

How do I start  
creating  
visualizations?



# Bottom-up: from data to vis

- Start with data
  - types
  - values
  - sparsity
- Possibilities
- Contextual information

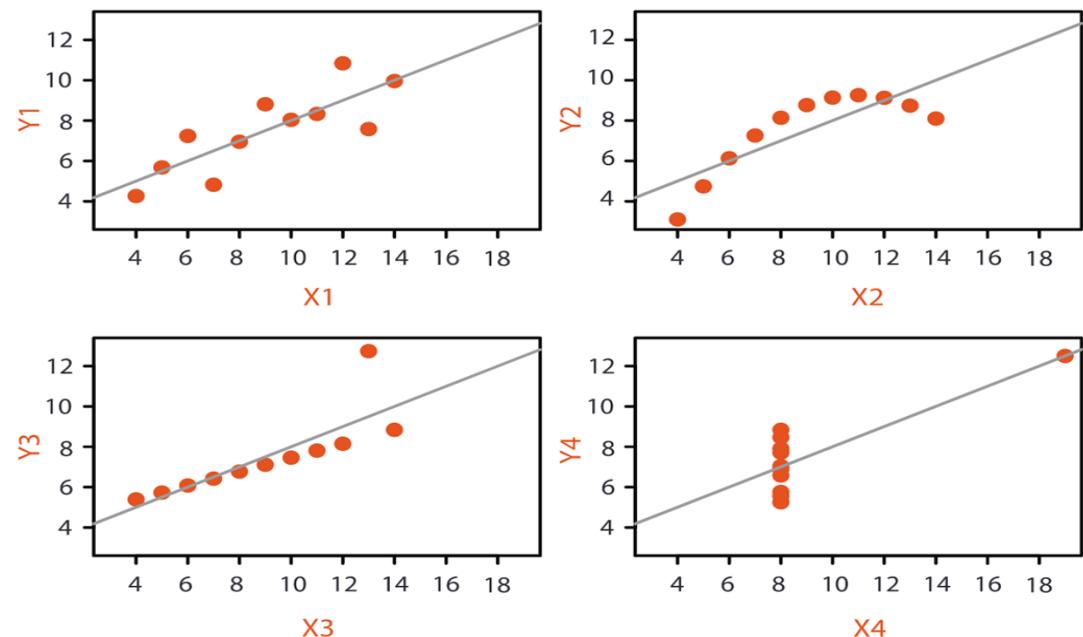


# What kind of data are you given?

- **Dataset**: a set of items with attributes
- Ex. Anscombe quartet: with four subdatasets with exact basic statistic descriptors

Anscombe's Quartet: Raw Data

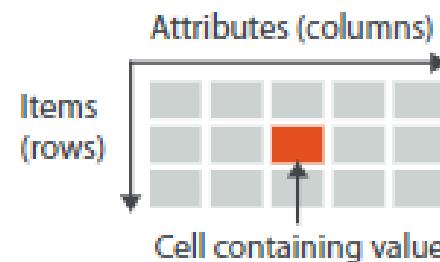
	1		2		3		4	
	X	Y	X	Y	X	Y	X	Y
	10.0	8.04	10.0	9.14	10.0	7.46	8.0	6.58
	8.0	6.95	8.0	8.14	8.0	6.77	8.0	5.76
	13.0	7.58	13.0	8.74	13.0	12.74	8.0	7.71
	9.0	8.81	9.0	8.77	9.0	7.11	8.0	8.84
	11.0	8.33	11.0	9.26	11.0	7.81	8.0	8.47
	14.0	9.96	14.0	8.10	14.0	8.84	8.0	7.04
	6.0	7.24	6.0	6.13	6.0	6.08	8.0	5.25
	4.0	4.26	4.0	3.10	4.0	5.39	19.0	12.50
	12.0	10.84	12.0	9.13	12.0	8.15	8.0	5.56
	7.0	4.82	7.0	7.26	7.0	6.42	8.0	7.91
	5.0	5.68	5.0	4.74	5.0	5.73	8.0	6.89
Mean	9.0	7.5	9.0	7.5	9.0	7.5	9.0	7.5
Variance	10.0	3.75	10.0	3.75	10.0	3.75	10.0	3.75
Correlation	0.816		0.816		0.816		0.816	



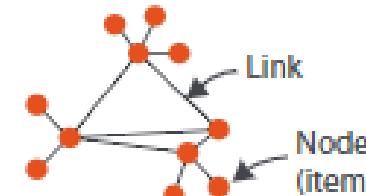
What kind of data are you given?  
What information can you figure out of it?

## → Dataset Types

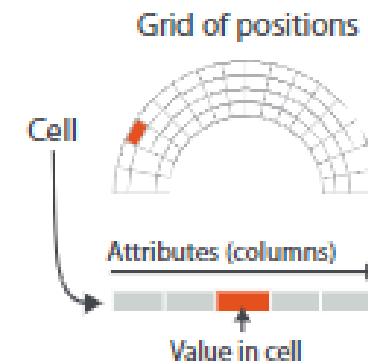
→ Tables



→ Networks



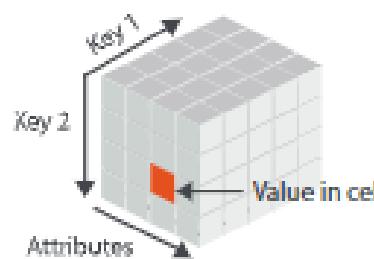
→ Fields (Continuous)



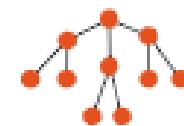
→ Geometry (Spatial)



→ Multidimensional Table



→ Trees



# Additional properties

## Dataset Availability

→ Static



→ Dynamic



## Attributes

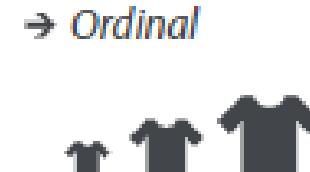
### Key vs value

#### Attribute Types

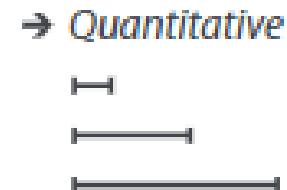
→ Categorical



→ Ordered



→ Ordinal



→ Quantitative

A	B	C	S	T	U
Order ID	Order Date	Order Priority	Product Container	Product Base Margin	Ship Date
3	10/14/06	5-Low	Large Box	0.8	10/21/06
6	2/21/08	4-Not Specified	Small Pack	0.55	2/22/08
32	7/16/07	2-High	Small Pack	0.79	7/17/07
32	7/16/07	2-High	Jumbo Box	0.72	7/17/07
32	7/16/07	2-High	Medium Box	0.6	7/18/07
32	7/16/07	2-High	Medium Box	0.65	7/18/07
35	10/23/07	4-Not Specified	Wrap Bag	0.52	10/24/07
35	10/23/07	4-Not Specified	Small Box	0.58	10/25/07
36	11/3/07	1-Urgent	Small Box	0.55	11/3/07
65	3/18/07	1-Urgent	Small Pack	0.49	3/19/07
66	1/20/05	5-Low	Wrap Bag	0.56	1/20/05
69	6/4/05	4-Not Specified	Small Pack	0.44	6/6/05
69	6/4/05	4-Not Specified		0.6	6/6/05
70	12/18/06	5-Low		0.59	12/23/06
70	12/18/06	5-Low		0.82	12/23/06
96	4/17/05	2-High		0.55	4/19/05
97	1/29/06	3-Medium		0.38	1/30/06
129	11/19/08	5-Low		0.37	11/28/08

quantitative  
ordinal  
categorical

#### Ordering Direction

→ Sequential



→ Diverging



→ Cyclic





# Top-down: from vis to data

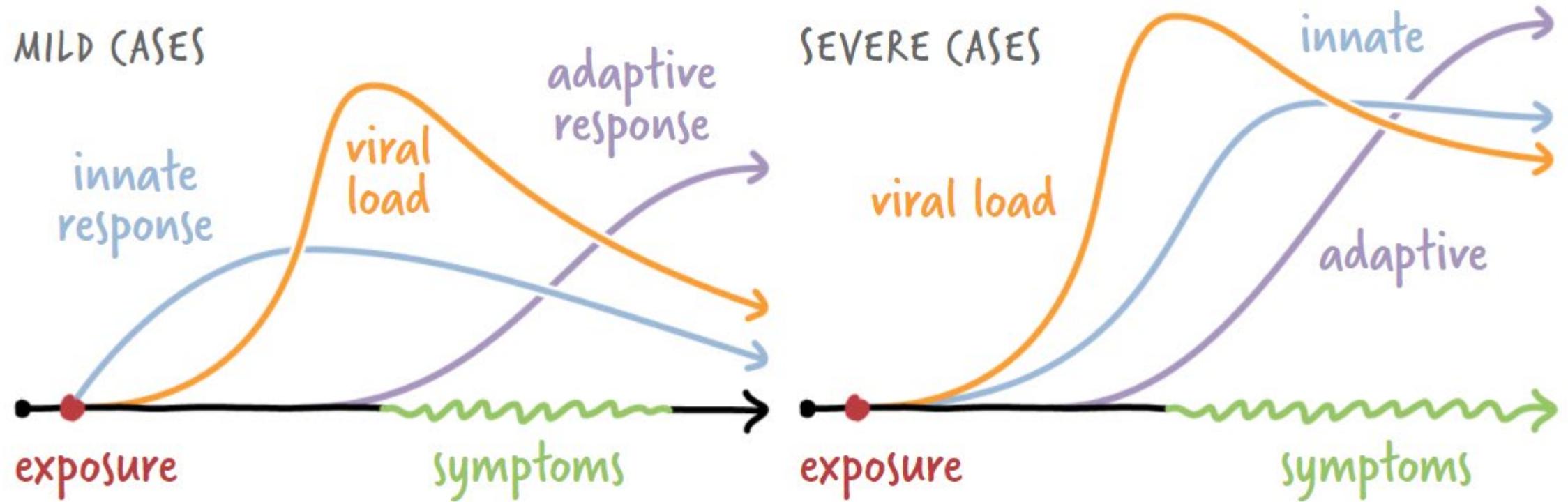
- Define your message
- Decide
  - Types and order of the charts
  - What to highlight
  - How to aggregate, ...
- May need to complement available data

# Which one?

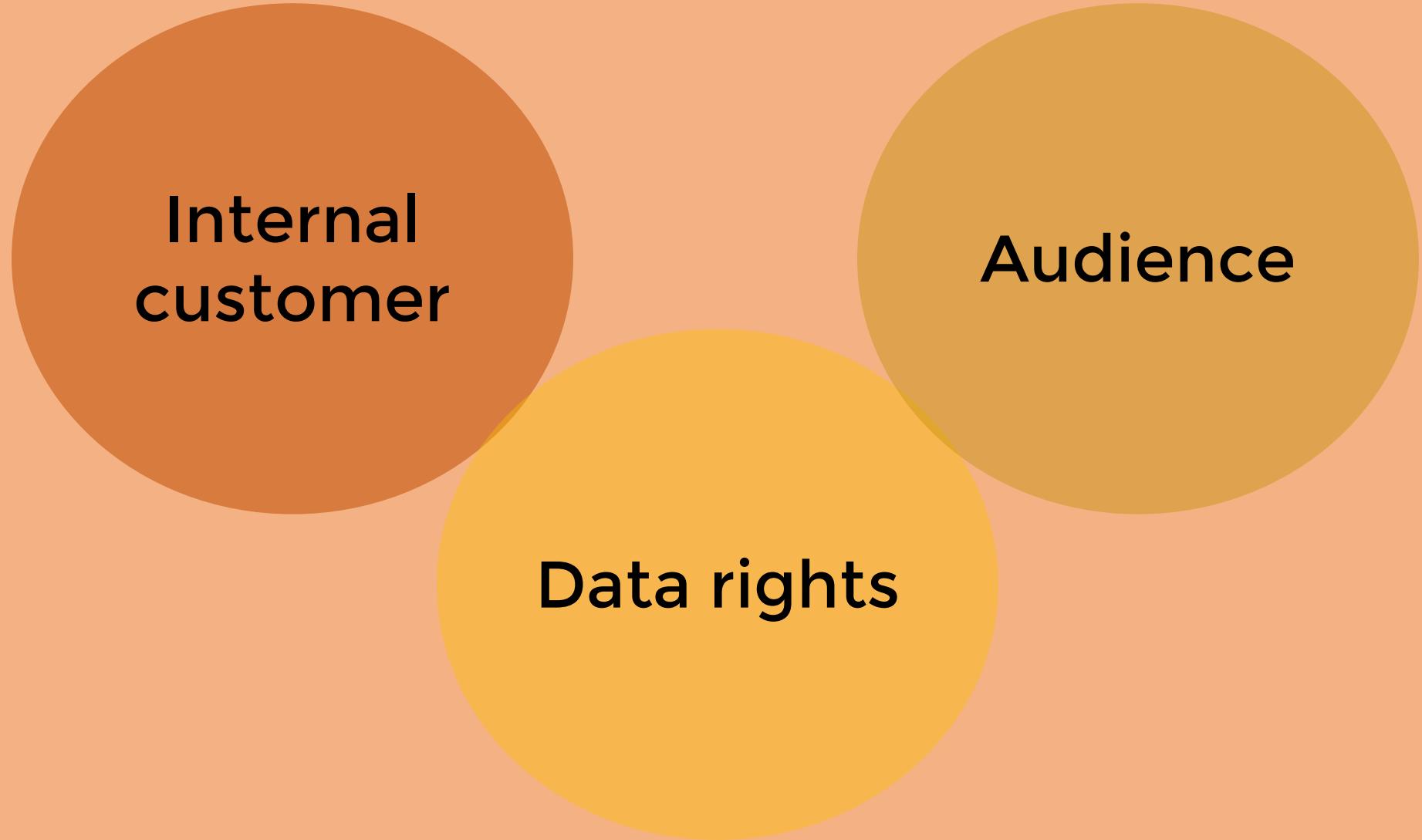
- It's not Bottom-Up *OR*  
Top-Down
- It's both of them!  
...in an iterative way



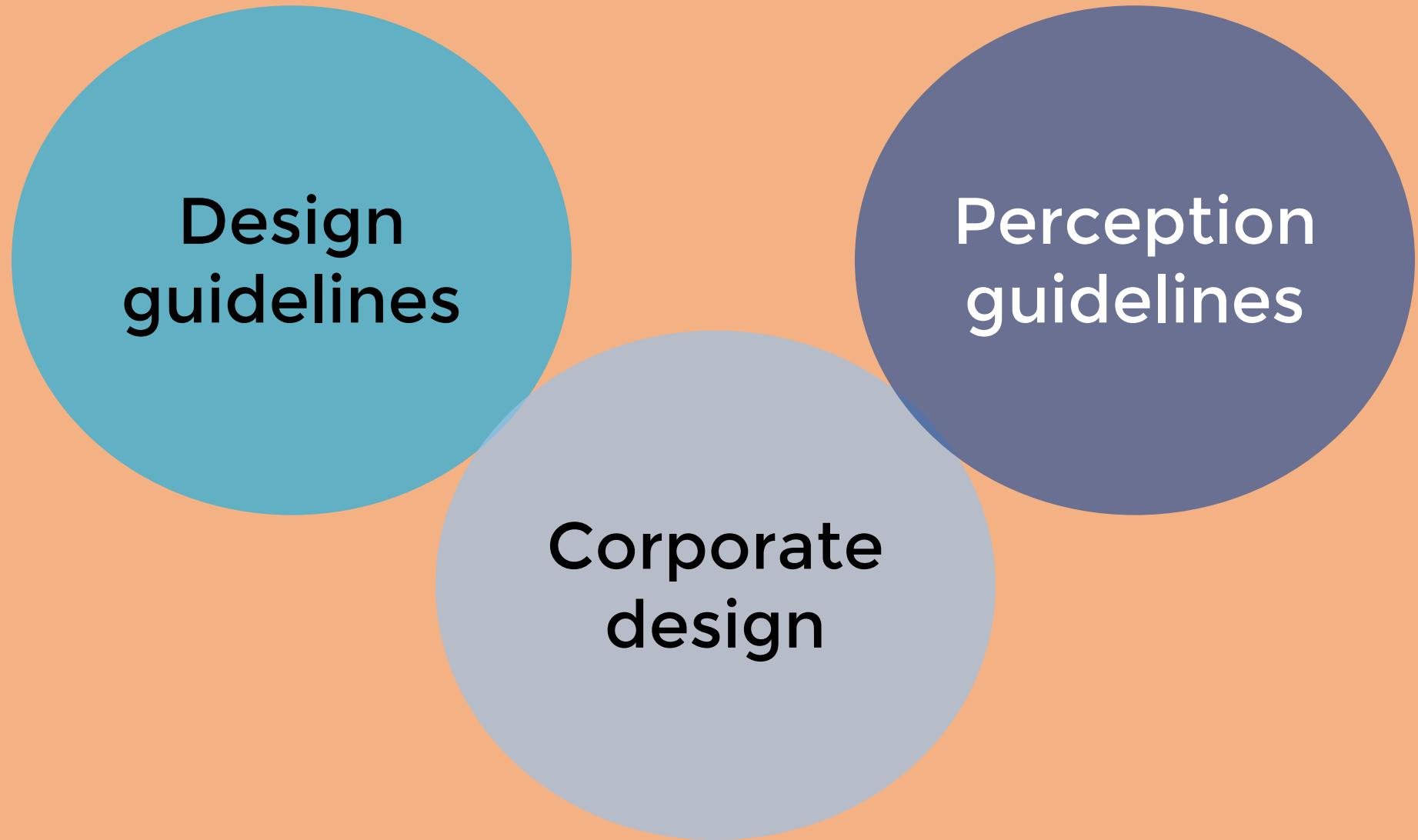
# Let's see an example: Charting a Covid-19 Immune Response



# Things to consider: message



# Things to consider: **visualization**





# Case study

## El banc dels aliments



# Banc dels aliments

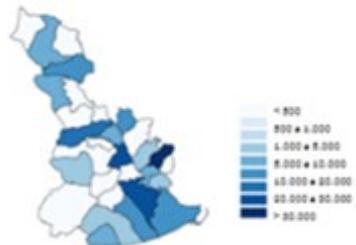
Estadístiques comarca Baix Llobregat de 2002 a 2004  
de carn, peix, embotits i fruites i verdures fresques

## Família aliments

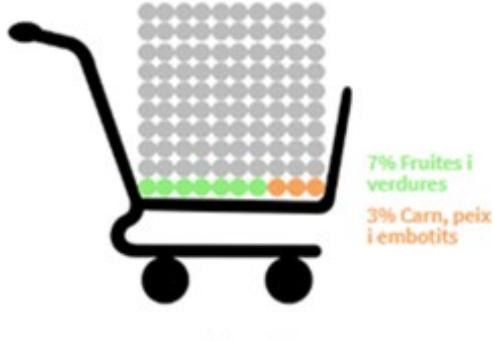
- Total
- Làctics i derivats
- Farines i derivats
- Arross,pasta,sucre,llegums
- Conserves i plats preparats
- Ollis i grèixos
- Carn,peix,embotits
- Begudes i infusions
- Fruitas i verdures fresques
- Congelats

Netejar filtres

## Kg aliments recollits



## Kg aliments recollits

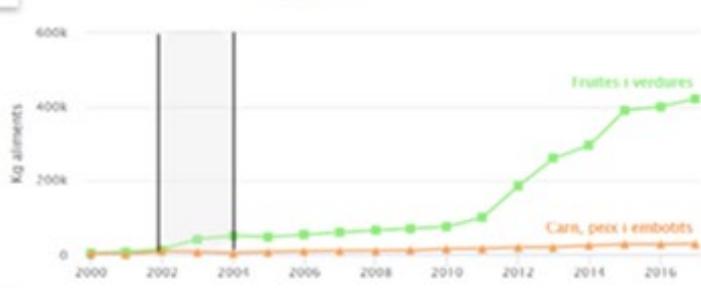


109.410 Kg

## Persones ateses



528 persones



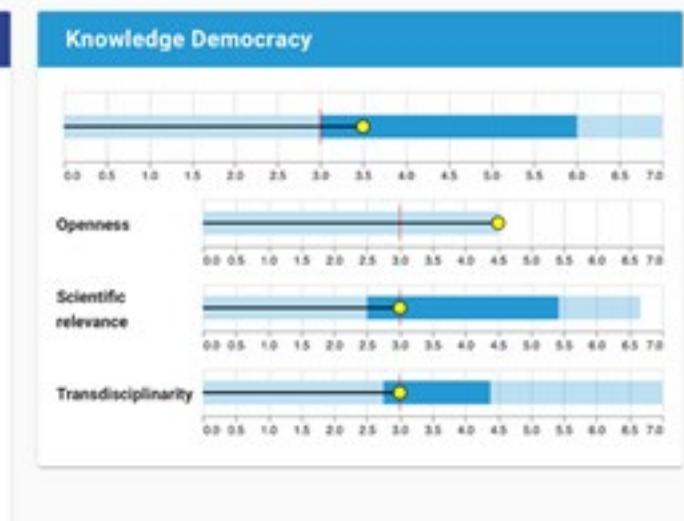
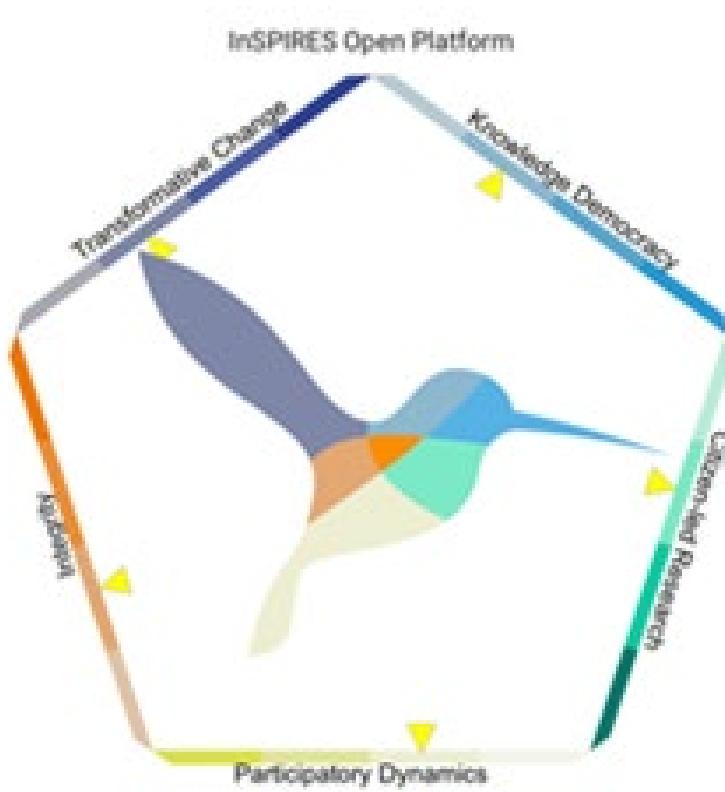


# Case study

## InSPIRES



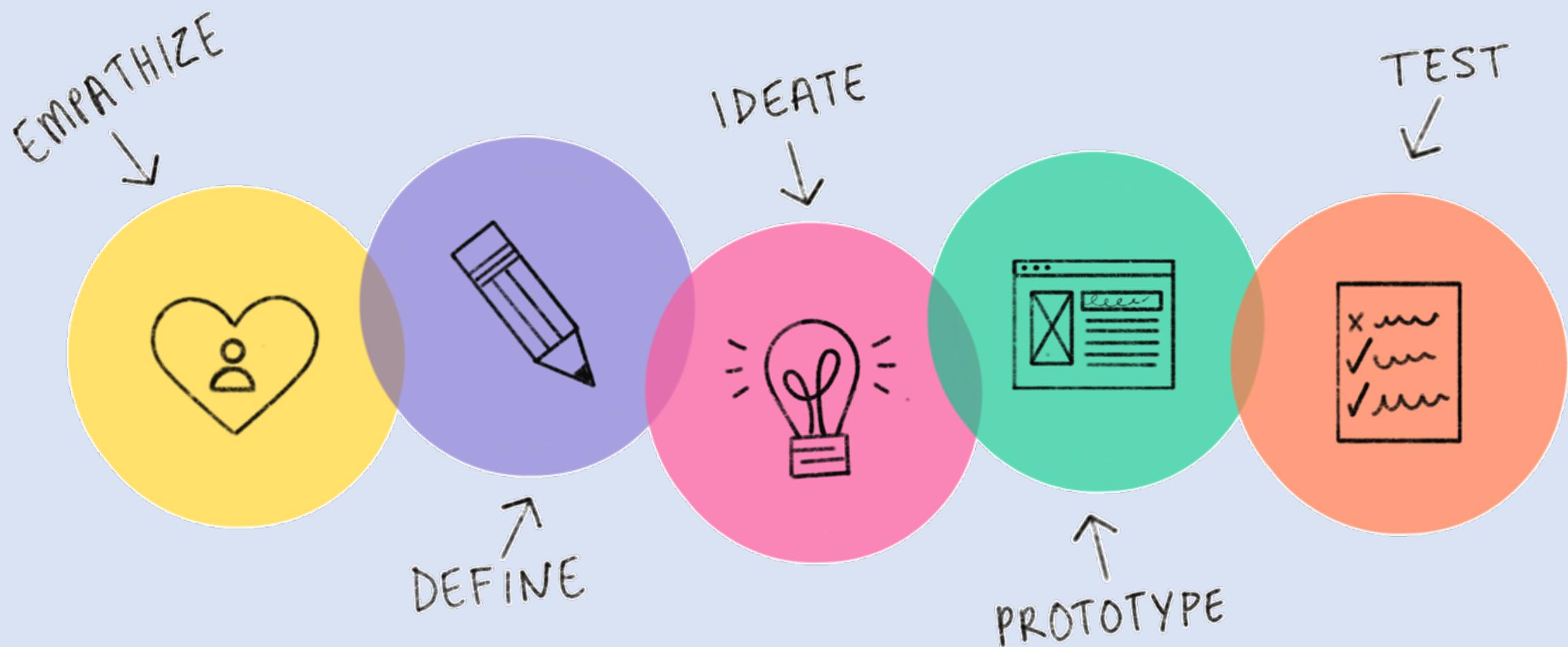
# Projects IV: Inspires platform



A close-up photograph of a fluffy, light-colored cat, possibly cream or light brown, sleeping peacefully. The cat's eyes are closed, and its head is resting on its front paws. A thought bubble originates from the cat's head, containing the text "Relax... HCI provides me with solutions".

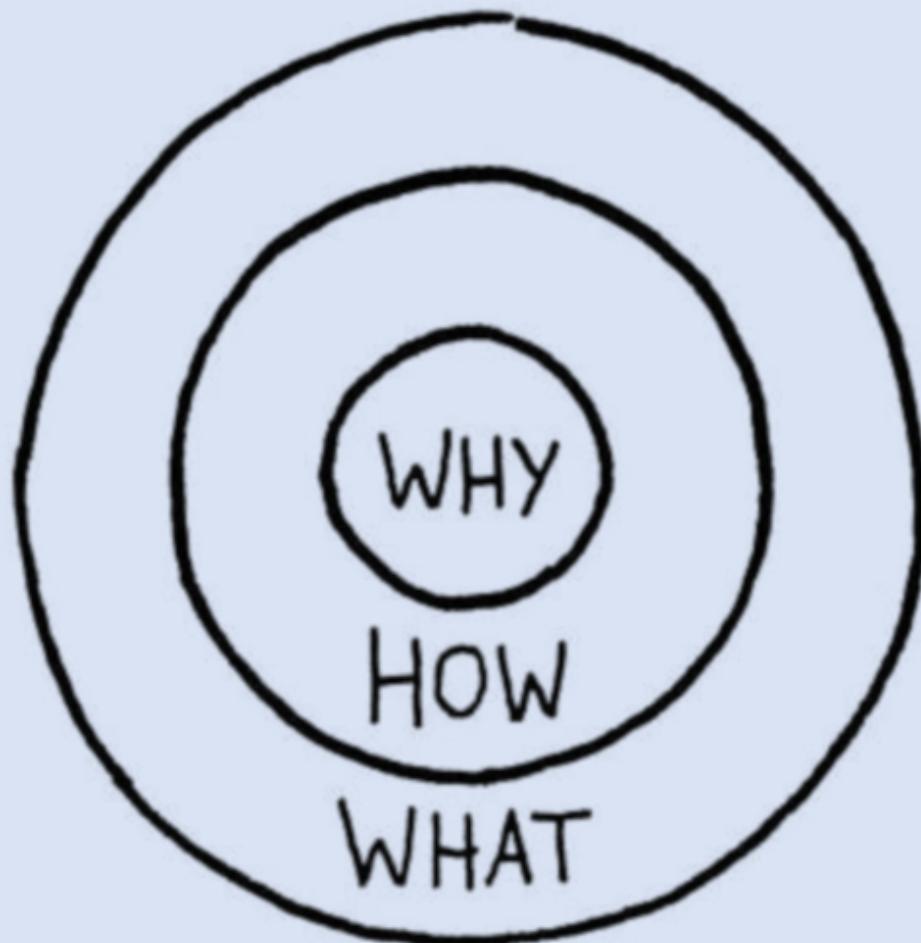
**Relax...**  
**HCI**  
**provides**  
**me with**  
**solutions**

# A complete method: Design Thinking





# Emphasize: gain an understanding





# Emphasize: visualization as a bridge

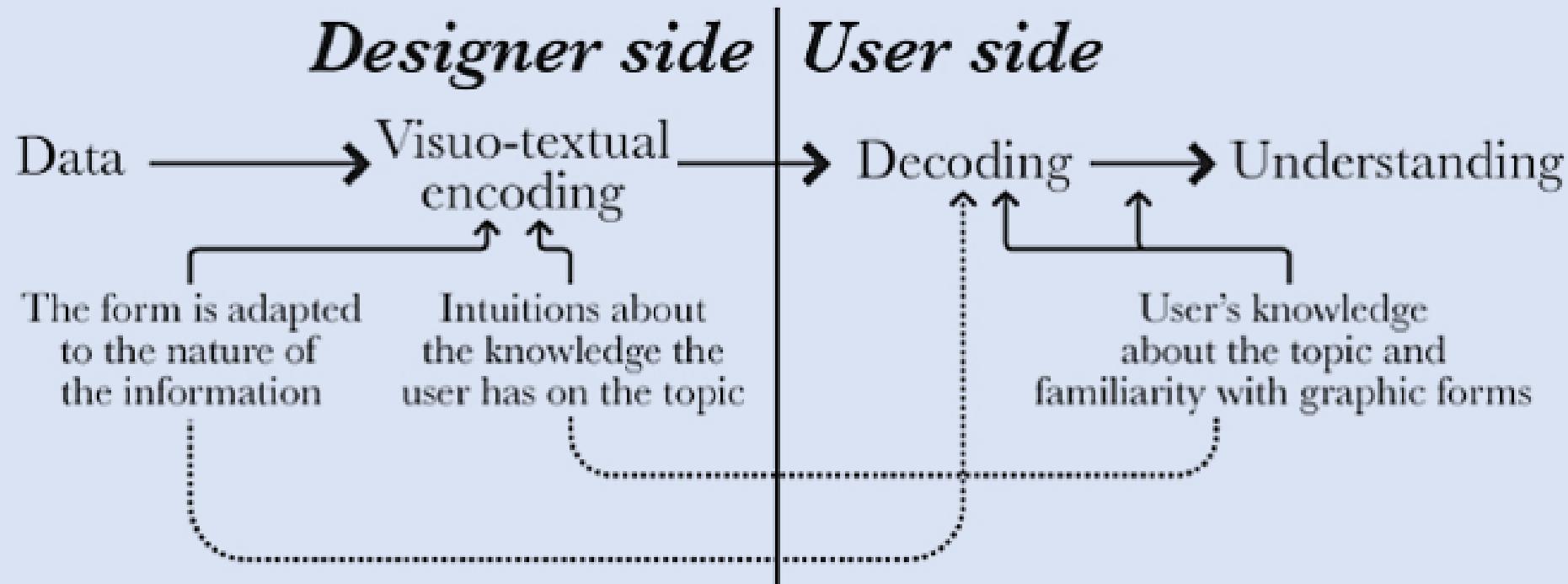
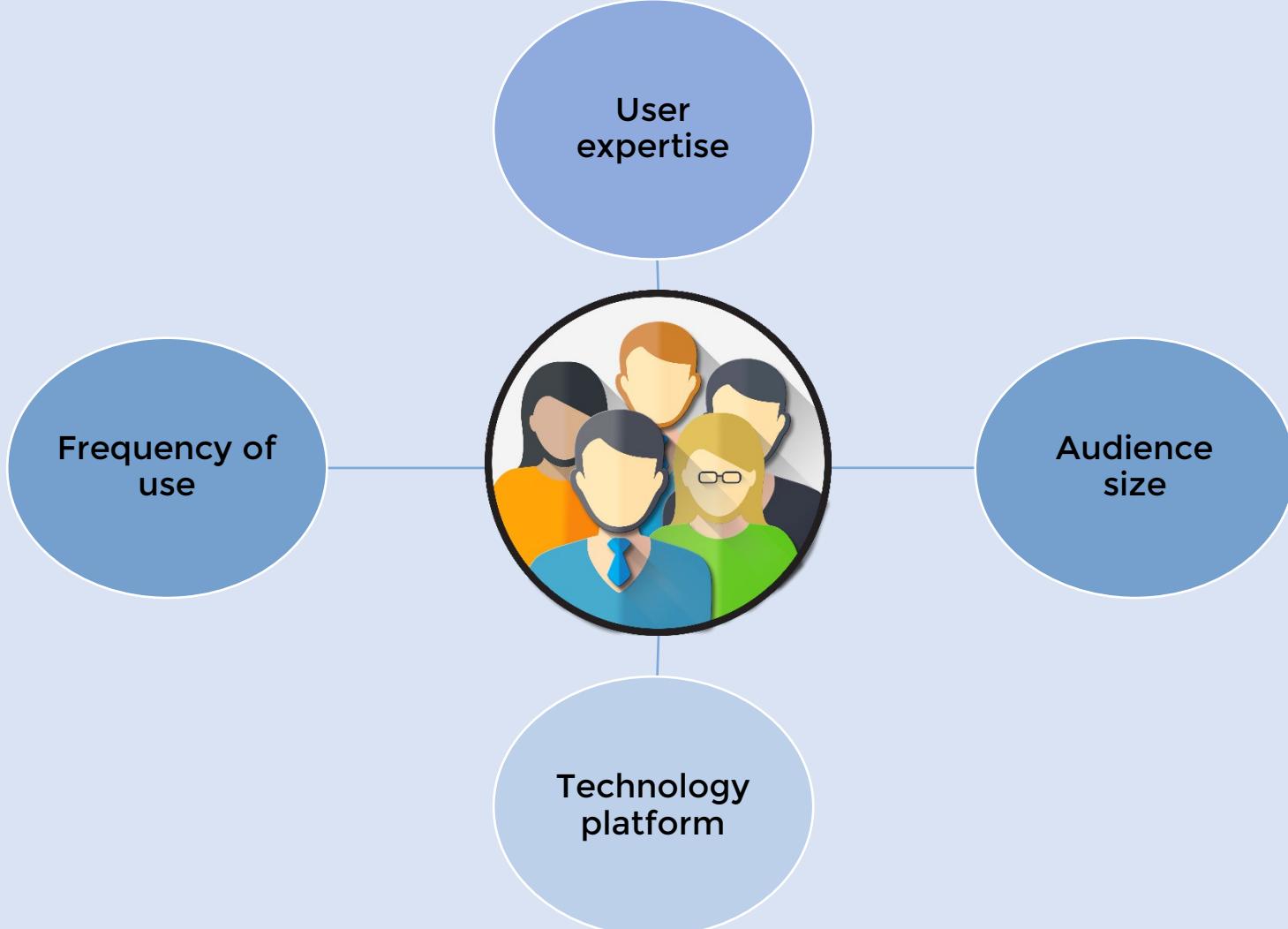


Figure 3.9. Designers encode, users decode.

Source:  
Cairo, the functional art



# Emphasize: knowing the user





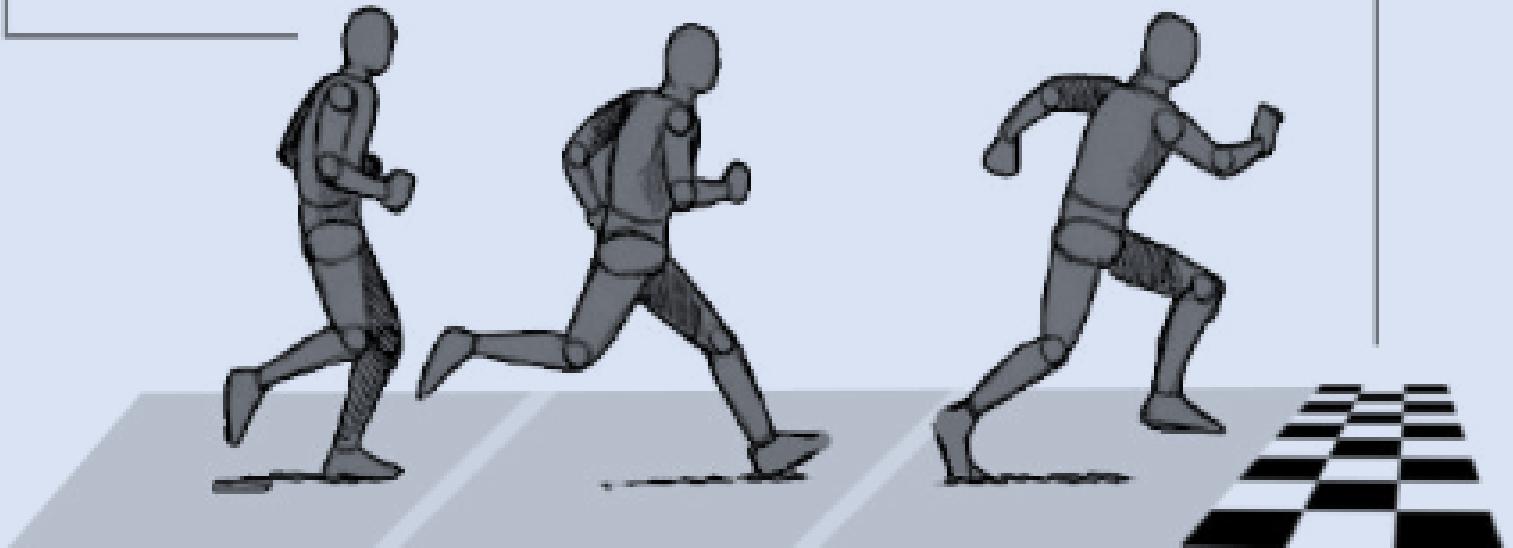
# Emphasize: personas

## 1. Persona

Defines who the story is about. This main character has attitudes, motivations, goals, and pain points, etc.

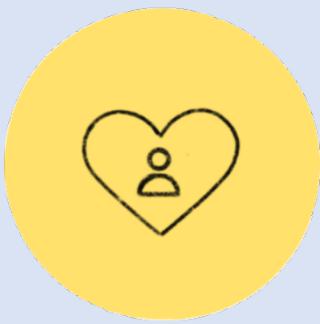
## 3. Goal

Defines what the persona wants or needs to fulfill. The goal is the motivation of why the persona is taking action. When that goal is reached, the scenario ends.



## 2. Scenario

Defines when, where, and how the story of the persona takes place. The scenario is the narrative that describes how the persona behaves as a sequence of events.



# Emphasize: personas



## Customers of The Daily Mirror

of The Daily Mirror from their comparison set | Sample size: 2868



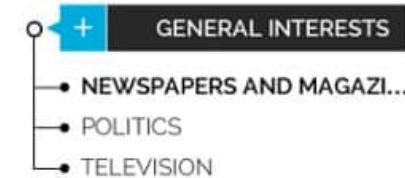
### FAVOURITE DISHES +

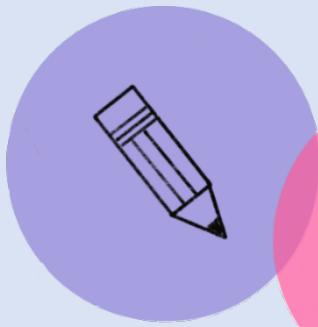
### HOBBIES & ACTIVITIES +

- DIY
- SHOPPING
- GOING ON DAY TRIPS

### FAVOURITE SPORTS +

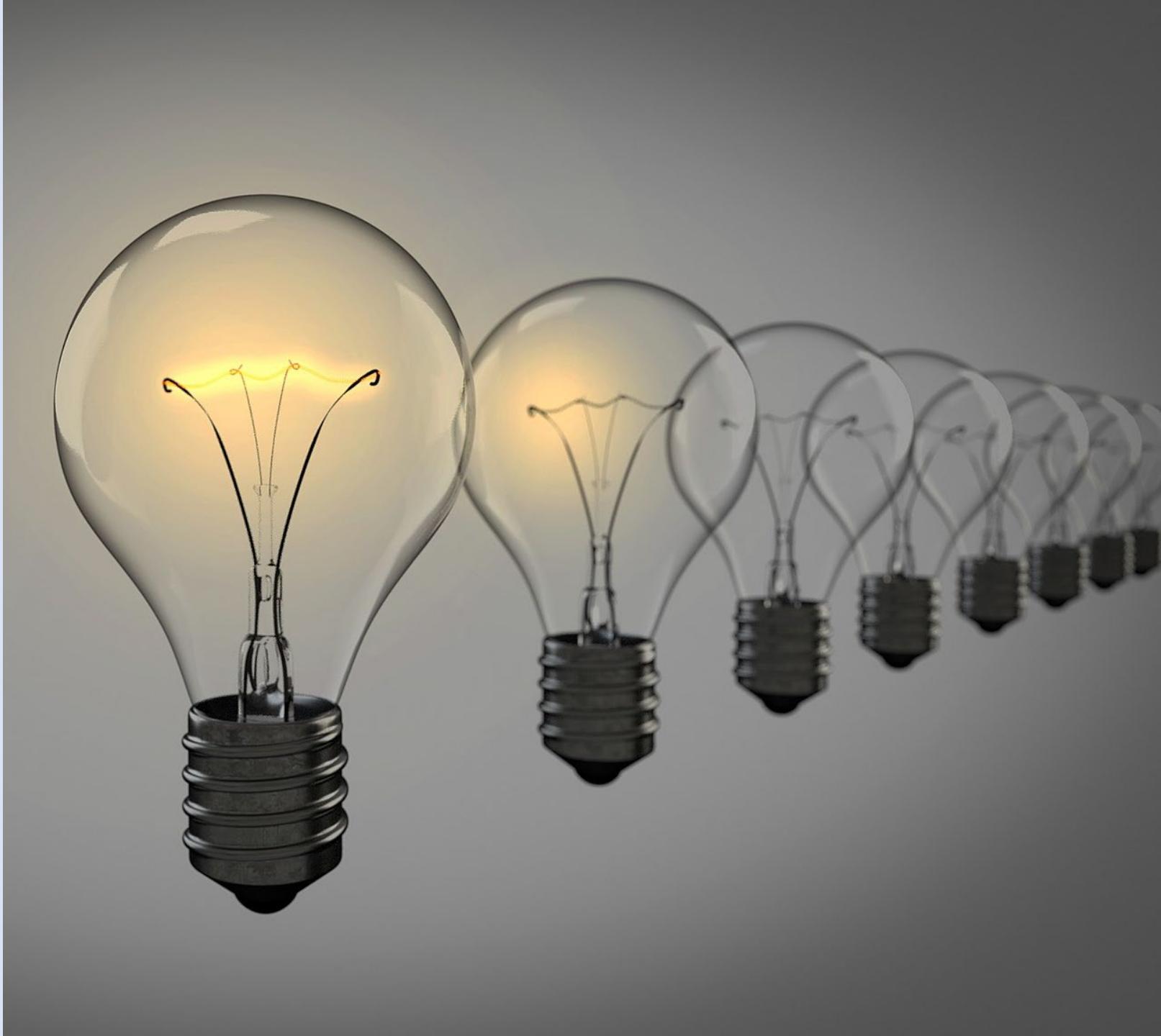
- FOOTBALL
- BOXING





## Define, ideate

- State the problem
- Solutions from alternative views





# Prototype: techniques

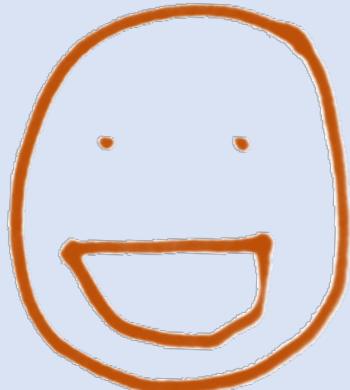
- Scenarios
- Questions
- Low fi prototypes
- High fi prototypes
- Implementation



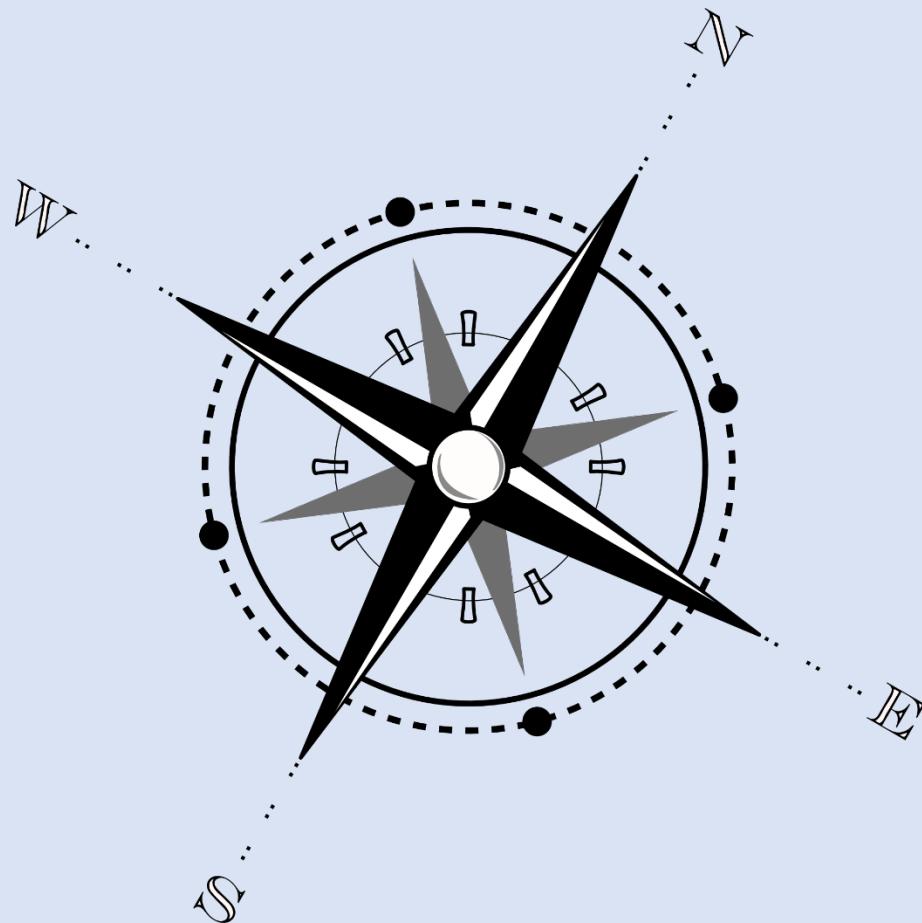


# Test: evaluate

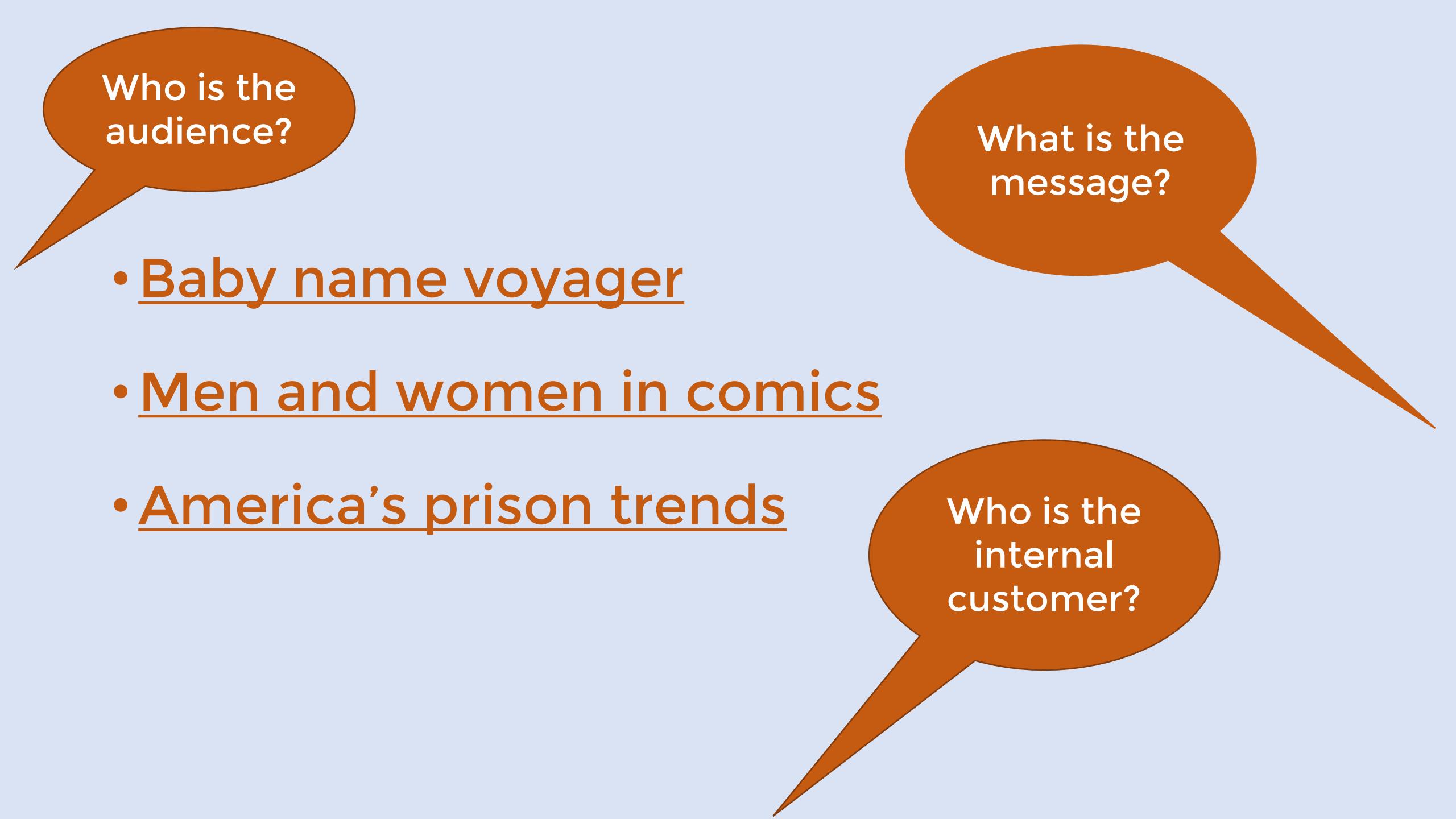
- Interviews, questionnaires
- Heuristic evaluation
- Usability testing



# Guidance



- UK Research guidelines
- Fluid Project
- Interaction Design Foundation



Who is the audience?

What is the message?

- Baby name voyager
- Men and women in comics
- America's prison trends

Who is the internal customer?

# Storytelling



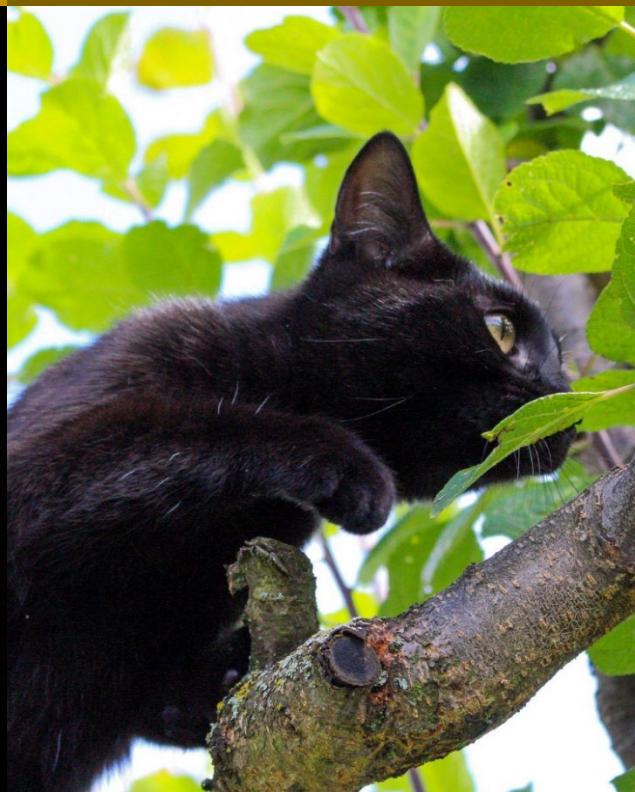
# 4 types of visualizations

Analysis

Exploration



Monitoring



Presentation

Storytelling



Infographic

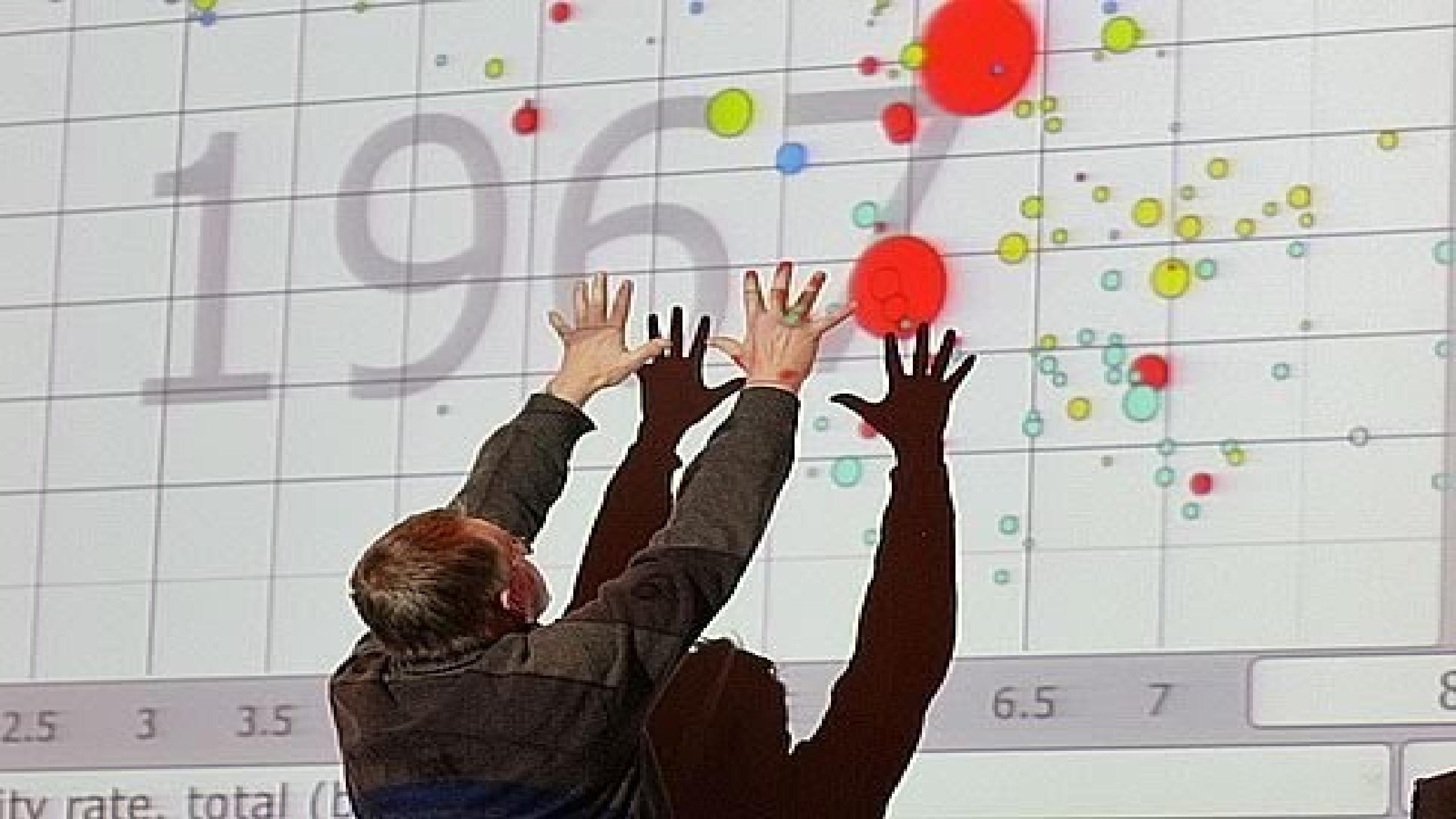


# Storytelling goes beyond data understanding

Engagement

Emotional  
connection

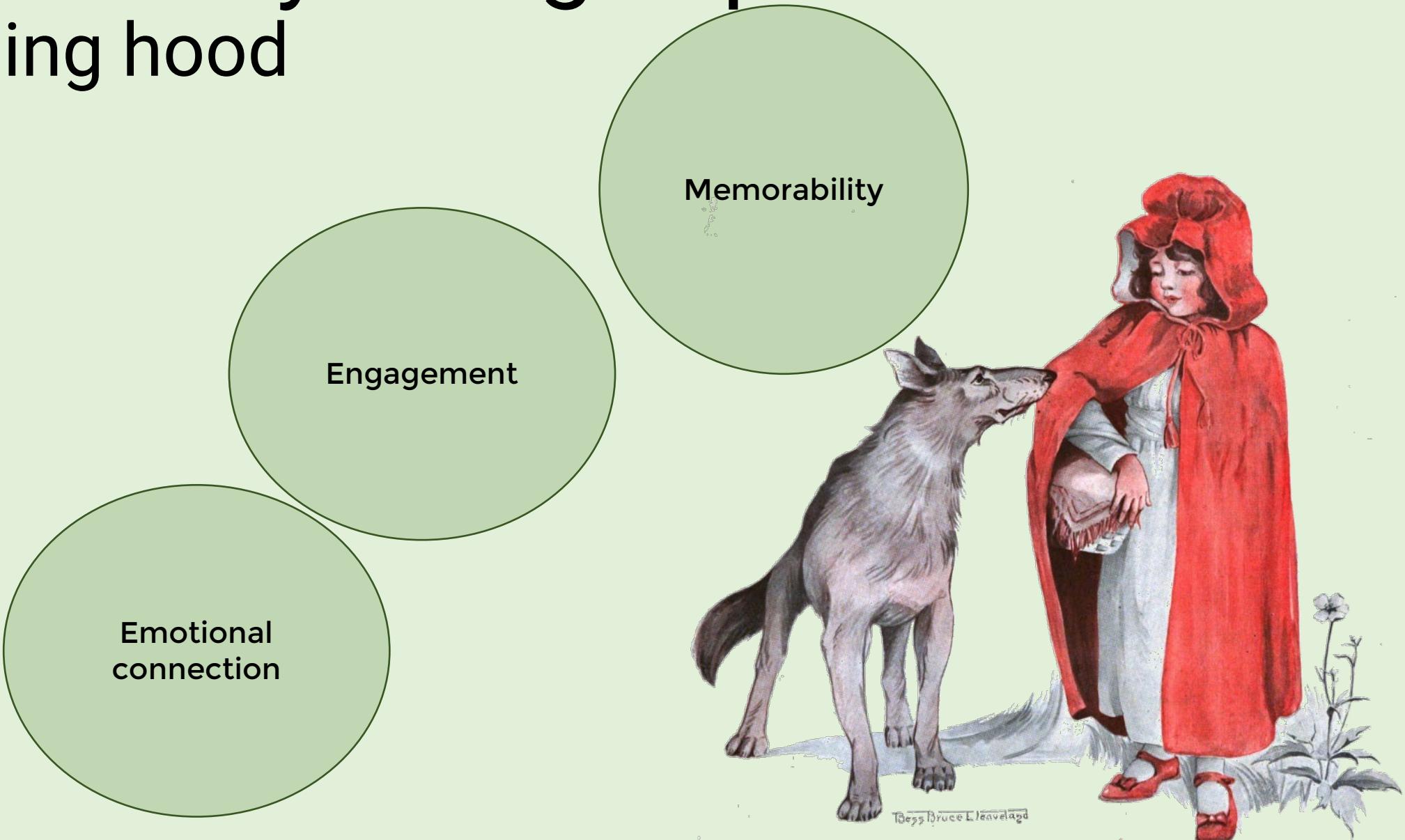




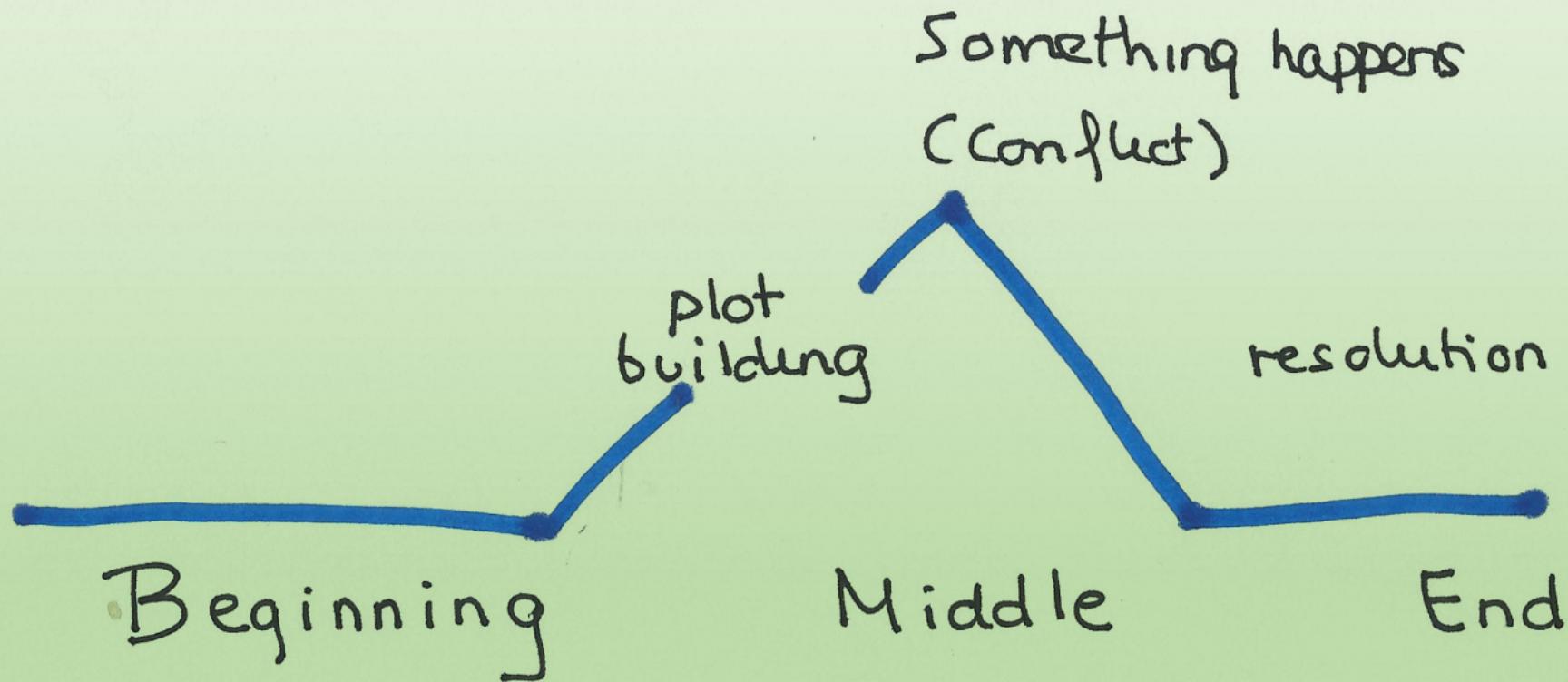
# Wonders of storytelling

- Remembering is easy with a story
- Magic from Plot-Twist-End: data are stories
- Captivation, emotionally engage
- Takes you on a journey, you don't want to turn away

# A child storytelling experience: Red riding hood



# The story



# Beginning

- Introduce the plot
- Essential elements
- Involve the audience:
  - Why should I pay attention?
  - What is in there for me?



# Conflict and tension

- Critical components of a story
- Create an imbalance with a problem to solve
- THEIR(your audience) problem, and they will have a stake on the solution



# Middle

- Develop with “what could be”
- Include demonstrating data such as external context, comparison points, examples
- What will happen if no action is taken
- How they can solve the problem
- Your audience is in a unique position to make a decision
- Keep motivation and resonance



# End

- Provide resolution
- Call to action
- Recap, wrap up and tie with the initial tension

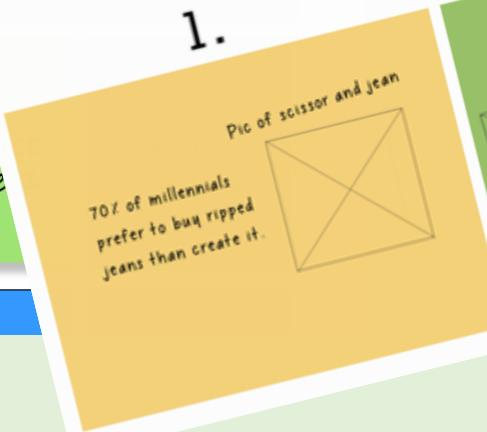
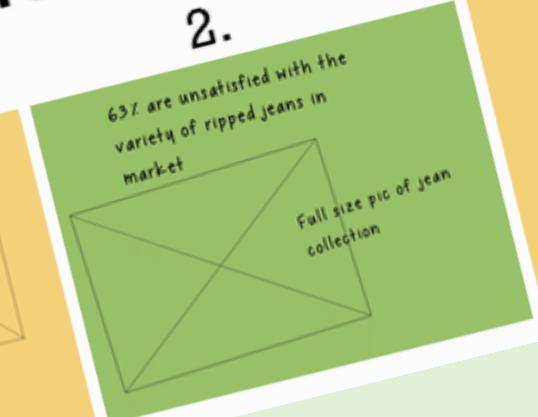


# Storyboarding tip

**FINAL OUTLINE**

Research Finding #1	Research Finding #2	Introduce Brand	SECTION HEADER The Problem	Problem #1
Problem #2	Problem #3	Problem #4	SECTION HEADER WHY CHOOSE	Reason #1
Reason #2	Reason #3	SECTION HEADER OUR PRODUCTS	Product Range	

**STORYBOARDING**

1. 
2. 
3. 



Identify  
beginning-  
middle-end



What tricks do  
they use for  
engagement?

- **How many slaves work for you?**



What is most  
memorable?

# 6 steps recipe

1. Importance of context
2. Choose effective visuals
3. Clutter is your enemy
4. Focus your audience attention
5. Think like a designer
6. Tell a story

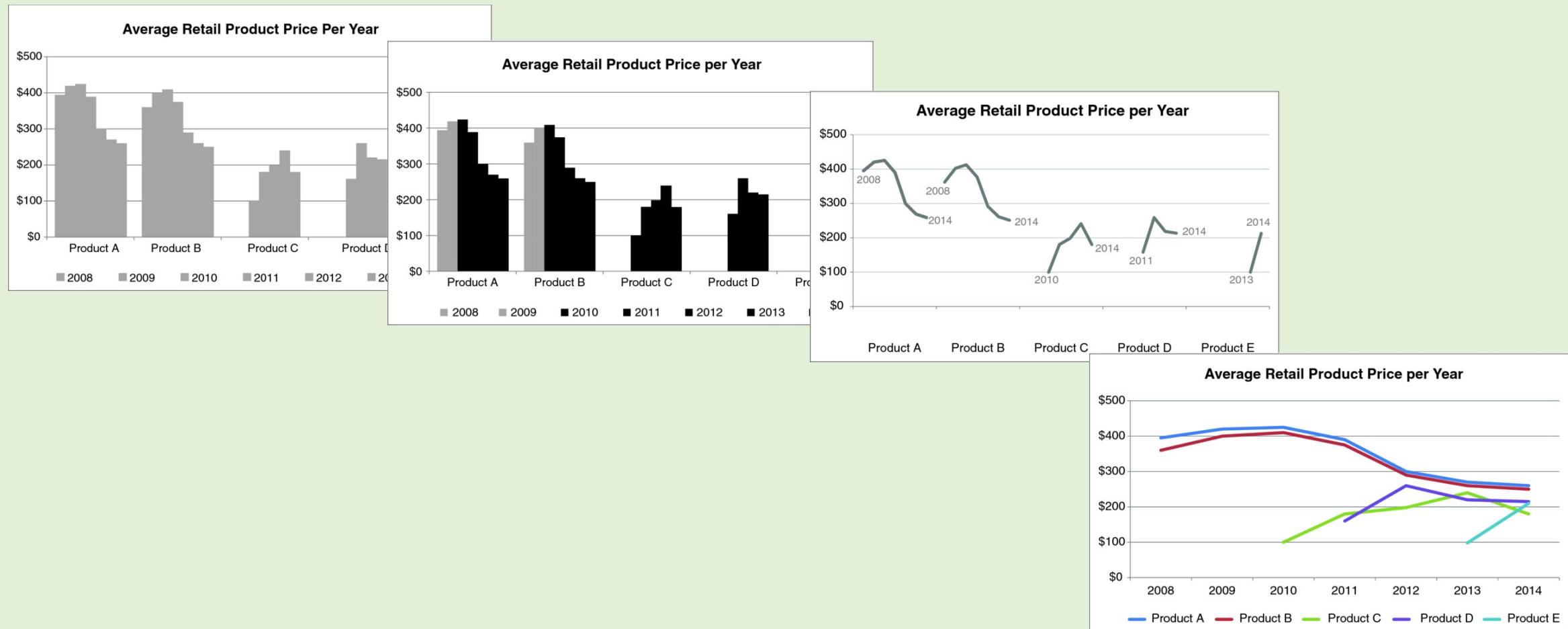
# Example of 6 steps recipe



# Example: importance of context

- Who: Responsible of Product, the primary decision maker in establishing our product's price.
- What: Understand how competitors' pricing has changed over time and recommend a price range.
- How: Show average retail price over time for Products A, B, C, D, and E.
- The Big Idea, then, could be something like: Based on analysis of pricing in the market over time, to be competitive, we recommend introducing our product at a retail price in the range \$ABC-\$XYZ.

# Example: choose visuals

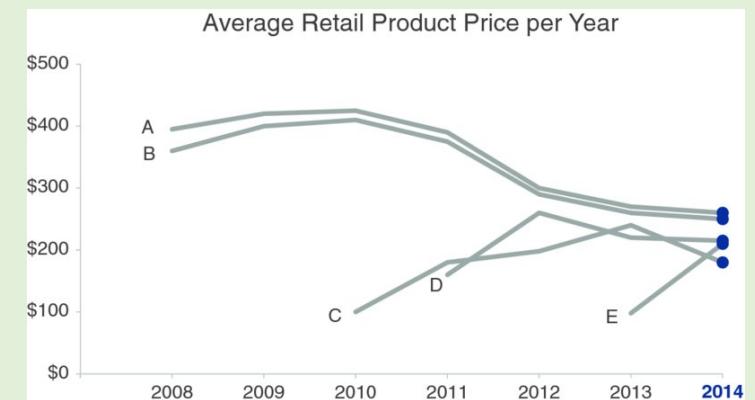
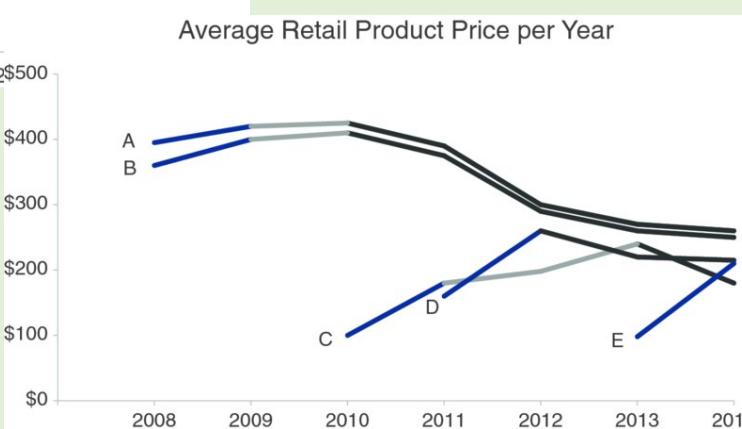
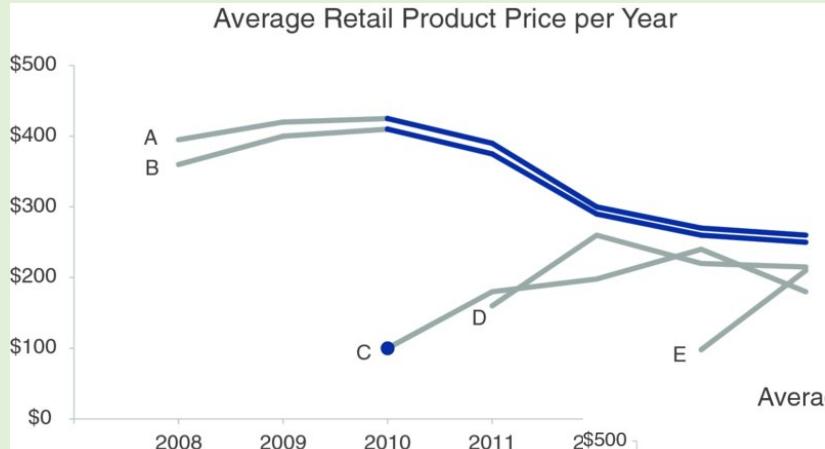


# Example: clutter is your enemy

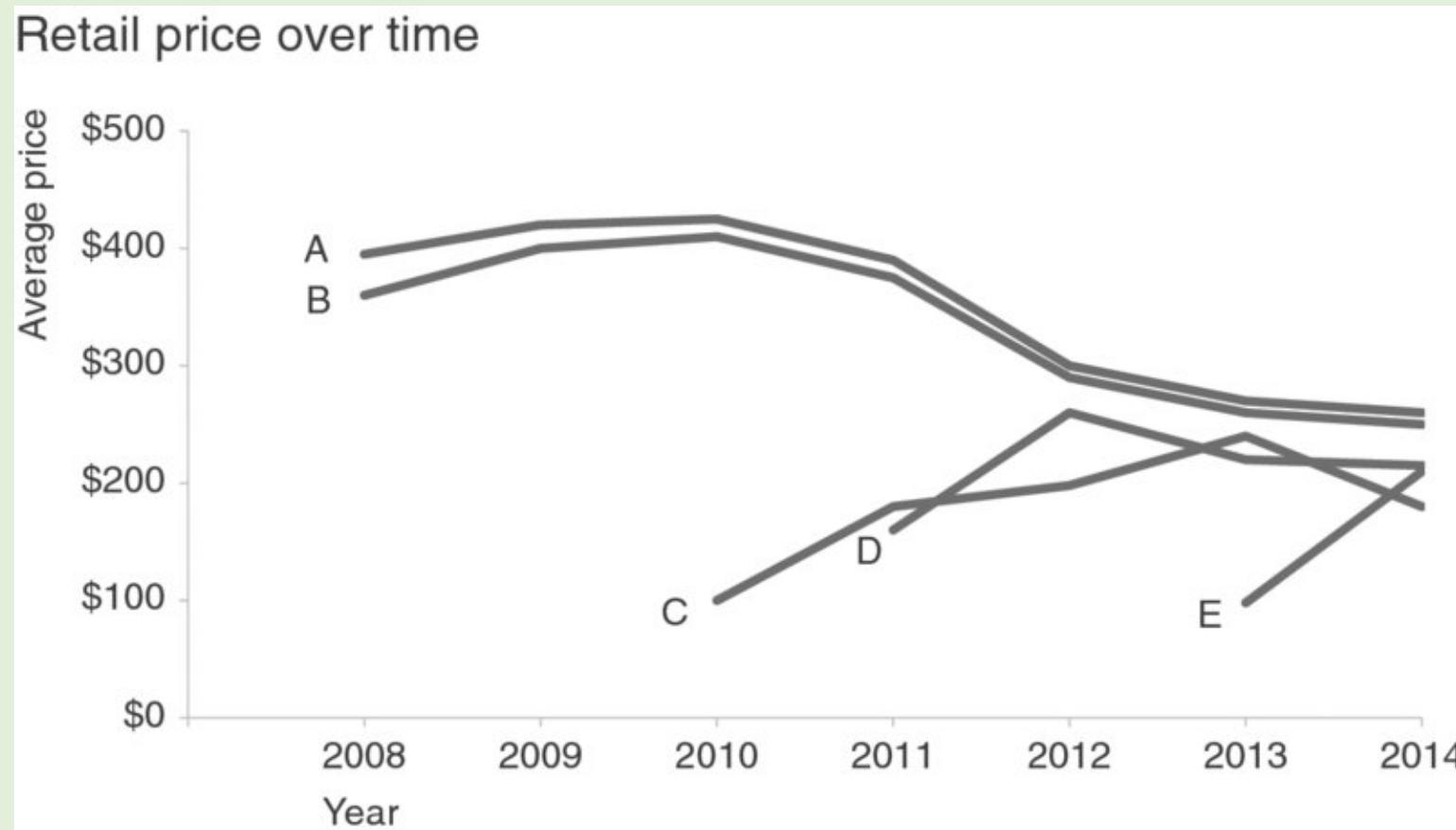


- De-emphasize the chart title.
- Remove chart border and gridlines
- Push the  $x$ - and  $y$ -axis lines and labels to the background
- Remove the variance in colors between the various lines.
- Label the lines directly

# Example: focus your audience attention



# Example: think like a designer

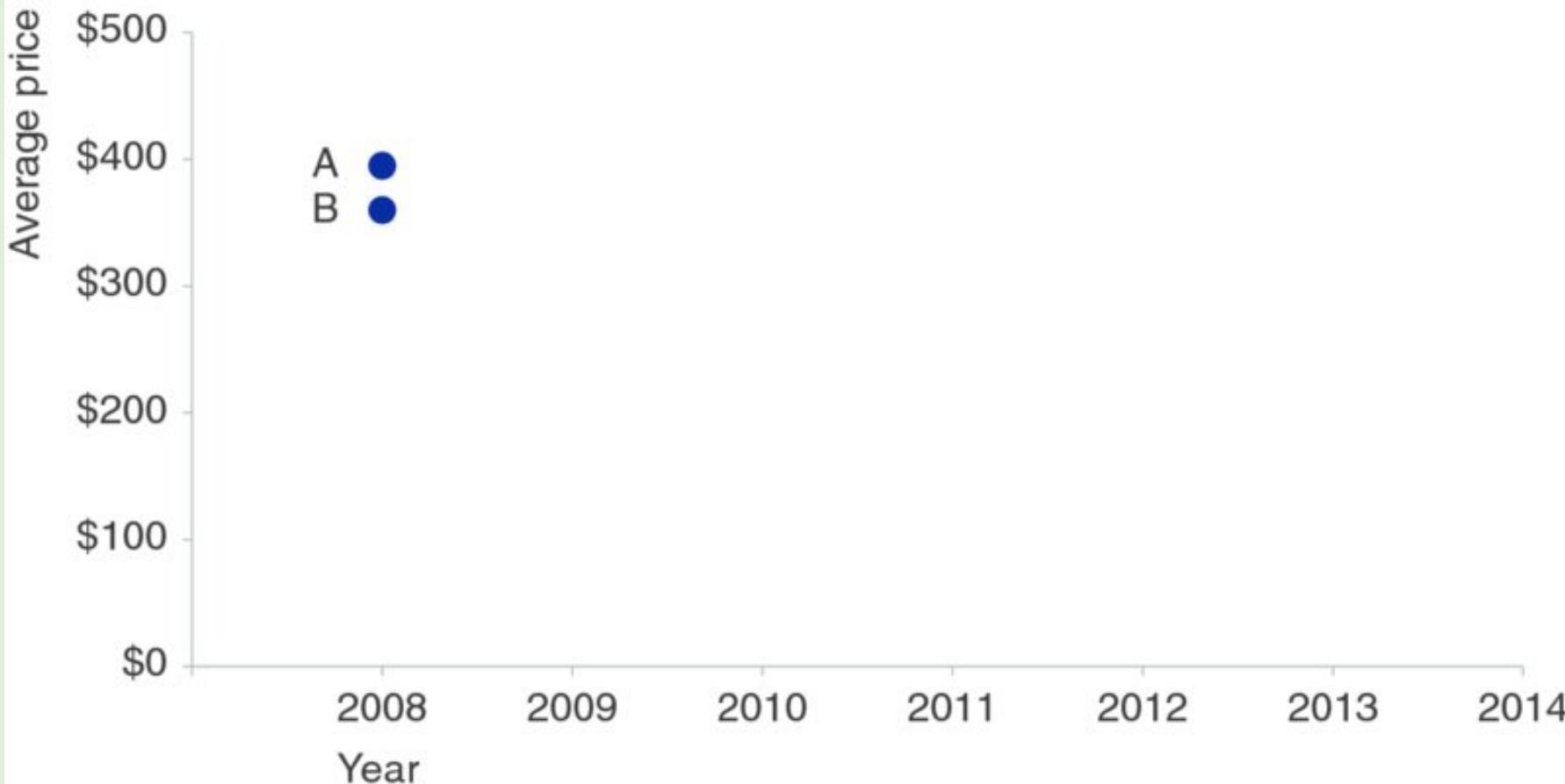


# Example: tell a story

- GOALS
  - Understand how prices have changed over time in the competitive landscape
  - Use this knowledge to inform the pricing of our product
- We will end with a specific recommendation.

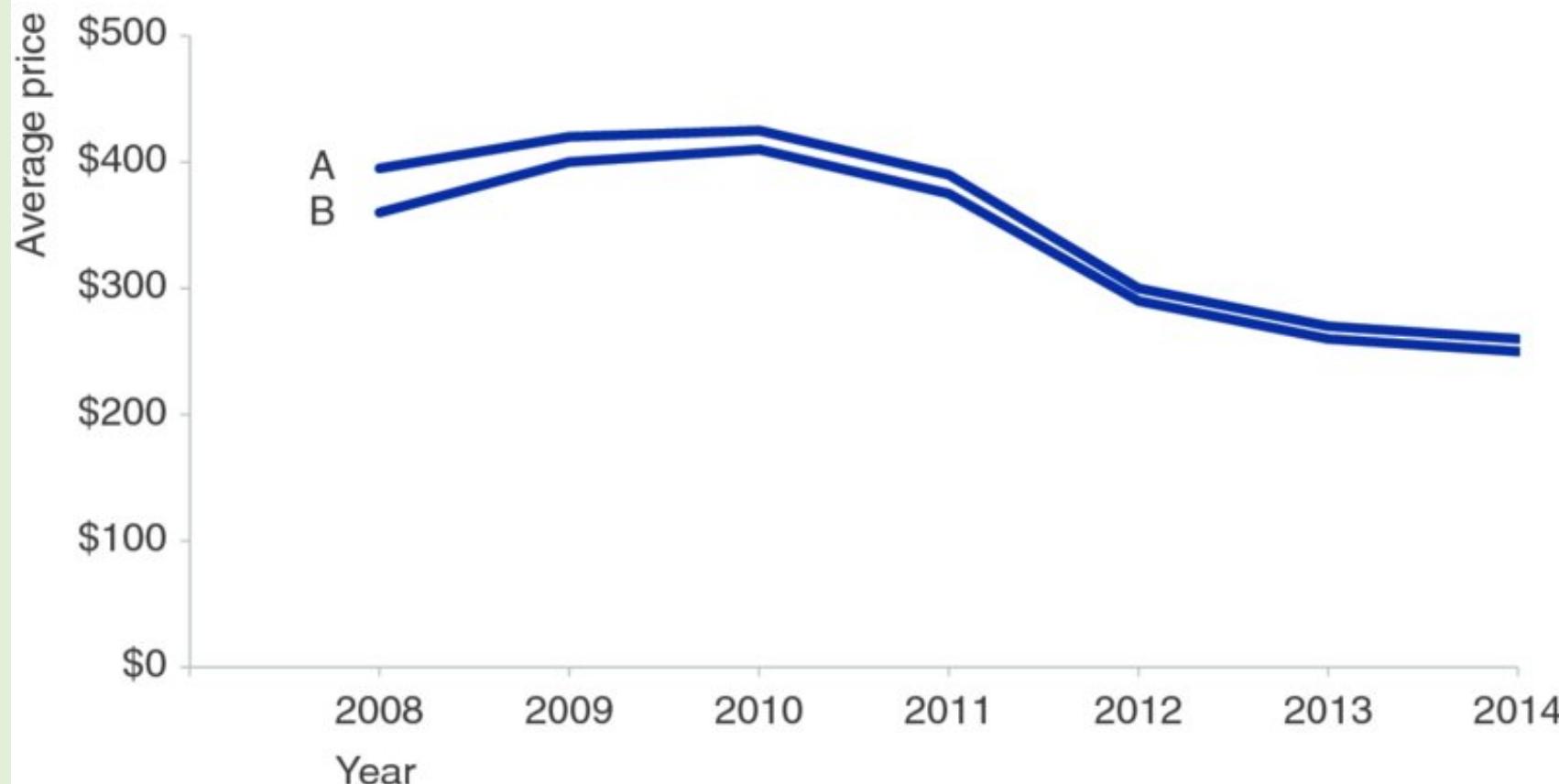
Products A and B were launched in 2008 at price points of **\$360+**

Retail price over time



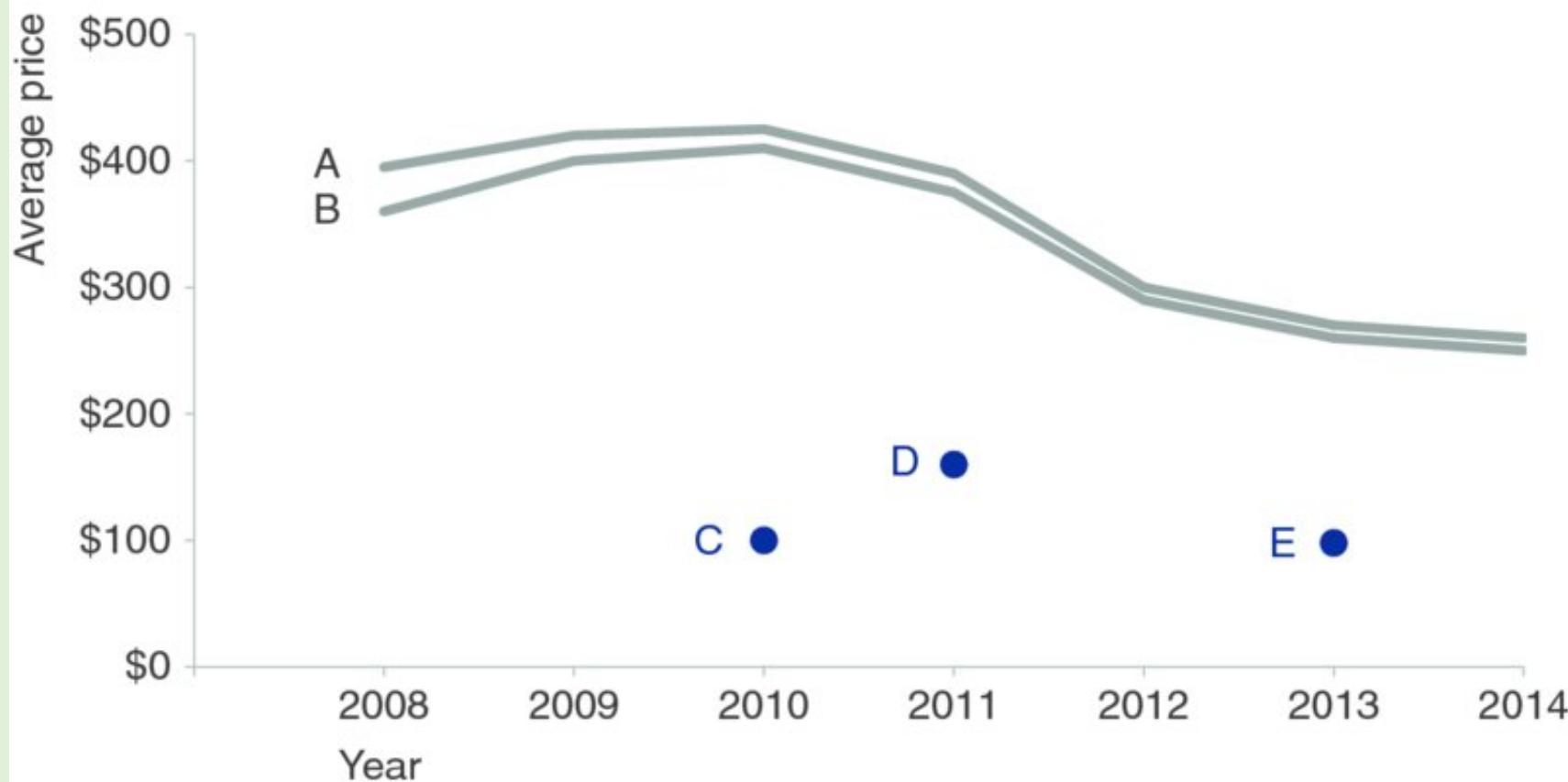
They have been priced similarly over time, with B consistently slightly lower than A

Retail price over time



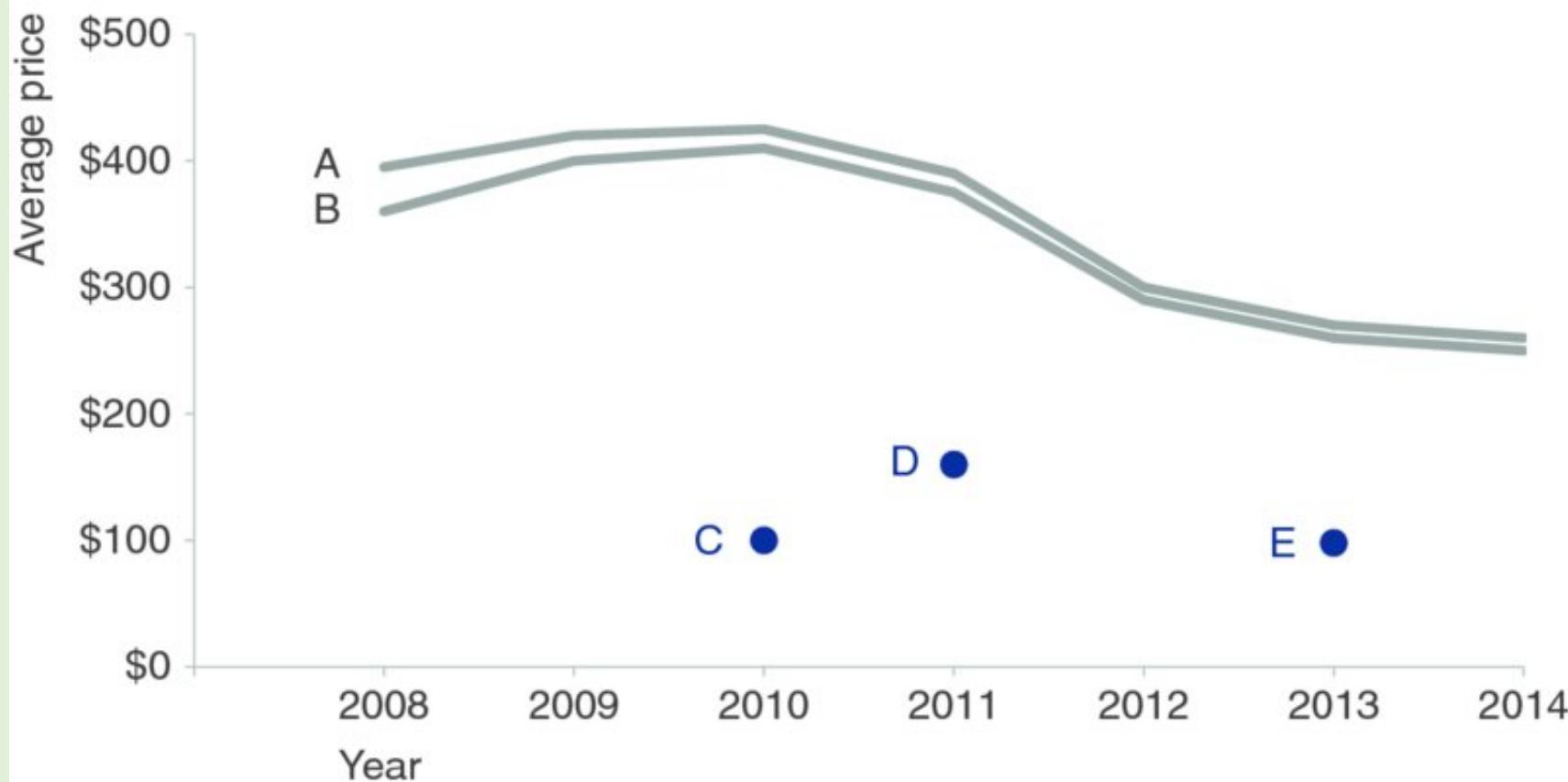
Products C, D, and E were each introduced later  
at **much lower price points**...

Retail price over time



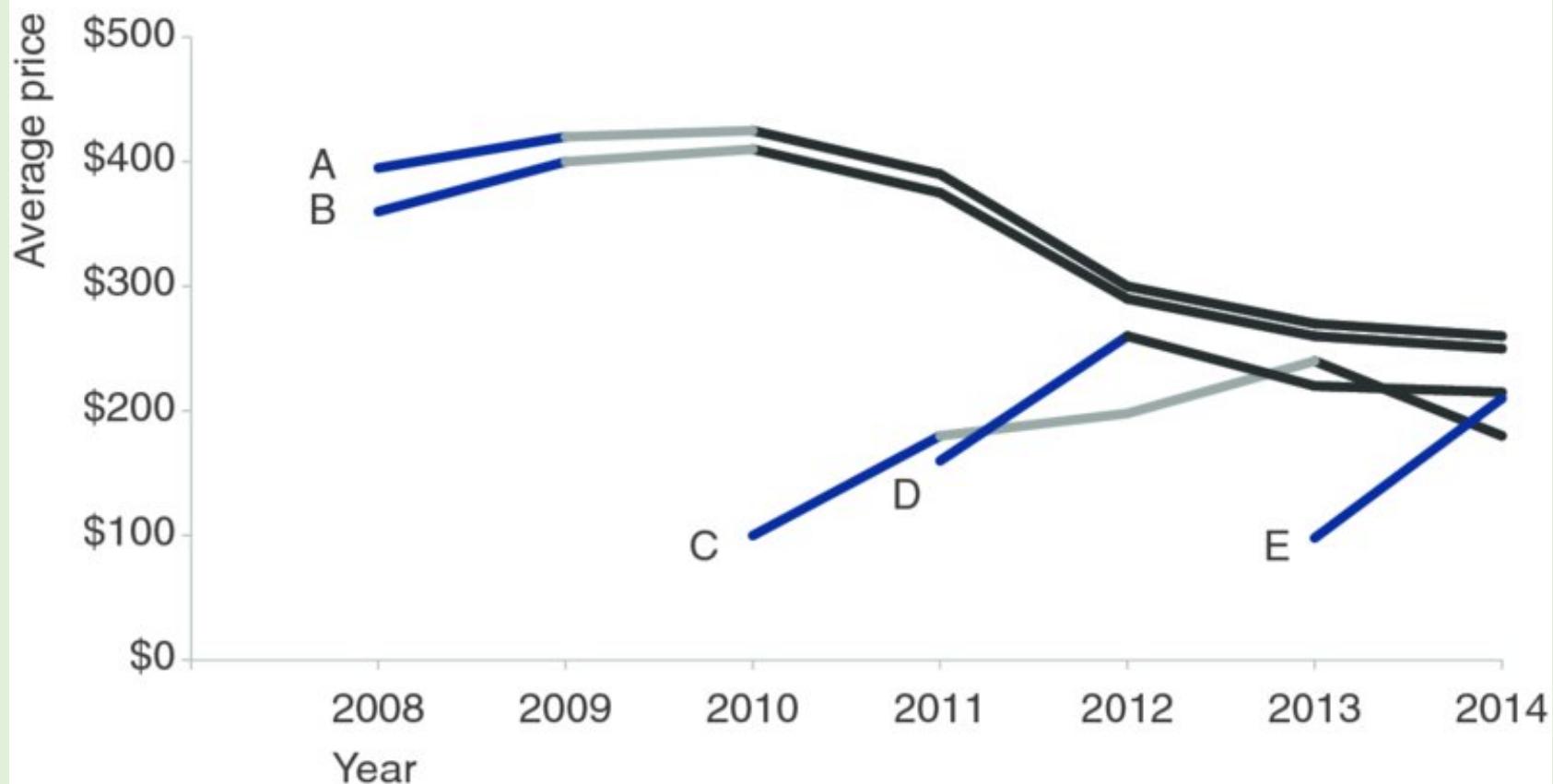
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Retail price over time



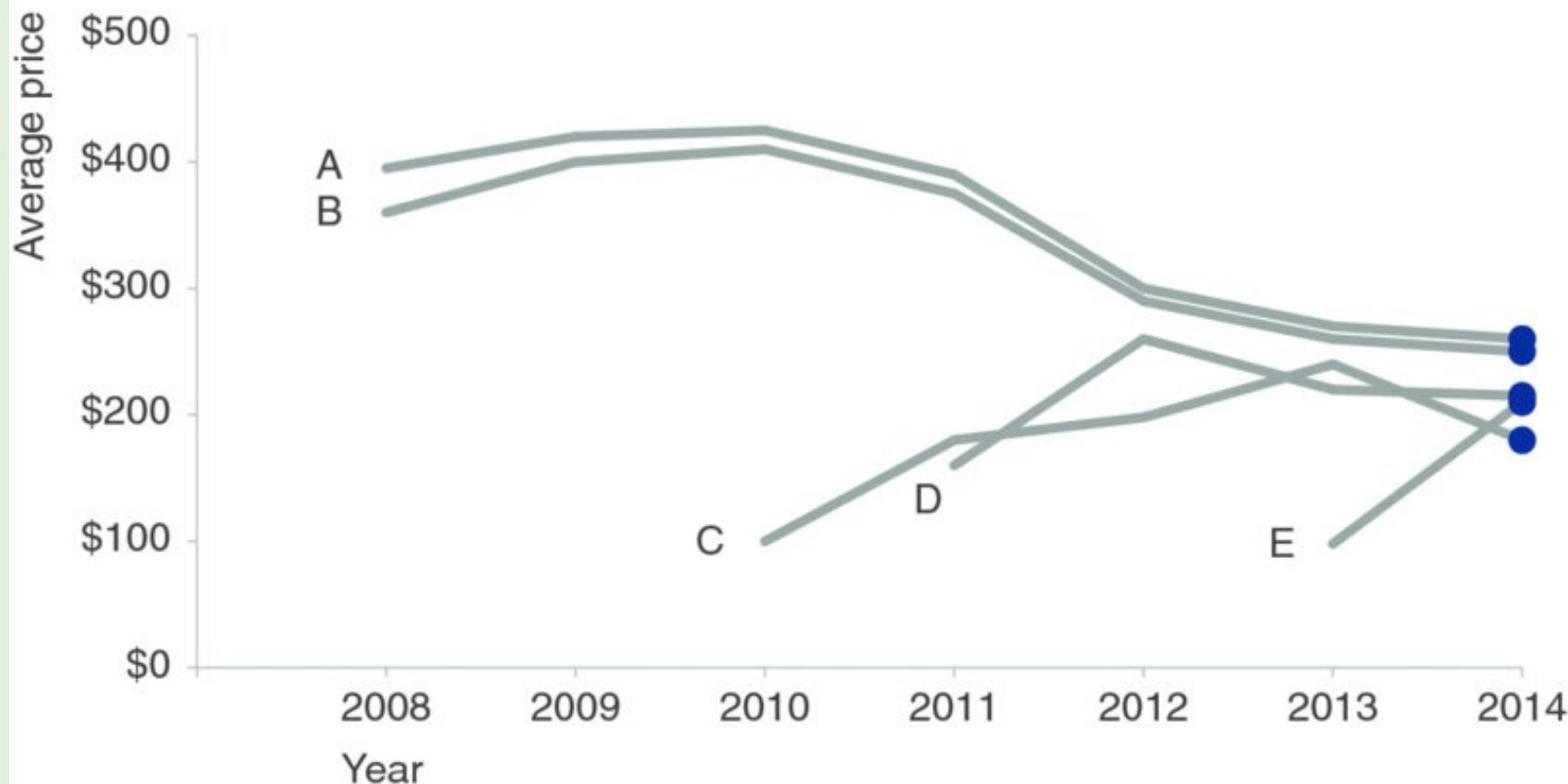
In fact, with the launch of a new product in this space, we tend to see an **initial price increase**, followed by a **decrease** over time

Retail price over time



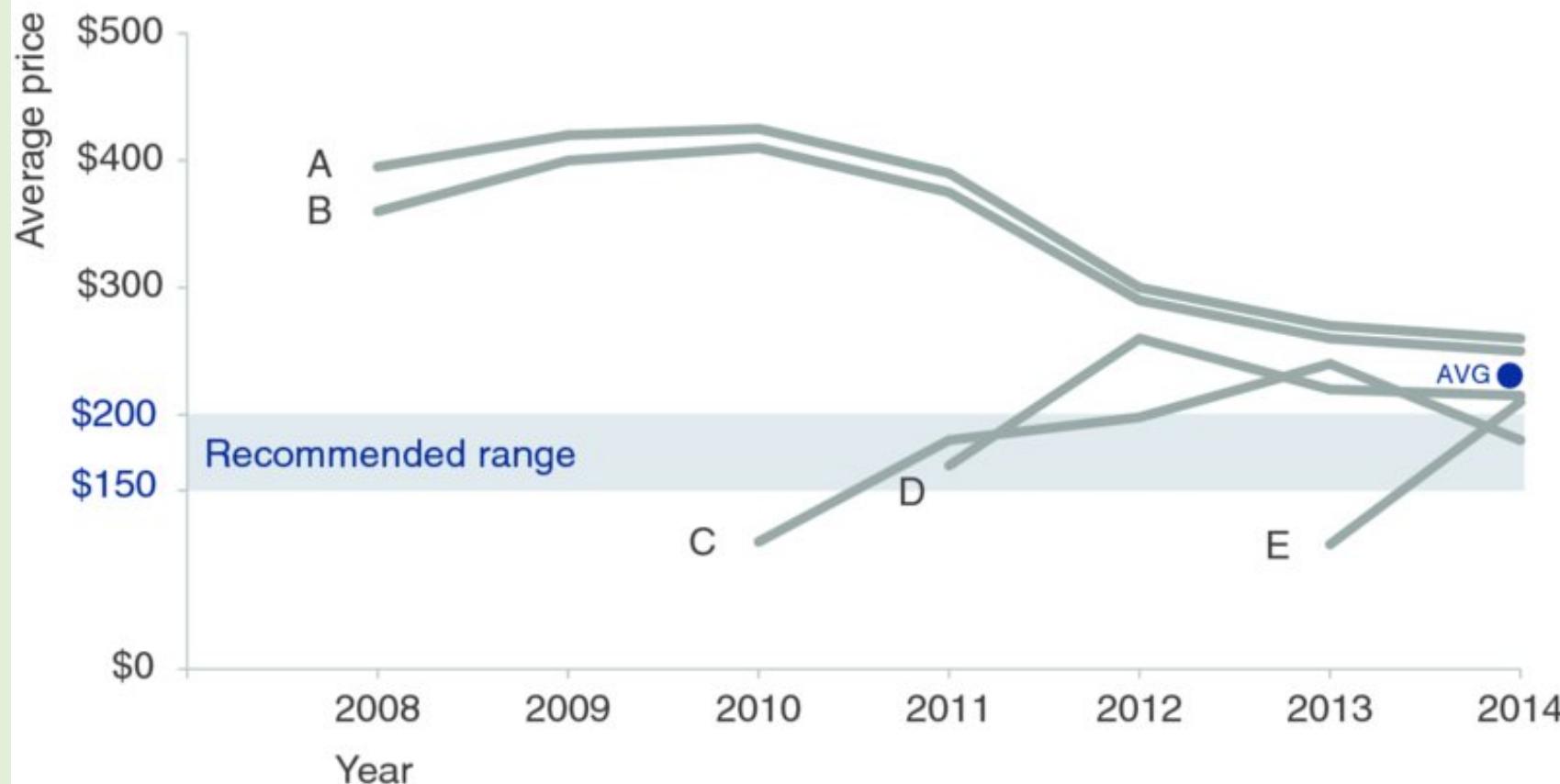
As of 2014, retail prices have converged, with an **average retail price of \$223**, ranging from a low of \$180 (C) to a high of \$260 (A)

Retail price over time



To be competitive, we recommend introducing our product *below* the \$223 average price point in the **\$150–\$200 range**

Retail price over time





# 3-minute story rehearsal

Try to convey your story in 3-min

- It must articulate your unique point of view
- It must convey what's at stake
- It must be a complete sentence.

# Wrap-up story-telling in infovis

- Engagement
  - Use striking language / strong imagery
  - Drive user focus
  - Identify emotional drivers
- Understanding
  - Users lack background information: provide context
  - Unclear visual encodings: explain piecemeal
  - Overwhelming: soft start

# Wrap-up story-telling in infovis

- Memorability
  - People forgets the message: connect symbols to reality by text, iconography or actual photos
  - Offer a plot
- Emotional connection
  - Offer fun, Humanize stories
  - Prioritise authenticity: real stories, use details such as names, real pictures...