PORTABILITY OF PROCESS-AWARE AND SERVICE-ORIENTED SOFTWARE

EVIDENCE AND METRICS

KARLSTADS UNIVERSITET
COMPUTER SCIENCE
DATAVETENSKAP

AFFILIATION – THEN

Distributed Systems Group

University of Bamberg, Germany

Prof. Dr. Guido Wirtz

Simon Harrer

Matthias Geiger

Stefan Kolb

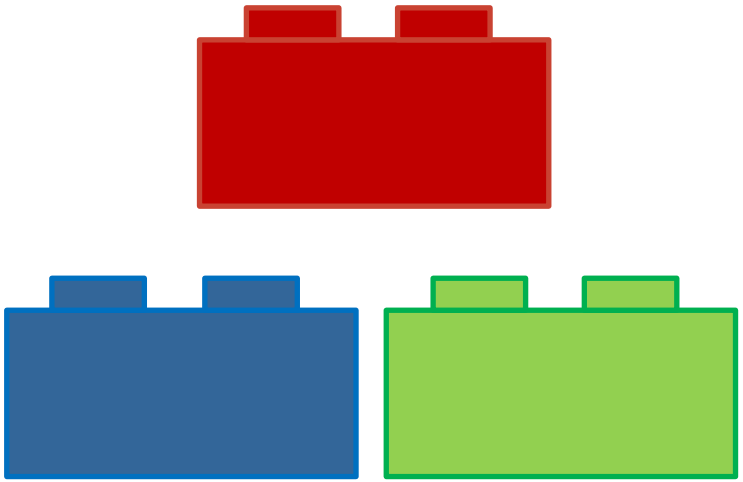
AFFILIATION – NOW

University of Karlstad, Sweden

Software Engineering Research Group

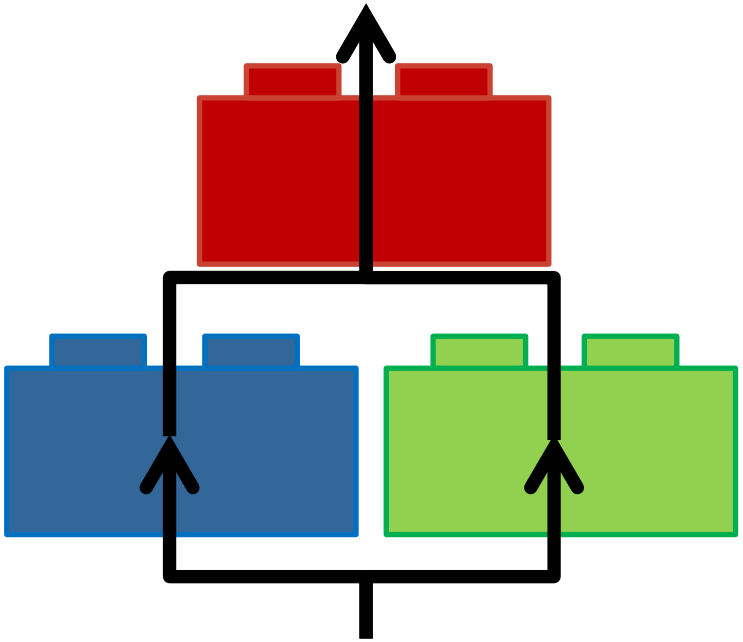
SERVICE-ORIENTATION

Uniform Interfaces
Technological Neutrality
Loose Coupling
Location Transparency



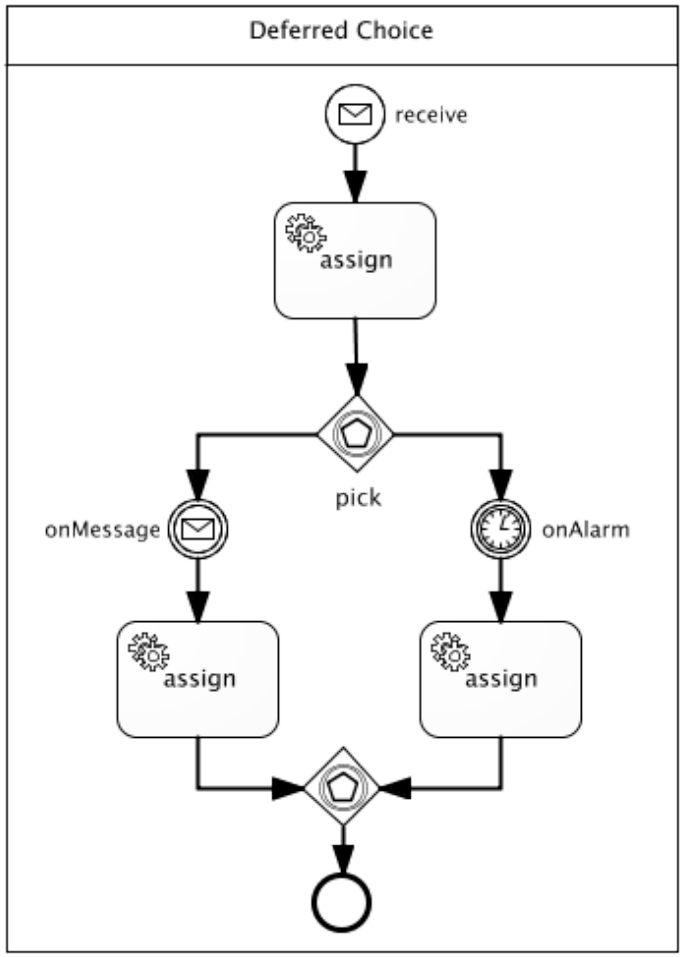
PROCESS-AWARENESS

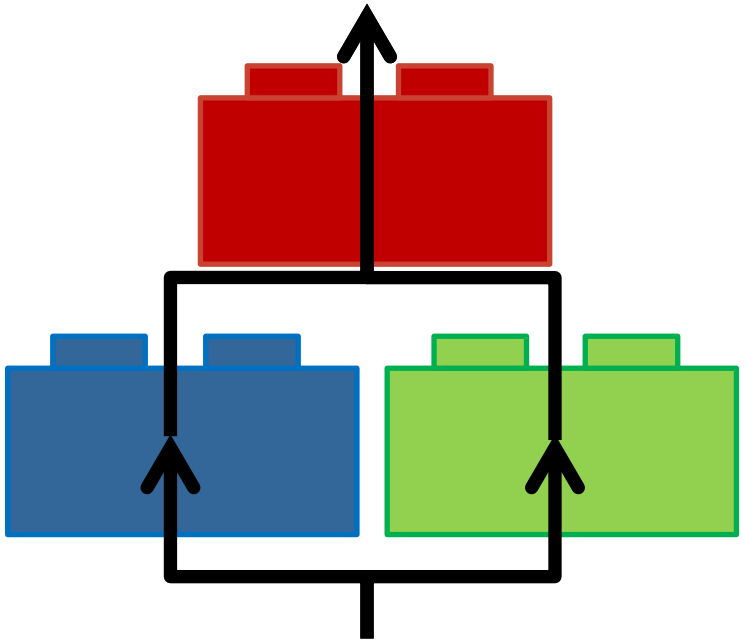
Service composition through process models



Explicit representations
Easier communication with stakeholders

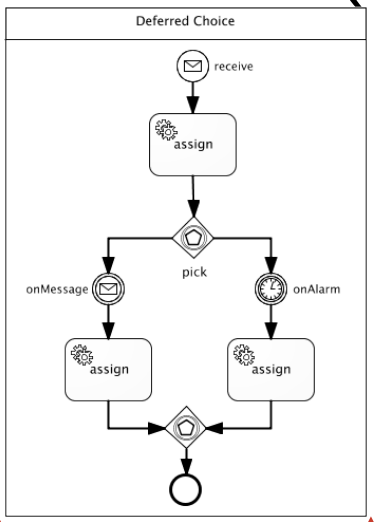
LANGUAGES FOR PROCESS-AWARENES



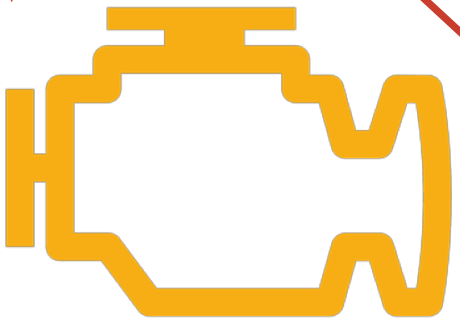


PROCESS MODELS AND ENGINES

Process Model (Software)



Execution



Engine (Middleware)

Protection from Vendor Lock-In
Scaling
Quality
Interfaces
Portability
Evolution
Maintainability
Standardization
Cloud Platforms
Performance Improvements

PROCESS LANGUAGES AND STANDARDS

- BPMN 2.0
- BPEL 2.0
- XPDL 2.2
- TOSCA 1.0

*"**One of the main goals** of this specification is to provide an interchange format … to **enable portability of process diagrams**"* – p. 9

PROCESS LANGUAGES AND STANDARDS

- BPMN 2.0
- BPEL 2.0
- XPDL 2.2
- TOSCA 1.0

"... the language effectively defines a portable execution format for business processes …" – p. 7

PROCESS LANGUAGES AND STANDARDS

BPMN 2.0

BPEL 2.0

XPDL 2.2

TOSCA 1.0

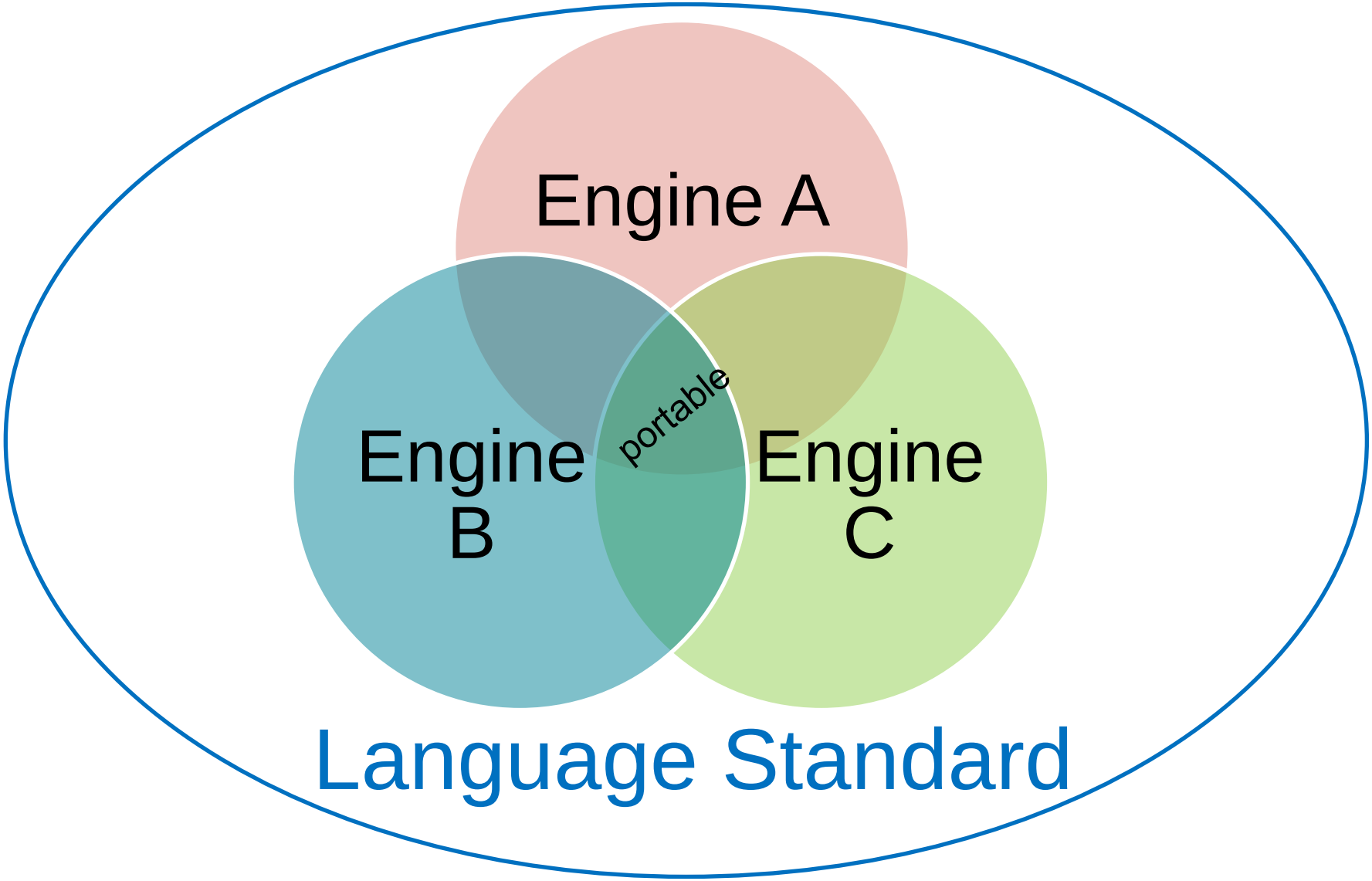
"... One goal of XPDL is to promote portability of abstract activity flow models between tools …" – p. 42

PROCESS LANGUAGES AND STANDARDS

- BPMN 2.0
- BPEL 2.0
- XPDL 2.2
- TOSCA 1.0

"… the specification relies on existing languages like BPMN or BPEL. Relying on existing standards in this space facilitates portability … " – p. 12

PORTABILITY IS BASED ON STANDARDS



RESEARCH TARGETS

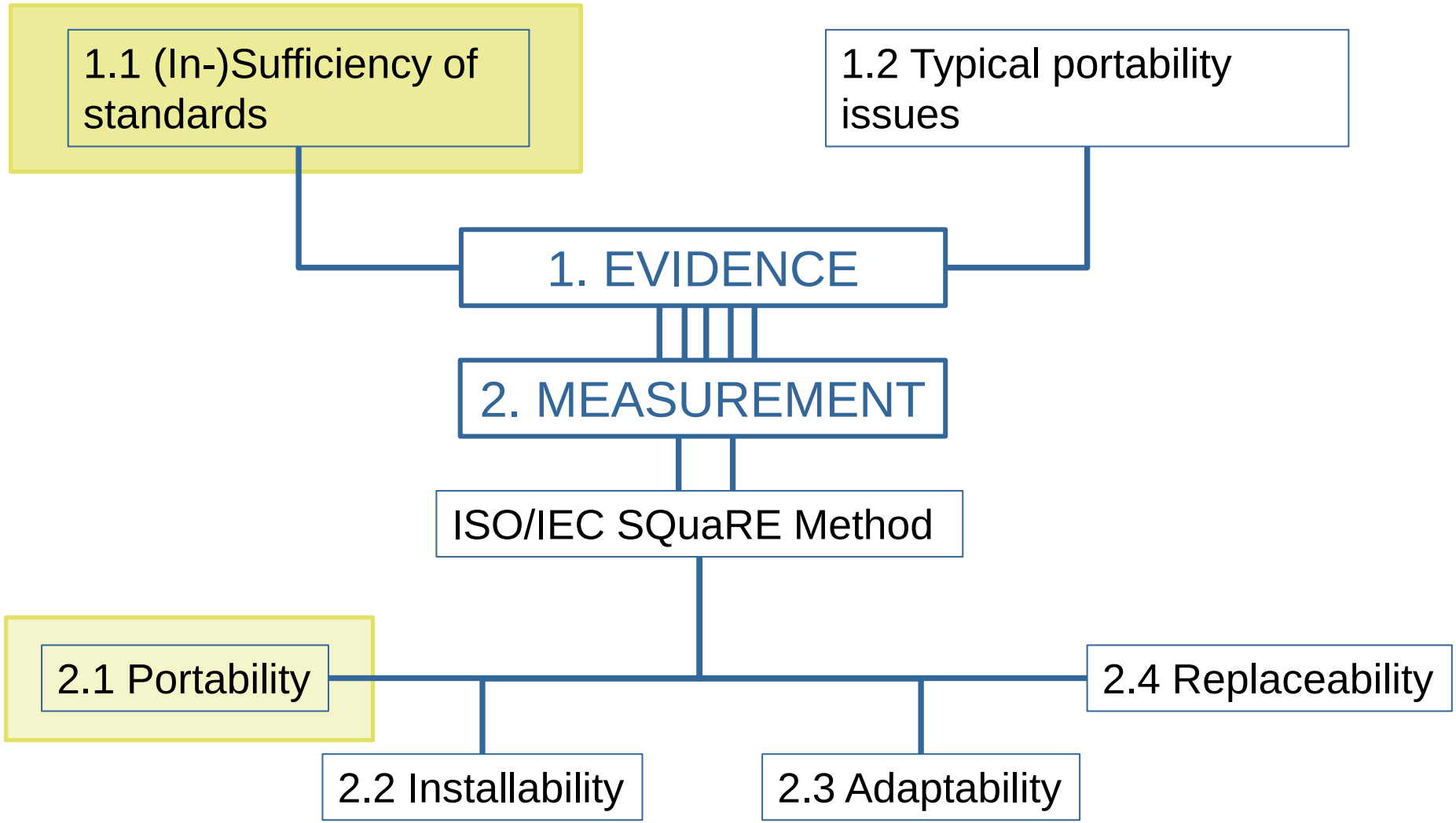
1. EVIDENCE

Investigation of standards-based portability

2. MEASUREMENT

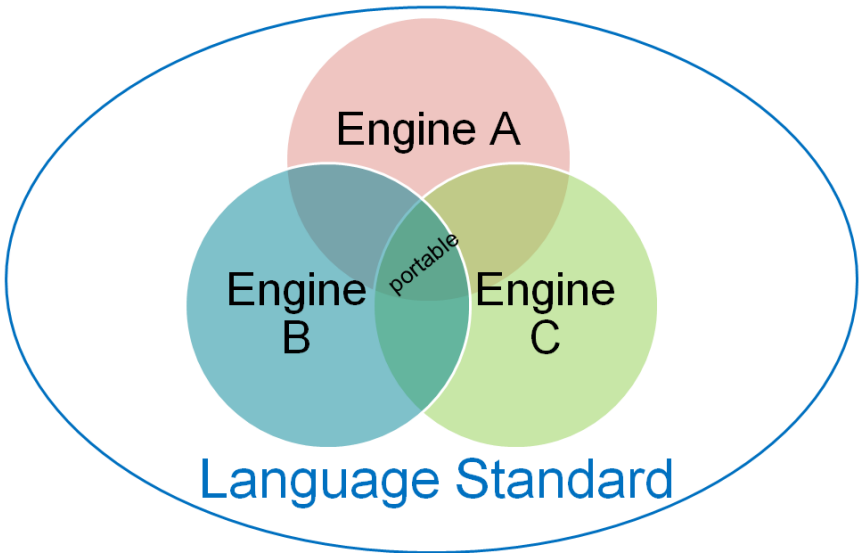
Development of a measurement framework for assessing portability

RESEARCH GOALS



EVALUATION OF STANDARD CONFORMANCE

Engine-independent test cases



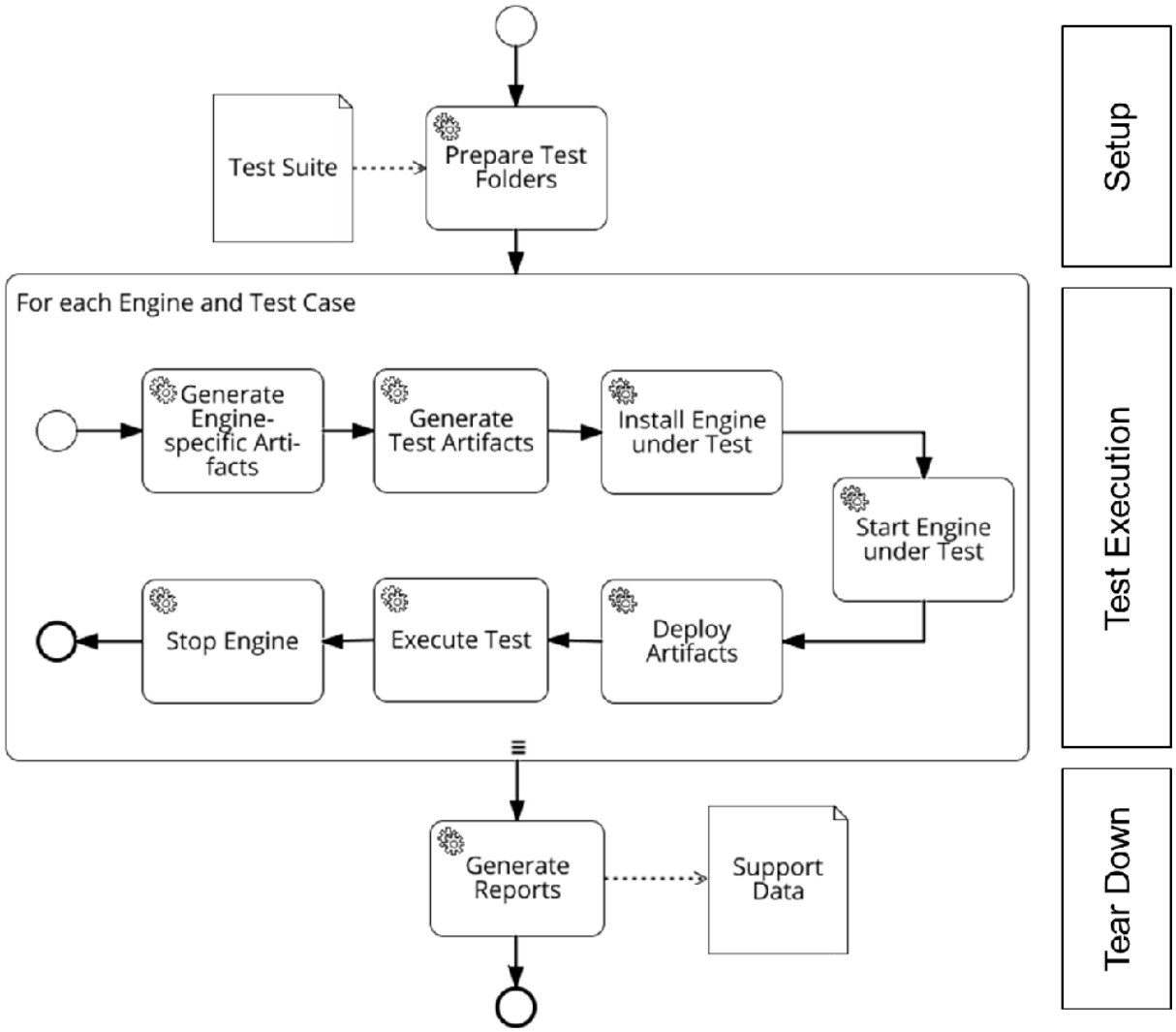
Engines

Comprehensive overview of standard conformance

TEST CASES AND ENGINES

Language Standards	Test Suites	Engines
BPEL 2.0	Conformance: 129 Tests	Apache ODE
		bpel-g
	CF-Pattern: 21 Tests	OpenESB
		Orchestra
		Petals ESB
		Commercial 1
		Commercial 2
		Commercial 3
BPMN 2.0	Conformance: 70 Tests	jBPM
		Activiti
		camunda BPM

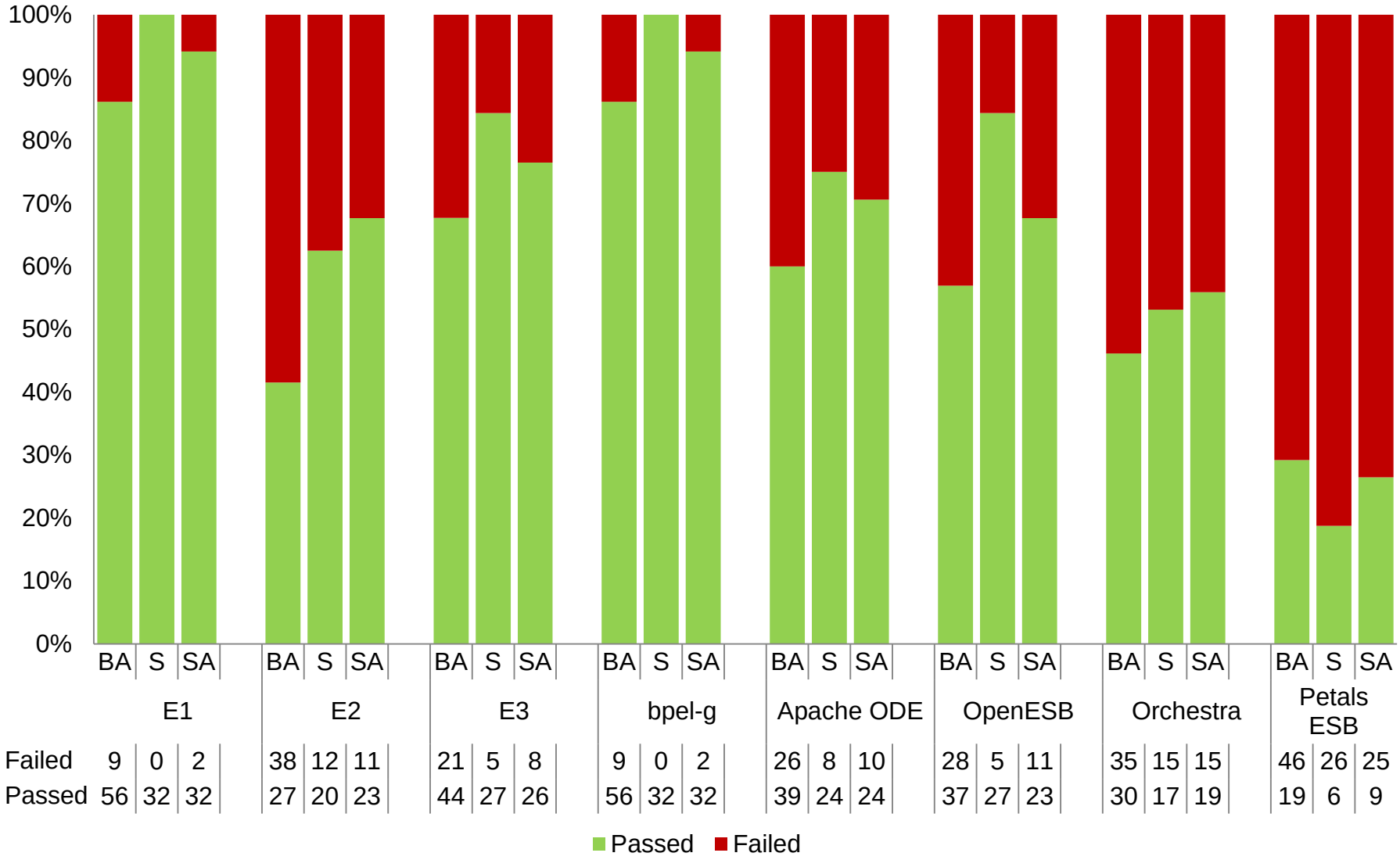
TEST AUTOMATIZATION WITH BETSY



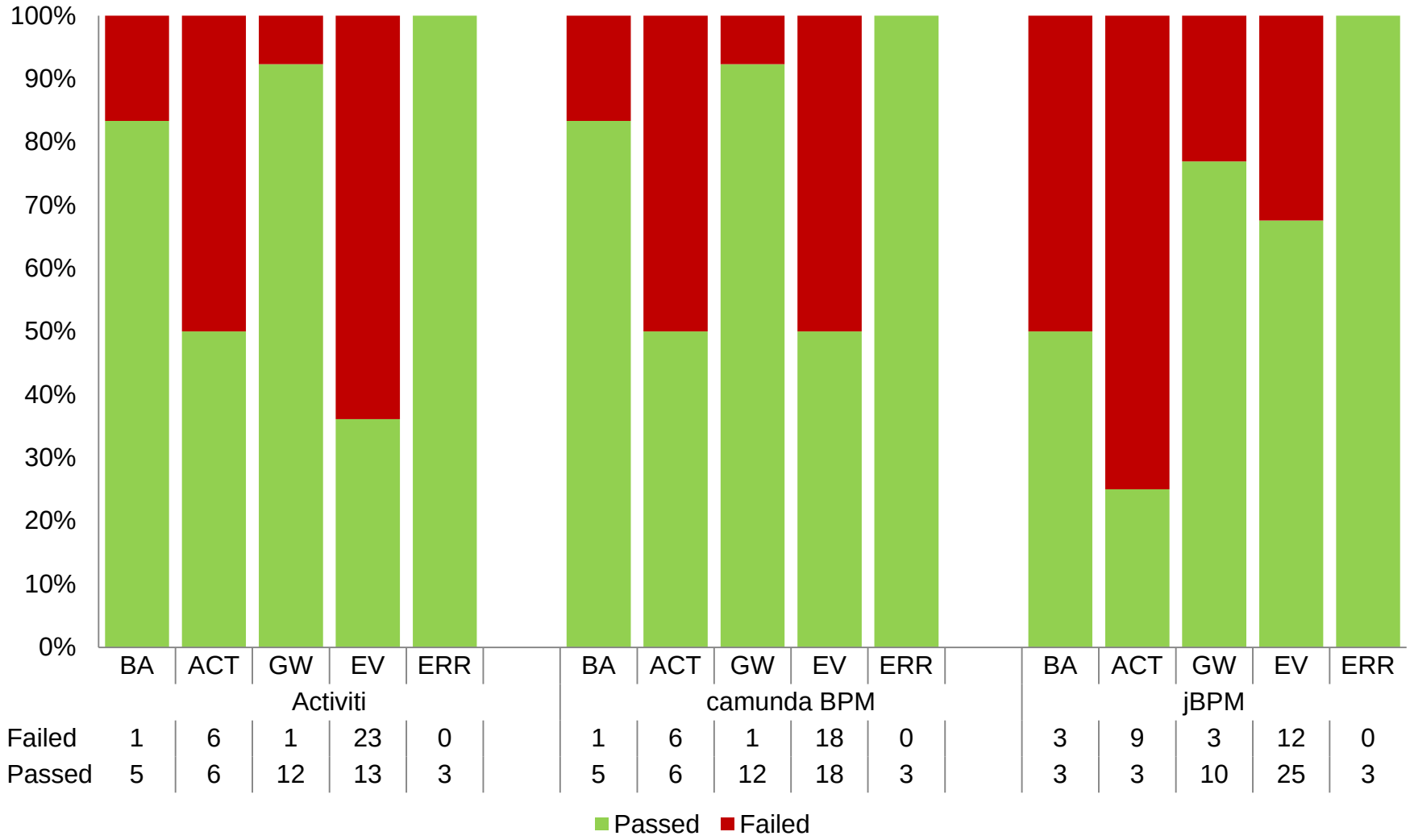
Benchmarking-system *betsy*:

- Fully automated
- Reproducible
- Open Source and freely available

BPEL 2.0 – STATE OF IMPLEMENTATION

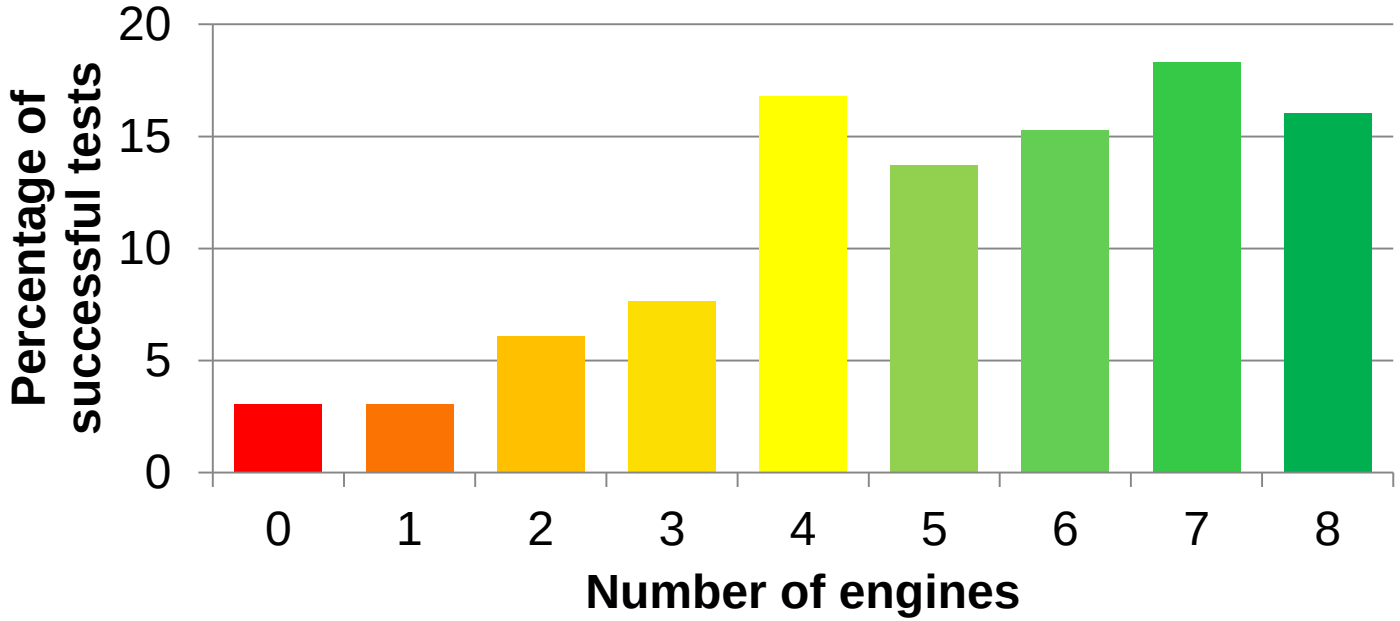


BPMN 2.0 – STATE OF IMPLEMENTATION

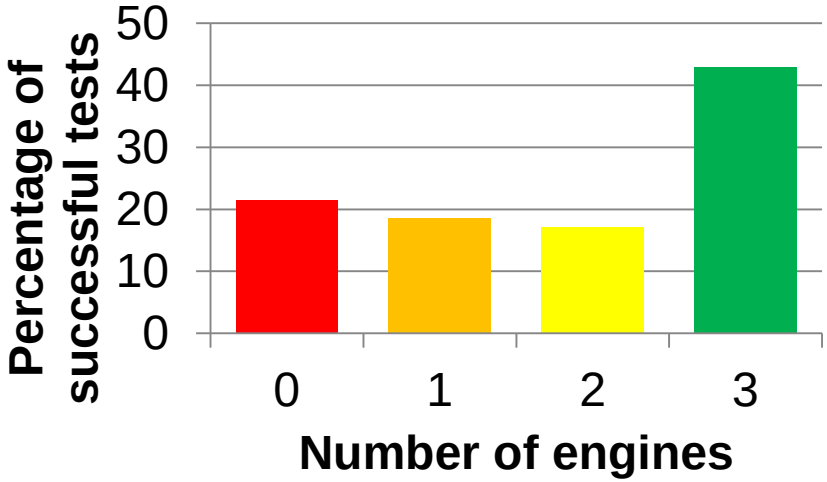


FEATURE INTERSECTION

BPEL

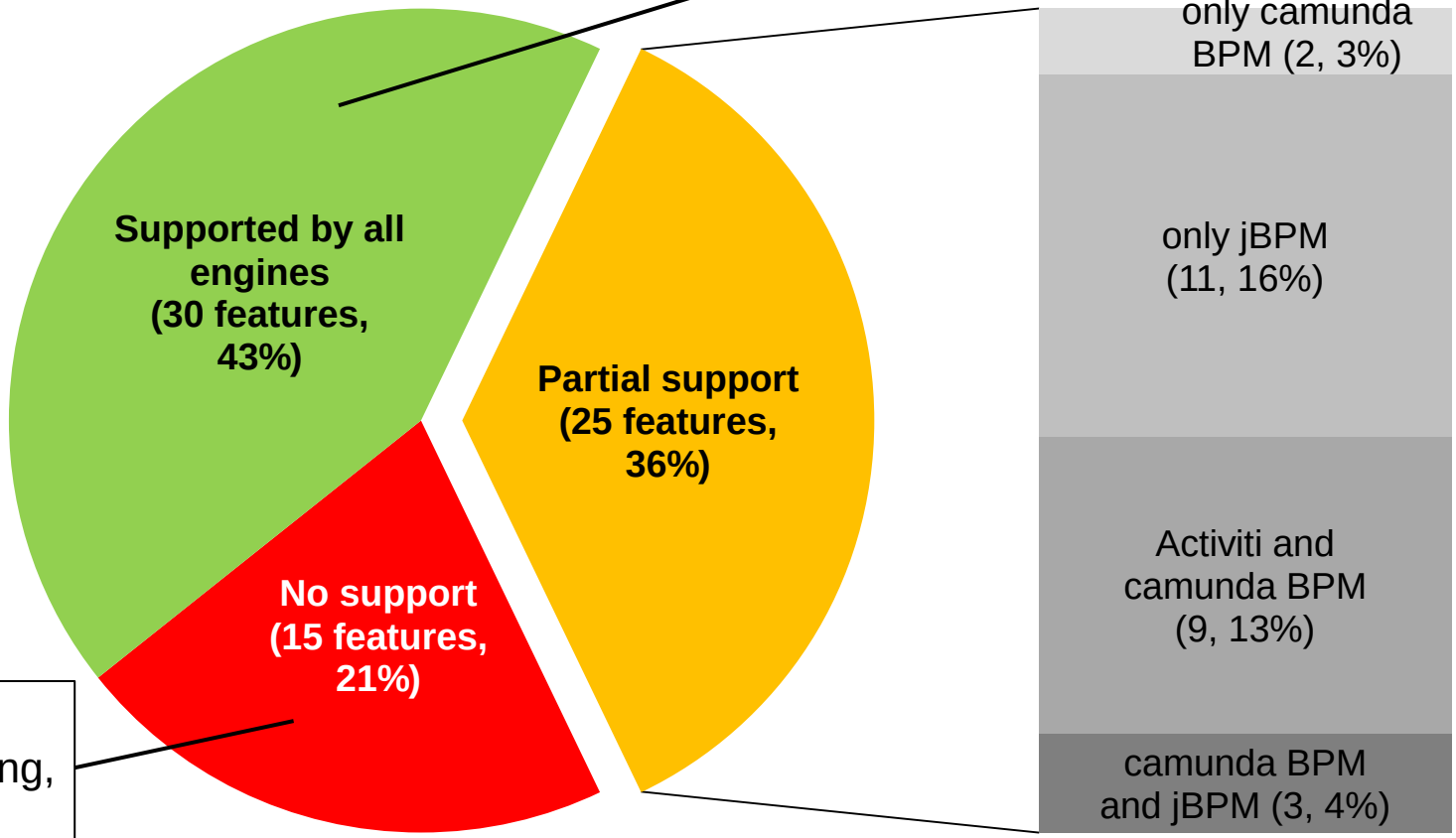


BPMN



BPMN 2.0 – SHARED LANGUAGE CONSTRUCTS

unconditional SequenceFlows, none StartEvents, none EndEvents, ScriptTasks, SubProcesses, Transactions, Lanes, Participants, ErrorEvents, TerminateEvents, EventBasedGateways, ParallelGateways



Parallelism, standard looping, various events

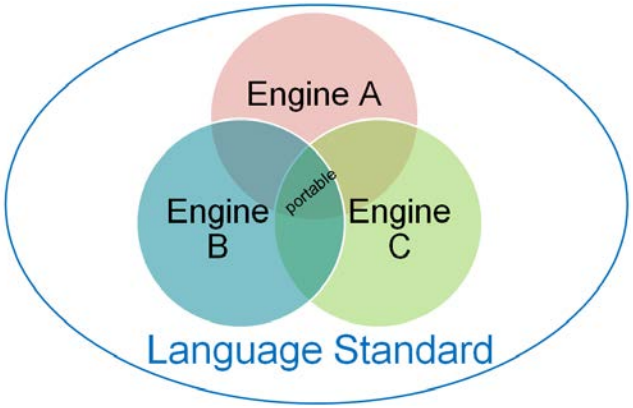
EVIDENCE FOR PORTABILITY ISSUES

1.1 (In-)Sufficiency of standards

1.2 Typical portability issues

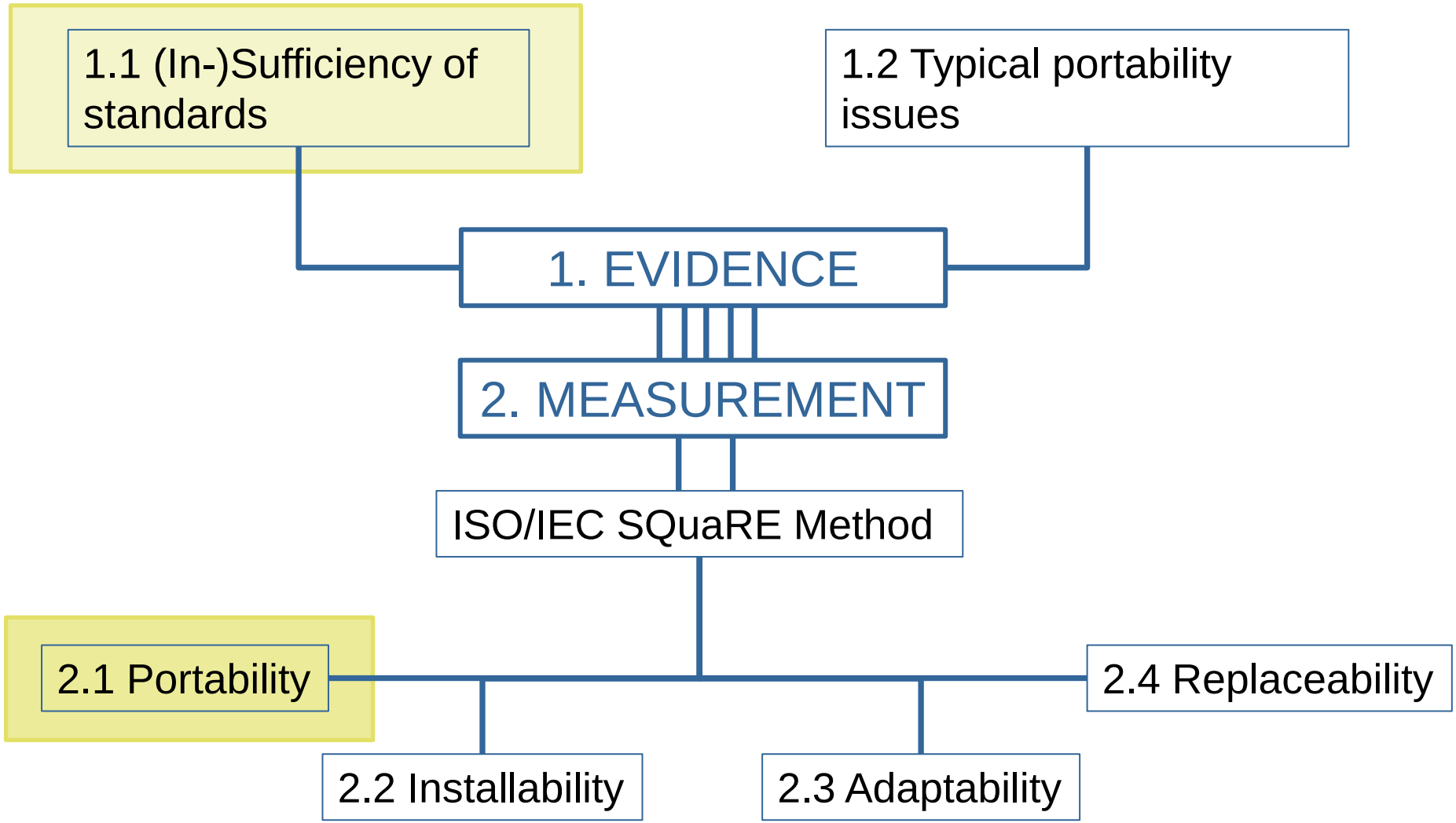
1. EVIDENCE

- Diverse state of implementation

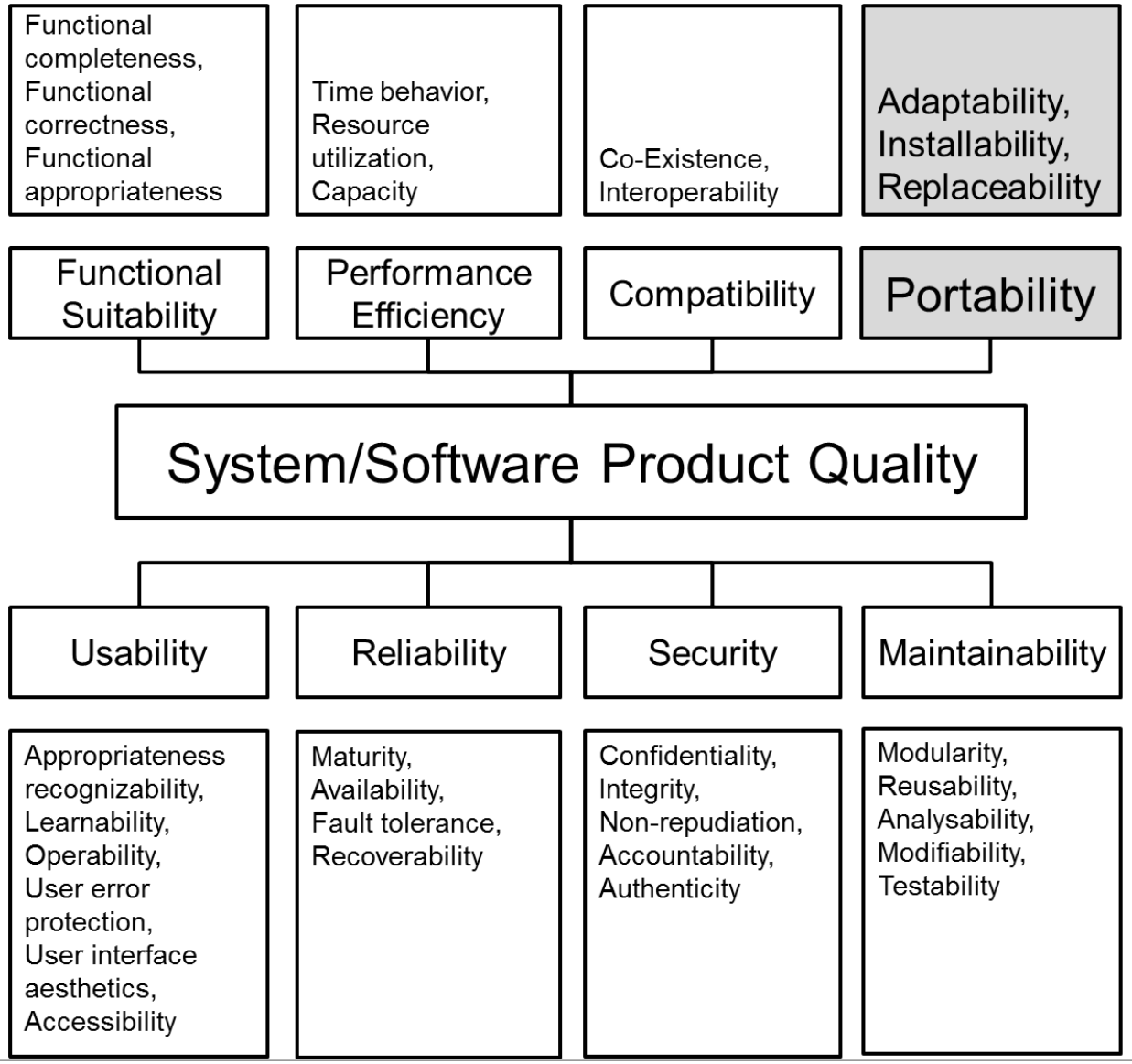


- Standardization goal not reached at the moment
- Portability difficult to achieve in this situation

RESEARCH GOALS



ISO/IEC SQUARE MODEL



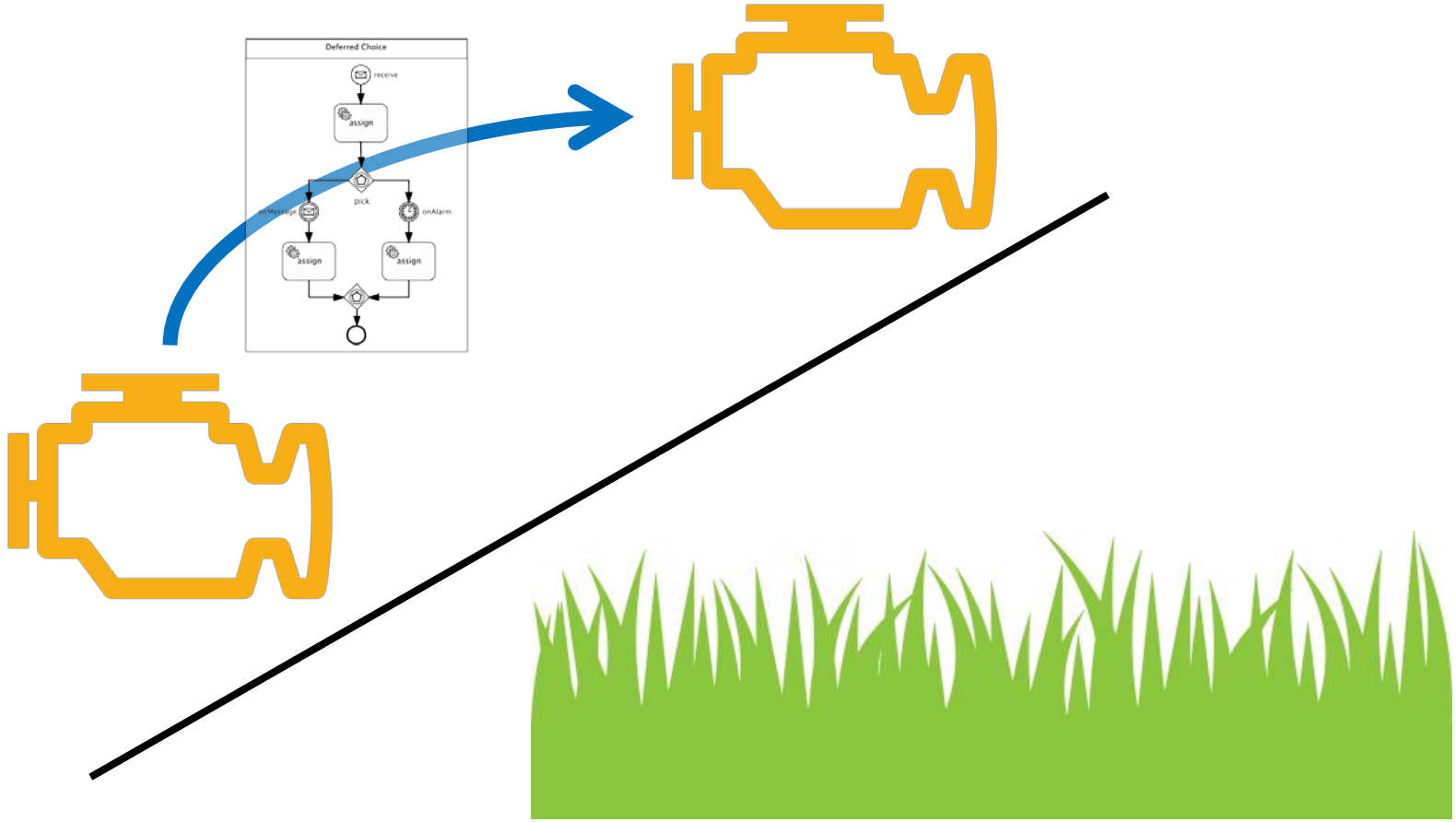
MEASUREMENT FRAMEWORK METHODOLOGY

1. Literature review
Derivation of metrics

2. Theoretical validation

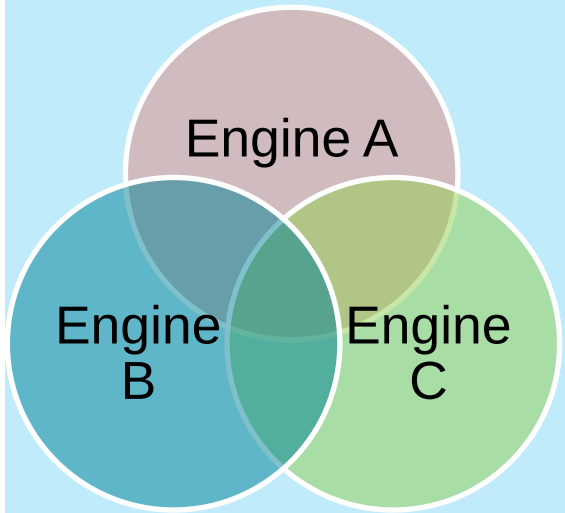
3. Practical / experimental evaluation
1. Implementation of measurement tool
2. Setting of hypotheses
3. Collection of test data
4. Statistical analysis

MEASUREMENT OF PORTABILITY



$$Portability = 1 - \frac{Effort\ of\ porting}{Effort\ of\ rewriting}$$

PORTABILITY METRICS

Weigthing	Severity			
Support in Engines	**Basic metric**	**Weighted metric**	**Control-flow**	**Communi-cation-flow**
	Classic, only LOC	Weigthed by number of engines	Limited to activities, events, gateways	Limited to constructs that define, send, or receive messages

TEST DATA FOR PORTABILITY EVALUATION

Origin	No. Models
Active Endpoints	22
Apache ODE	25
Oracle	82
Explorative search	86
Repository Crawling	1427

Validity checks:

- Syntactical correctness
- Basic requirements for executable models

SELECTED HYPOTHESES

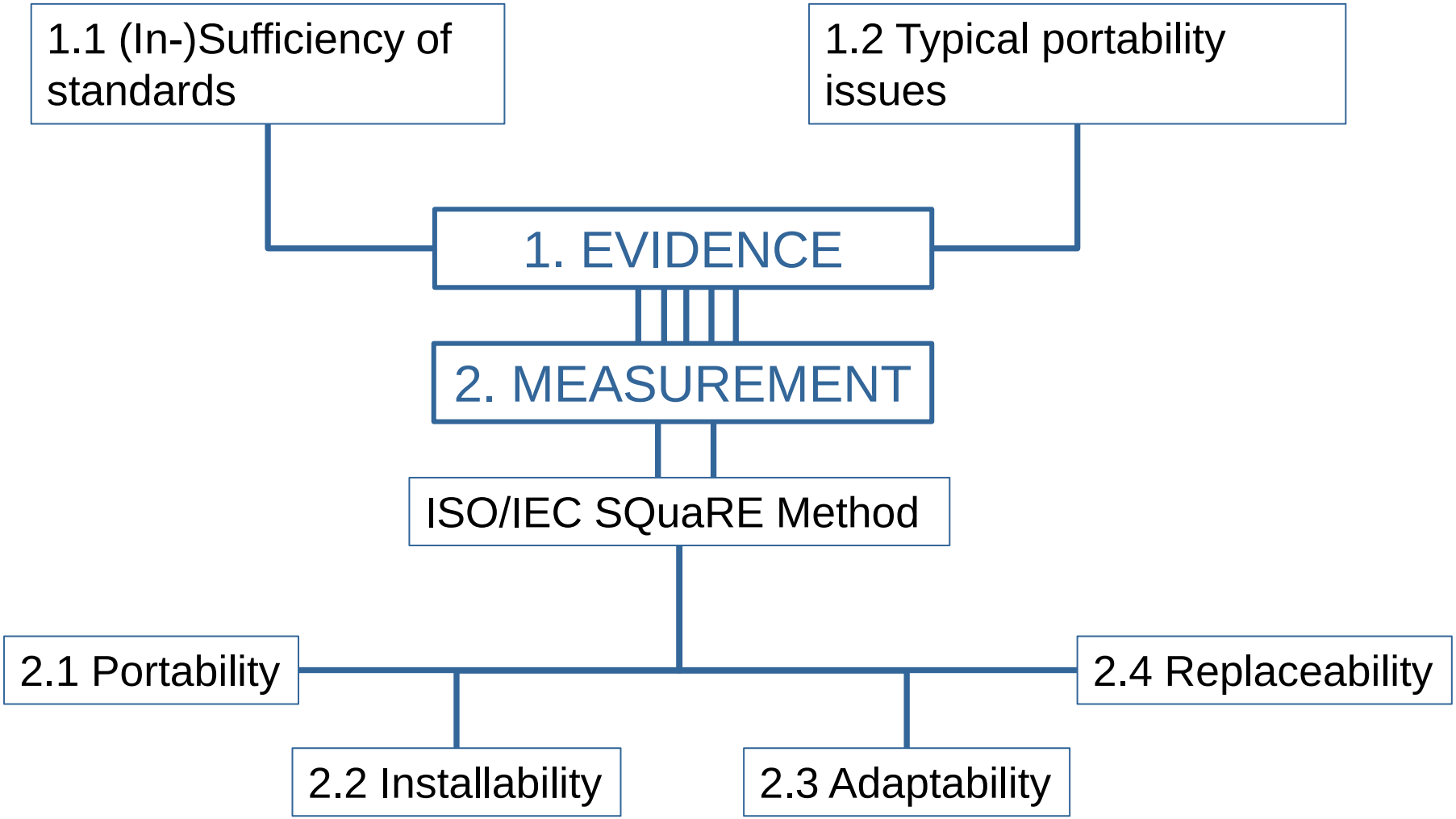
Library (selected)	Basic	Weighted	Control-flow	Communication-flow
Oracle	0.72	0.87	0.68	1
Explorative search	0.84	0.99	0.59	0.53

Repeated execution of the experiment does not result in significantly different values. The measurement framework is stable

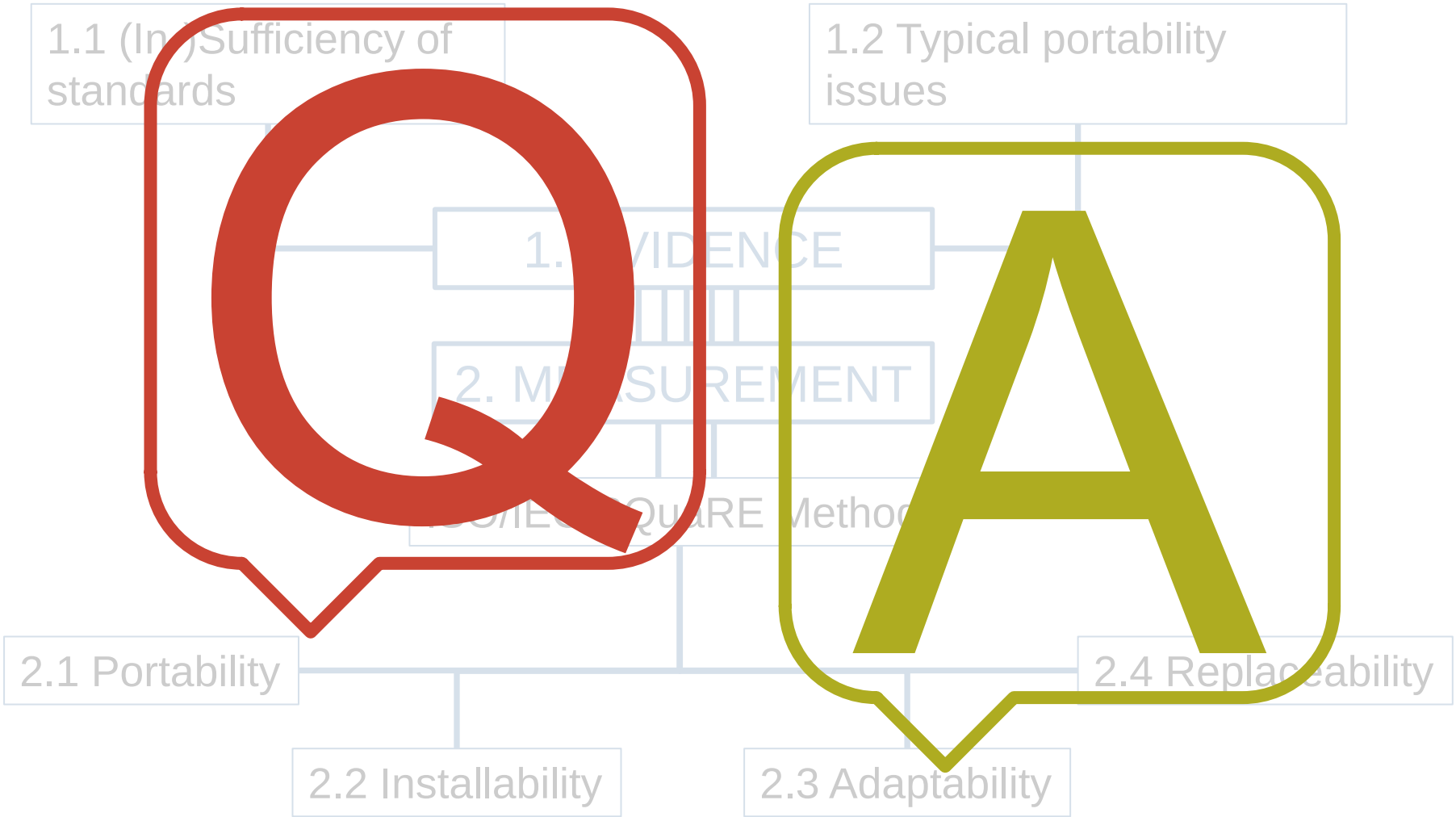
Metric	Discriminative power
Basic metric	0.23
Weighted metric	0.32

A weighting by engines increases discriminative power

SUMMARY


1.1 (In-)Sufficiency of standards
1.2 Typical portability issues
1. EVIDENCE
2. MEASUREMENT
ISO/IEC SQuaRE Method
2.1 Portability
2.2 Installability
2.3 Adaptability
2.4 Replaceability

SUMMARY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Q
A