in prior studies replicate in a data visualization design context?

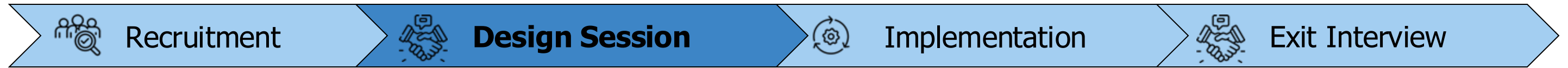
RQ2: How do the factors unique to data visualization influence design outcomes?

RQ3: How do designers decide which aspects of examples to incorporate into their designs?

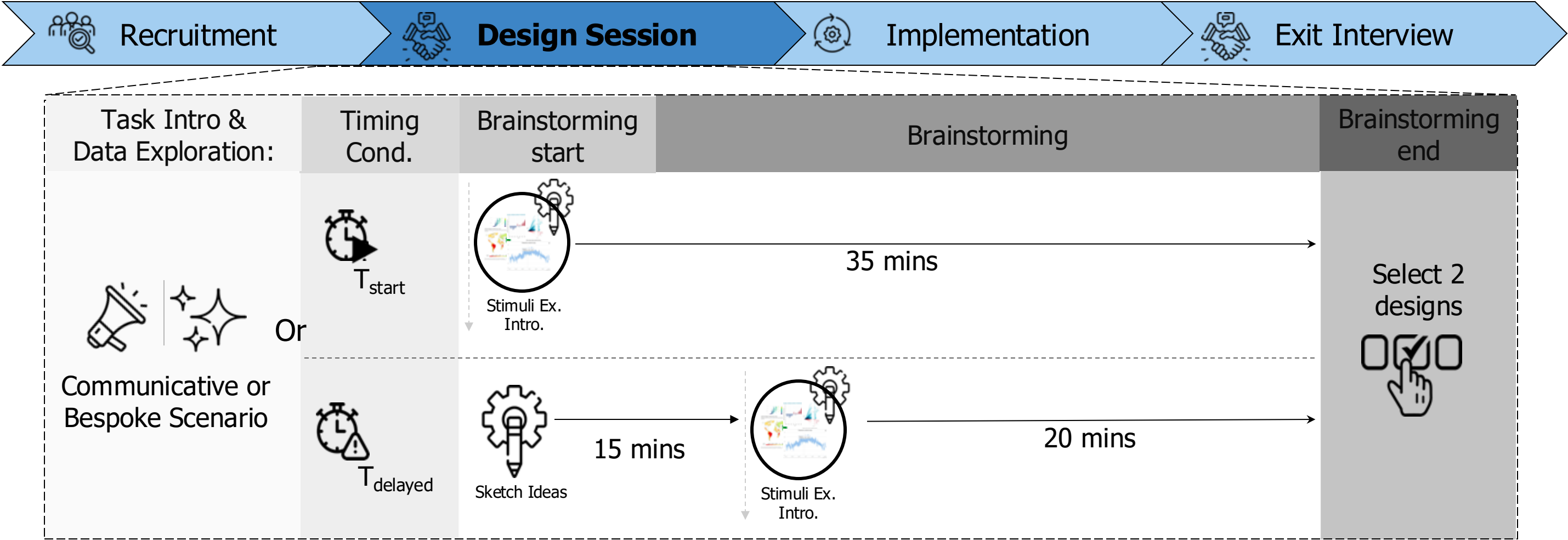


Experiment and Analysis

Experiment Protocol

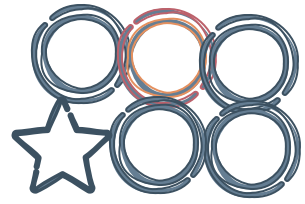


Experiment Protocol

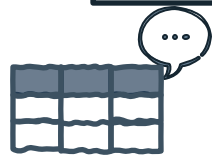


Factors of Interest in Study

Factors from prior studies

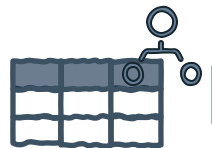


Factors unique to visualization



Data Topic Similarity

Measures similarity between data topics (e.g., climate, food)



Data Schema Similarity

Measures similarity in data schemas

Design Outcomes of Interest



Quantity of designs produced

Measures how many design sketches were produced



Variety of designs produced

Measures how distinct are the designs from each other

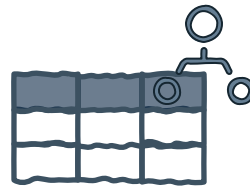
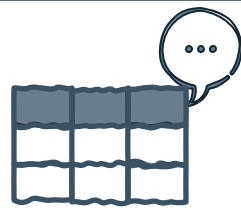


Ideas transferred from examples

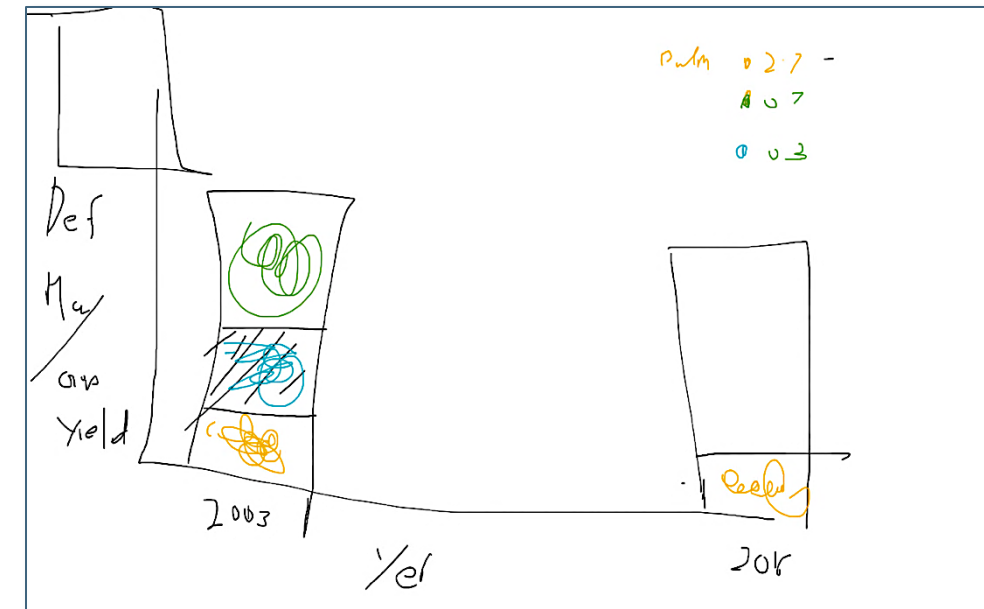
Measures how many ideas are transferred from an example into the designs

Quantifying Examples and Sketches

Factors Of Interest



Design Outcomes Of Interest

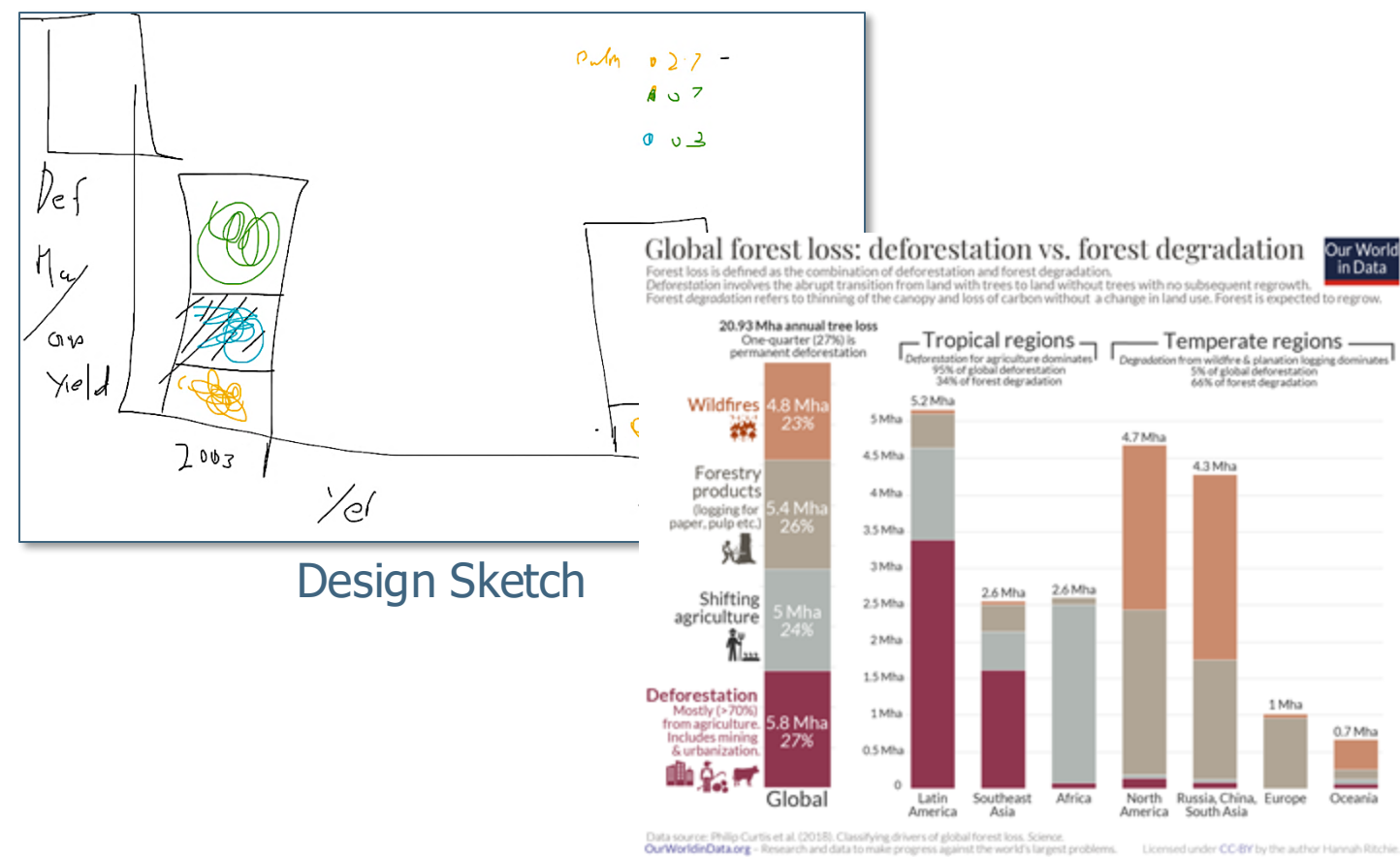


Design sketch produced by participants

How can we quantitatively evaluate how these factors influence design properties?

Quantifying Examples and Sketches

Examples and sketches were annotated to identify design properties.



Example: img-010

Design Properties

Marks

Data Types

Encodings

Layout

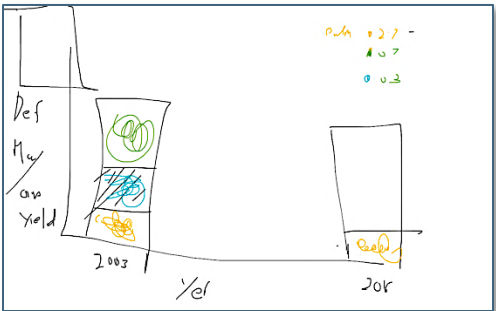
Annotations

Composition

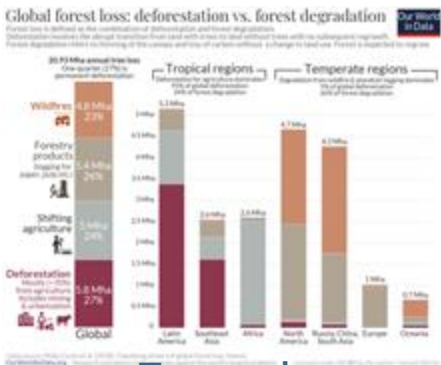
Visualization Type

Quantifying Examples and Sketches

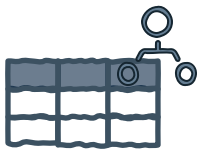
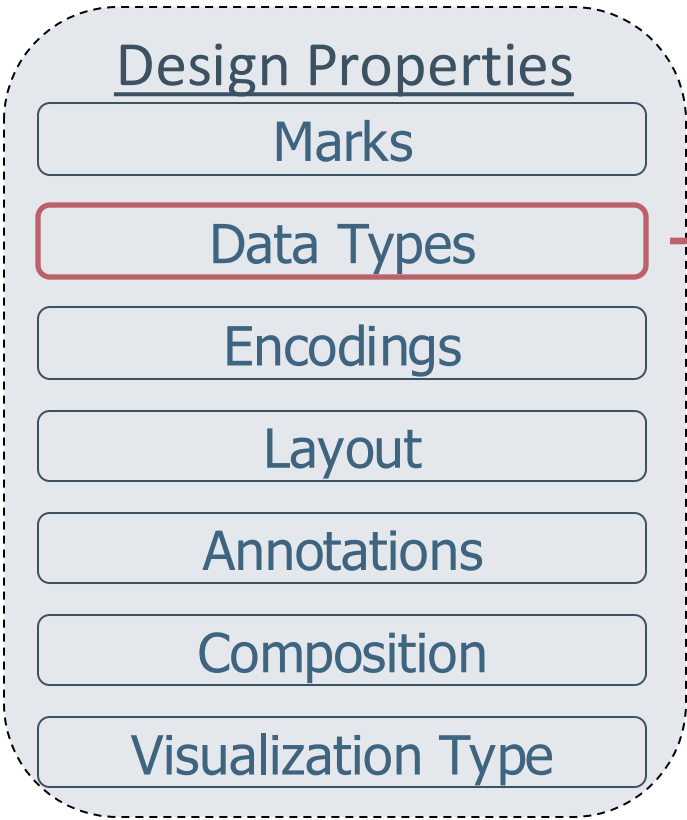
Design Properties were used to derive metrics to measure factors



Design Sketch



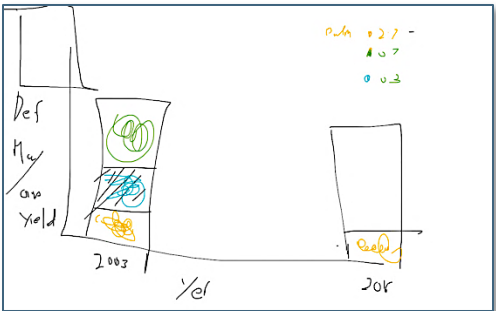
Example:
img-010



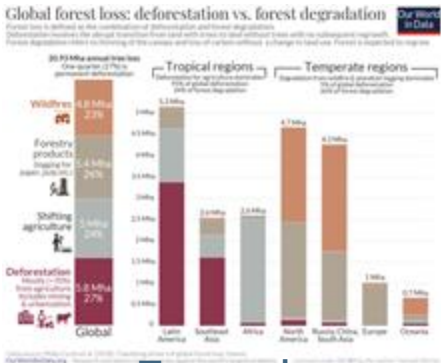
Data Schema Similarity

Quantifying Examples and Sketches

Design Properties were used to derive metrics to measure factors



Design Sketch



Example:
img-010



Diversity of examples



Variety of sketches



Main Findings

Main Findings: Quantitative



Timing of introduction

A delayed introduction in examples leads to:



Curation of examples with less similar data topics



Increase in quantity of design sketches

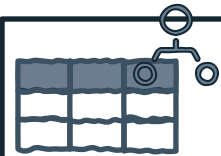
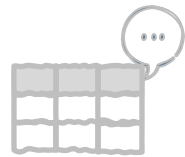


Increased variety of design sketches

Main Findings: Quantitative



Timing of introduction



Data Schema Similarity

Curating examples with similar dataset schema similarity leads to:

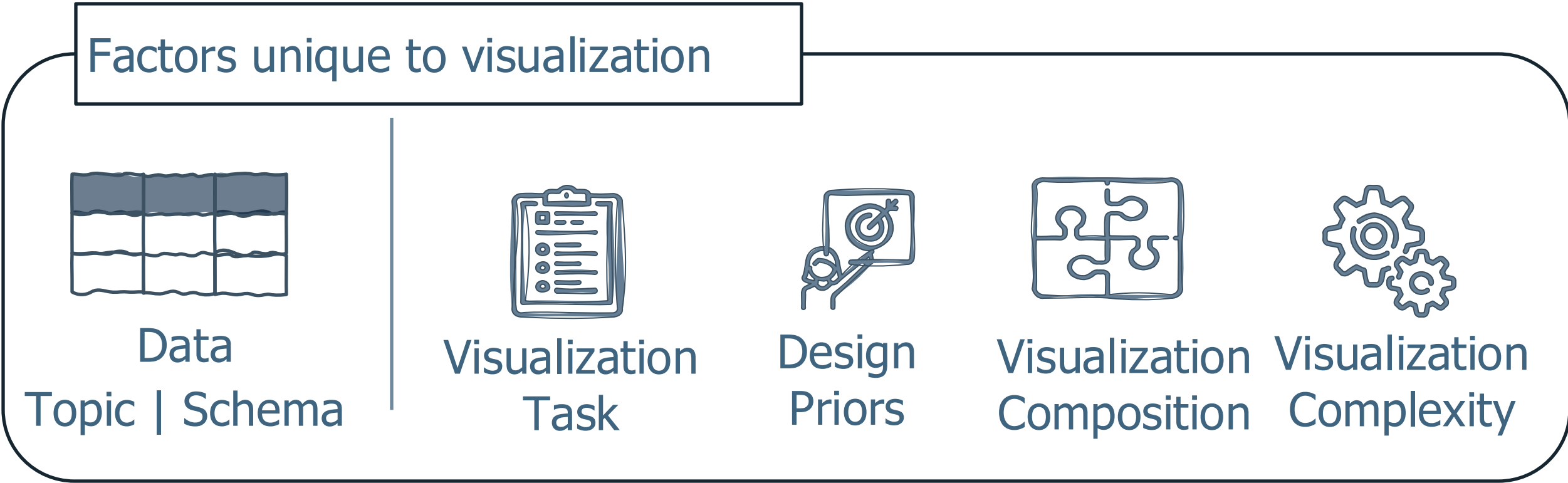


Increased idea transfer

Main Findings: Qualitative



Designers thought process





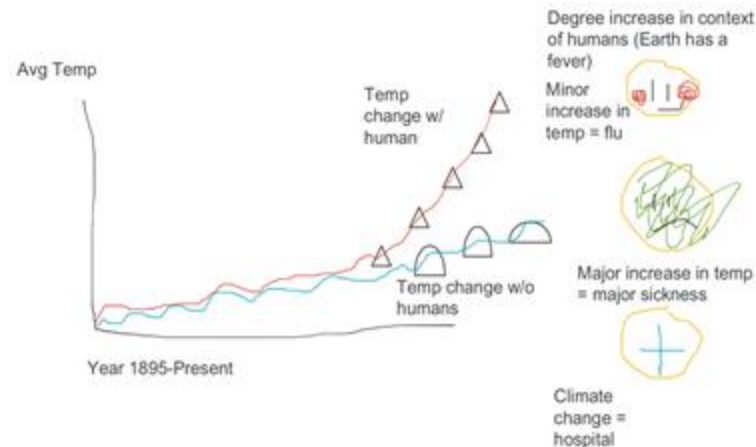
Implications of Findings

Implications for Designers and Instructors

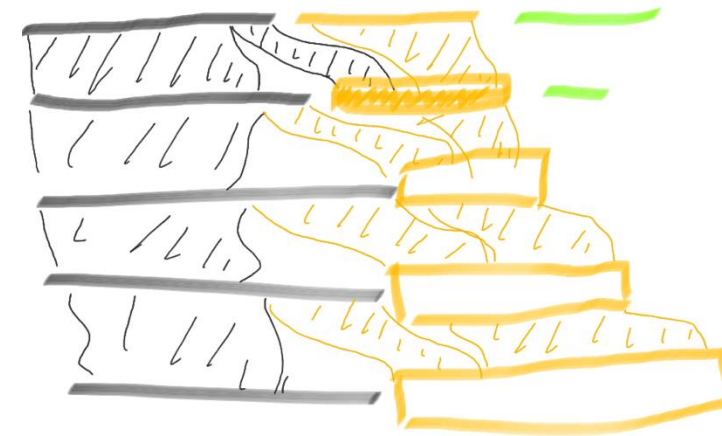
- Design variety can be enhanced with a timed introduction of examples.

Implications for Designers

- Design variety can be enhanced with a timed introduction of examples.
- Careful evaluation is needed when considering design examples.
 - A mismatch between data and intended visualization leads to infeasible designs



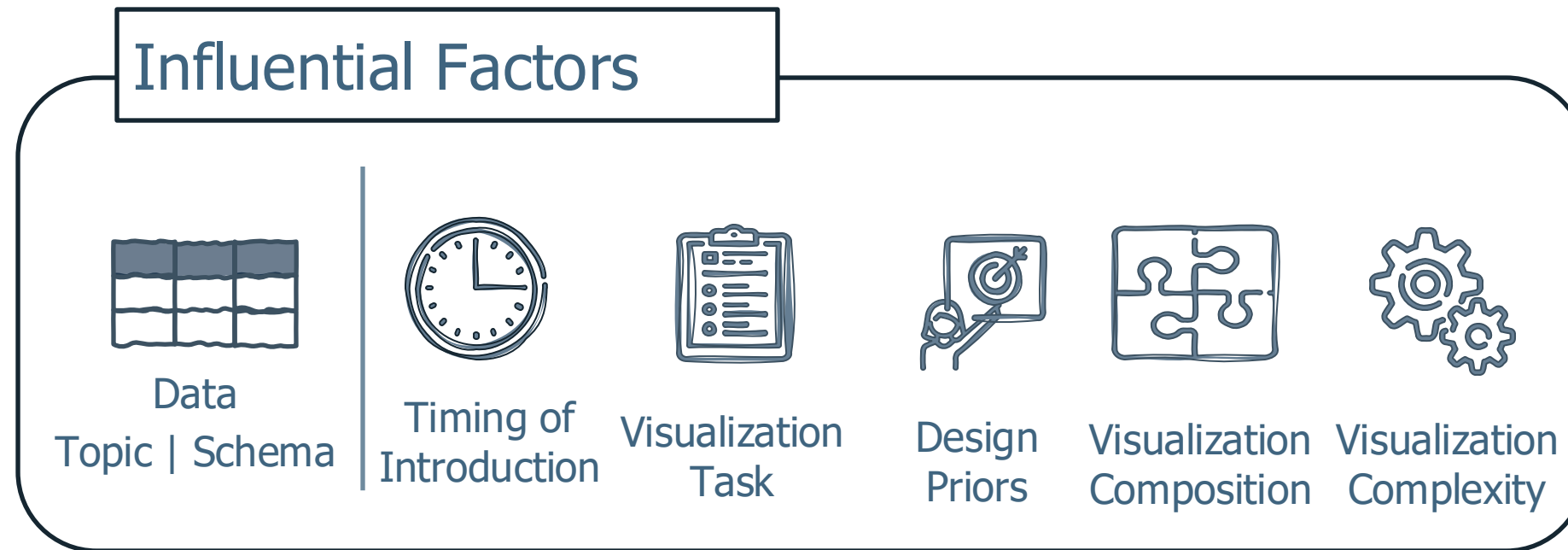
Requesting data not
in present in dataset



Incompatible data

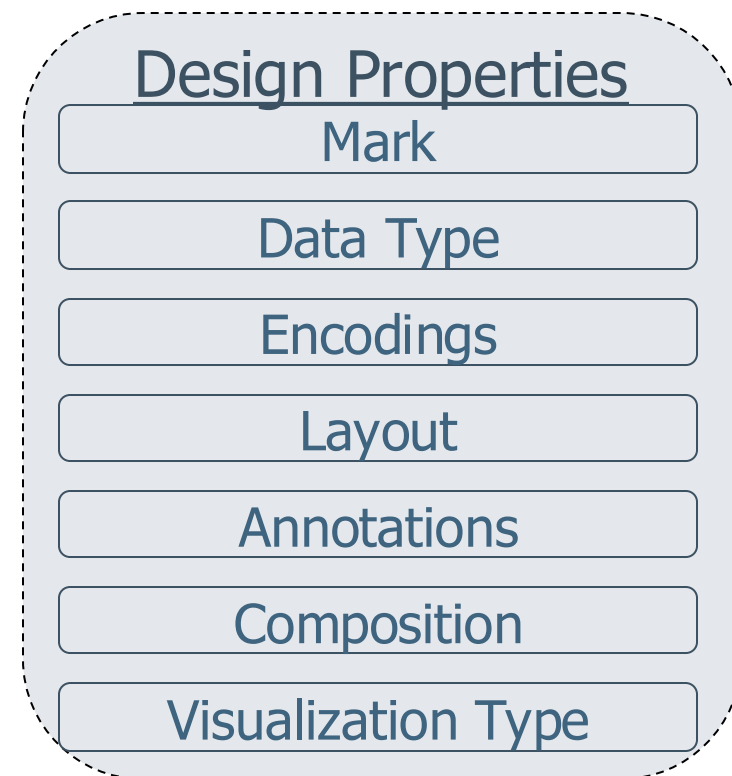
Implications for Research

- Investigate emergent factors.



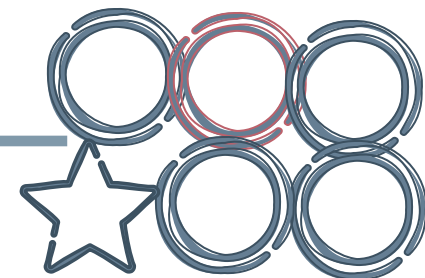
Implications for Research

- Investigate emergent factors.
- Develop robust metrics for quantifying visualization design properties.



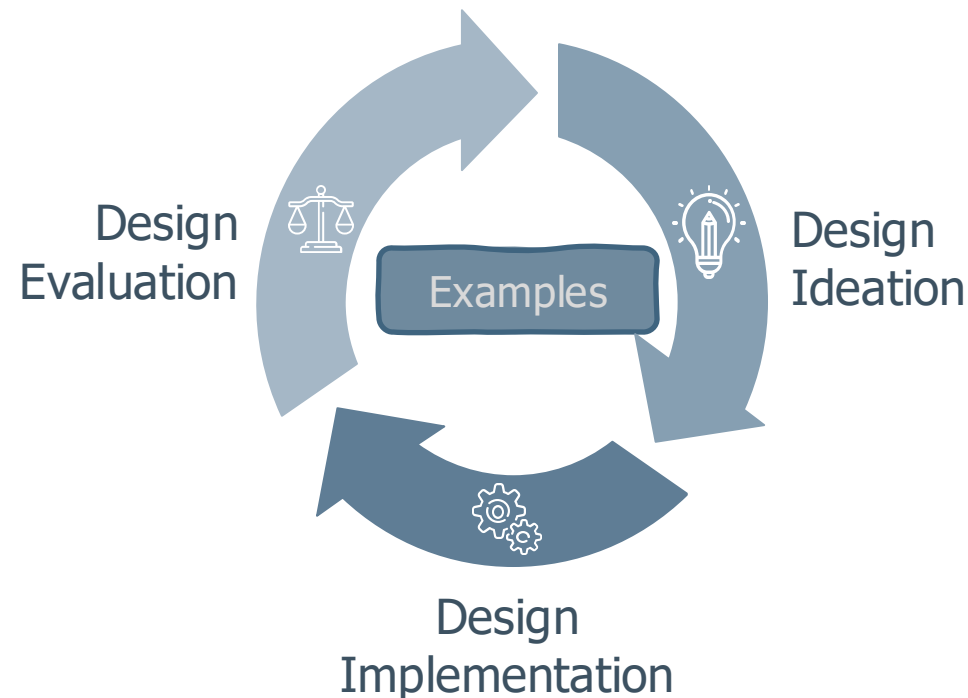
→ How do we describe the different property dimensions of data visualization designs?

How do we measure the diversity of a set of visualization designs?



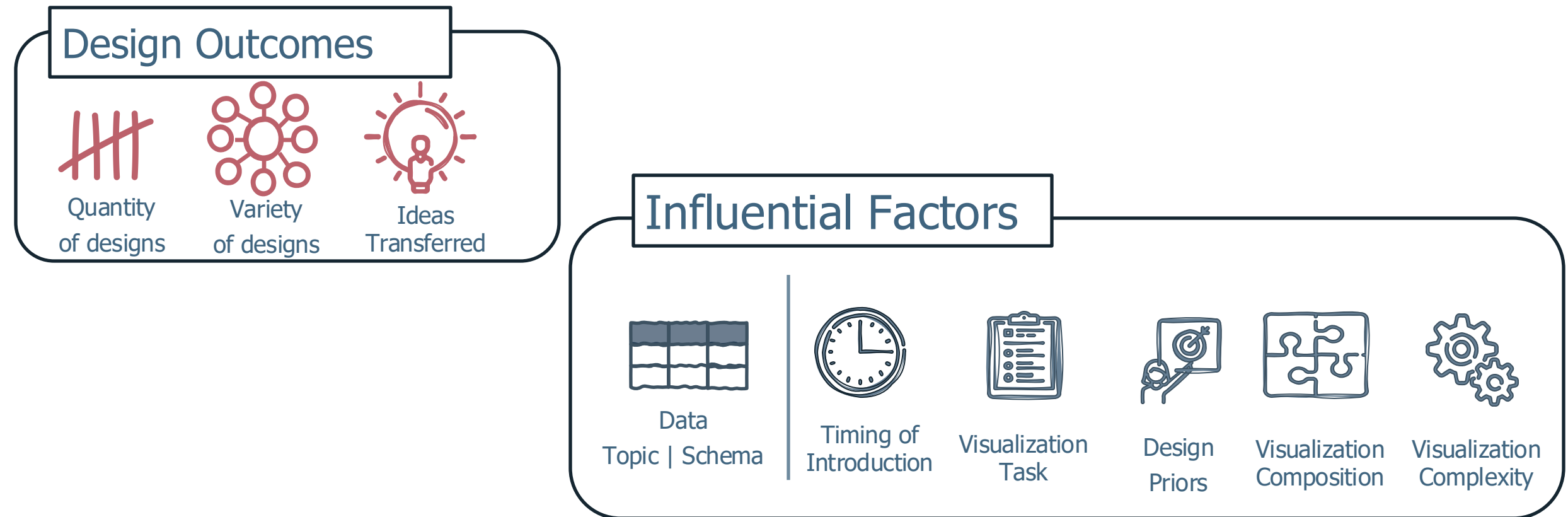
Implications for Research

- Investigate emergent factors.
- Develop robust metrics for quantifying visualization design properties.
- Studying how examples influence outcomes of design iterations



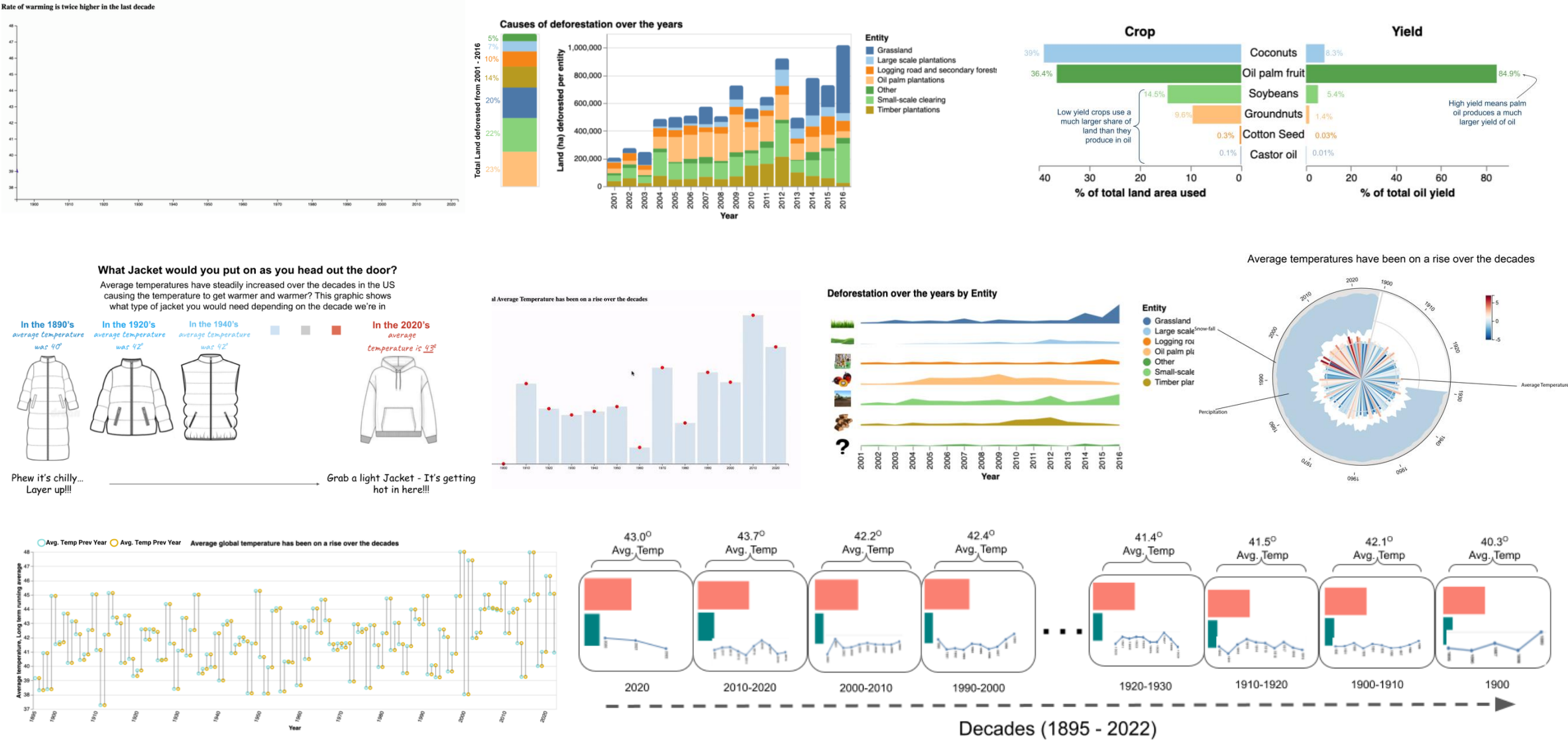
Summary

We sought to understand the influence of examples on design outcomes.

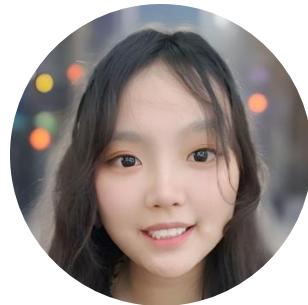


Interesting designs created by participants

Scan to view design gallery.



Questions?



Thank you to my collaborators!
