

# How to Define the Quality of a Single Sequence?

Lucjan Janowski – AGH

# Quality – Inspired by Bogdan Ćmiel

## Quality

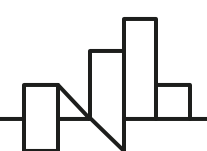


Personal experience:

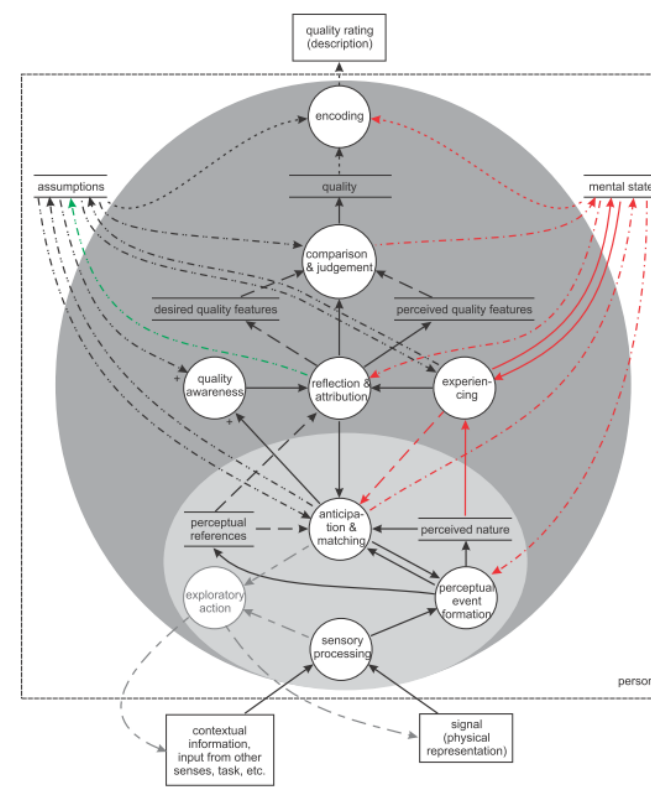
- Subjective
- Specific situation
- Expectations
- ...



A file quality

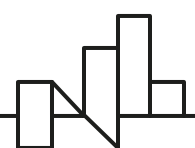


# Personal vs Group

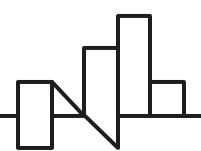


We use MOS, but this is just an estimation

“Quality of Experience:  
Advanced Concepts,  
Applications and Methods”



# Sequence Quality – Crowd





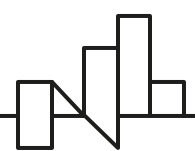
# Sequence Quality – Crowd



Def:

Quality for file  $S_k$ , ( $Q(S_k)$ ) is the mean over opinions of "all" subjects.

$$Q(S_k) = \lim_{n \rightarrow \infty} \frac{1}{n} \sum_{i=1}^n U_{iS_k}$$



# Sequence Quality – Crowd

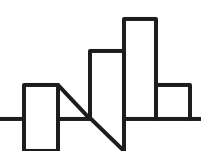


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What is the scale?





# Sequence Quality – Crowd



What kind of device and environment is used?



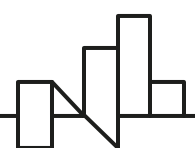
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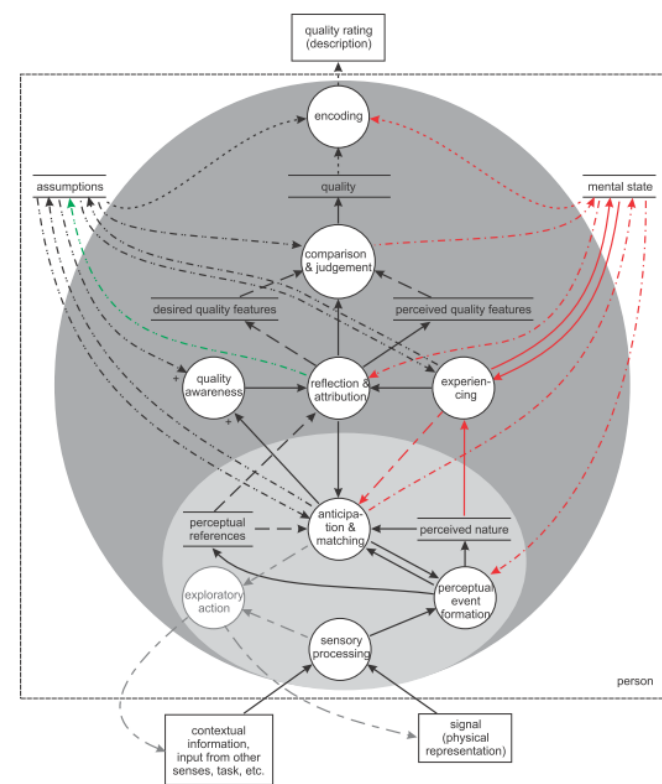
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# Sequence Quality – Crowd



Subject's side



What kind of device and environment is used?

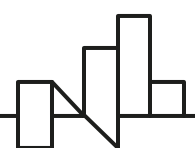


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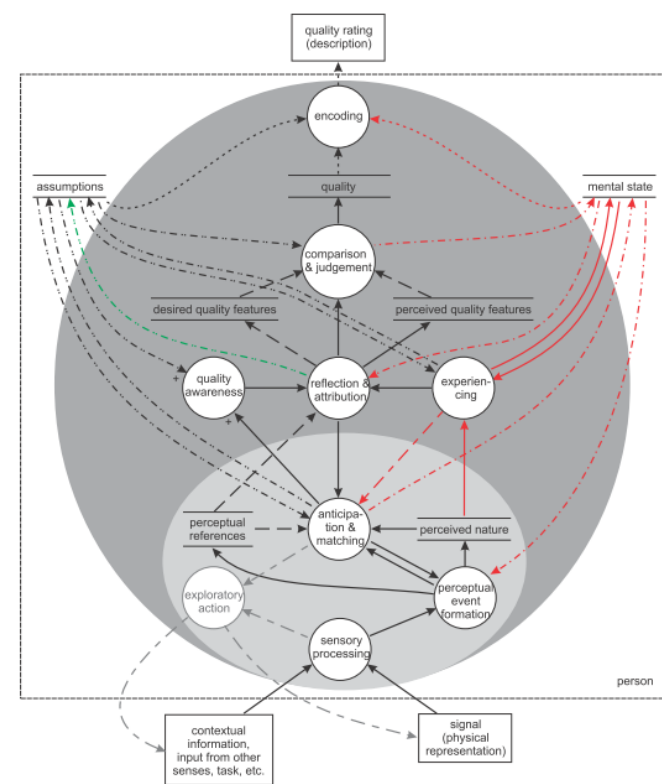
$$Q(S_k) = \lim_{n \rightarrow \infty} \frac{1}{n} \sum_{i=1}^n U_{iS_k}$$





# Sequence Quality – Crowd

$$Q(S_k) = f(t)$$



Subject's side



What kind of device and environment is used?



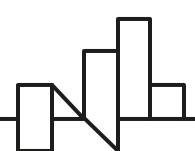
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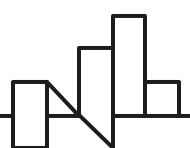
# Crowd Quality – Consequences

## Advantages:

- When we fix scale (ACR for example):
  - The quality is limited to 1-5 interval
  - Quality 1 means that each person in the world answers 1 for that sequence – in practice impossible
- Nice mathematical properties
- We can test whether a specific method works correctly if we have a lot of answers for specific sequence(s), knowing that more answers give better results

## Disadvantages:

- Presented at the previous slides: fixing scale, device, lab/environment settings, all surrounding sequences, ...
- We define quality by scoring, which is not the same thing
- The scores should be updated/removed with the technology change, but we do not know when they should be corrected





# Sequence Quality – Experts



$$S_k = EQ(S_k) \forall k \in K$$

$$S_k = f(S_k, EQ(\cdot)) \forall k \notin K$$



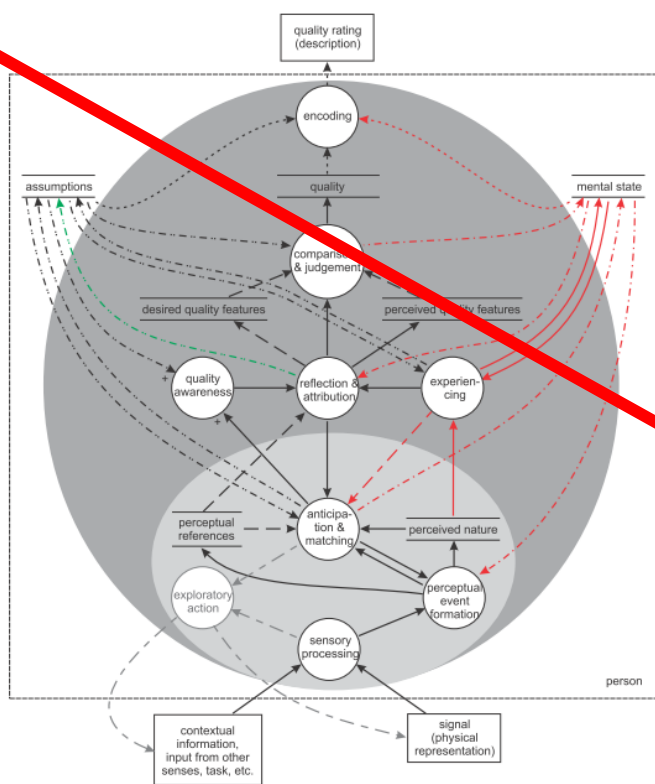
# Sequence Quality – Experts

$$Q(S_k) = f(t)$$



A file:  $S_k$

Quality



Subject's side

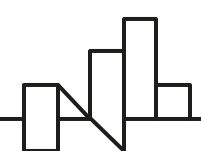
What kind of device and environment is used?



What is the scale?

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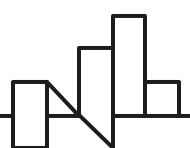
# Experts – Consequences

## Advantages:

- Probably with experts we can solve most problems generated by subjects – like device influence, environment etc.
- Time and technology corrections are possible

## Disadvantages:

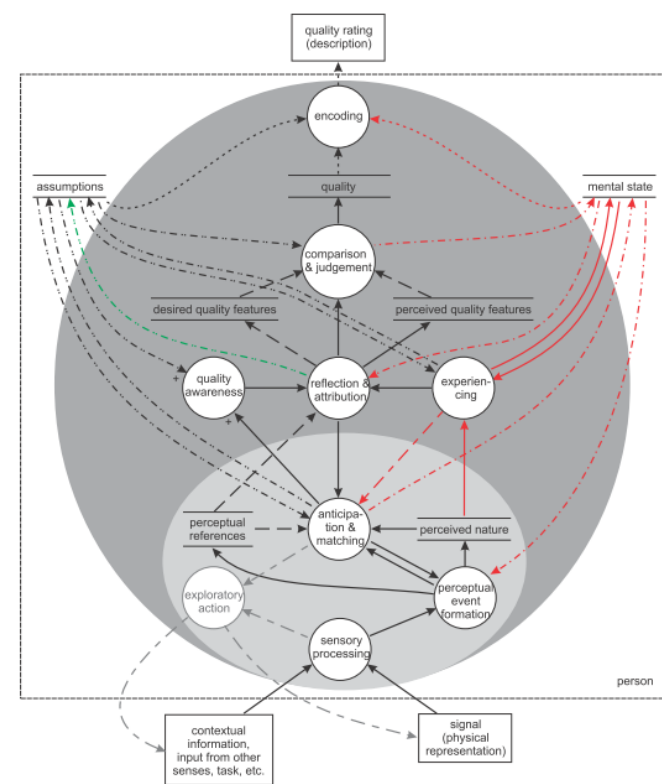
- We have scores for just few sequences
- We must know the function, which can be more challenging than finding quality itself  $f(\cdot)$
- We probably need additional functions for other devices, environments, etc.





# Sequence Quality – Hidden

$$Q(S_k) = f(t)$$



Subject's side



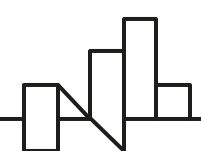
What kind of device and environment is used?



What is the scale?



Def:  
Quality for file  $S_k$ , ( $Q(S_k)$ ) is a hidden value which is changed by subjects to a score.





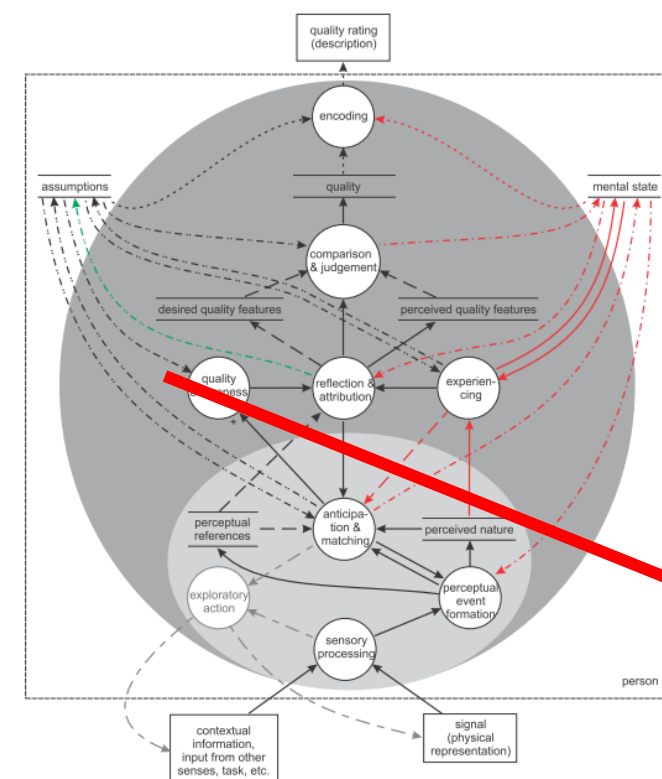
# Sequence Quality – Hidden

$$Q(S_k) = f(t)$$



A file:  $S_k$

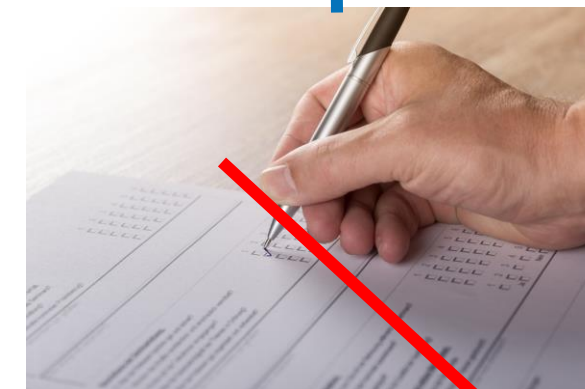
Quality



Subject's side



What kind of device and environment is used?

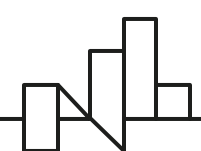


What is the scale?



Def. Quality for file  $S_k$ , ( $Q(S_k)$ ) is a hidden value which is changed by subjects to a score.

How they change it?



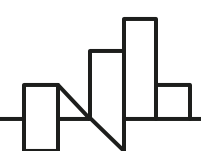
# Hidden Variable – Consequences

## Advantages:

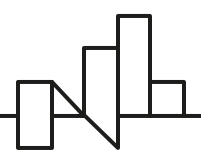
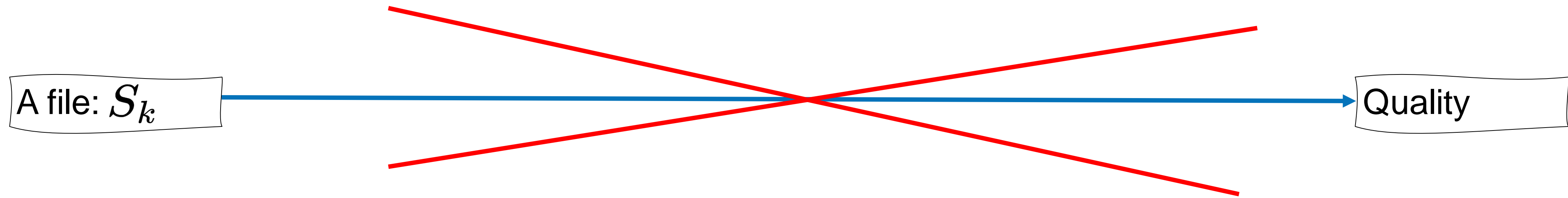
- Quality is a single number for a specific file
- A nice theory well described in psychology
- Looks reasonable, quality is as it is, what is changed is how we express it on a test or other activity

## Disadvantages:

- We change the problem of detecting quality to problem of detecting the changes in the usage of the scale etc.
- It is not obvious, and rather unrealistic, whether the hidden quality is a single value

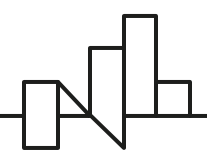
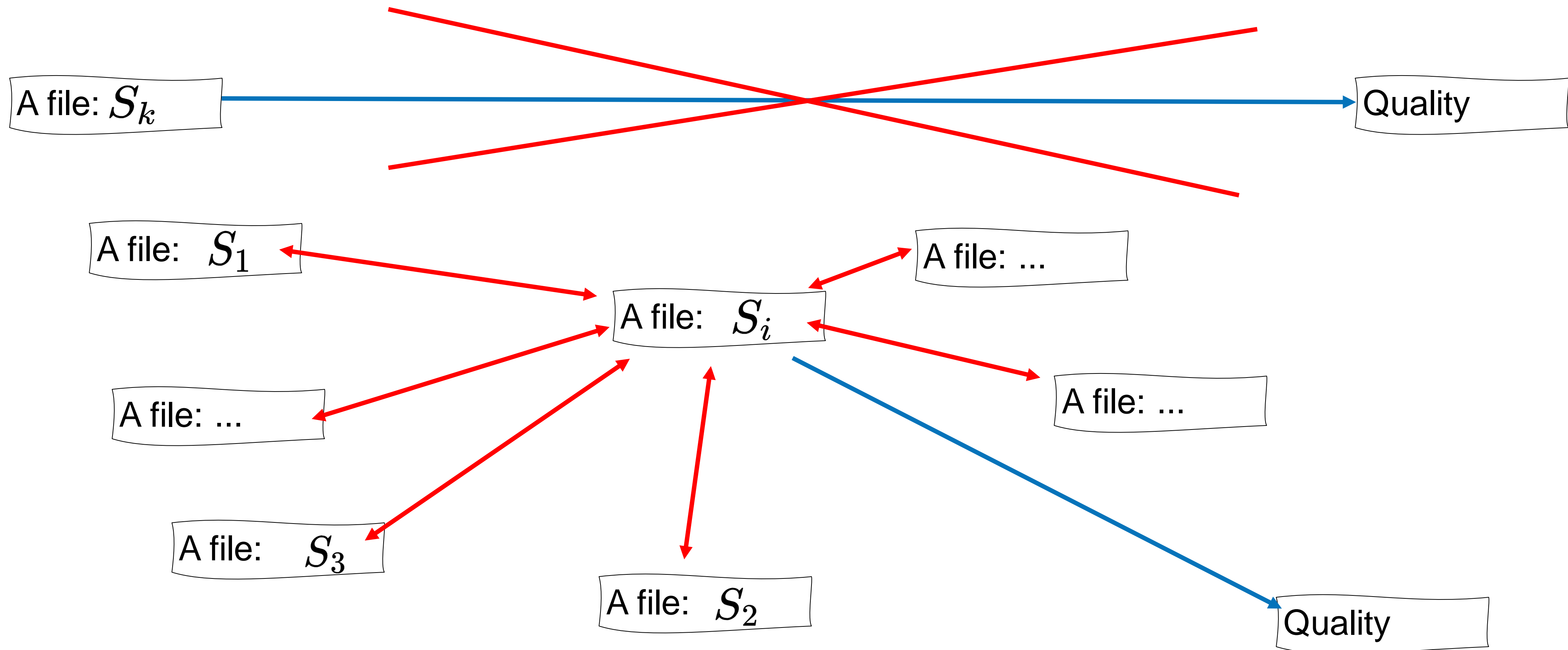


# Sequence Quality – Compared





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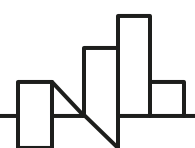
# Comparisons – Consequences

Advantages:

- We think about quality only for specific experiment/settings

Disadvantages:

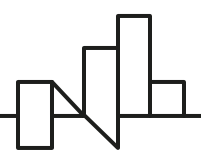
- It says that quality does not exist
- Metrics are relevant not objective





# What Is Your Opinion?

<https://create.kahoot.it/share/vqeg/087a11c8-4e1e-4cc0-9f26-56b2d82fae54>







# Thank you!

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