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# Psychology of Standards

## The Psychological Effects of Process Norms in Product-developing Organizations

Dr. Tobias Rüdiger Maier, Advanced Therapy
Process Insights Europe in Munich, March 19-20, 2025

# Psychology of Standards

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Organization Development


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## Psychology of Standards

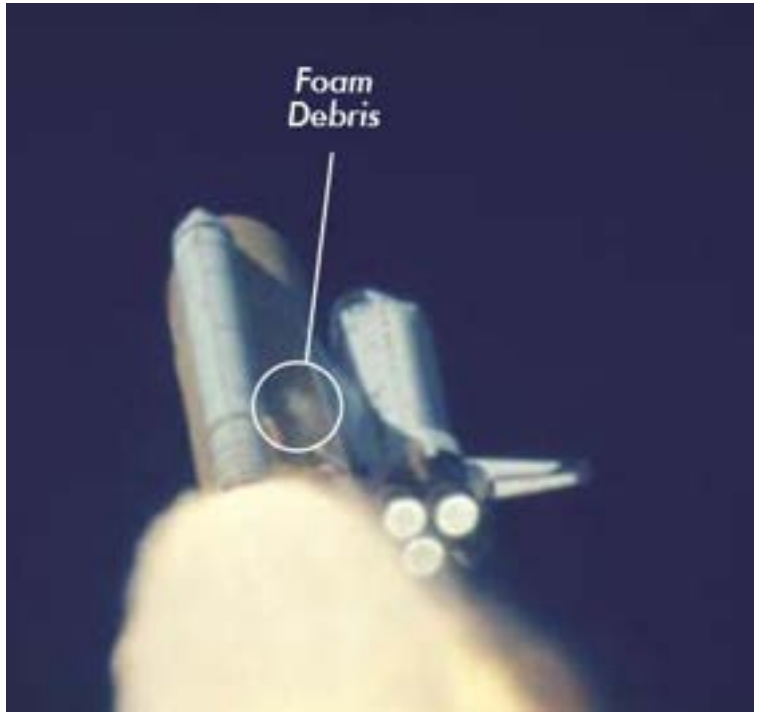
# Introduction

Agenda:

- Introduction
- Defining the Context
- Cognition (A)
- Behaviour (B)
- Conclusion

# Introduction
# Human shortcomings

Columbia Accident Investigation Board 2003:
"[…] *detection of the dangers posed by foam was impeded by 'blind spots'* […]"




We shall ask ourselves:
*How can we ensure that standards are not compromised by blind spots?*

https://ntrs.nasa.gov/citations/20030066167 (Fig. 3.3-2)

# Introduction
# Work motivation

Worldwide

- only 15 % of employees feel **engaged**.
- and  81 % of employees are thinking of **quitting** their jobs for better offers.

We shall ask ourselves:

*How can we ensure that standards don’t pay into demotivation?*

https://teamstage.io/motivation-statistics/#top-motivation-statistics-editor-s-choice

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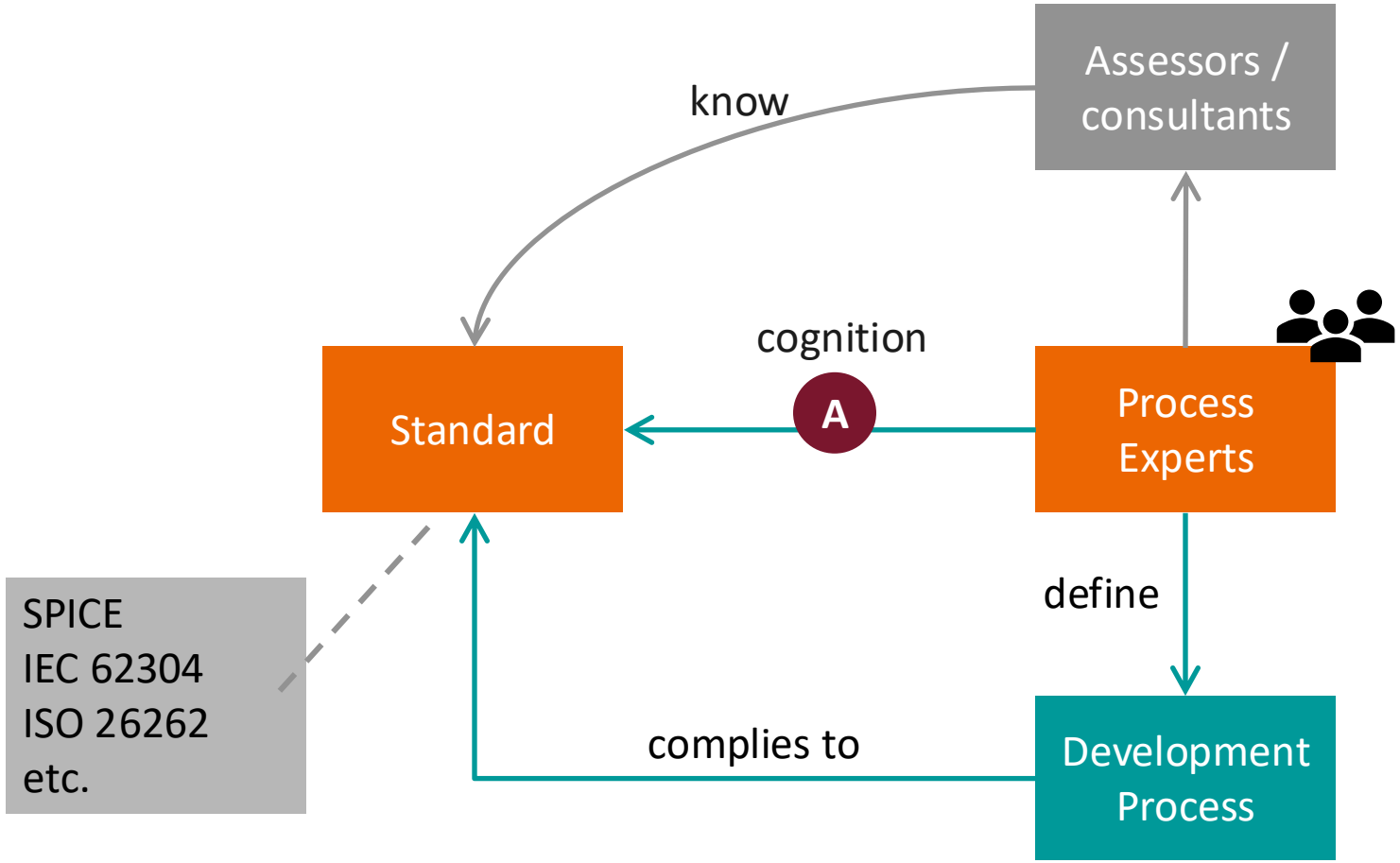
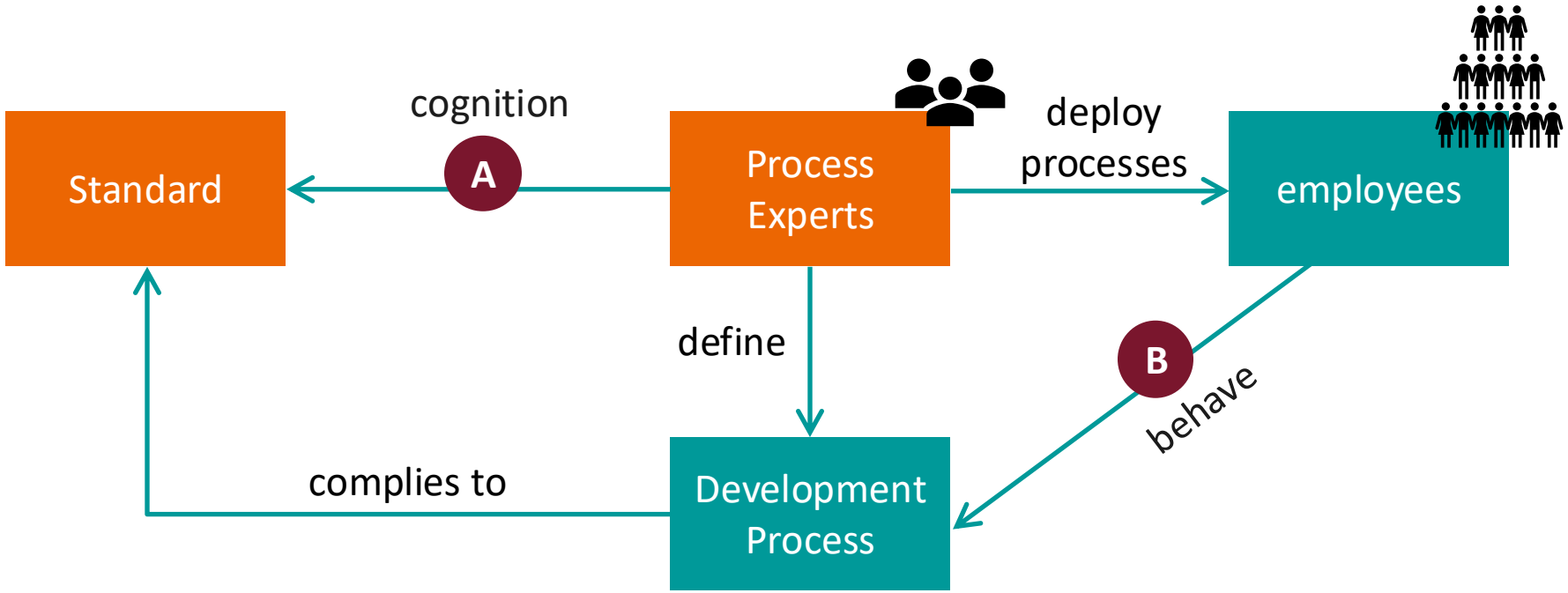
## Psychology of Standards

# Defining the context

# Cognition (A):
# Standards have a direct psychological impact



# Bahaviour (B):
# Standards have an indirect psychological impact



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## Psychology of Standards

# Cognition (A)

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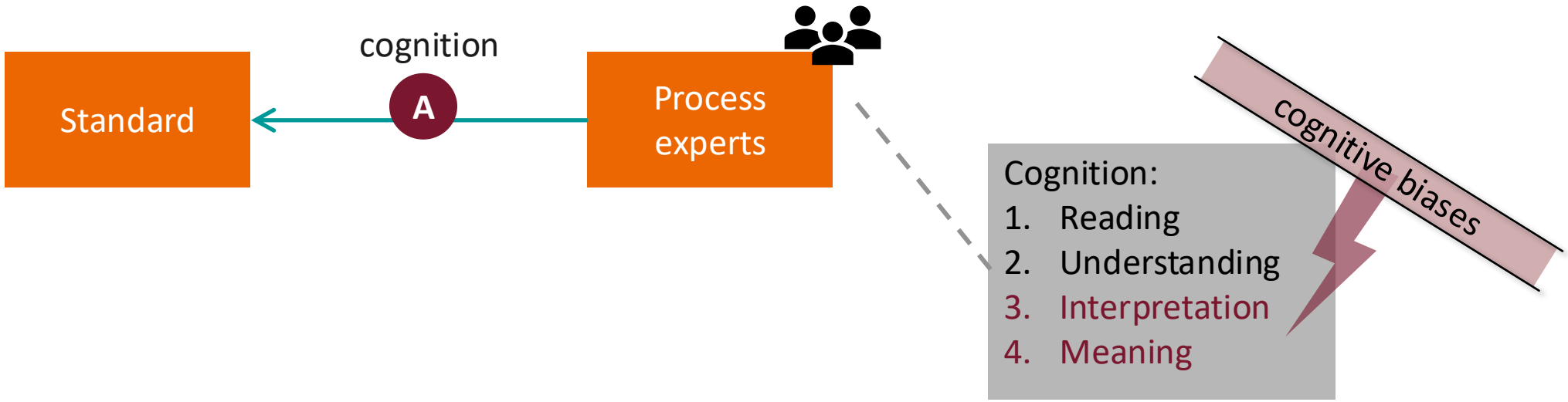

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selection bias

2-4-6
What is the rule behind the series?

The real rule is simple:

$x < y < z$

with $x, y, z \in \mathbb{N}$

# Cognition | interpretation

Cognition steps:

- ✓ 1. **Reading**
  (alphabet, grammar, syntax)
- ✓ 2. **Understanding**
  (vocabulary, semantics)
- ❑ 3. **Interpretation** affected by
  - Context effects
  - Motivation
  - Fixation
  - Framing
  - (other cognitive biases)


Photo by David Lezcano on Unsplash

# Cognition | interpretation | context

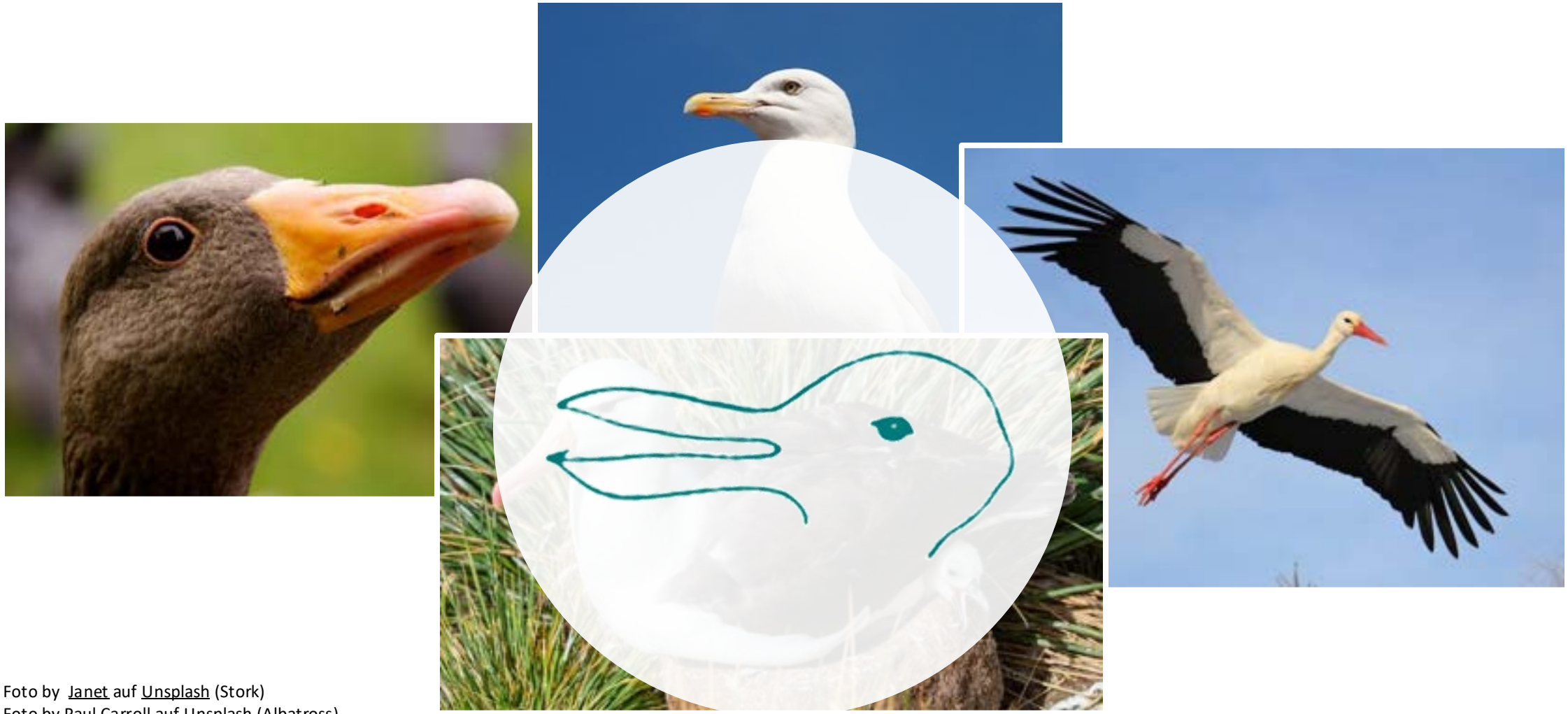


Foto by Janet auf Unsplash (Stork)
Foto by Paul Carroll auf Unsplash (Albatross)
Foto by Victoria auf Unsplash (seagull)
Foto by Paolo Chiabrando auf Unsplash (goose)
Middle: Commodity sketch characterized as „well-known picture“ by Fisher (1968) with neither source of permission nor the claim of own creation

# Cognition | interpretation | context

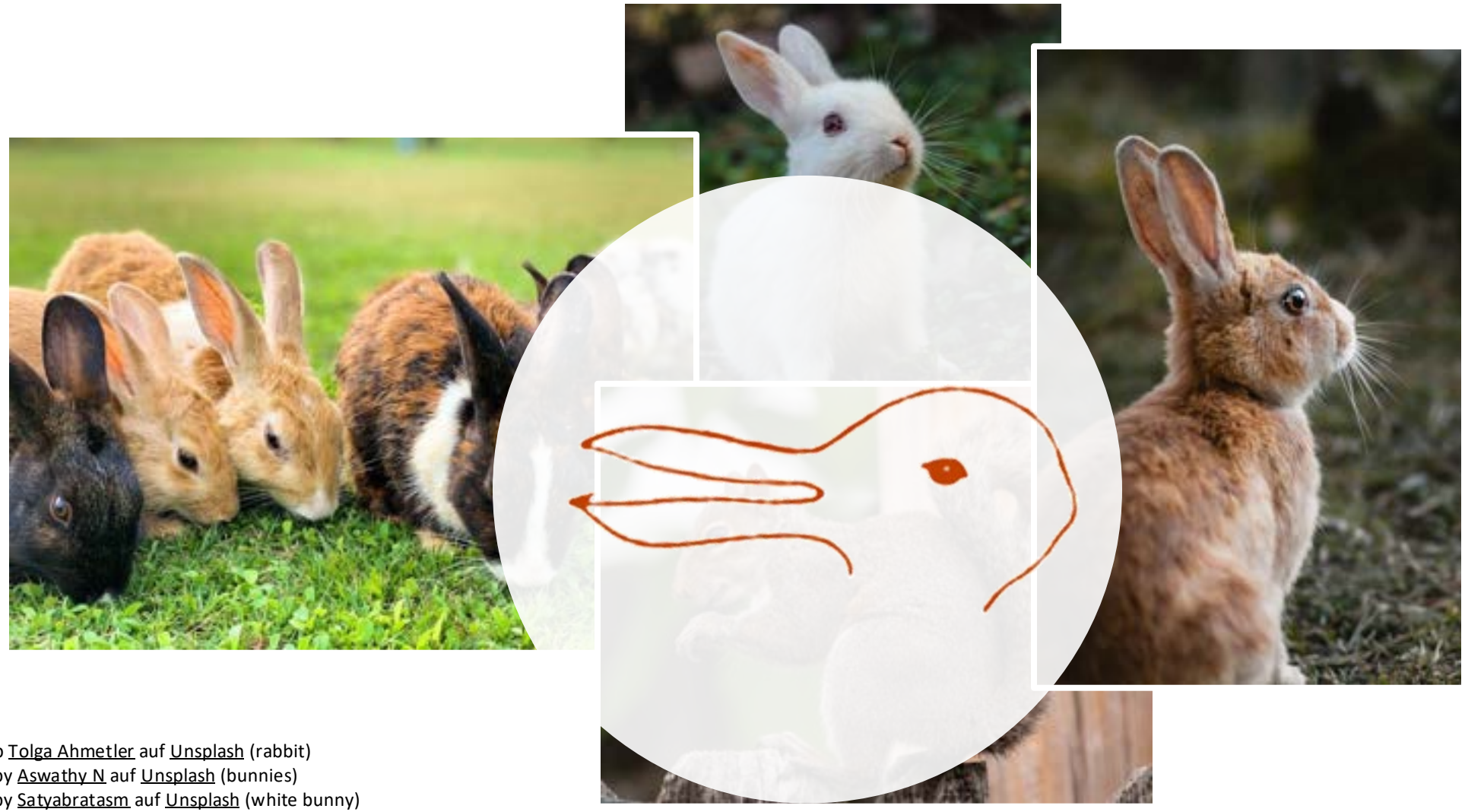


Foto b Tolga Ahmetler auf Unsplash (rabbit)
Foto by Aswathy N auf Unsplash (bunnies)
Foto by Satyabratasm auf Unsplash (white bunny)
Foto by Joshua J. Cotten auf Unsplash (squirrel)
Middle: Commodity sketch characterized as „well-known picture“ by Fisher (1968) with neither source of permission nor the claim of own creation

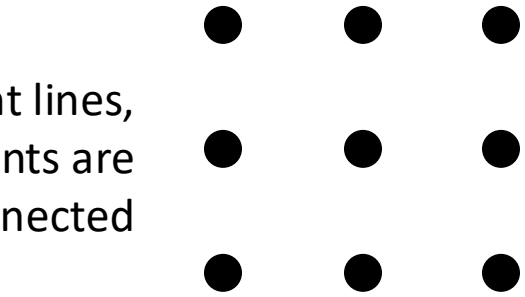
# Cognition | interpretation | motivation

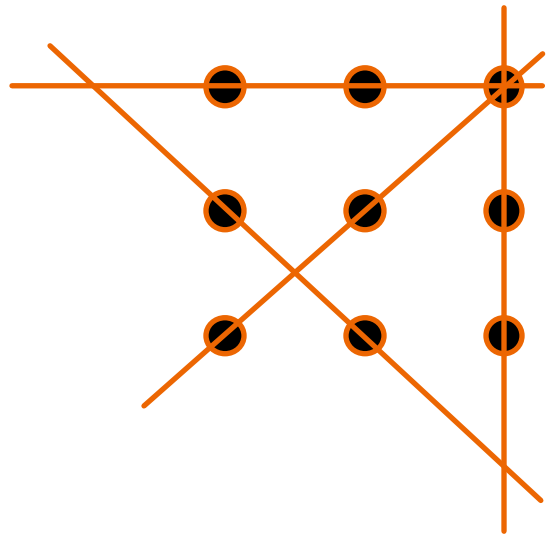
***I don't want to change much in our processes.***
*Let's see what is really required by the norms…*


Photo by David Lezcano on Unsplash

# Cognition | interpretation | fixation

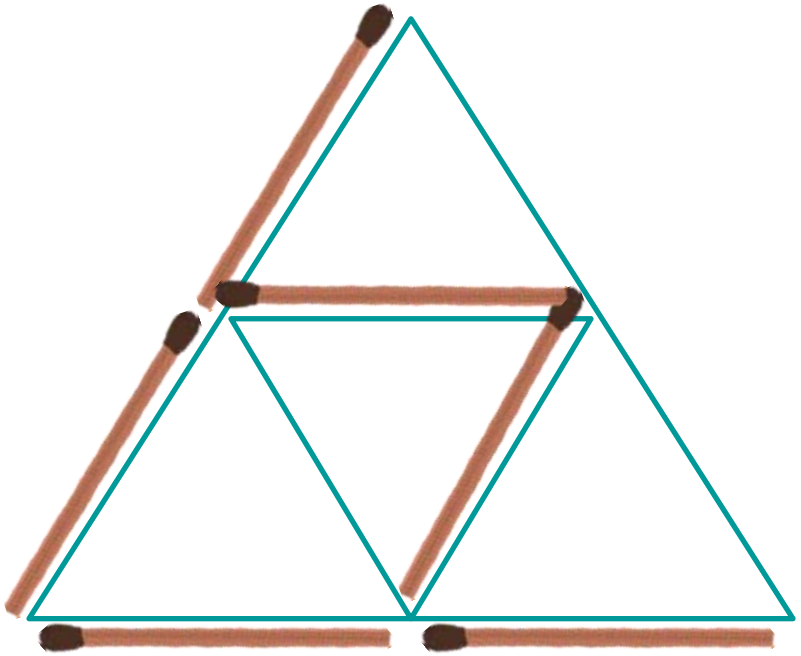
Use 4 straight lines, so that all points are connected





# Cognition | interpretation | fixation

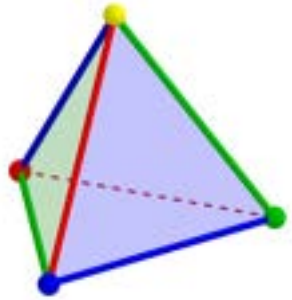
Arrange all six matches so that they form 4 equilateral triangles

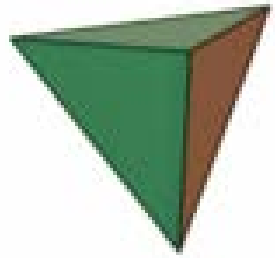


# Cognition | interpretation | fixation

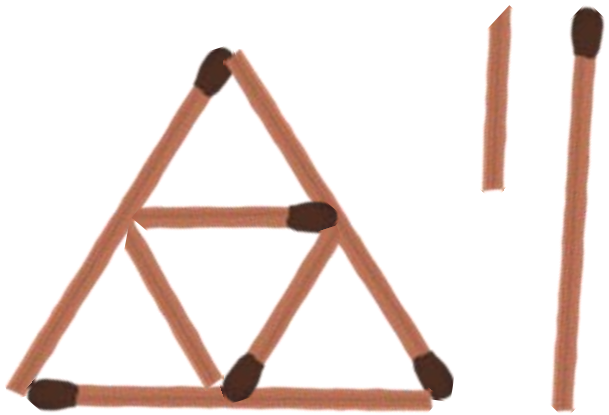
Arrange all six matches so that they form 4 equilateral triangles

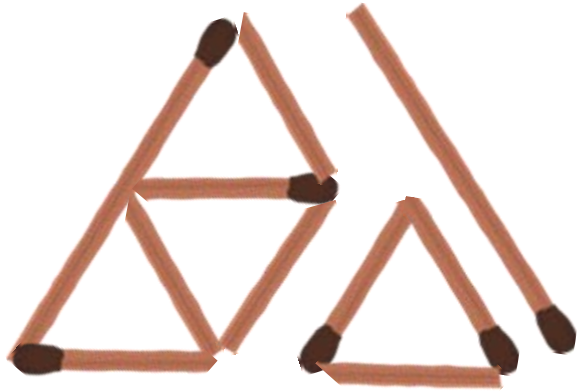
**Don’t destroy anything!**

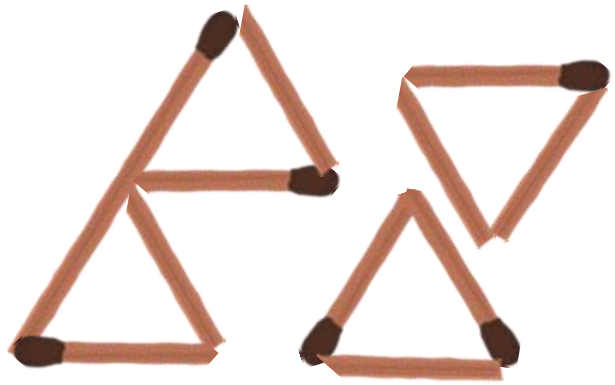








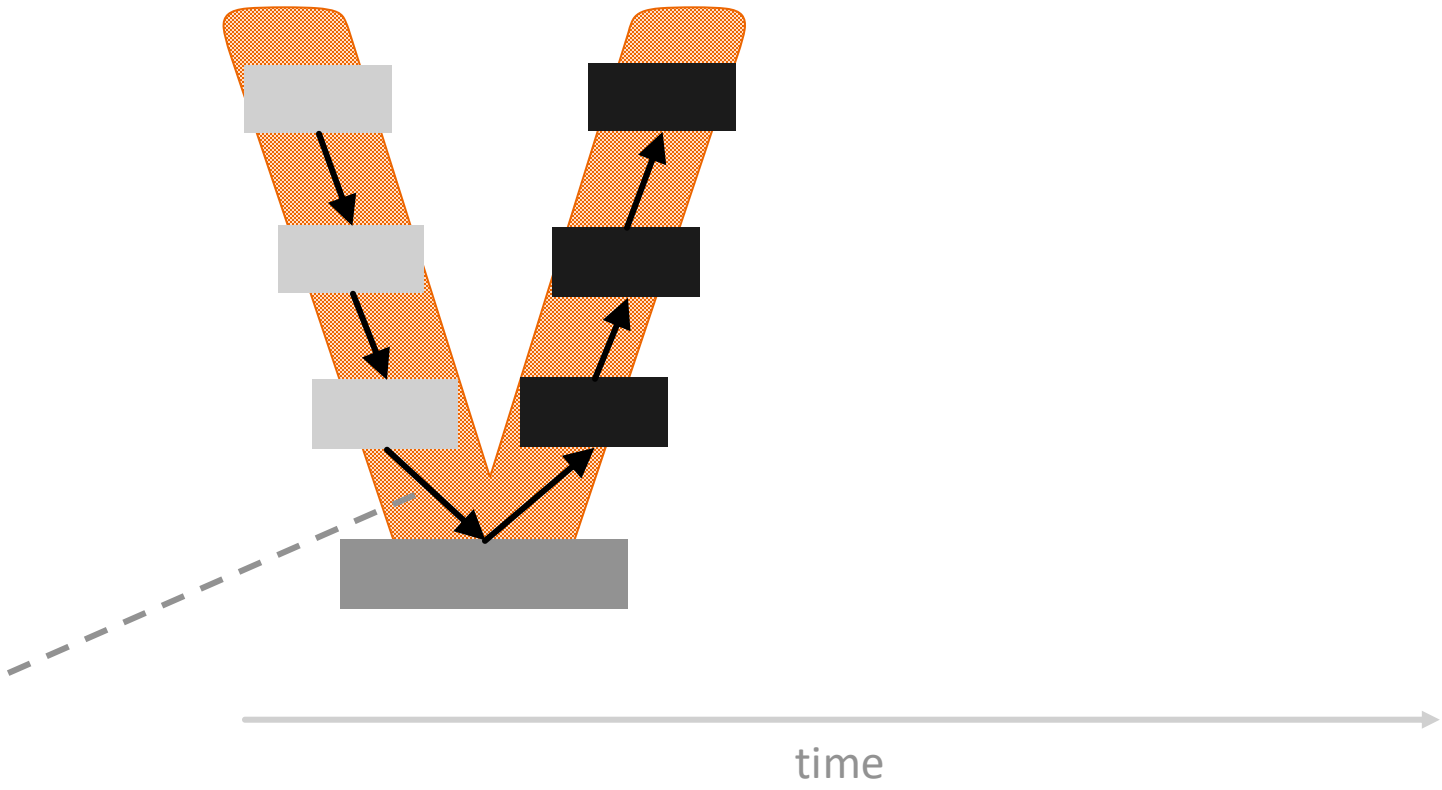




# Cognition | interpretation | fixation

Incorporated by many development standards, like

- IEC62304
- AutomotiveSPICE
- ISO 26262

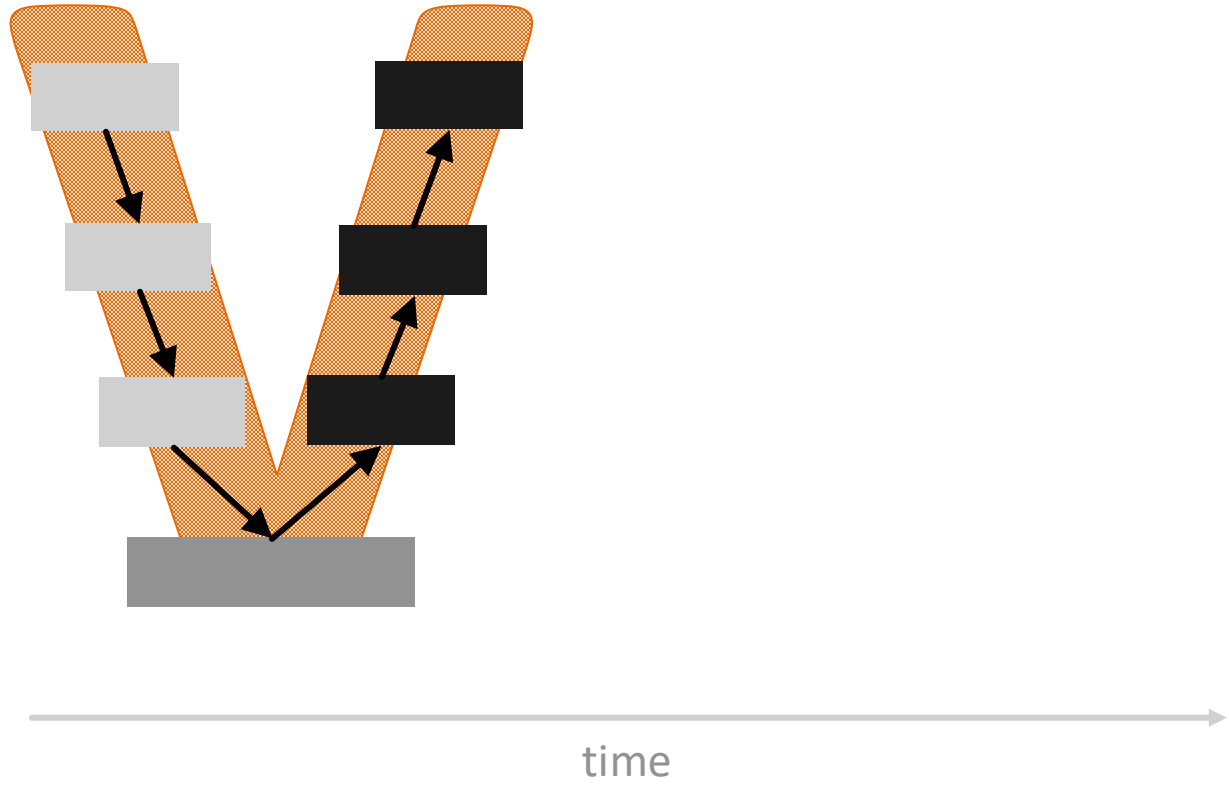


# Cognition | interpretation | fixation

**V-Modell, but…**

IEC 62304 Annex B.1.1 (p38)

***Other life cycles**, particularly evolutionary life cycles, permit PROCESS outputs to be produced before all the inputs for that PROCESS are available.*



# Cognition | interpretation | fixation

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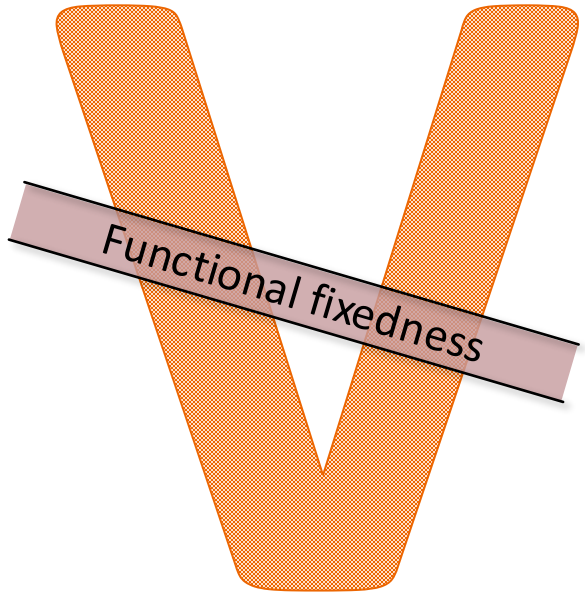
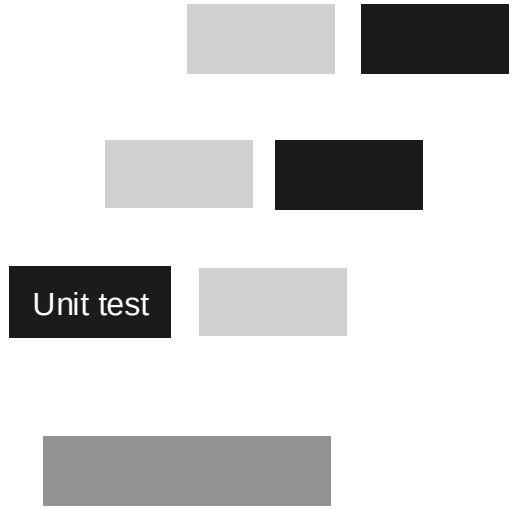


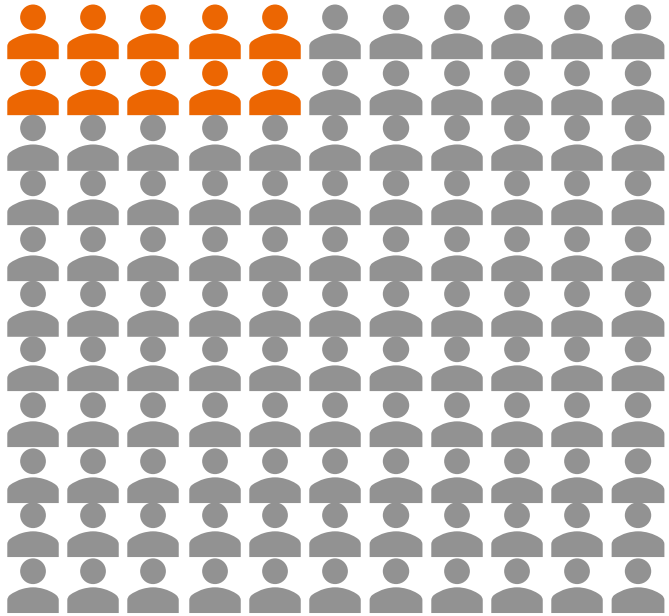

Possible?
Do we have a **fixation** (‘*blind spot*’) here?




time

# Cognition | interpretation | framing

**Medical treatment**
**Death rate 10 %**



Patients and hospital members assess the treatment risks higher if you talk about death rate!

**Medical treatment**
**Survival rate 90 %**

Rothman & Salovay, 1997

# Cognition | interpretation | framing

framing

*How would you write it?*

1) *More than 98 % of passed unit tests will meet the quality requirement.*

2) *Less than 2 % of passed unit tests will miss the quality requirement.*

pseudocertainty effect

*The tendency to avoid risks if the expected outcome is positive, but to take risks for avoiding negative outcomes.*

https://en.wikipedia.org/wiki/Pseudocertainty_effect

# Cognition | meaning

Cognition steps:

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  - Context effects
  - Motivation
  - Fixation
  - Framing
  - (other cognitive biases)
- ❑ Construction of **meaning** depends on our knowledge of the “world” (including cultural imprint)


Photo by David Lezcano on Unsplash

# Cognition | meaning | *example*

5.4.4 Verify detailed design [IEC 62304]
The MANUFACTURER shall verify and document that the software detailed design
a) implements the software ARCHITECTURE; and
b) is free from contradiction with the software ARCHITECTURE.
[Class C]

3.33 **VERIFICATION:**
Confirmation through provision of objective evidence that the specified requirements have been fulfilled.

*What is even an objective evidence?*

*objective*: based on real facts and not influenced by personal beliefs or feelings

https://dictionary.cambridge.org/dictionary/english/objective

Photo by Georgi Kalaydzhiev auf Unsplash

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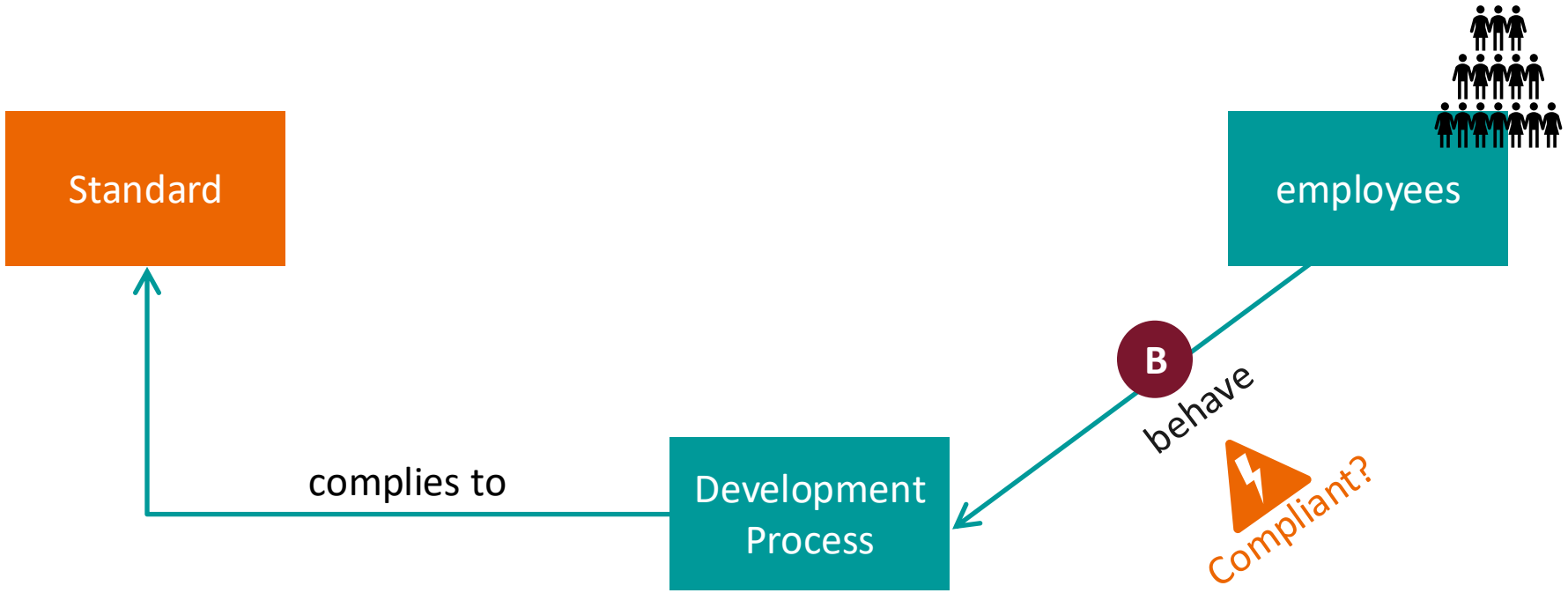
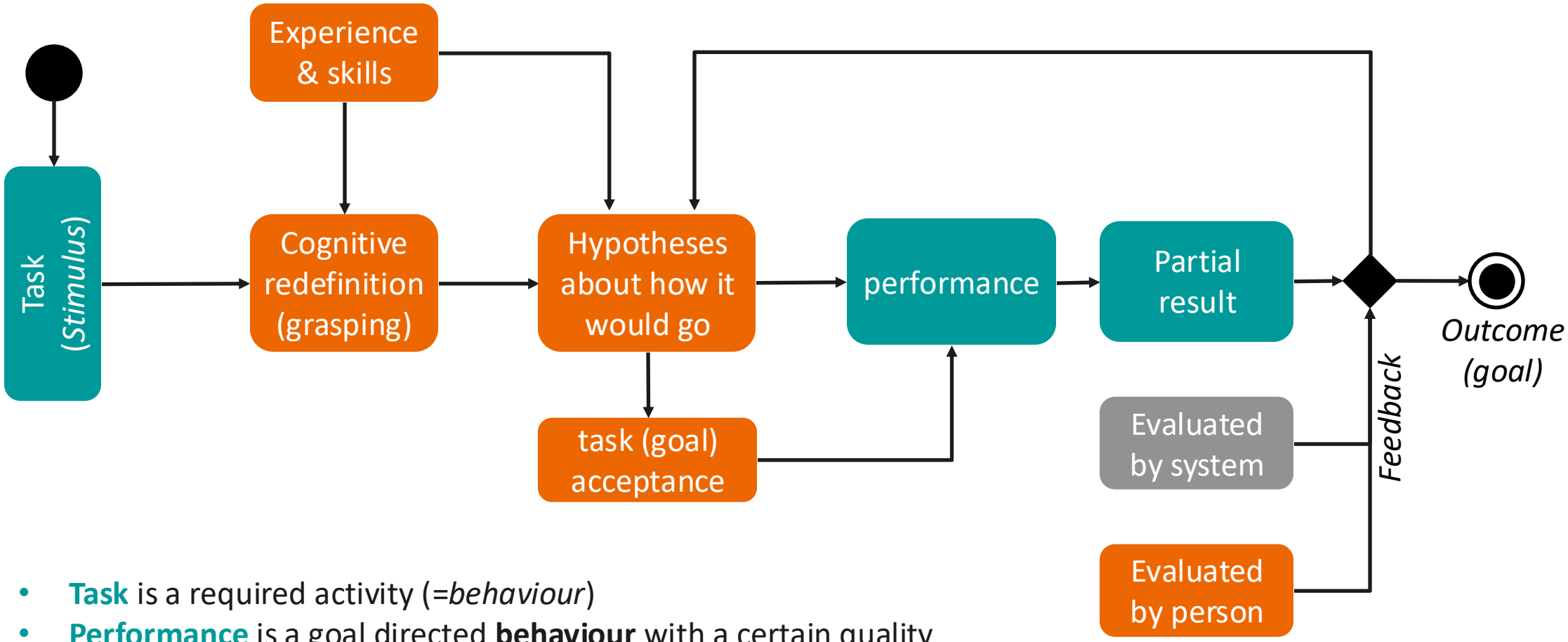
# Behaviour (B)

# Behaviour (B):
# Indirect psychological impact of norms



# Task concept for work behaviour

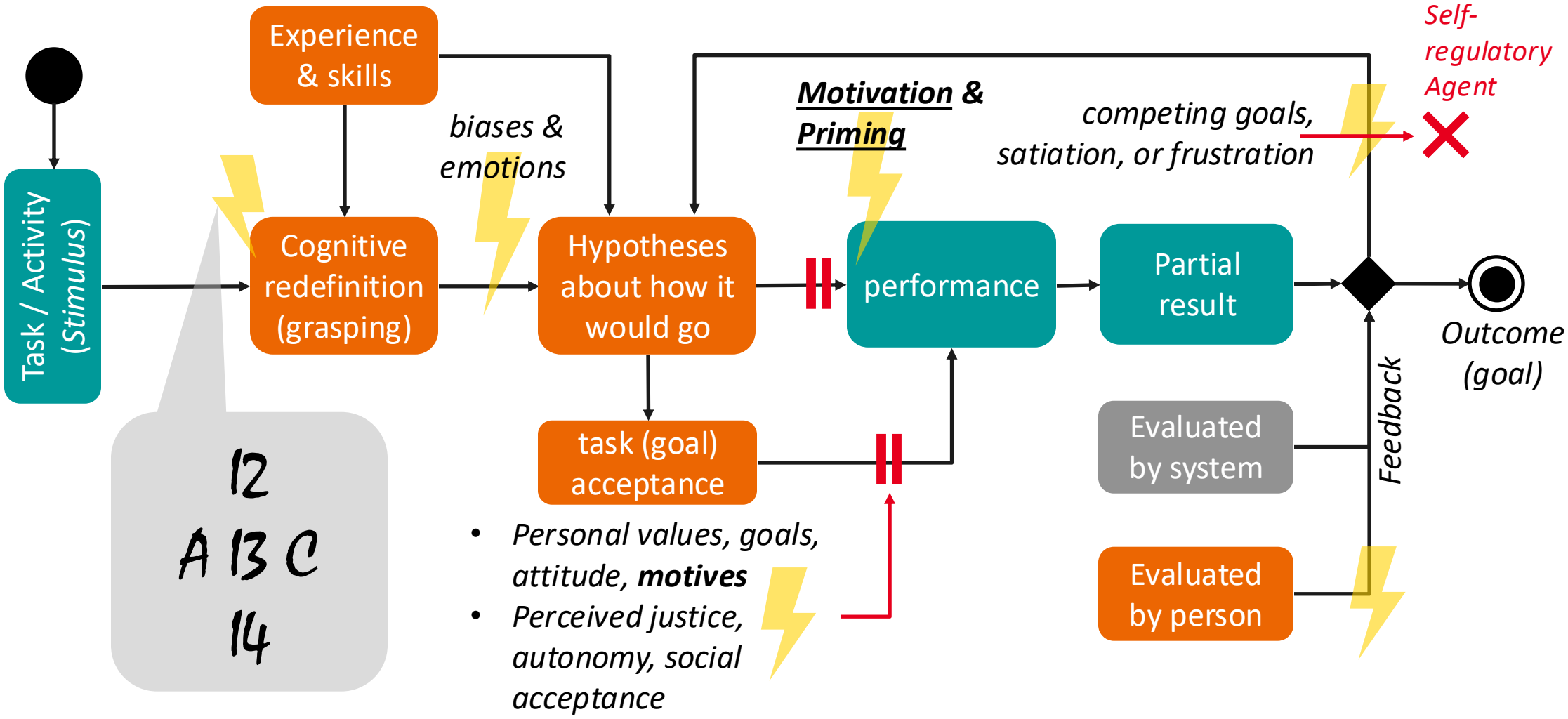
## (Richard Hackman 1969)




- **Task** is a required activity (=*behaviour*)
- **Performance** is a goal directed **behaviour** with a certain quality

# Task concept for work behaviour

## (Richard Hackman 1969)




Concept of cognitive biases introduced by Kahneman and Tversky 1979
Self-regulatory concept agent by Vancouver, Weinhardt and Schmidt 2010

# Job Characteristics Model
## (Hackman/Oldham 1974)

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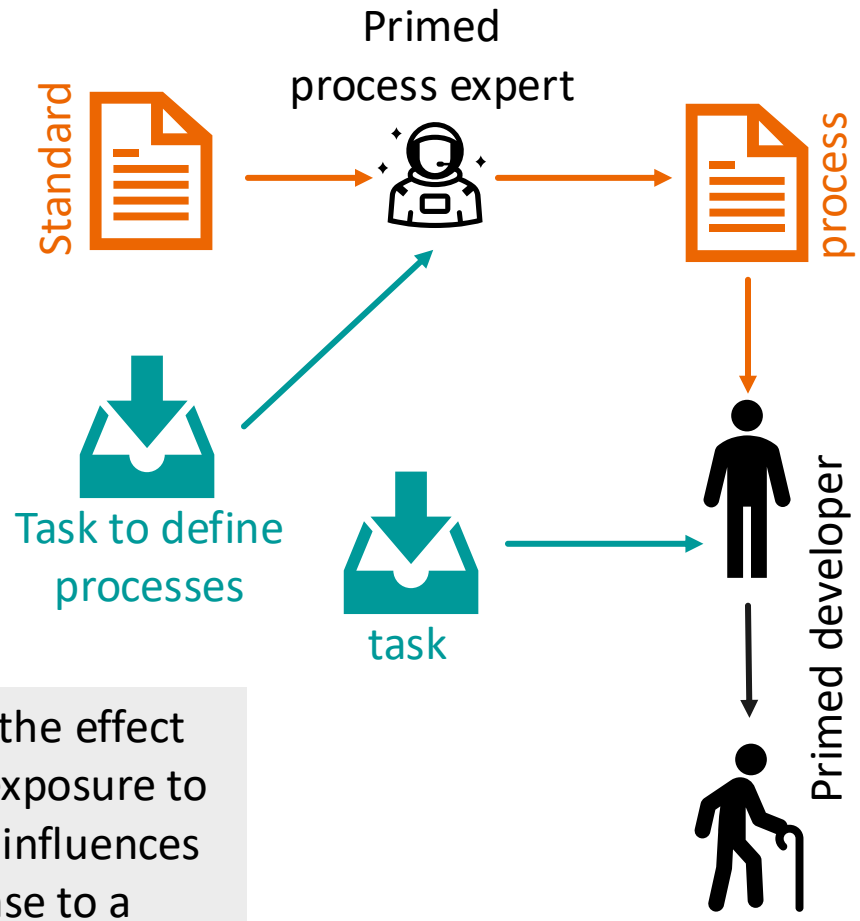
*Moderators:*

*growth need* | *context factors* | *knowledge and skills*

| Core job characteristics | | Psychological states | Correlated outcomes |
|---|---|---|---|
| **Task Identity** | **Task identity:** How much of the job is about doing something from *start* to *finish* with a visible outcome? (i.e., completion of a whole piece of work). | **meaningfulness** of the work | intrinsic motivation |
| Skill Variety | | | |
| Task Significance | | | |
| Autonomy | | **responsibility** for outcome of work | Work performance and quality |
| Feedback | | **Knowledge** about the results | Work satisfaction |
| | | | Low fluctuation and absenteeism |

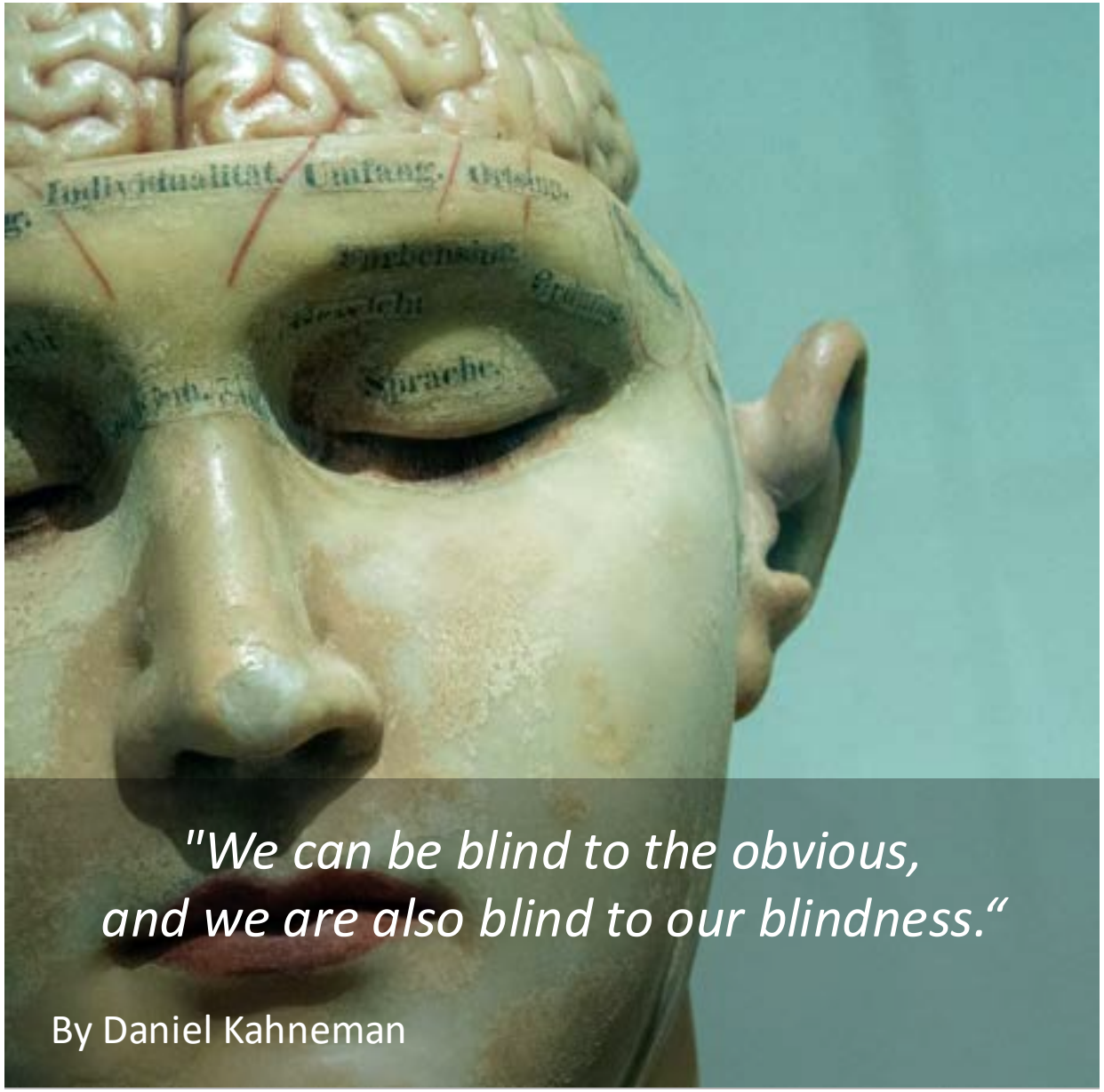
# Priming
## (see Kahneman 2011)




**Priming** is the effect by which exposure to a stimulus influences the response to a subsequent stimulus

Example snippet of an automotive supplier process document which shall cover SUP.9 (ASPICE)

**2.2 Software Product Problems**
Software problems comprise all kinds of issues related to the software developed in the scope of this project.
…
Typical software problems include but are not limited to faults in the user interface or in any functionality of the product, or problems with the interfaces to other systems.

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## Psychology of Standards

# Conclusion

Don't believe everything you think!

# We pioneer breakthroughs in healthcare.
# For everyone. Everywhere. Sustainably.

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