Evaluating Usefulness of Software Metrics

An Industrial Experience Report

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Metric-based Evaluation of Implemented Software Architectures

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Identify attributes
Define metrics
Validate metrics

Validity versus Usefulness

Does it measure what we want to measure?

What can we do with the metric?

When is a metric useful?

A metric is considered useful if the metric:

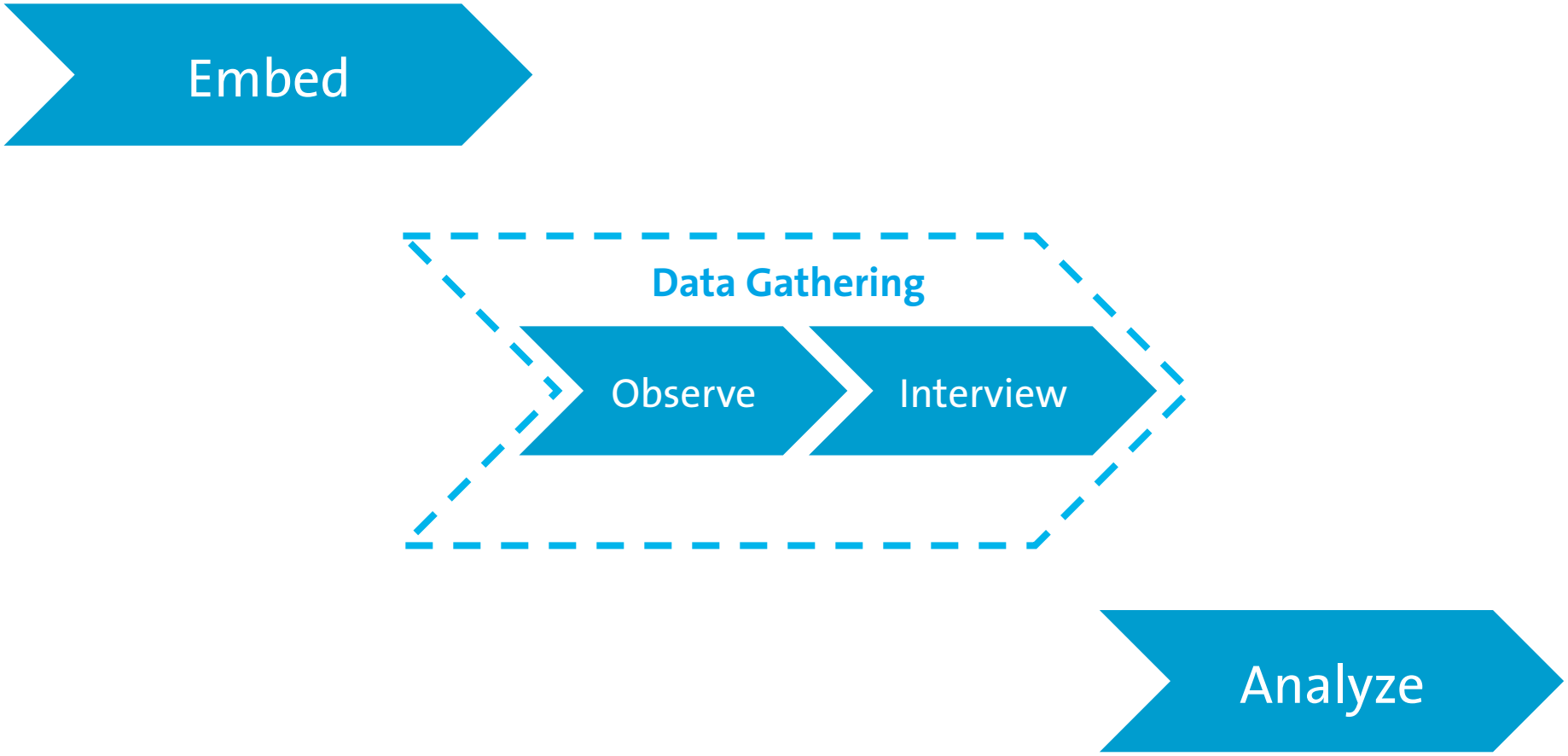
... corresponds to the intuition of the measurer

(Fenton et. al, *Software Metrics: A Rigorous and Practical Approach*, 1998)

... is actively used in a decision making process

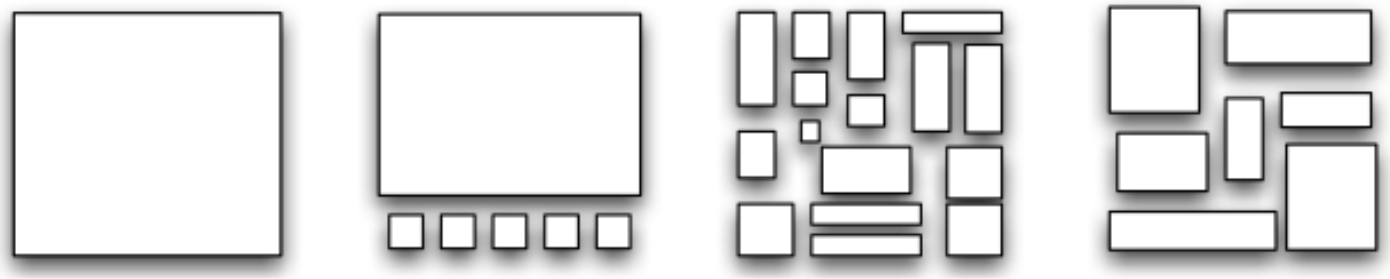
(Gopal et. al, *The impact of institutional forces on software metrics programs*, 2005)

A four step evaluation process



Context:
Evaluating Implemented Architectures

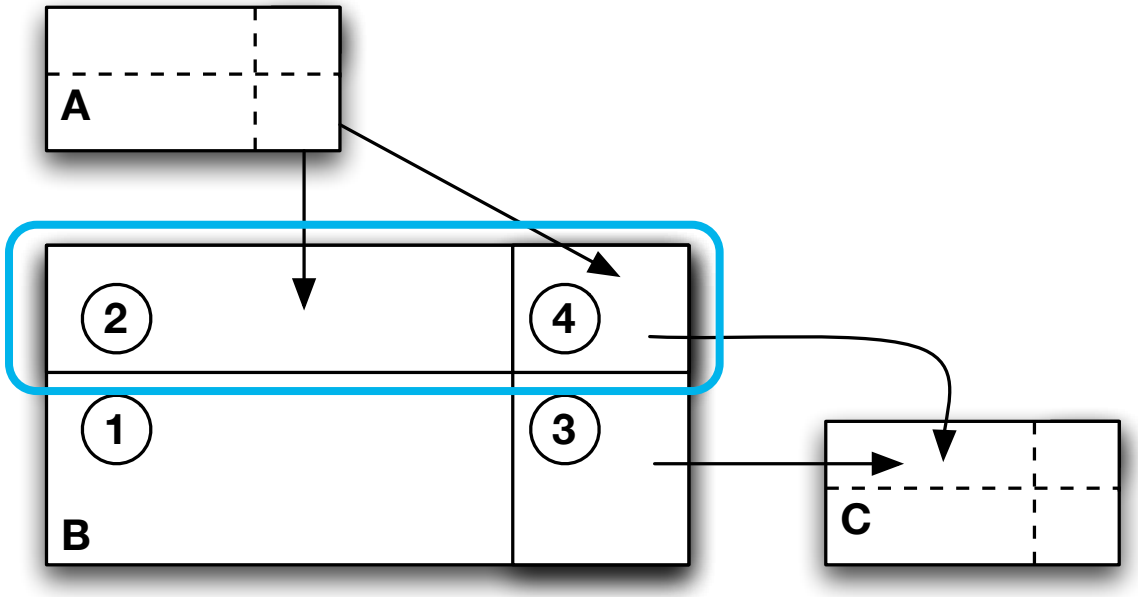
Subject metrics
Component Balance



0.0 **0.2** **0.3** **0.8**

E. Bouwers, et.al. *Quantifying the Analyzability of Software Architectures*. WICSA 2011

Subject metrics
Component Independence



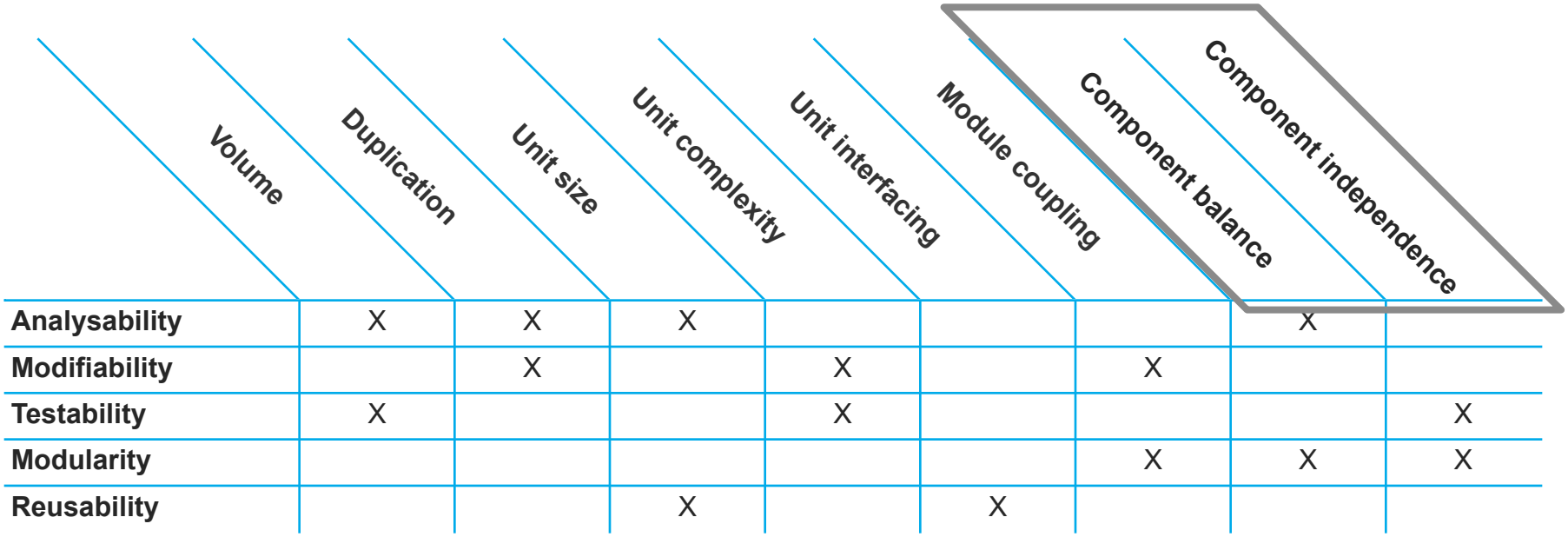
1. Internal code
2. Incoming code
3. Outbound code
4. Transit code

Less = better

E. Bouwers, et.al. *Dependency profiles for software architecture evaluations.* ICSM 2011

Embedding

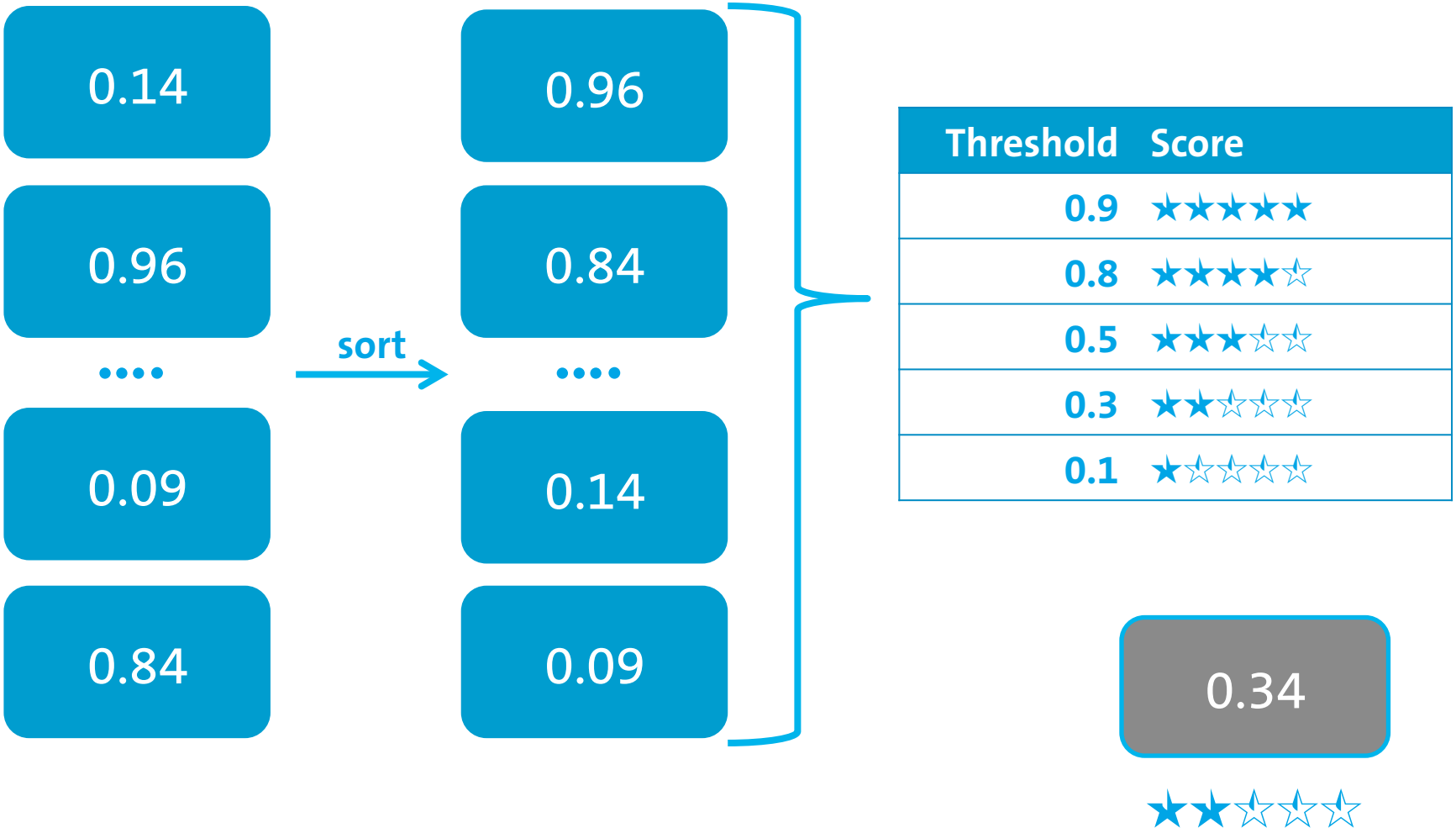
The software measurement model



	Volume	Duplication	Unit size	Unit complexity	Unit interfacing	Module coupling	Component balance	Component independence
Analysability	X	X	X				X	
Modifiability		X		X		X		
Testability	X			X				X
Modularity						X	X	X
Reusability			X		X			

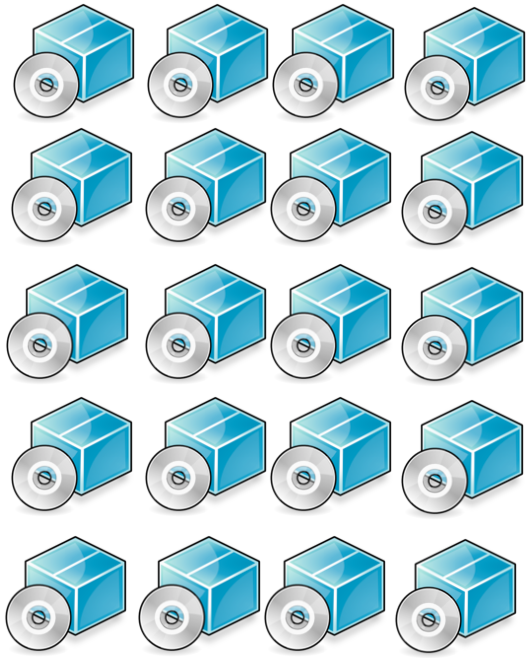
Embedding

A bechmark based approach



Note: example thresholds

Embedding
Who, what, how?



http://www.freeiconsweb.com/

Data gathering
Memos and interviews

49 memo's

17 different consultants

11 different customers/suppliers

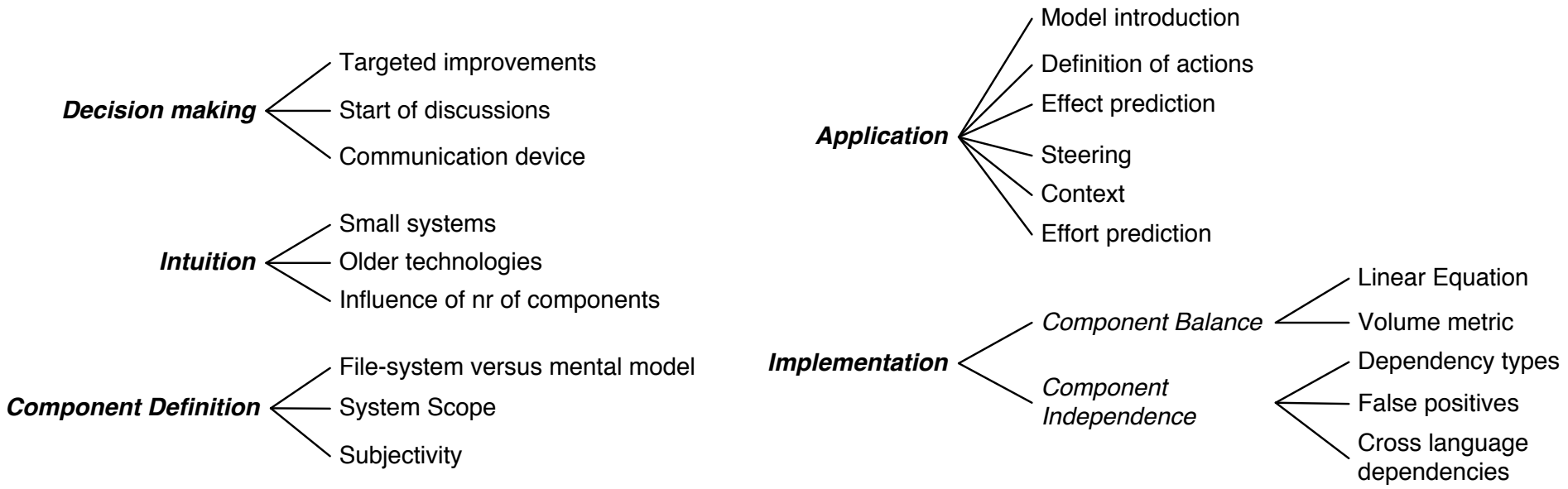
30 minutes interviews with 11 consultants

Open discussion: 'How do you use ....'

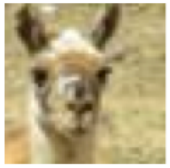
Closed questions (1-5 scale):

- **How useful do you find the metric?**
- **Does it make your job easier?**

Overall results from observations



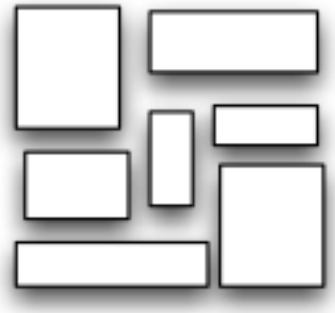
Specific results
Decision making



In "eating-your-own-dogfood-news", the new component independence metric helped us find a remnant of old design in the that was subsequently refactored, resulting in a +0.1 maintainability and a +0.85 component independence

Specific results

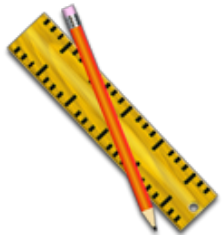
Communication device



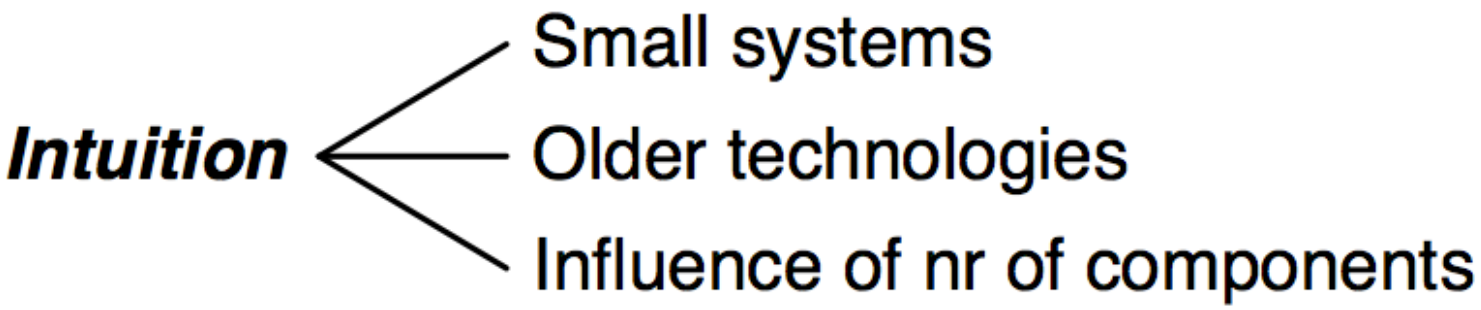
File-system

Mental model

Measurement

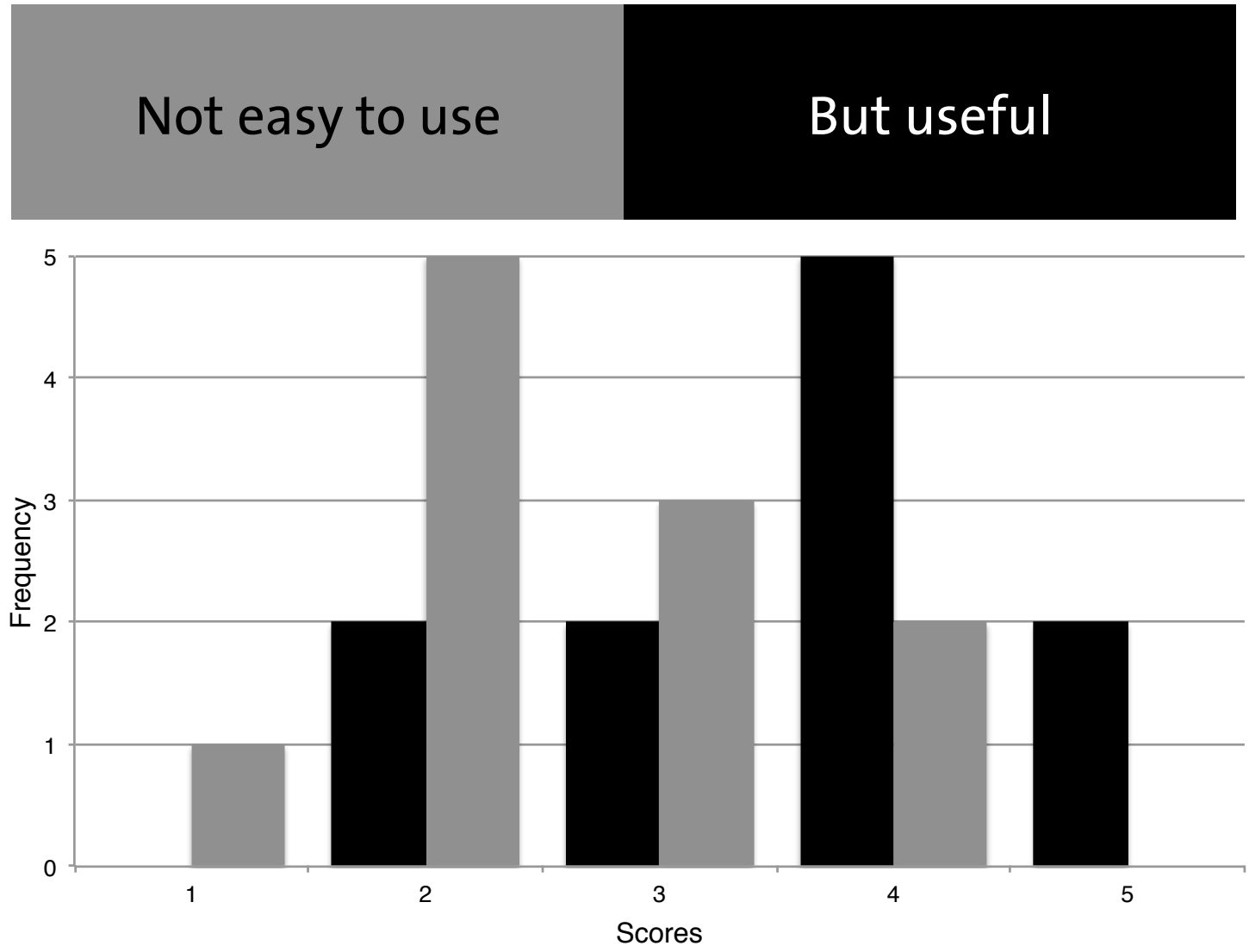


Specific results

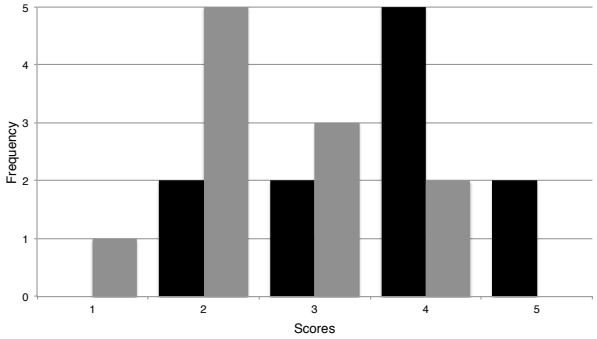


Interviews

Results of talking to 11 experts

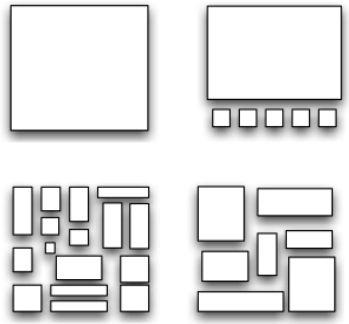


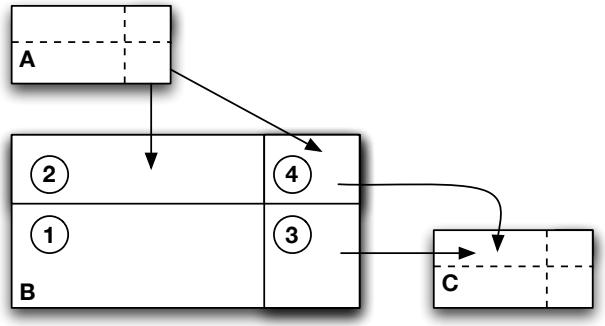
Analyze



Intuition
- Small systems
- Older technologies
- Influence of nr of components

So are the metrics useful?





In the context of evaluating implemented architectures?
YES!

Is this evaluation useful?

For industry?
YES!

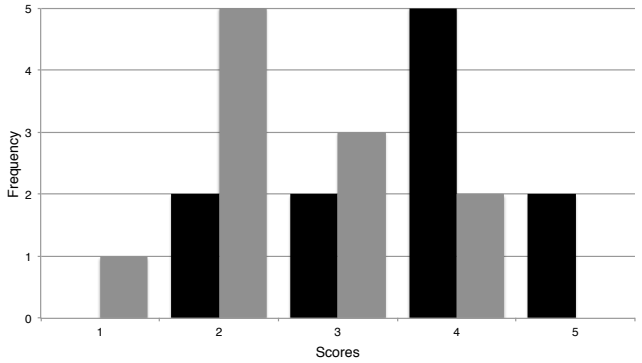
For academia?
YES!

To summarize

	Volume	Duplication	Unit size	Unit complexity	Unit interfacing	Module coupling	Component balance	Component independence
Analysability	X	X	X				X	
Modifiability		X		X		X		
Testability	X			X				X
Modularity						X	X	X
Reusability			X		X			

- ***Decision making***
  - Targeted improvements
  - Start of discussions
  - Communication device
- ***Intuition***
  - Small systems
  - Older technologies
  - Influence of nr of components
- ***Component Definition***
  - File-system versus mental model
  - System Scope
  - Subjectivity

- ***Application***
  - Model introduction
  - Definition of actions
  - Effect prediction
  - Steering
  - Context
  - Effort prediction
- ***Implementation***
  - *Component Balance*
    - Linear Equation
    - Volume metric
  - *Component Independence*
    - Dependency types
    - False positives
    - Cross language dependencies



Usefulness