Does AI mean data vis is dead?

Does AI mean data visualization is dead?

A discussion on the impact of AI
on enterprise business analytics tools such as
IBM Cognos Analytics

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TorCHI
29 January, 2020

Who are we?

User experience designers on the
IBM Cognos Analytics product team.

| Anne Stevens | Jamie Waese | Afrooz Samaei |

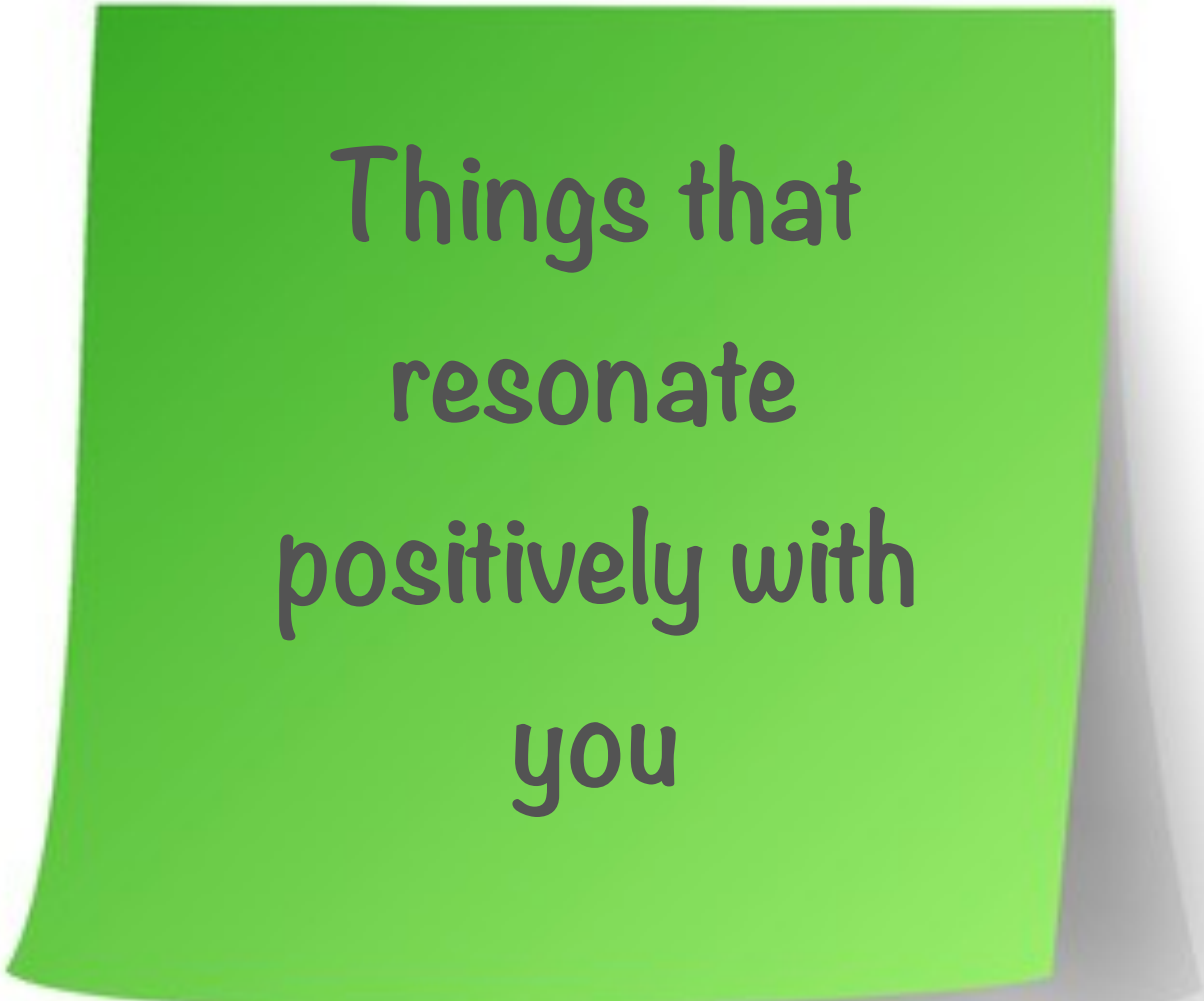# Outline

- **Introduction**

- What is the impact of AI as it relates to business intelligence tools?

- Lively conversation

Your task

Things you question or don't agree with

Things that resonate positively with you

Visualization and AI

AI is being used here as a collective name for all computer algorithms that (from a human perspective) appear to perform 'higher level analysis' independently.

Visualization assists humans in understanding the context of a higher level (sub)task.

Modern computer systems can replace increasingly complex human subtasks with automated equivalents, which removes the human from the task.

As we add more automation, are we decreasing the need for visualization of that task's context?
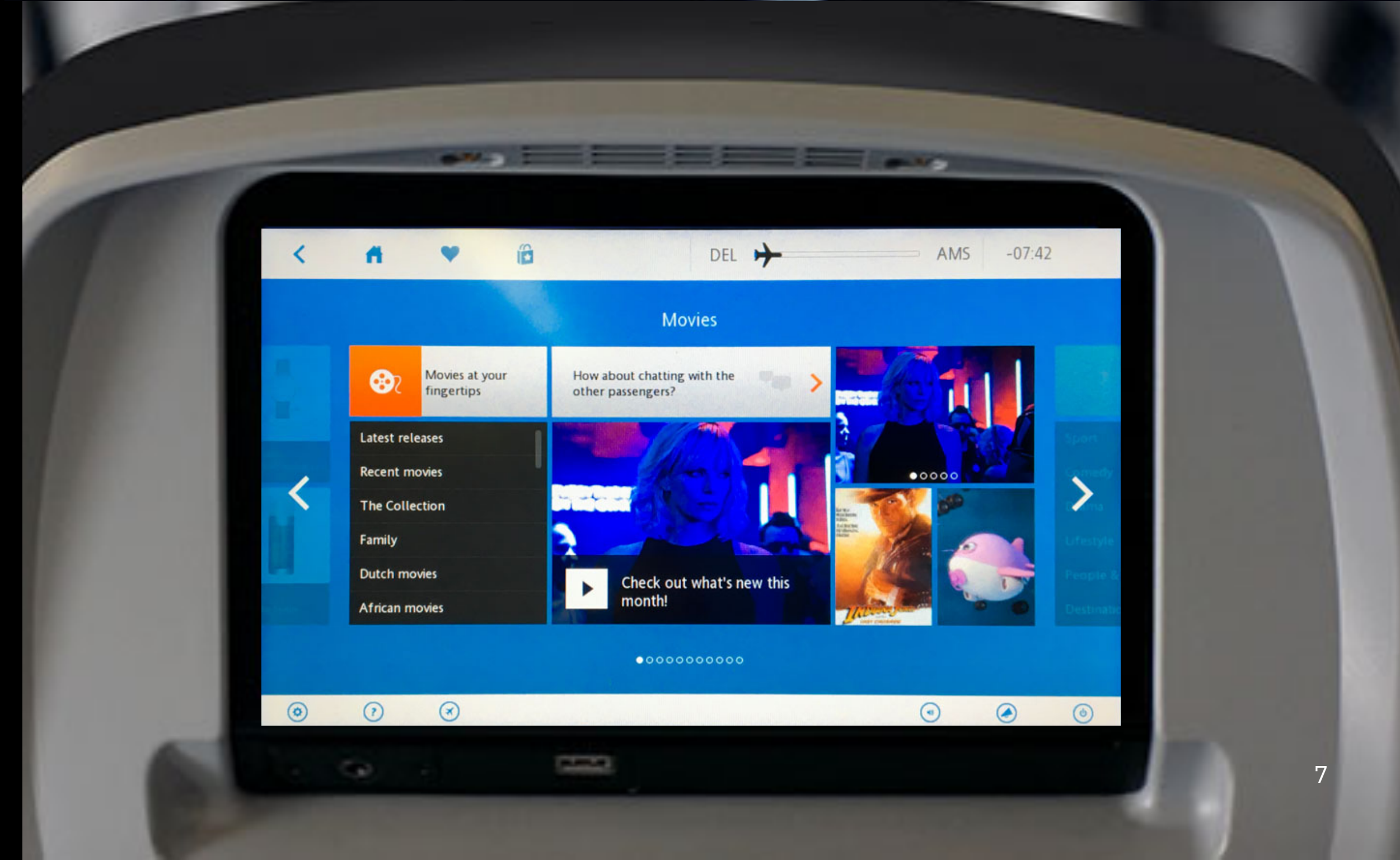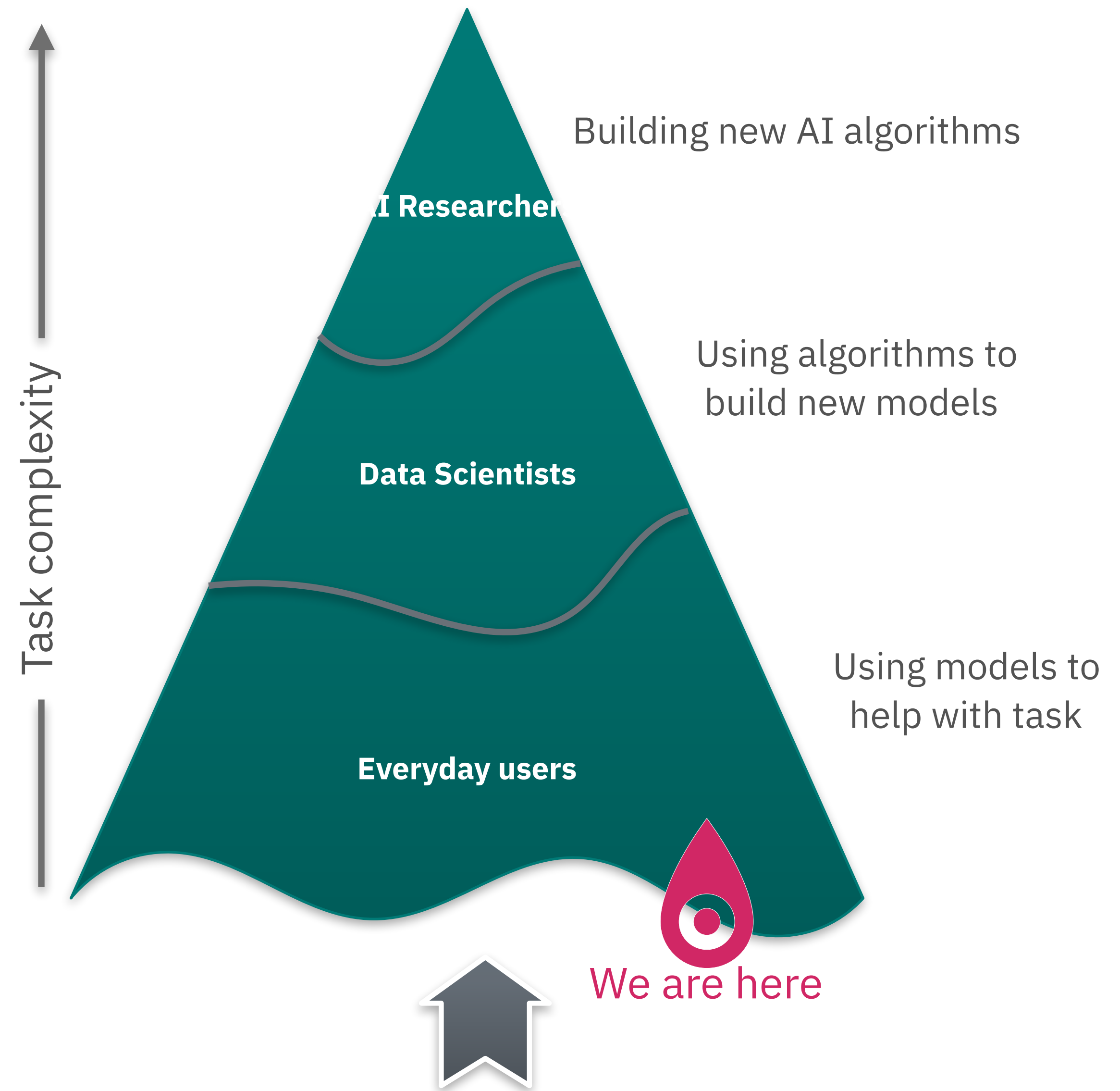
Visualization and AI at IEEE Vis

Visualization has been used to understand tasks at all level of complexity:

- Helping researchers to see inside their algorithms (e.g. VisxAi)
- Helping data scientists understand the limits of their models.
- Helping everyday users with their genre

We are interested in what amount of visualization is still needed for users having limited exposure to models and AI

Task complexity

Building new AI algorithms

AI Researchers

Using algorithms to build new models

Data Scientists

Using models to help with task

Everyday users

We are here

Automation pushes this border up

Business users

Previously, we could count on experienced analytics users, who often have the product name in their job title.

Business users are looking for a quick way to get answers to their questions and see insights in their data.

IBM Cognos Analytics

Cognos Analytics is IBM's flagship Business Intelligence product providing

- Dashboarding

- Reporting (hifi print output)

- On-the-fly data ingestion and modeling

- AI natural language assistance

- Full Enterprise Capabilities

We have made significant investments in automated data analysis.
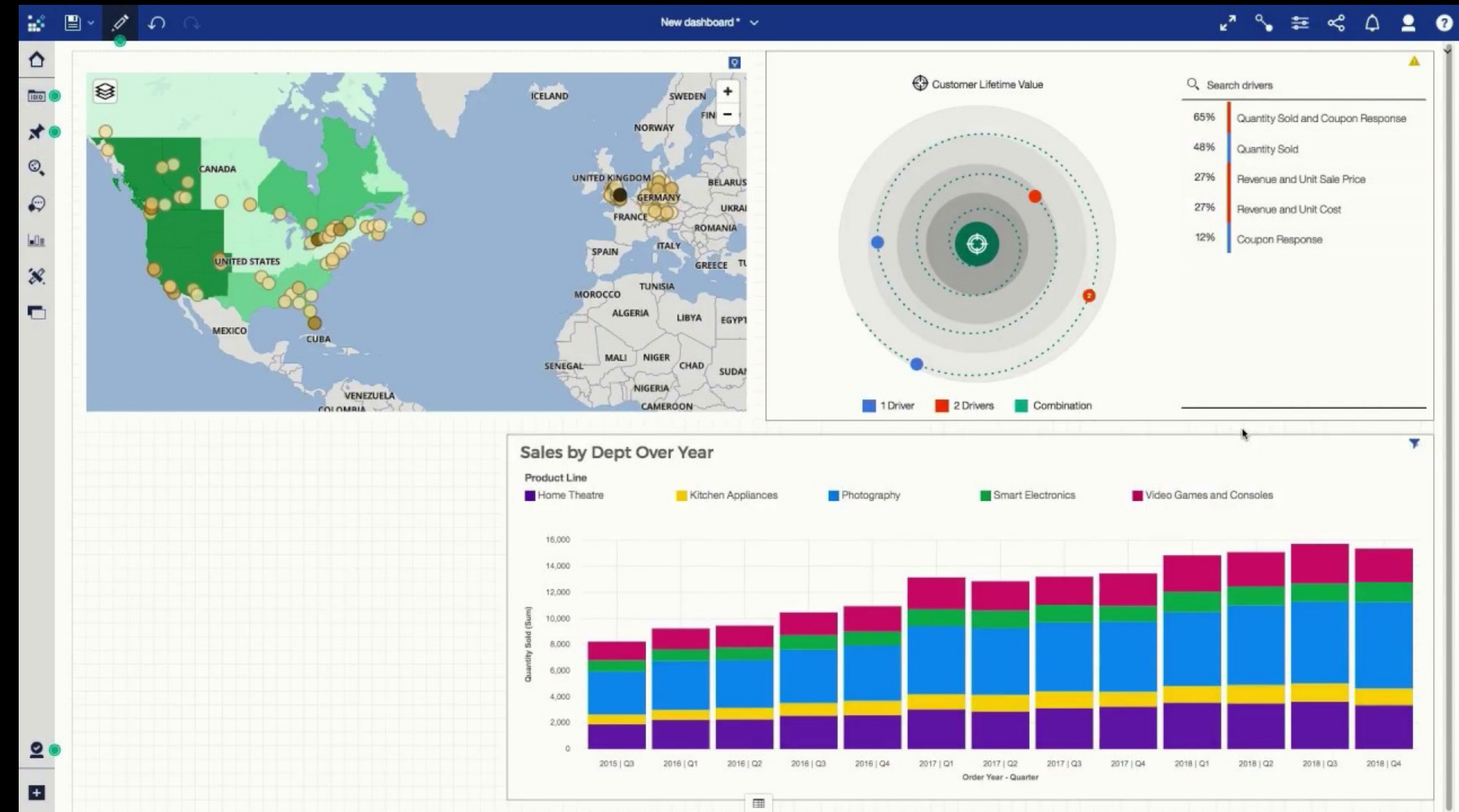
Model based capabilities : Advanced Forecasting

Model based capabilities : Overview of field relationships
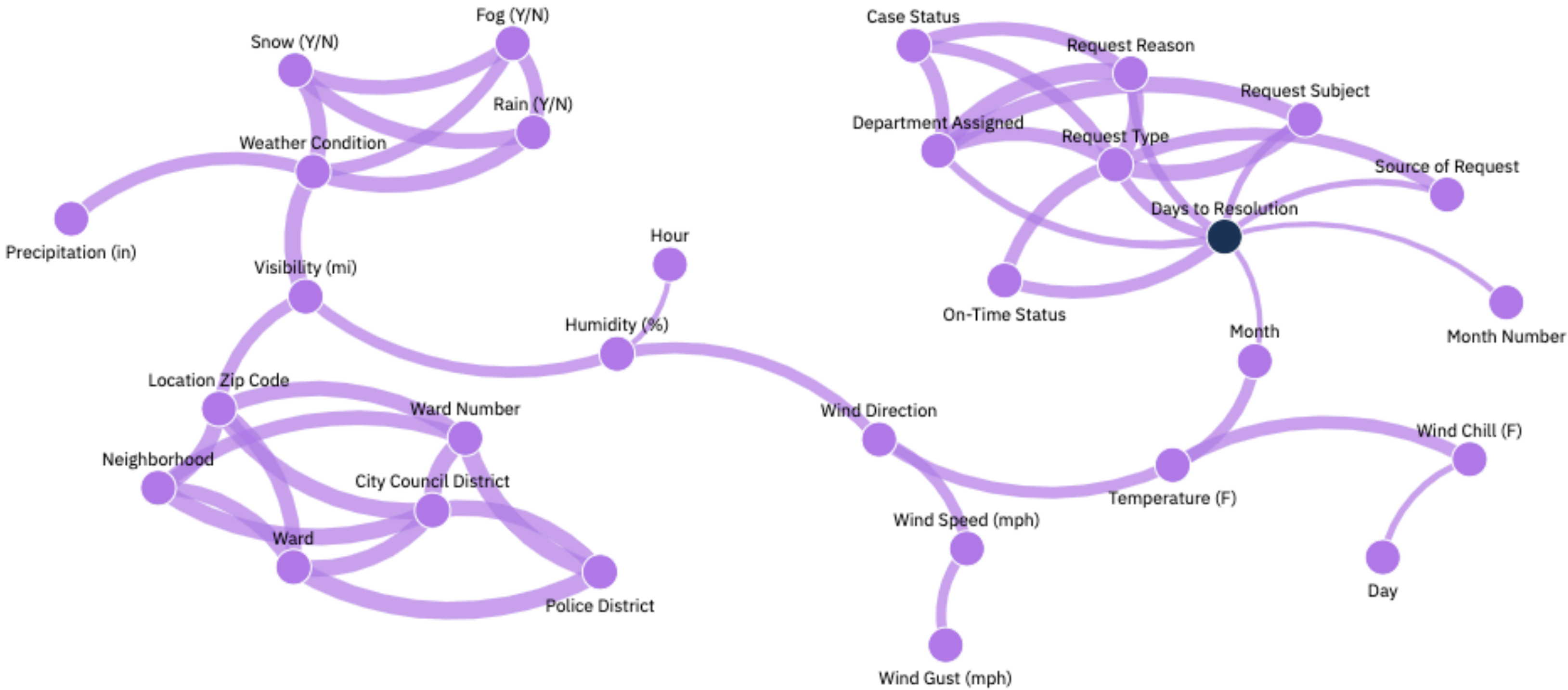
Model based capabilities : Driver Analysis
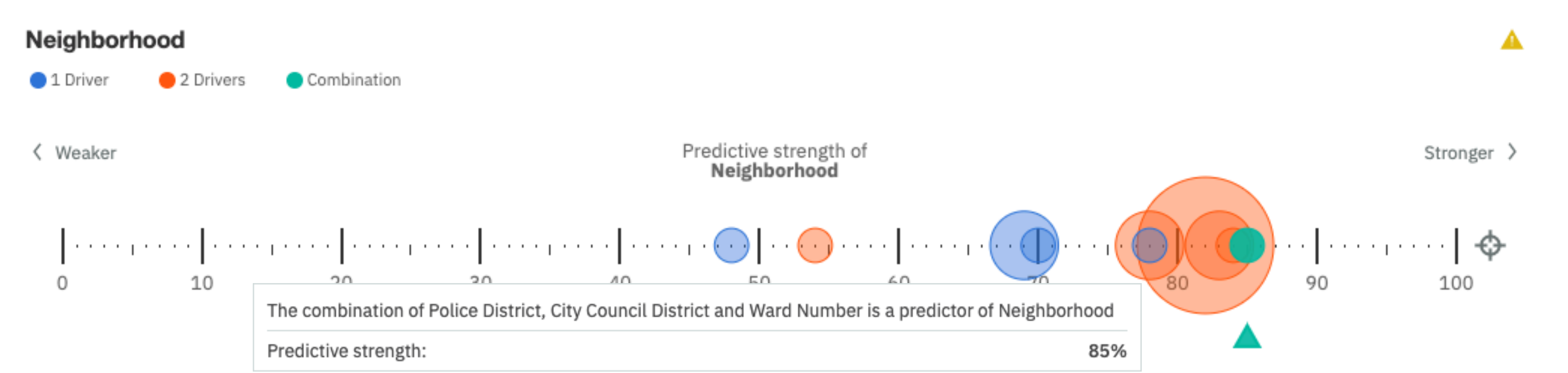
Model based capabilities : Decision Tree Analysis

Model based capabilities : Analysis of Meaningful Differences
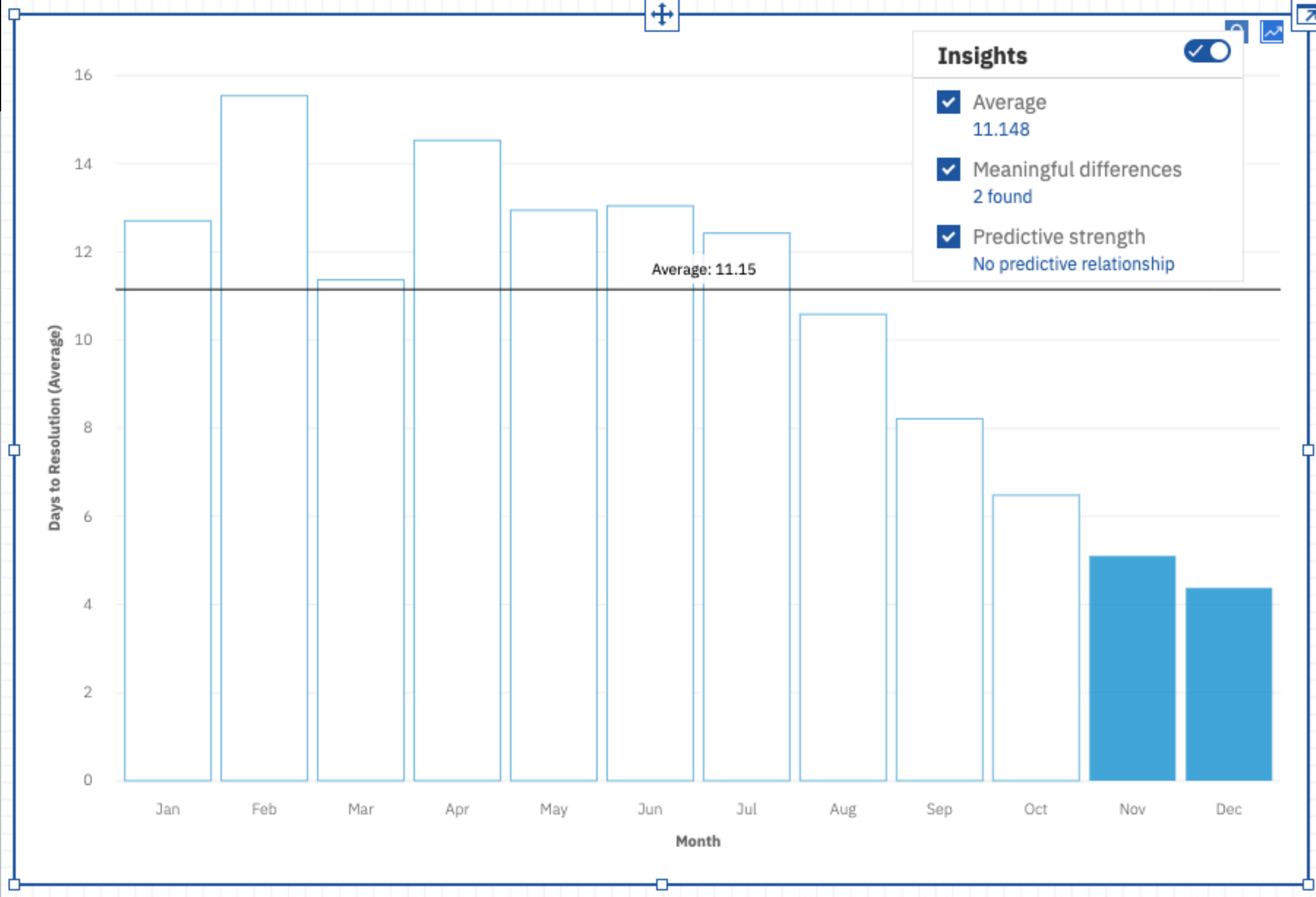
NLP based capabilities: Conversational Interaction

Outline

- Introduction

- **What is the impact of AI as it relates to business intelligence tools?**

- Lively conversation

What is the impact of AI as it relates to business intelligence tools?

Show of hands

Would you describe yourself as a...

- Designer
- Engineer/developer
- Data scientist
- Something else

Your experience with AI is…

- Low
- Medium
- High

Show of hands

IBM

Why did we undertake this research?

Tap into the collective wisdom of IBMers

Capture snapshot in time

AI is a rapidly evolving field.

What is top of mind in 2019?

Understand areas convergence and divergence

Capture areas of convergence, as well as critical areas of disagreement that we need to keep our eyes on.

Identify areas that are most actionable

Especially for practitioners in the field today

15 semi-structured interviews with IBMers

Roles

- Designers (5)

- Developers, system architects (4)

- Researchers (3)

- Sales and product offering (2)

- Developer and designer (1)

Backgrounds

- Software

- Computer systems

- Industrial and mechanical engineering

- Accounting

- Journalism

- Data science

- Graphic design

- Biology and health sciences

- Architecture

- Computer animation

Education levels

- PhD (4)

- Masters degree or graduate certificate (6)

- Bachelors degree or undergraduate certificate (5)

Geographies

- USA (7)

- Canada (5)

- Netherlands (1)

- Israel (1)

- Germany (1)

Ice breaker question

*"It might be tempting to think that the relationship between AI and datavis is that **to the extent that AI development succeeds, datavis will become irrelevant**.*

*After all, **will we need a speedometer** to visualize how fast a car is going when it's driving itself?"*

Nicolas Kruchten, VP of Product, Plotly
Data Visualization for Artificial Intelligence, Medium, March 13, 2018

Do you need a speedometer in a self driving car?

Do you need a speedometer in a self driving car?

Not really

Hell yes!

Do you need a speedometer in a self driving car?

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Hell yes!

I don't need one in an elevator, why in a car?

Speedometer no; dashboard yes

Do you need a speedometer in a self driving car?

Not really
- I don't need one in an elevator, why in a car?
- Speedometer no; dashboard yes

Hell yes!
- I will never trust the AI 100%
- It gives me a sense of control
- I'm inherently curious

Do you need a speedometer in a self driving car?

Not really

- I don't need one in an elevator, why in a car?
- Speedometer no; dashboard yes

Hell yes!

- **I will never trust the AI 100%**
  - Everything man made breaks
  - Could encounter situations not trained for
- It gives me a sense of control
  - Tells me things are working as they should
  - I need to know when to take over (or jump)
- I'm inherently curious

Emergent themes

How AI is transforming the field of data visualization

Or maybe not

How AI is transforming the role of the user?

Expert user

Non expert user

Challenges of implementing AI features

Reports from the battle front

Does AI transform data visualization?

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No, not really

Yes, absolutely

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Chart primitives, perception endure

All the heavy lifting is still under the hood

Visualization needed for context & trust

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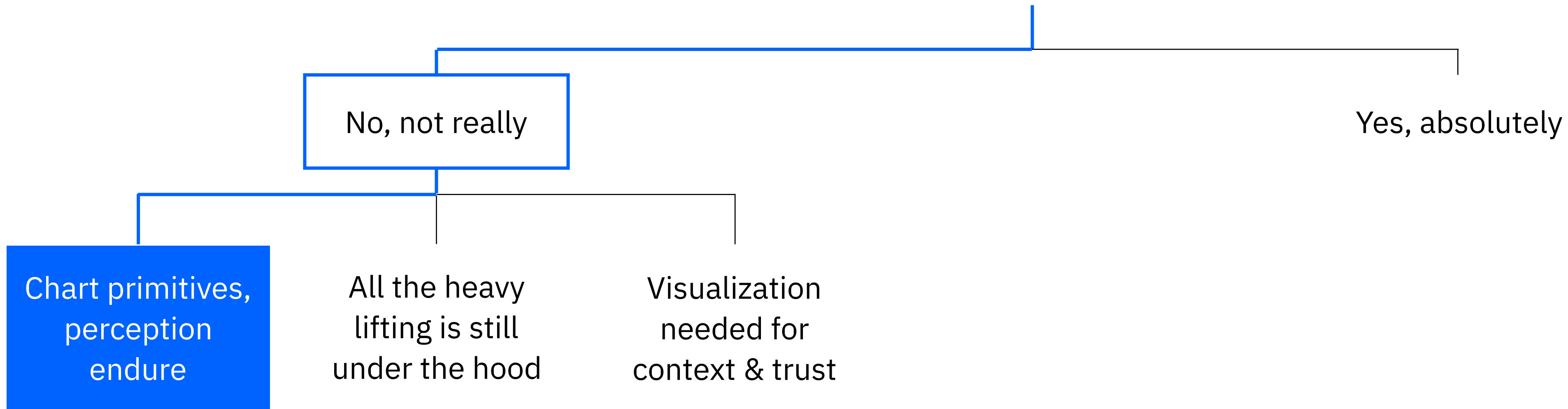
Chart primitives, perception endure

"Human perception doesn't change because of AI"

"I do not have the impression that people want less information."

- Researcher

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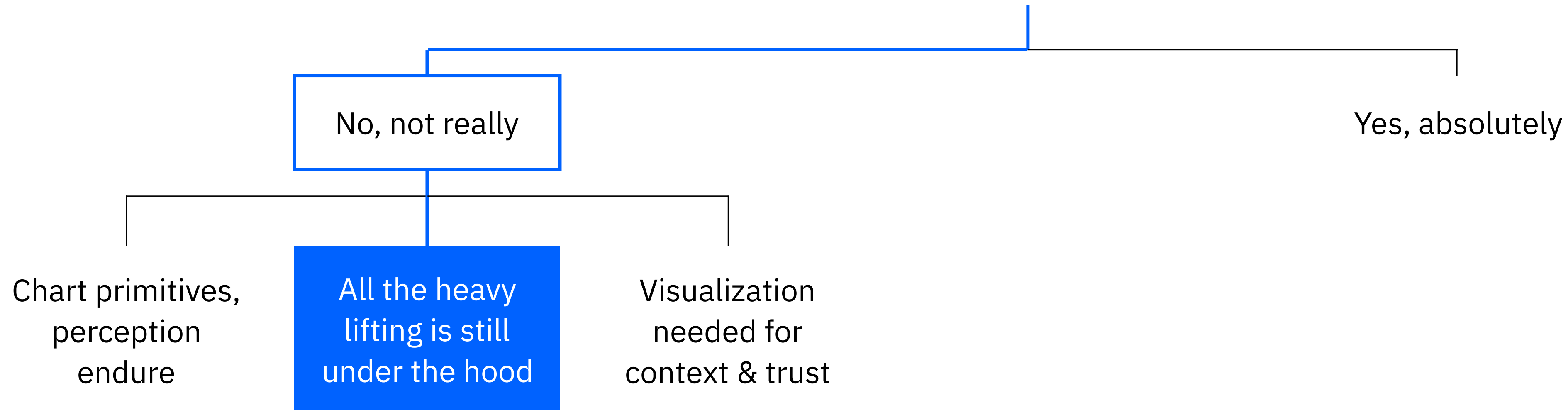
All the analytics heavy lifting is still under the hood

The charts will always exist. AI just changes the inputs and outputs. ***The difference is under the hood. The AI generated data is great, but the charts are still pretty mundane.***

- Developer/Architect

Does AI transform data visualization?

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All the heavy lifting is still under the hood

Visualization needed for context & trust

Yes, absolutely
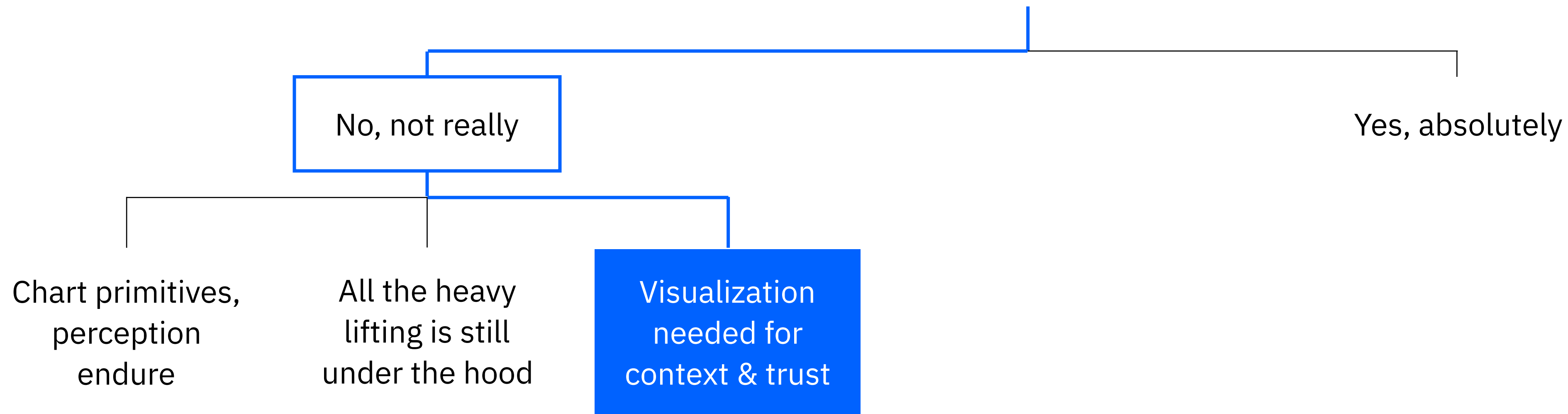
Visualization is needed for context and trust

"I don't see how anybody will trust AI just on its own without visualization; without feedback. If you look around at all the recent articles, they're all about removing bias. It's about trust. How can I ensure this model isn't discriminating against women or men. The only way to overcome that is to visualize; to see it.

- Developer

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All the heavy lifting is still under the hood

Visualization needed for context & trust

AI outputs

AI processes

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- All the heavy lifting is still under the hood
- Visualization needed for context & trust

Yes, absolutely

- **AI outputs**
  - Automation means there's less to visualize
  - Get out of the data weeds
  - Uncertainty, data quality
- AI processes
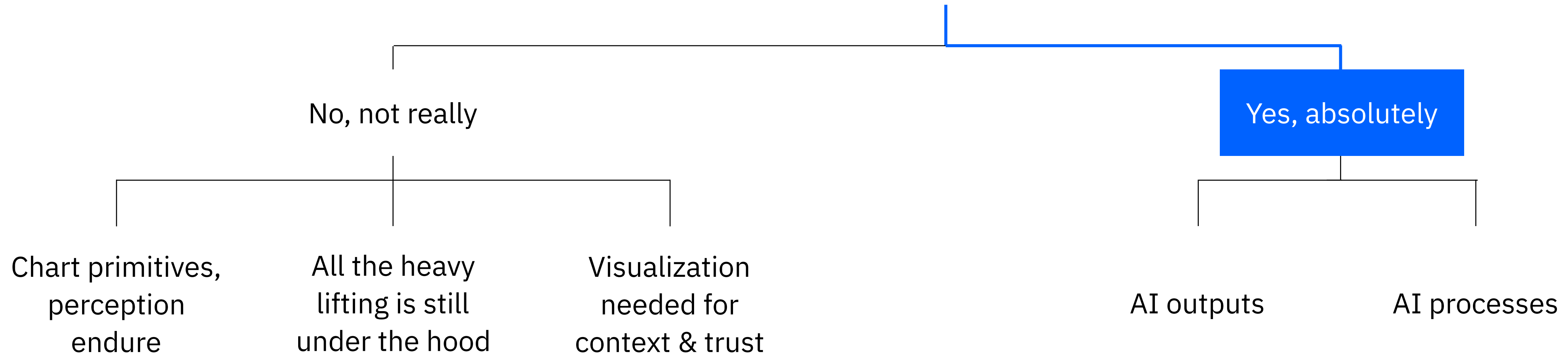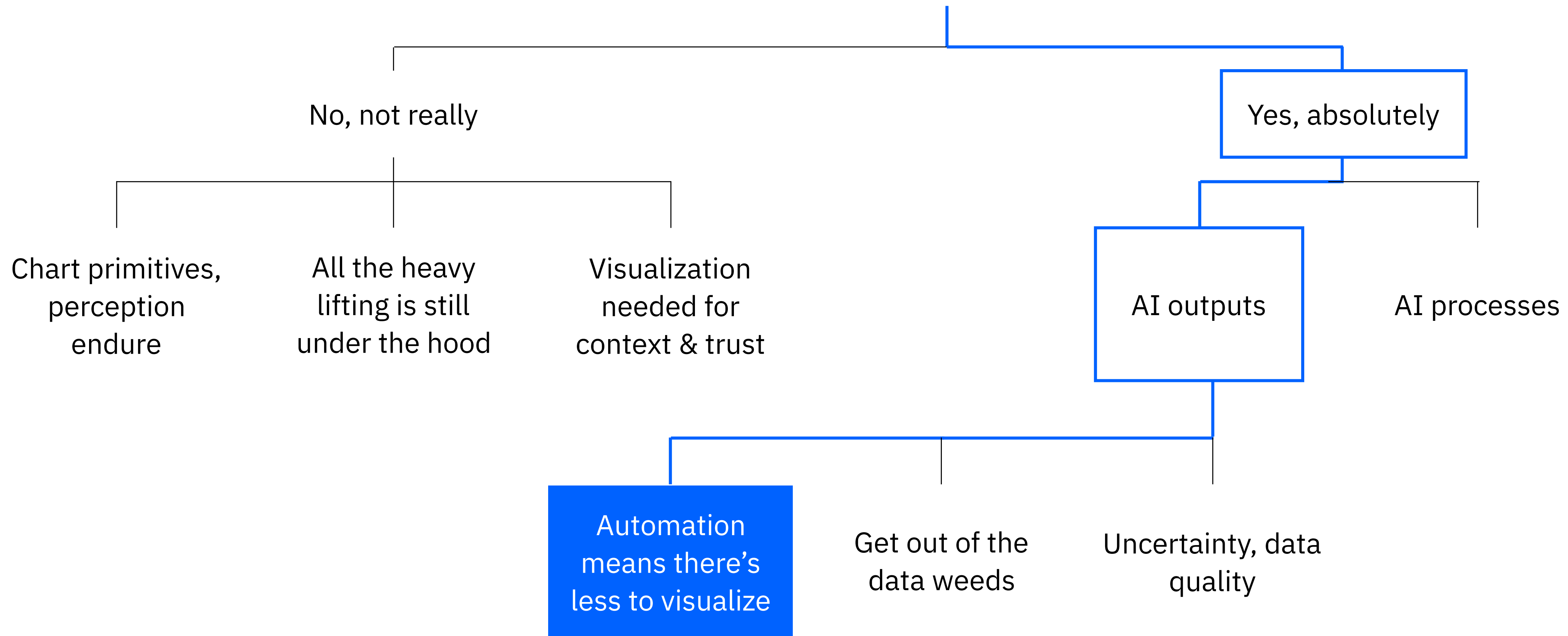
Automation means there's less to visualize

*"Maybe right now you have an understanding from dashboards of inventory or purchases … **some of that goes away because the system automates it.***

Once we rely more on AI, and it is trustworthy, then there's less to monitor. … It goes back to trust."

- Designer

Does AI transform data visualization?

```
                    Does AI transform data visualization?
                                    │
        ┌───────────────────────────┴───────────────────────────┐
   No, not really                                          Yes, absolutely
        │                                                        │
  ┌─────┼─────────────────┐                          ┌───────────┴───────────┐
Chart      All the heavy   Visualization         AI outputs              AI processes
primitives, lifting is still needed for              │
perception  under the hood  context & trust    ┌─────┴─────────┐
endure                                     Automation    Get out    Uncertainty,
                                           means there's  of the     data
                                           less to        data       quality
                                           visualize      weeds
```
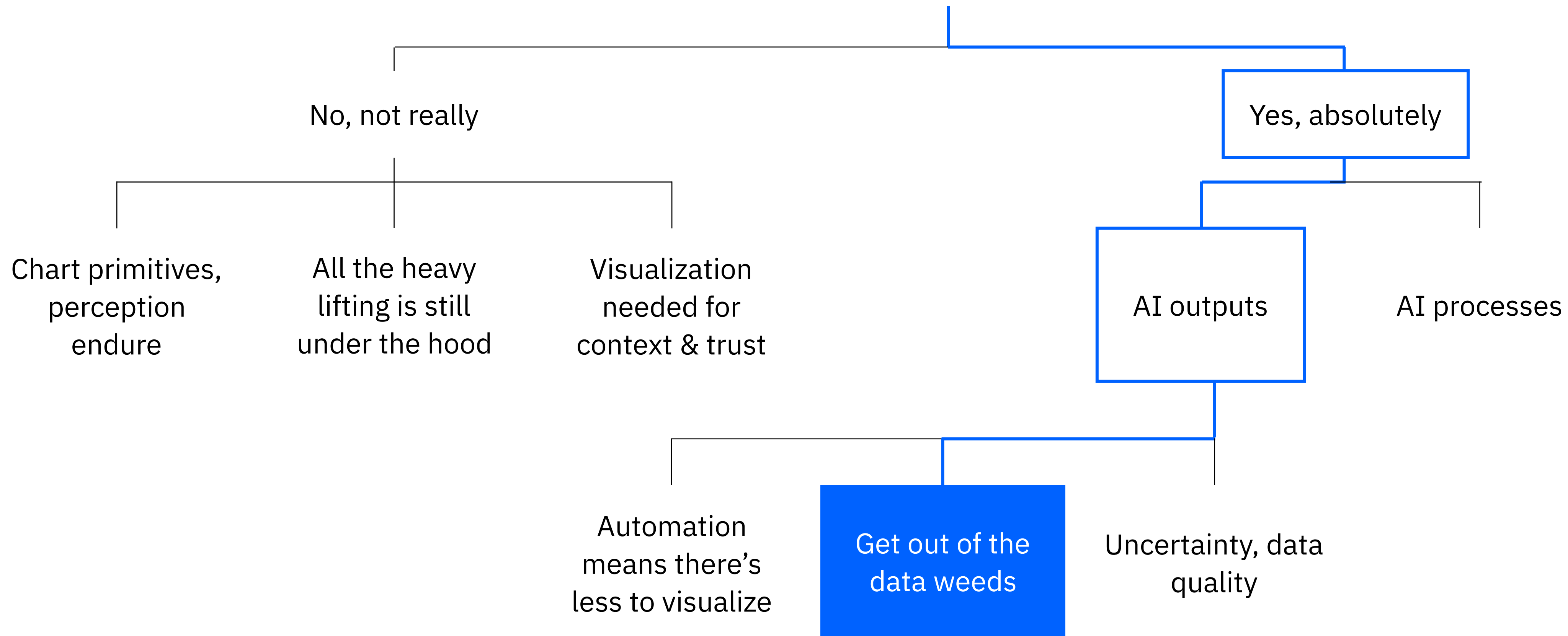
Get out of the data weeds

*"It might change the thing we communicate. We no longer care about speed but we probably care about something else. AI is all about aggregation. **Information can make you not play in the weeds but at a higher level**.*

- Designer

Does AI transform data visualization?

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Yes, absolutely

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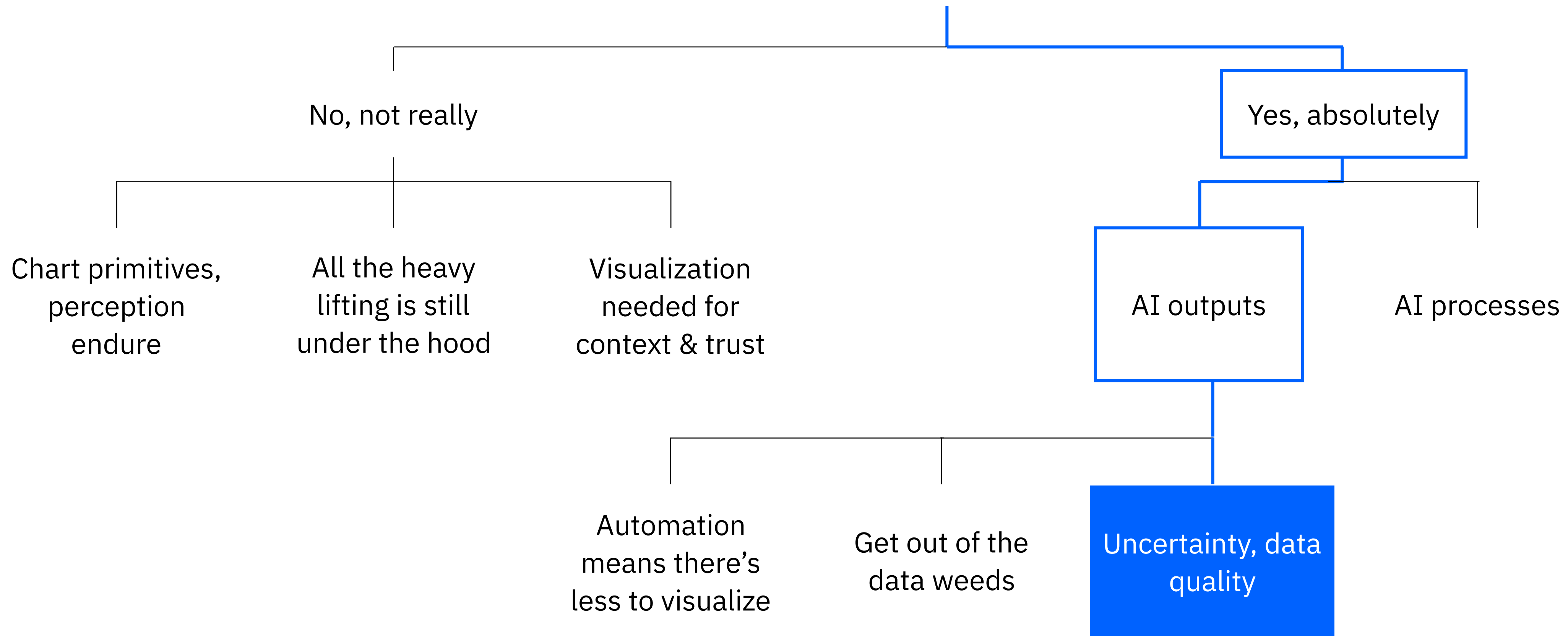
Uncertainty, data quality

*"There is an authority with putting dots on a certain place and not somewhere else on a paper ... there is not much you can argue with. There is **quite a bit of work on uncertainty in visualization and I don't think it is a done chapter yet in information visualization. I think there is a lot to do**. Many people think DV as a done field. I don't think so."*

- Researcher

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- **AI processes**
  - Shed light into the 'black box'
  - Visualizations as inputs to AI

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Shed light into the 'black box'

*"**Black boxes are scary**. I need to see what are you doing so I can override it if necessary."*
— Developer

*"An AI model can have 300 dimensions of data. People try to visualize that. **And that is where data visualization is transformed for the worst**."*
— Designer

Does AI transform data visualization?

No, not really

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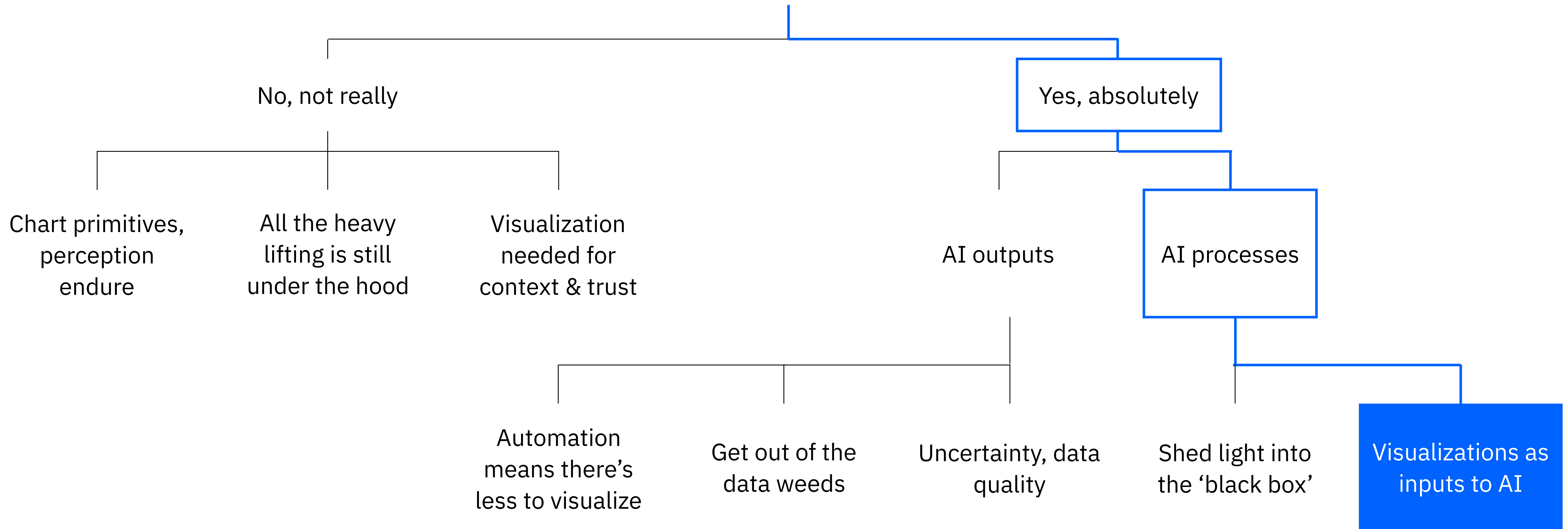
Visualizations as inputs to AIs

"AI is excellent at handling images, so why couldn't data visualizations of data be the input to a machine learning algorithm?"

- Research

Take away

Takeaway

It's complicated

There is a lot of difference of opinion

Parable of the six blind men and the elephant

Parable of the six blind men and the elephant

Perception is limited and subjective
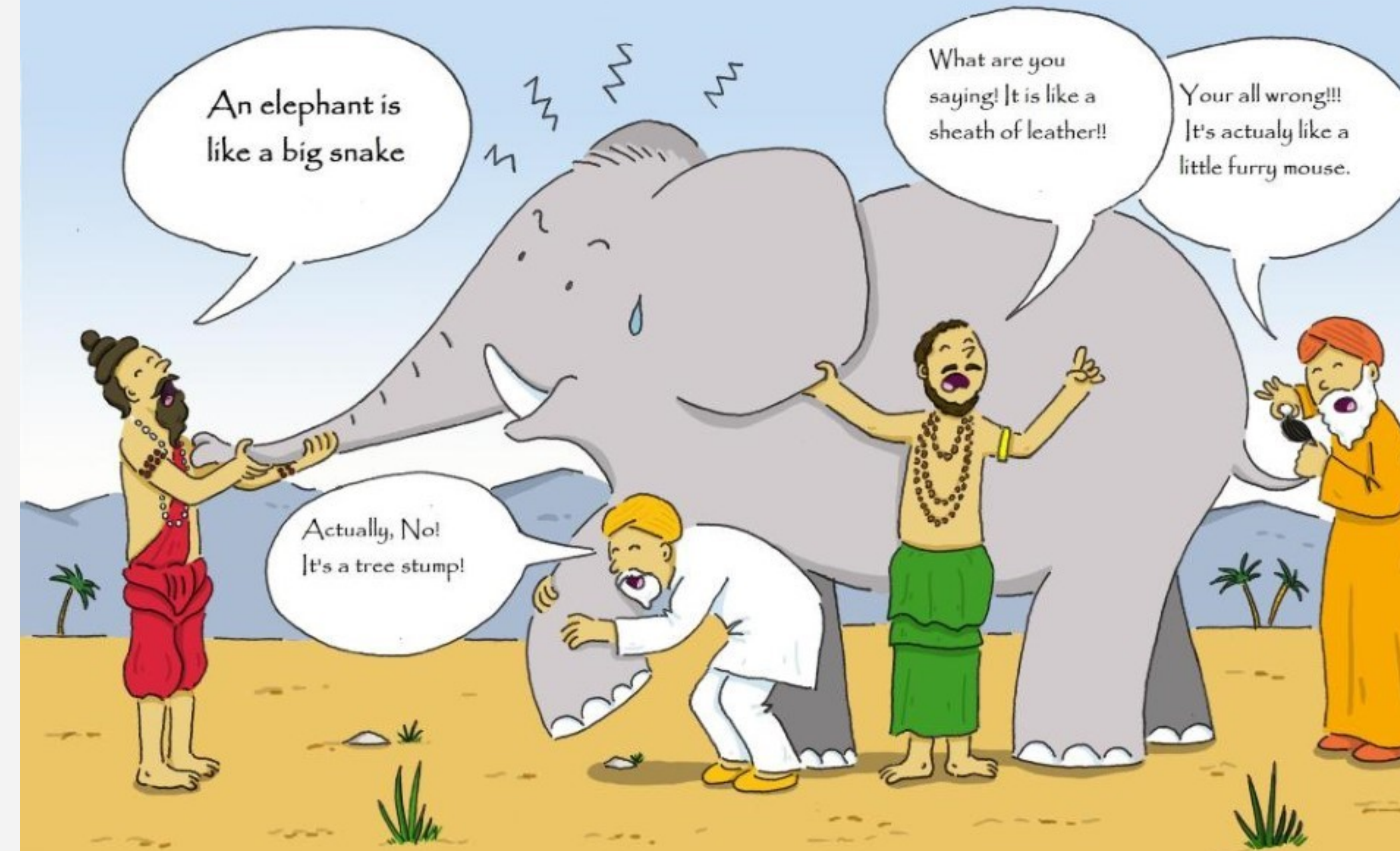
Emergent themes

How AI is transforming the field of data visualization

Or maybe not

How AI is transforming the role of the user?

Expert user

Non expert user

Challenges of implementing AI features

Reports from the battle front

How might AI transform the roles of our users?

How might AI transform the roles of our users?

End user

Domain expert

Data visualization expert

How might AI transform the roles of our users?

End user

Domain expert

Data visualization expert

Automation reduces analyst role

New data expand analyst role

New skill sets change roles

How might AI transform the roles of our users?

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Move up the decision making pyramid

Passive consumer
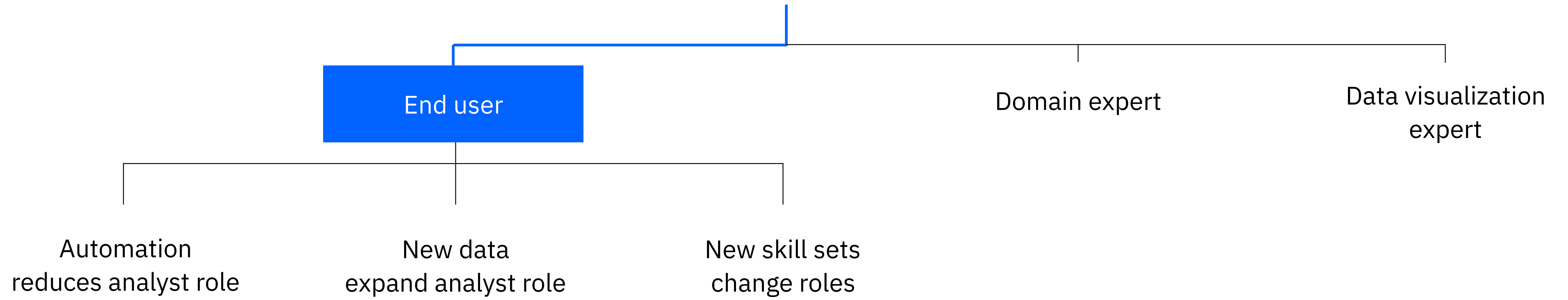
Analyst role reduction

"Future is more about representing the answer or the meaning, not just the data itself. As though it is about removing the noise."

- Designer

How might AI transform the roles of our users?

```
End user          Domain expert    Data visualization
                                   expert
```

End user branches to:
- **Automation reduces analyst role**
- New data expand analyst role
- New skill sets change roles

Automation reduces analyst role branches to:
- **Move up the decision making pyramid**
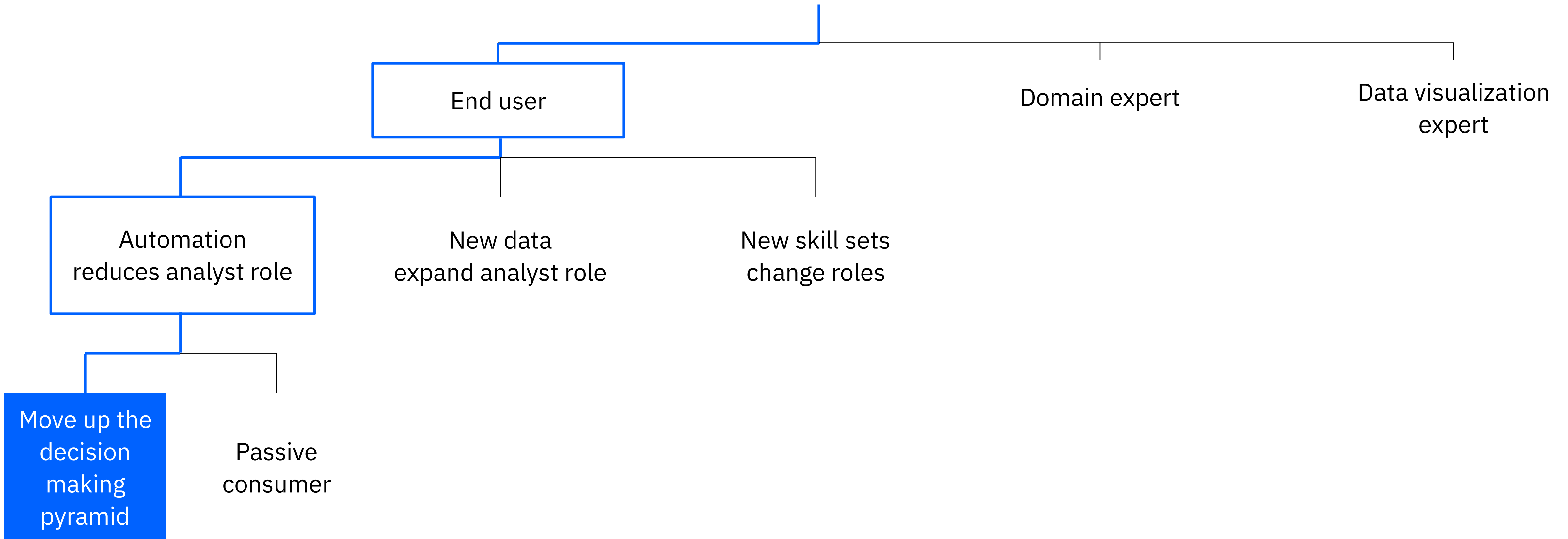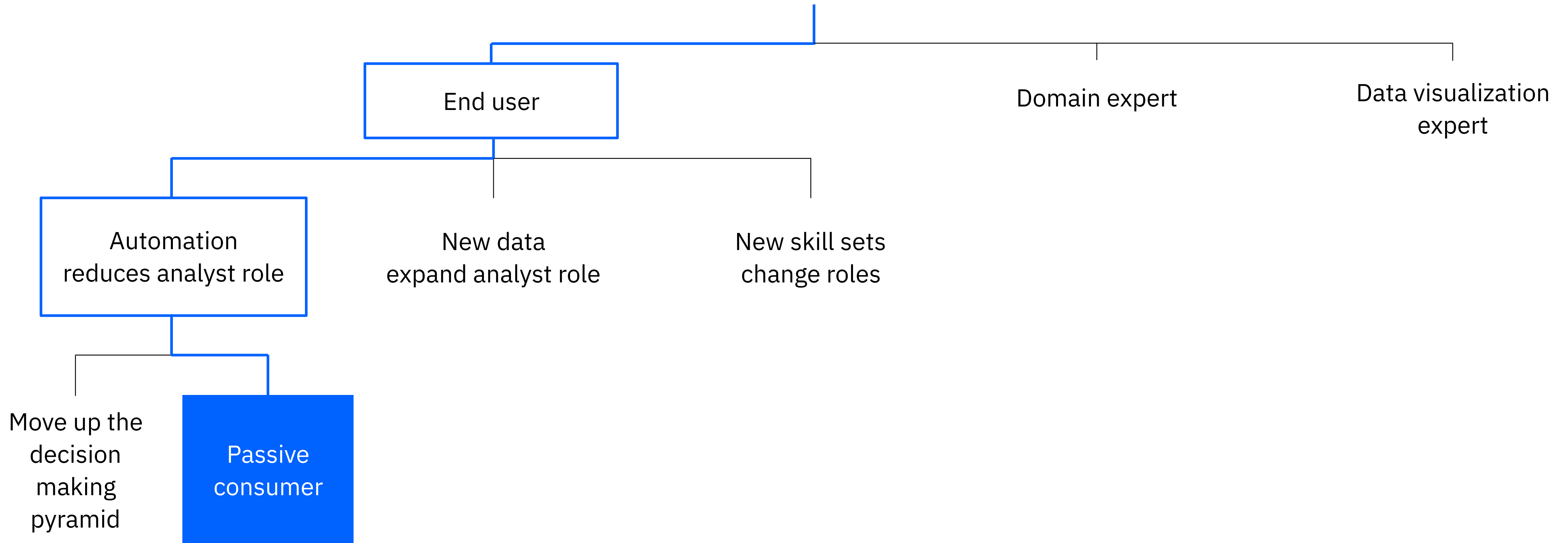- Passive consumer

Executive decision-makers

"In future the jobs would be focused on translating the data patterns to business. Users will not have to be proficient in basic statistical principles. Their role, as the domain expert, will be more about translating insights to a particular business contexts."

- Researcher

How might AI transform the roles of our users?

End user — Domain expert — Data visualization expert

End user:
- Automation reduces analyst role
  - Move up the decision making pyramid
  - Passive consumer
- New data expand analyst role
- New skill sets change roles

Passive consumers

"AI takes a lot of jobs away from the users who need dashboards to do their jobs. They will have to move to some higher-level positions that are not yet automated."

- System architect

How might AI transform the roles of our users?

```
                    End user                          Domain expert      Data visualization
                                                                              expert

Automation          New data          New skill sets
reduces analyst     expand analyst    change roles
role                role

Move up the         Passive
decision            consumer
making
pyramid
```
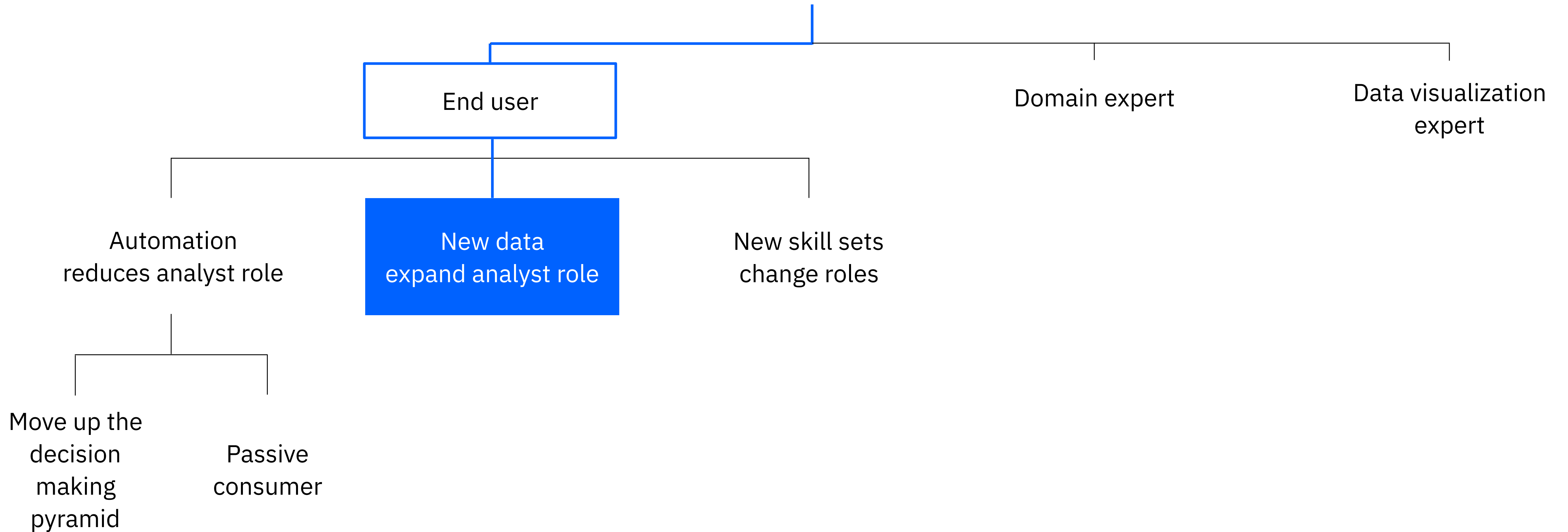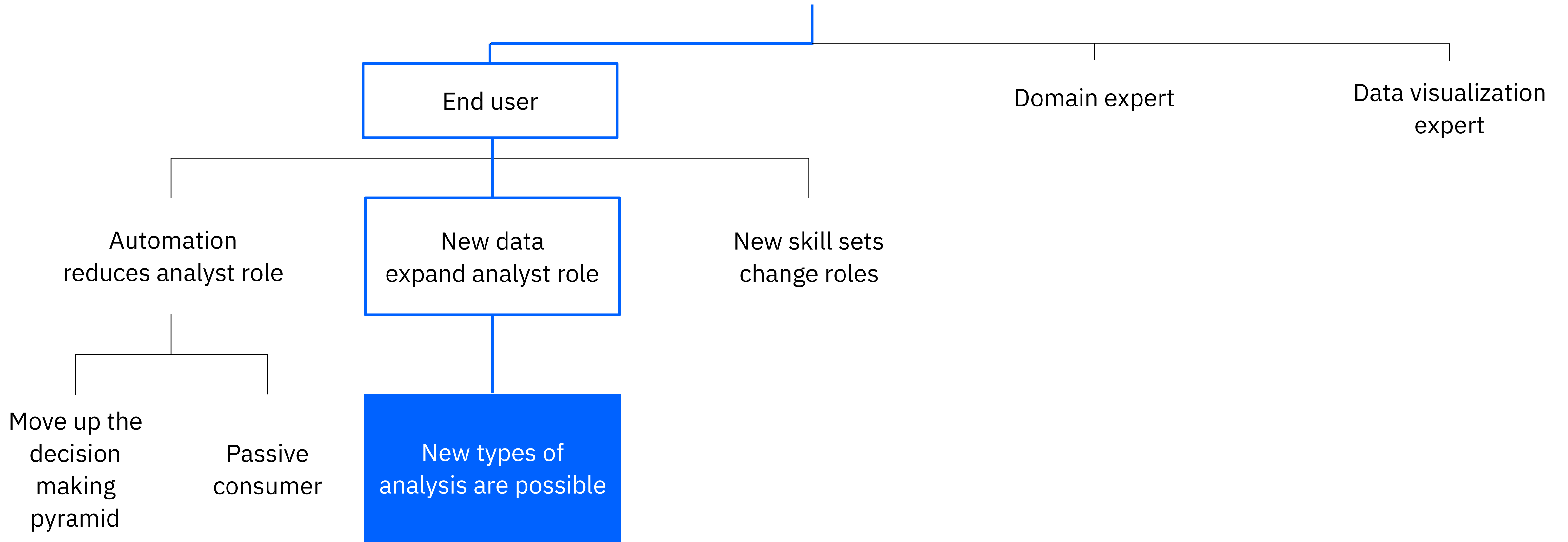
Analyst role expansion

"In analysis scenario the user defines the pace. In a car, the human is more of an observer. In a business/analysis case, the human is still the pace keeper and in more control. They use AI as an assistant."

- Research scientist

How might AI transform the roles of our users?

```
                  End user            Domain expert      Data visualization
                                                               expert

   Automation        New data          New skill sets
reduces analyst role  expand analyst role  change roles

Move up the        New types of
decision    Passive  analysis are possible
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pyramid
```
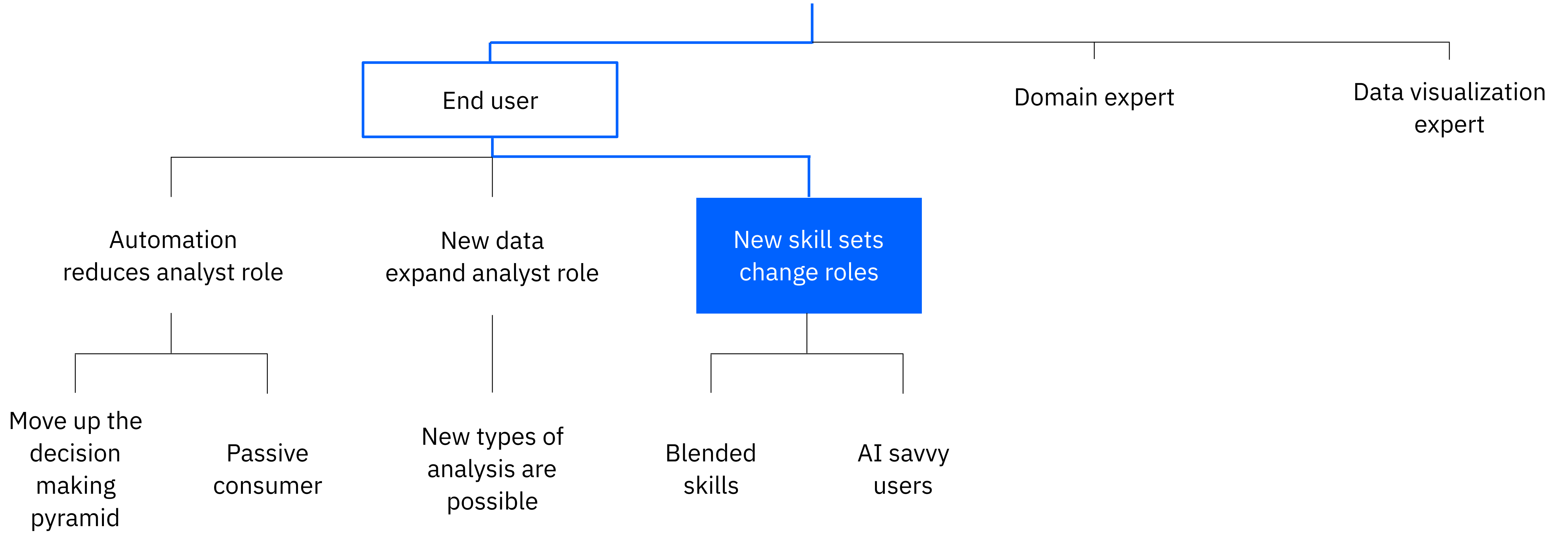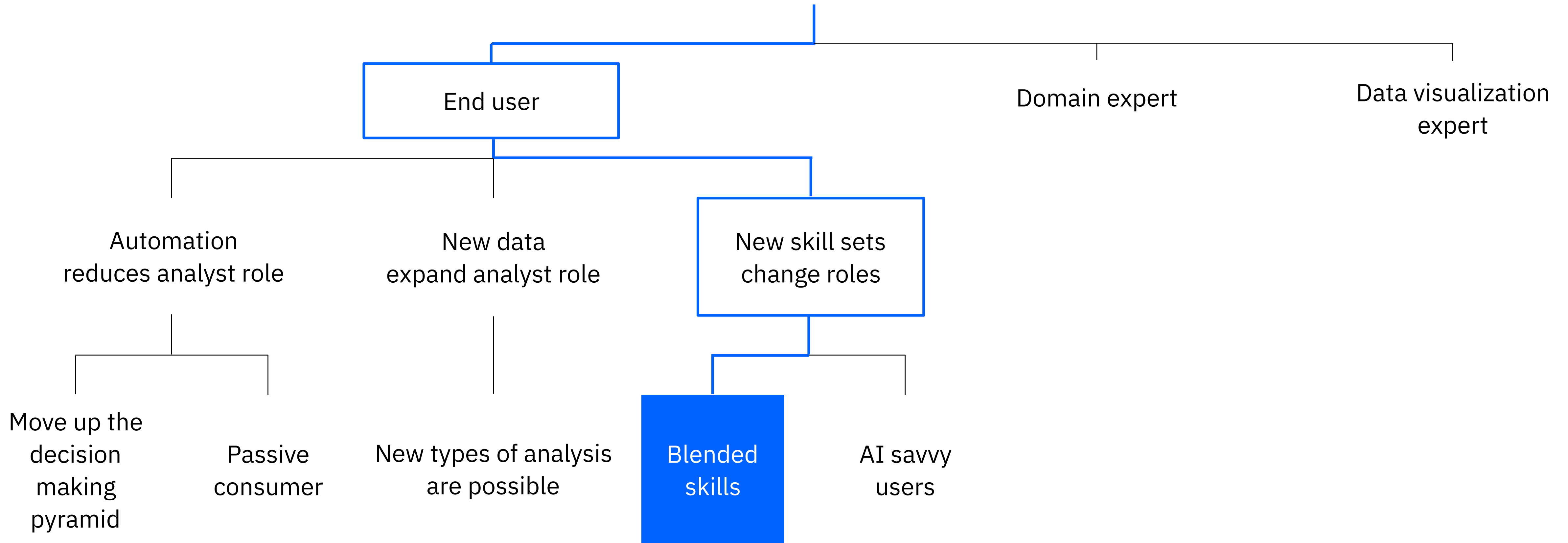
New types of analysis

"Users will be going after things that we didn't used to do before. For example, we can use sentiment analysis to analyze customer sentiment. Previously, analysts were probably just looking at basic sales data. Same kind of decision; different data.

\- System architect

How might AI transform the roles of our users?

- End user
  - Automation reduces analyst role
    - Move up the decision making pyramid
    - Passive consumer
  - New data expand analyst role
    - New types of analysis are possible
  - New skill sets change roles
    - Blended skills
    - AI savvy users
- Domain expert
- Data visualization expert

How might AI transform the roles of our users?

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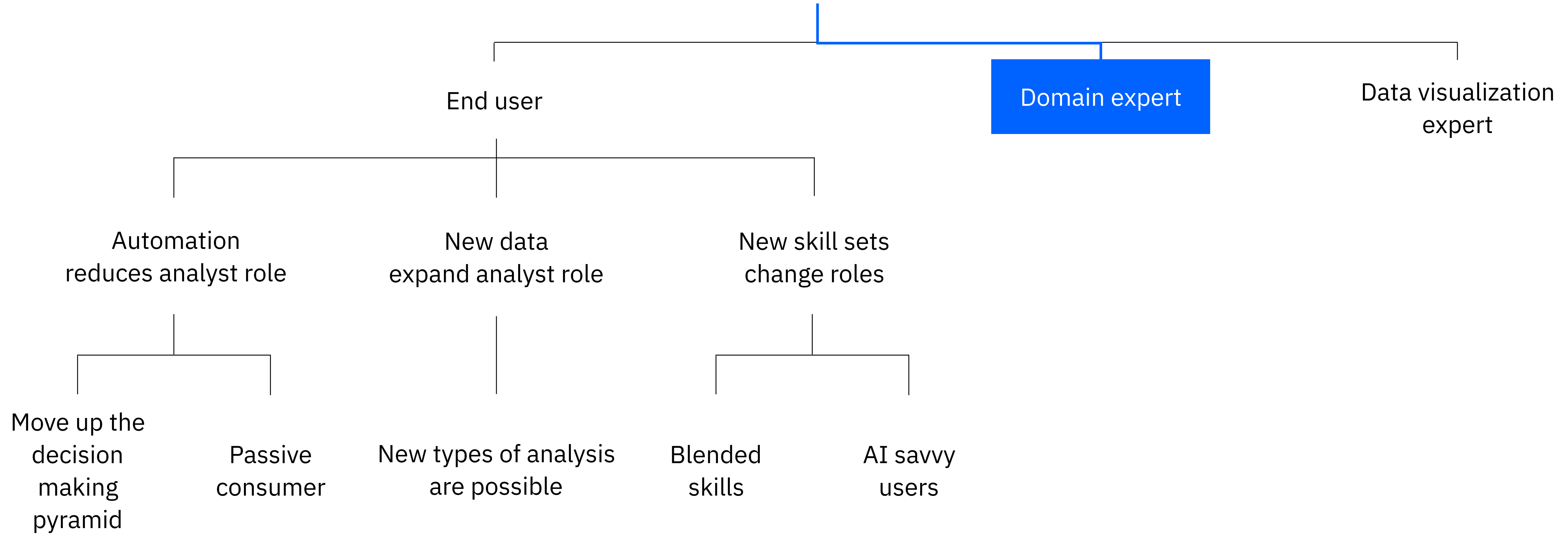
Domain expert

Data visualization expert

AI savvy users

"*The generation Z worker took Python in their math class as a 14 -year old could write predictive algorithms to work better in their domain; what was previously considered as advanced data science skills.*"

- Sales/business consultant

How might AI transform the roles of our users?

- **End user**
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How might AI transform the roles of our users?

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Automation
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New data
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New skill sets
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Becomes model
trainer

Move up the
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Passive
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New types of analysis
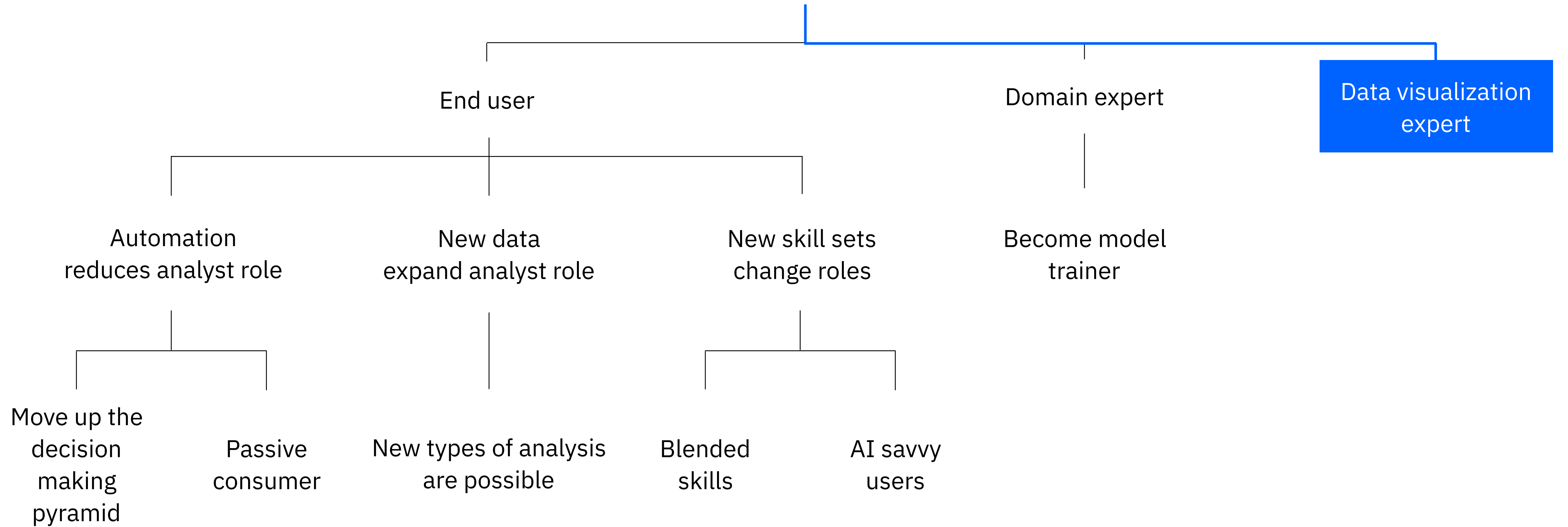are possible
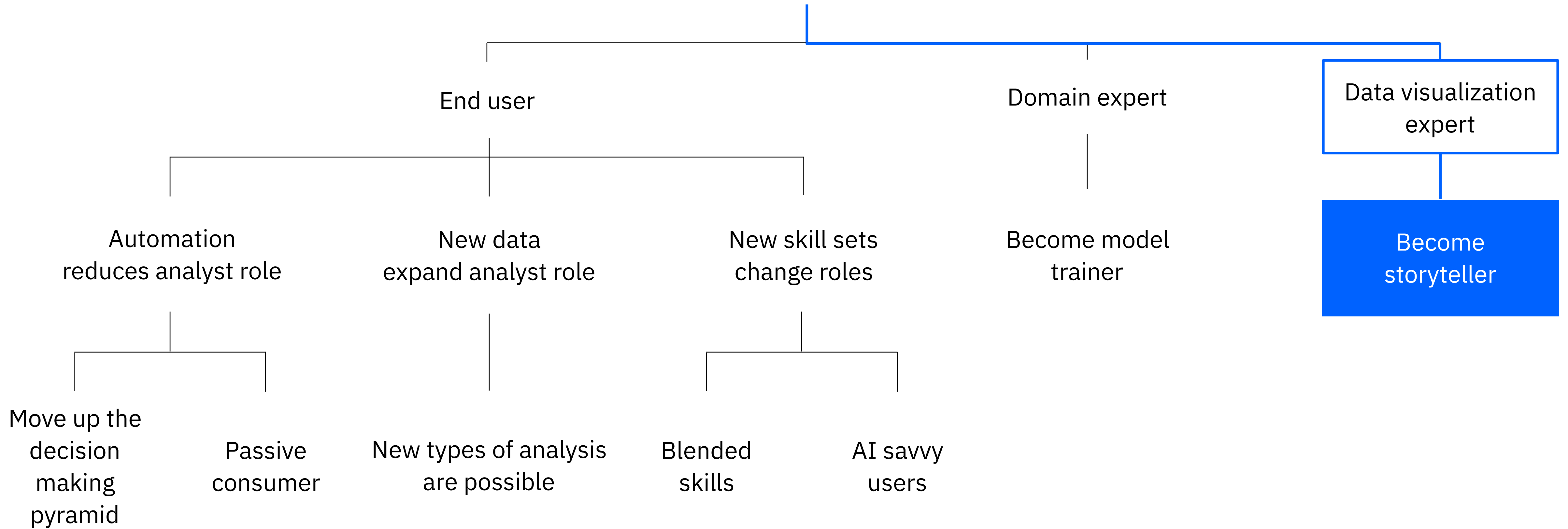
Blended
skills

AI savvy
users

Model trainer

*"AI could shift certain roles, but definitely does not eliminate
the need for them."*

- Designer

How might AI transform the roles of our users?

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Become model
trainer

Become
storyteller

Move up the
decision
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pyramid

Passive
consumer

New types of analysis
are possible

Blended
skills

AI savvy
users

Storyteller

"Dashboard work would become less time consuming because dashboard tools become better. In that case data visualization will become used for more interesting storytelling work. Data science in conveying AI concepts is very complicated. You want to be able to tell the story of what the models are doing."

- Designer / Developer

Takeaway

Takeaway

Skill sets of future expert and non-experts

There is an uncertainty around the skill sets of future experts and non-experts.
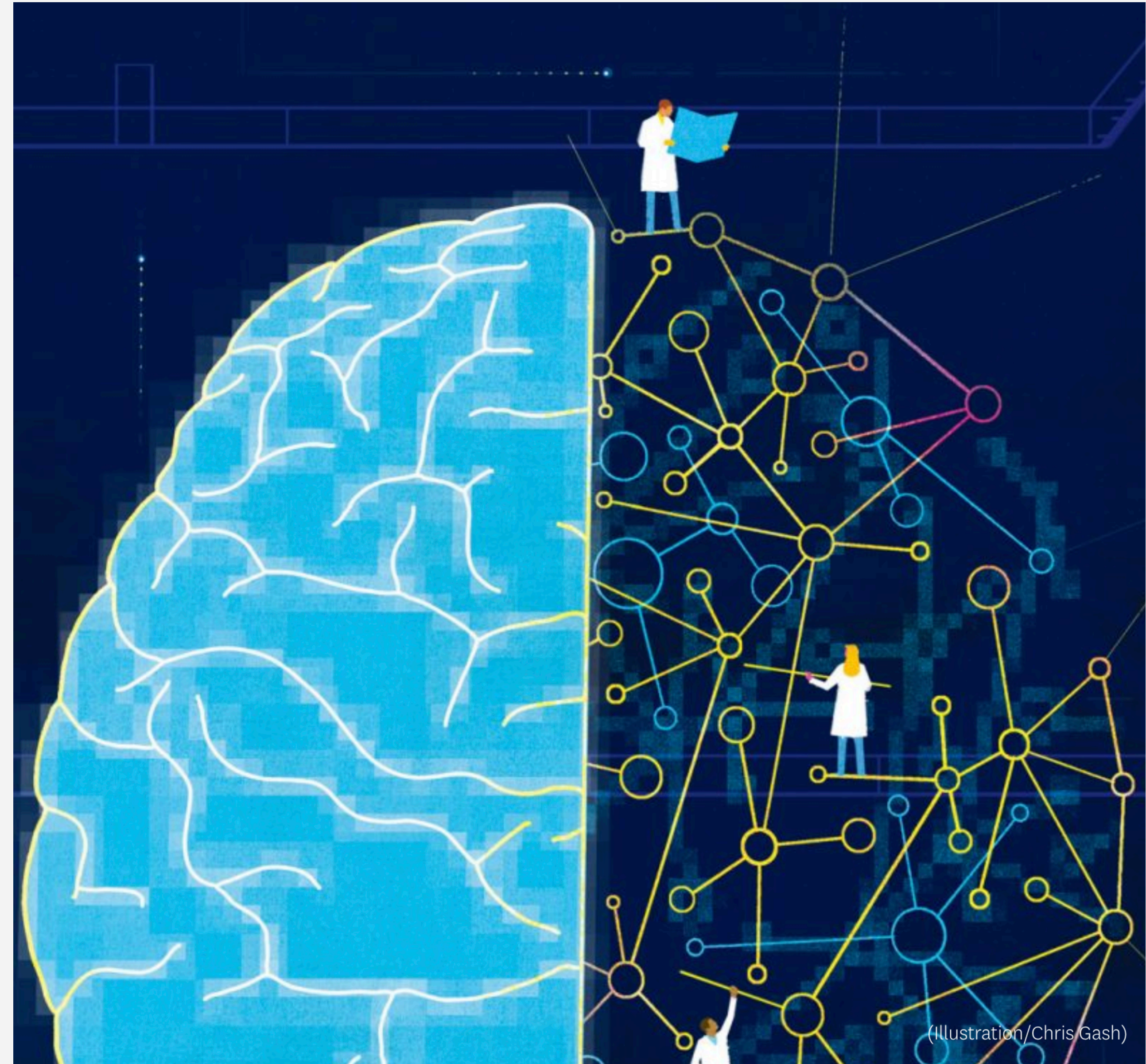
(Illustration/Chris Gash)

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Reports from the battle front

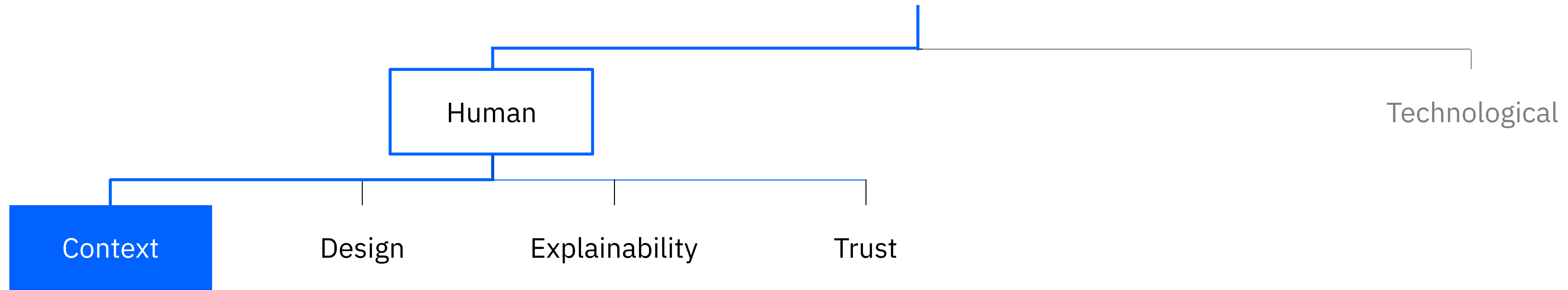**What are the challenges of implementing AI features in BI tools?**

What are the challenges of implementing AI features in BI tools?

Human

Technological

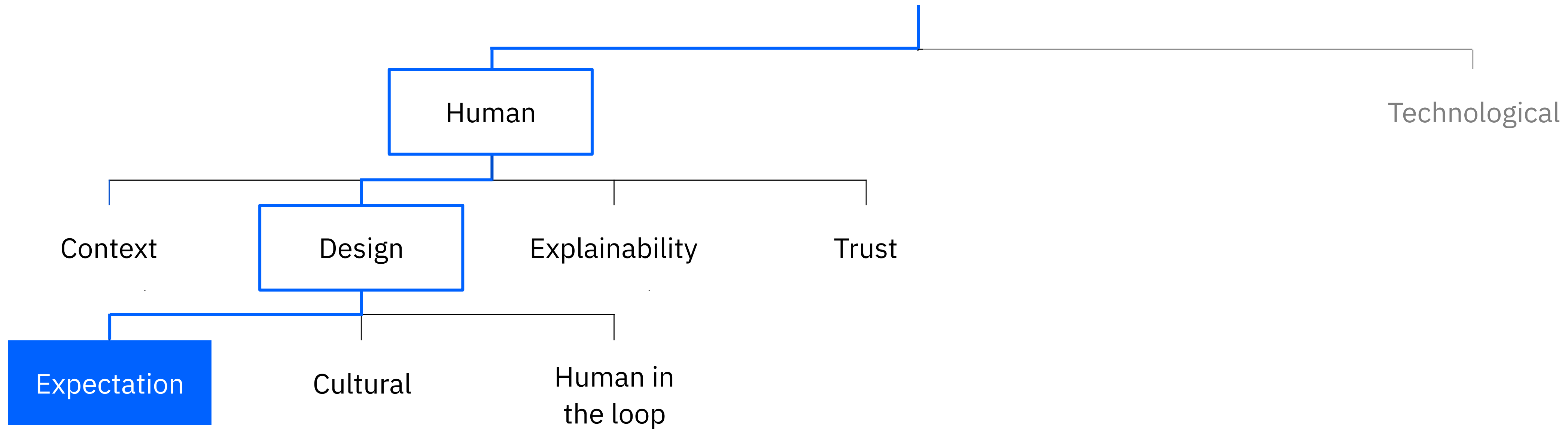# What are the challenges of implementing AI features in BI tools?

Human

Technological

Context

Design

Explainability

Trust

Context

"A model that optimizes for profit may not consider other factors, such as social profile."

- Designer / Developer

What are the challenges of implementing AI features in BI tools?

```
                          Human

Context        Design        Explainability        Trust        Technological

Expectation    Cultural    Human in
                           the loop
```
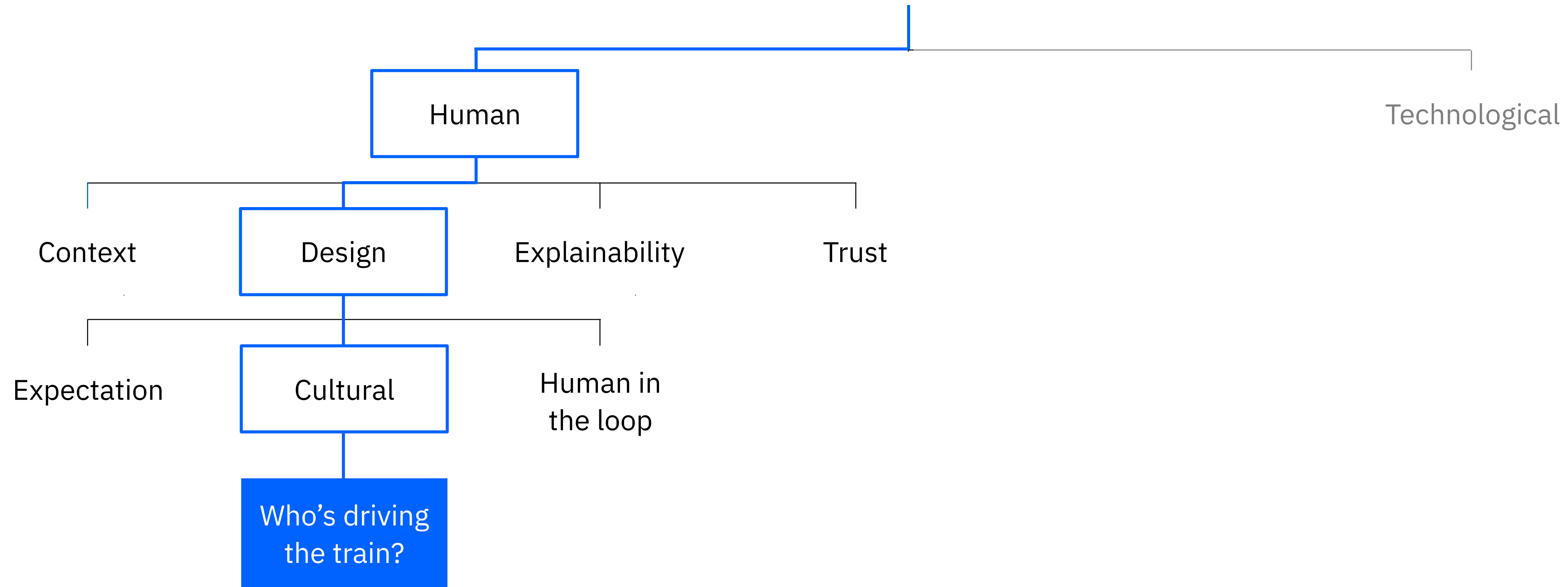
Expectation

"People thought the new assistant could do things it was never intended to do. People wanted it to do sensible meaningful things, but it didn't do that right out of the box."

- Developer

What are the challenges of implementing AI features in BI tools?

```
                              Human                              Technological

        Context           Design           Explainability            Trust

    Expectation          Cultural          Human in
                                           the loop

                      Who's driving
                        the train?
```
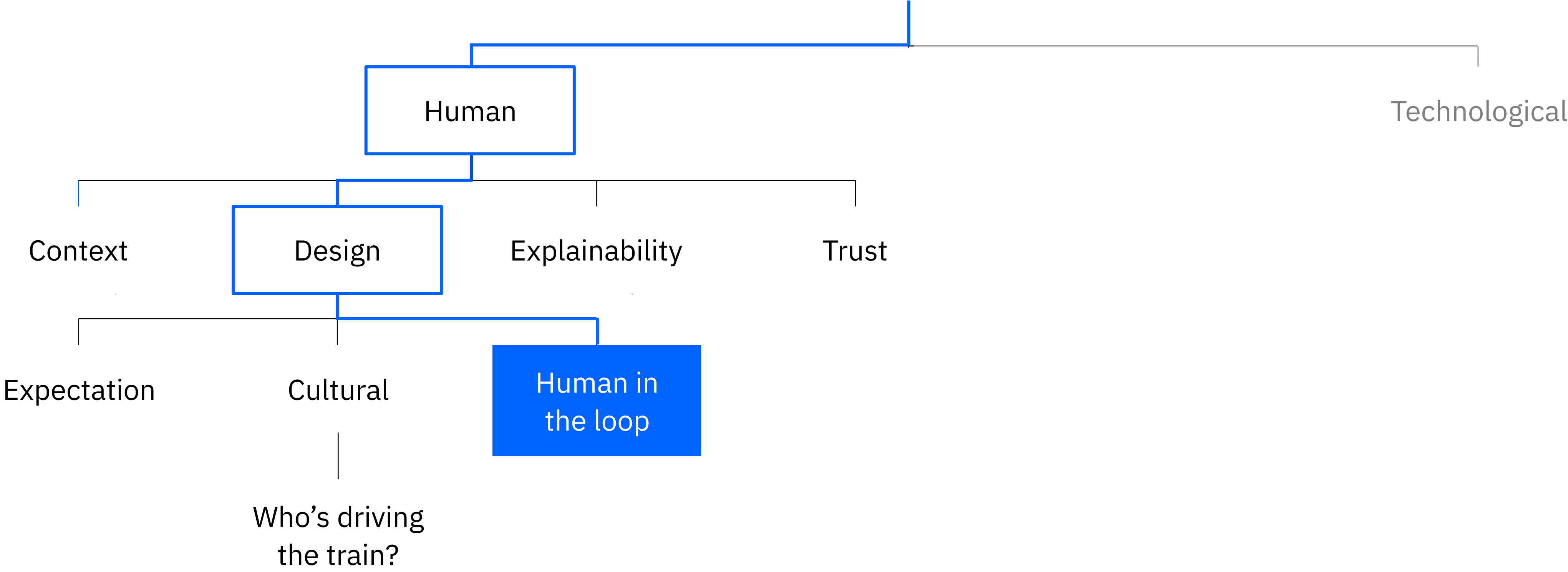
Who's driving the train?

"A lot of customers just want a faster horse. This doesn't necessarily drive innovation in the market place."

- Offering manager

What are the challenges of implementing AI features in BI tools?

Human

Technological

Context   Design   Explainability   Trust

Expectation   Cultural   Human in the loop

Who's driving the train?
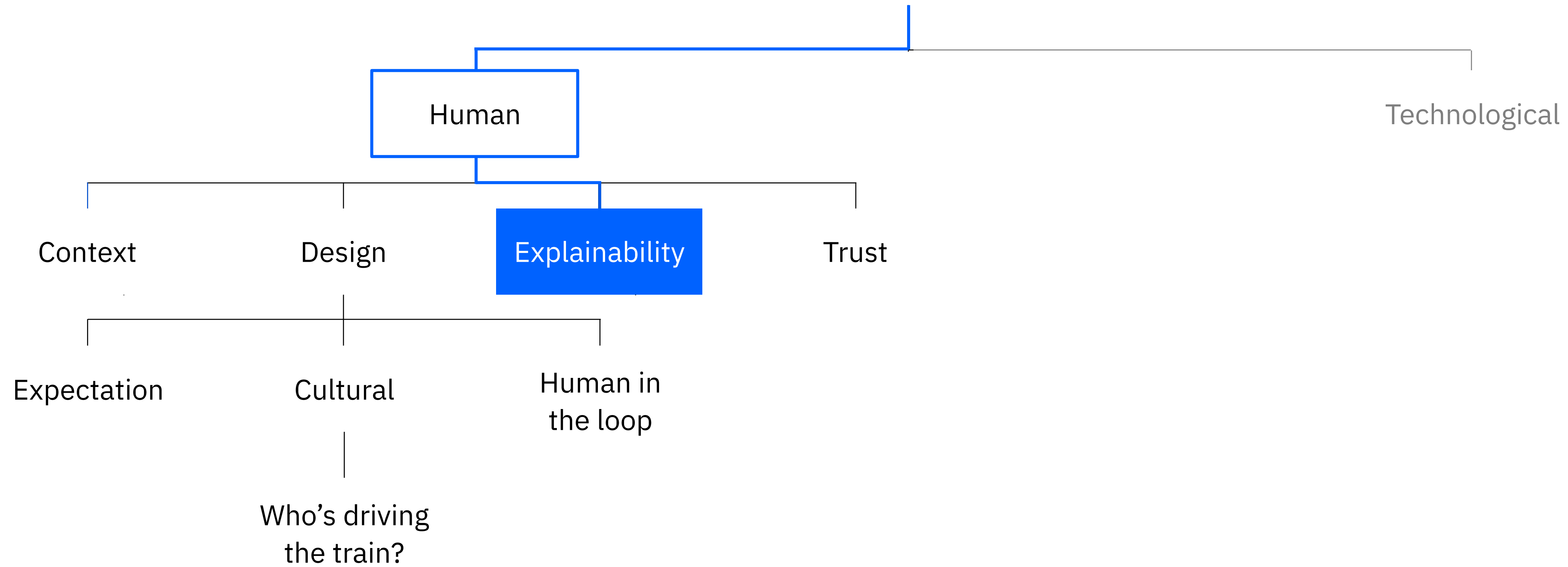
Human in the loop

"A properly built machine does not require a user in the loop."
- Developer

"There will be edge cases. A good self driving car model should ask if you want to hit the grandmother or the children."

- Researcher

What are the challenges of implementing AI features in BI tools?

Human

Technological

Context   Design   Explainability   Trust

Expectation   Cultural   Human in the loop
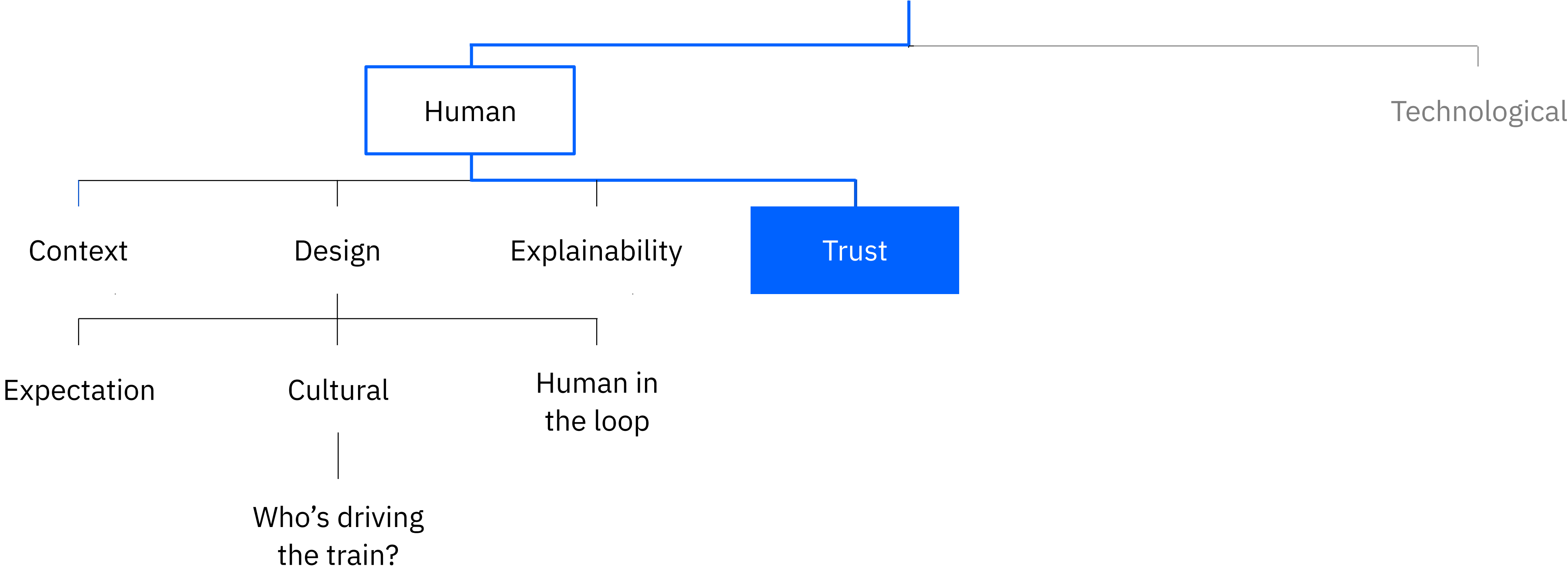
Who's driving the train?

Explainability

"When you disagree with the output you want to see why the model reached the conclusion it did, and most importantly override it."

- UX Designer

What are the challenges of implementing AI features in BI tools?

Human

Technological

Context

Design

Explainability

Trust

Expectation

Cultural

Human in the loop
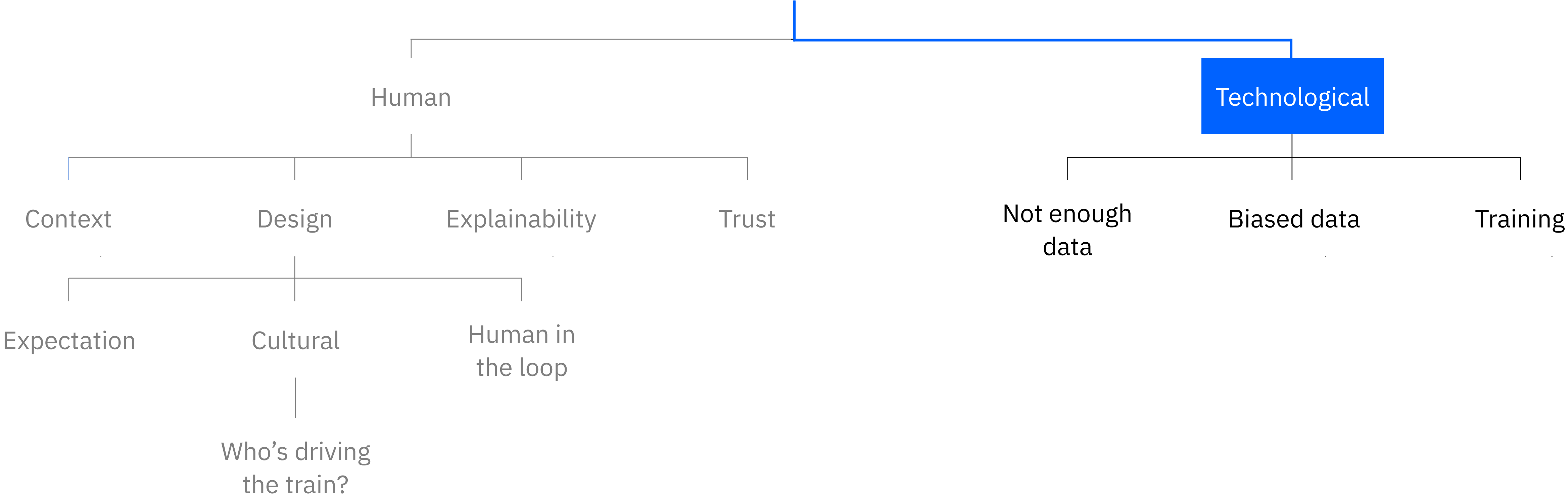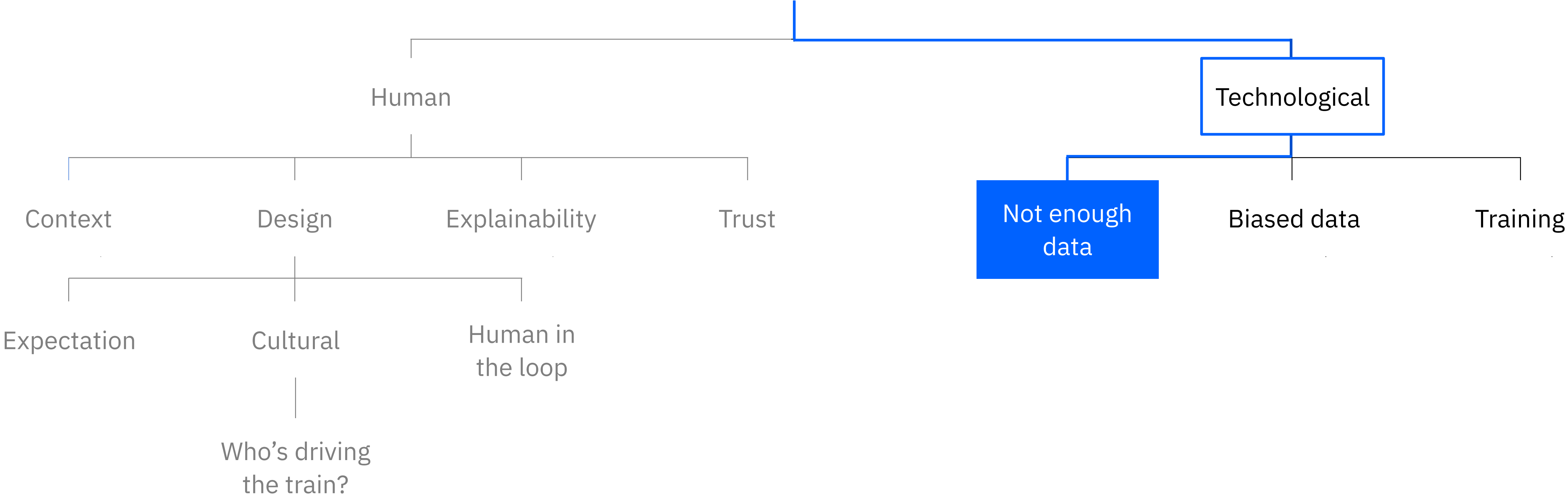
Who's driving the train?

Trust

*"There is a **trust spectrum**. The first time I use a model it may need to disclose everything. Maybe not the second time because I'm starting to trust it but the third time I need more explanations again."*

- Designer

What are the challenges of implementing AI features in BI tools?

```
                                    Human                                          Technological

        Context        Design        Explainability        Trust        Not enough        Biased data        Training
                                                                          data

    Expectation    Cultural    Human in
                               the loop

              Who's driving
               the train?
```

What are the challenges of implementing AI features in BI tools?

Human
- Context
- Design
  - Expectation
  - Cultural
    - Who's driving the train?
  - Human in the loop
- Explainability
- Trust

Technological
- Not enough data
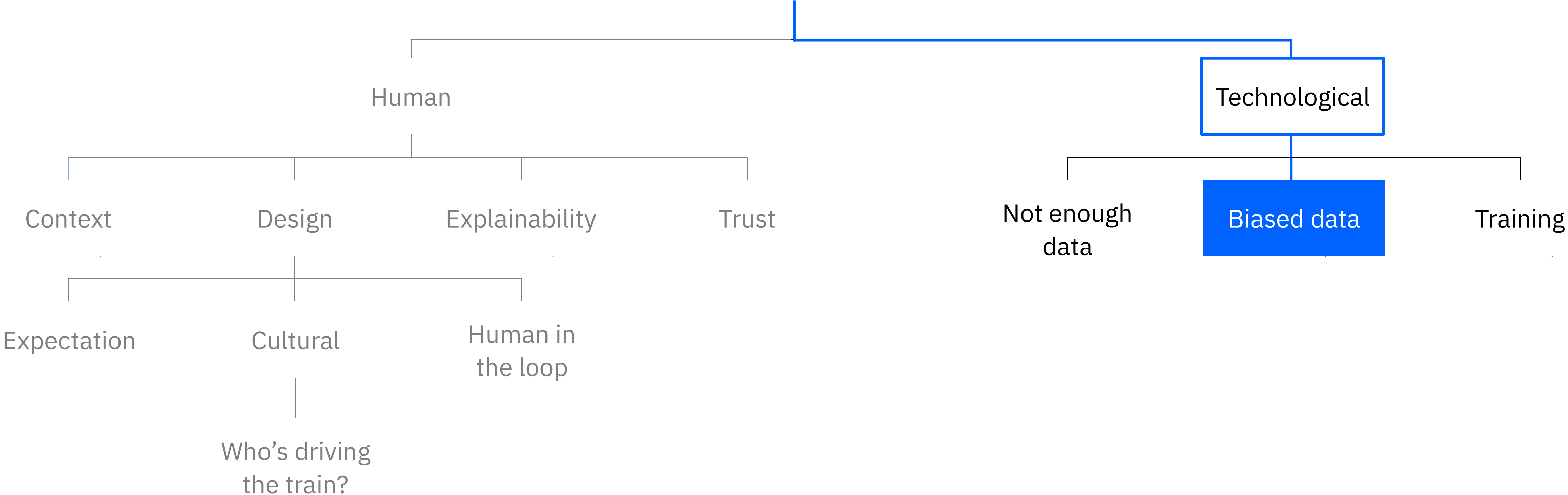- Biased data
- Training

Not enough data

"Our biggest challenge was the vis recommender. Do I have enough samples to train the model? Where do I get the samples? Are they categorized properly and ready to use?"

- Developer

What are the challenges of implementing AI features in BI tools?

Human

- Context
- Design
  - Expectation
  - Cultural
    - Who's driving the train?
  - Human in the loop
- Explainability
- Trust

Technological

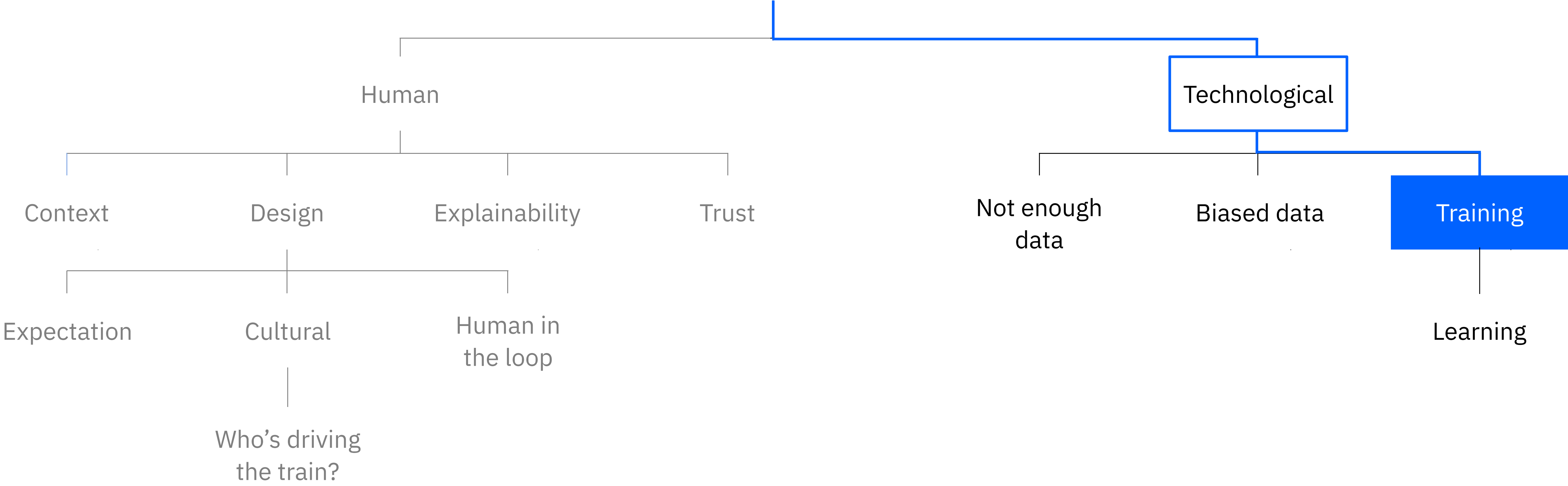- Not enough data
- **Biased data**
- Training

Biased data

"You might make a machine learning model for oncology but cancer knowledge is obsolete every five years. Therefore, we'll never replace cancer diagnosis by humans with machines."

- System architect

What are the challenges of implementing AI features in BI tools?

Human

Context   Design   Explainability   Trust

Expectation   Cultural   Human in the loop

Who's driving the train?

Technological

Not enough data   Biased data   Training

Learning

Training

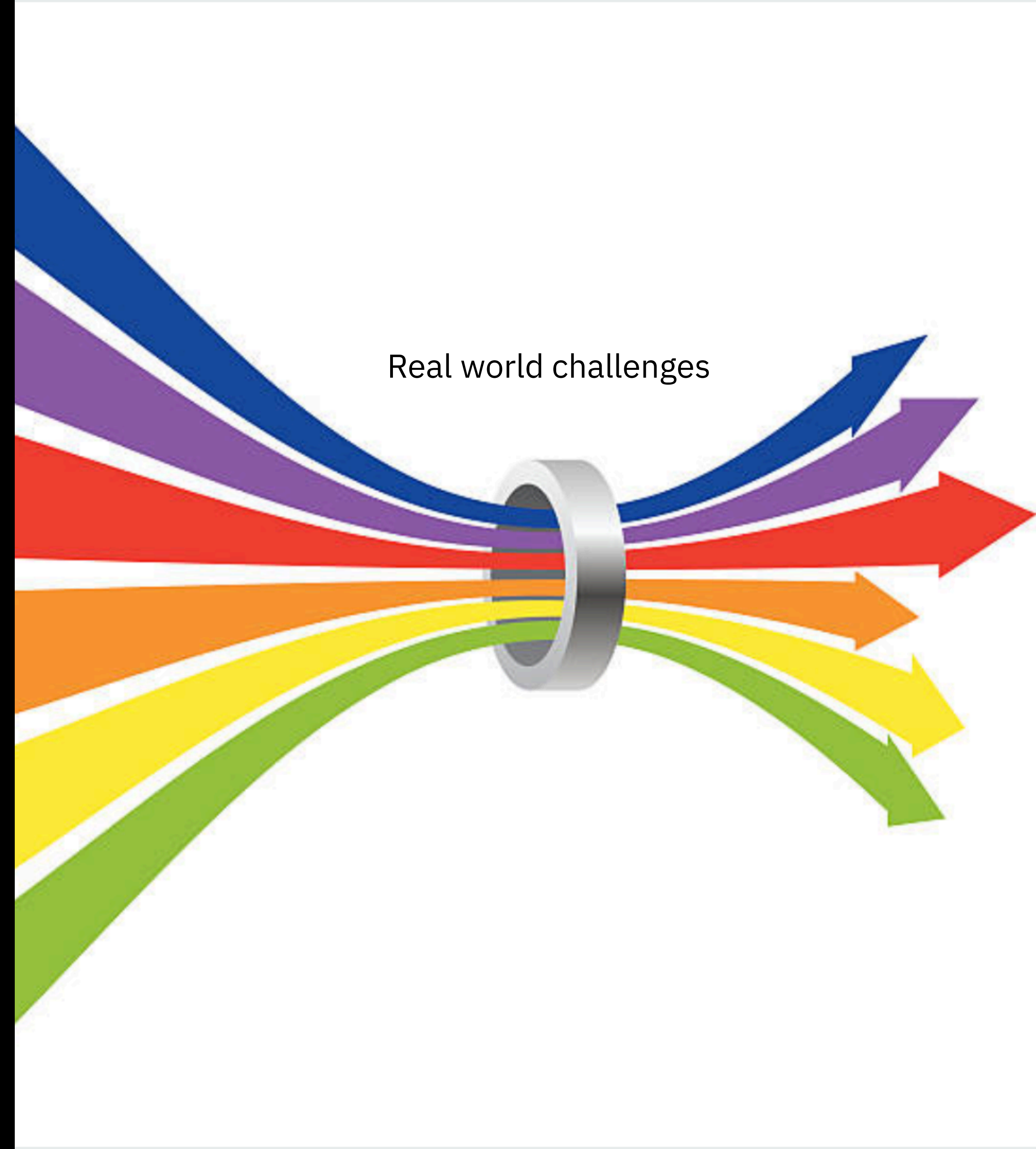*"Training is never over."*

- Developer

"A recommender system shouldn't make the same bad recommendation twice."
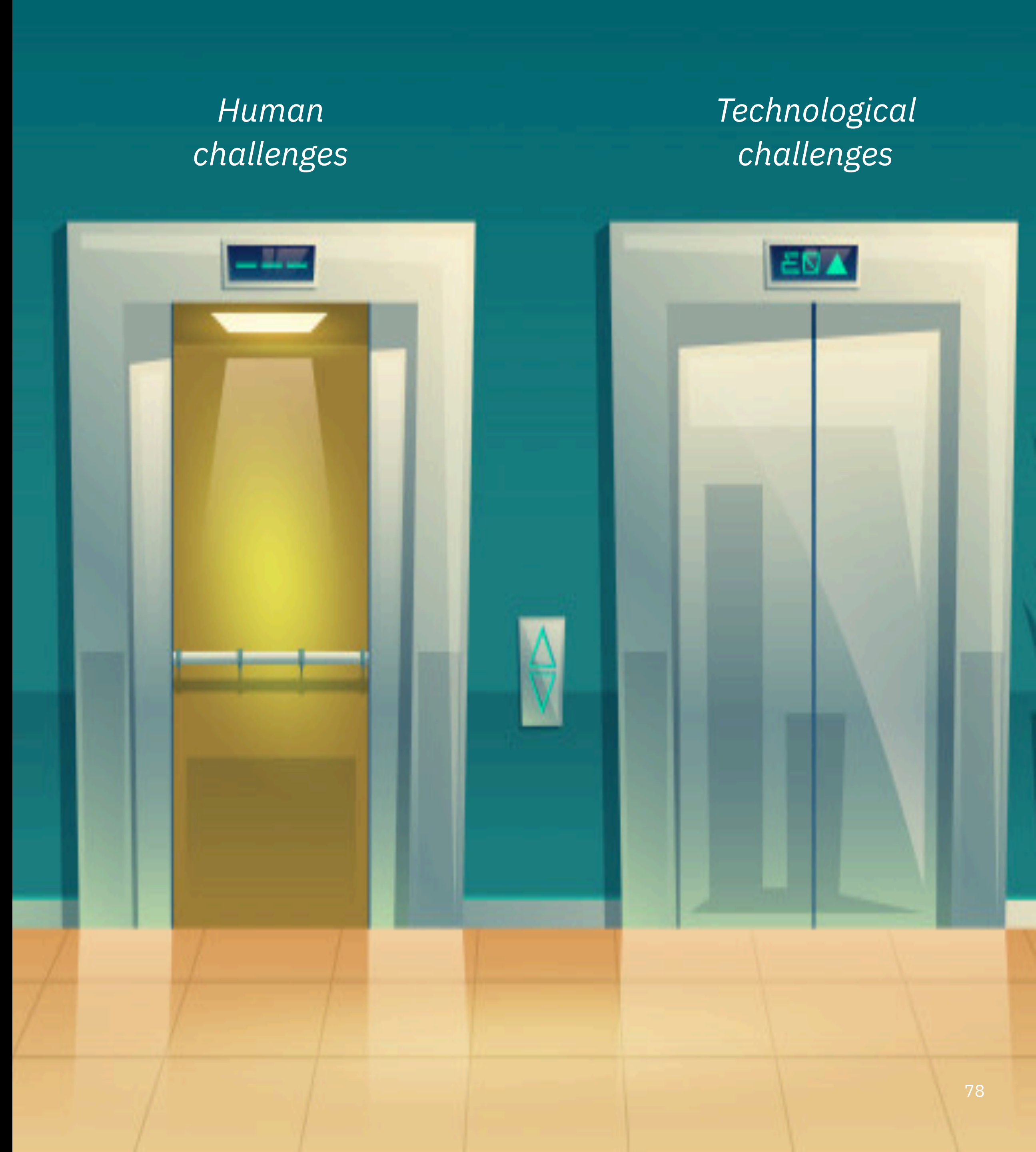
- Developer

Take aways

Takeaway 1

Real-world challenges may prove to be the bottleneck for future progress.

Real world challenges

Takeaway 2

Human challenges may be easier to solve than technological challenges.

Human challenges

Technological challenges

Takeaway 3

Introducing AI features into a mature BI tool is especially complicated.

Wrap up

So what does all this mean for Data Visualization?

AI transforms data visualization

- Or not

- It's complicated

- Depends on your perspective, and the timeframe you have in sight

AI implementation poses challenges

- Not just technical, but human as well

AI impacts the role of the user

- Both expert and non-expert

- There may be a critical uncertainty about the skill sets of future end users

Q & A

Does a self driving car need a speedometer?

- Yes
- No

Show of hands

IBM

Show of hands

Does AI transform data visualization?

- Yes
- No

When you add AI to a car the role of the driver changes to a passenger. Does something similar happen when you add AI to a data analytics tool?

- Yes
- No

Show of hands

IBM

Show of hands

Which challenges are more difficult?

- Human
- Technological

How might AI transform the roles of data analysts?

- (Not really a multiple choice question!)

Show of hands

IBM