

The Correspondence between Software Quality Models and Technical Debt Estimation Approaches

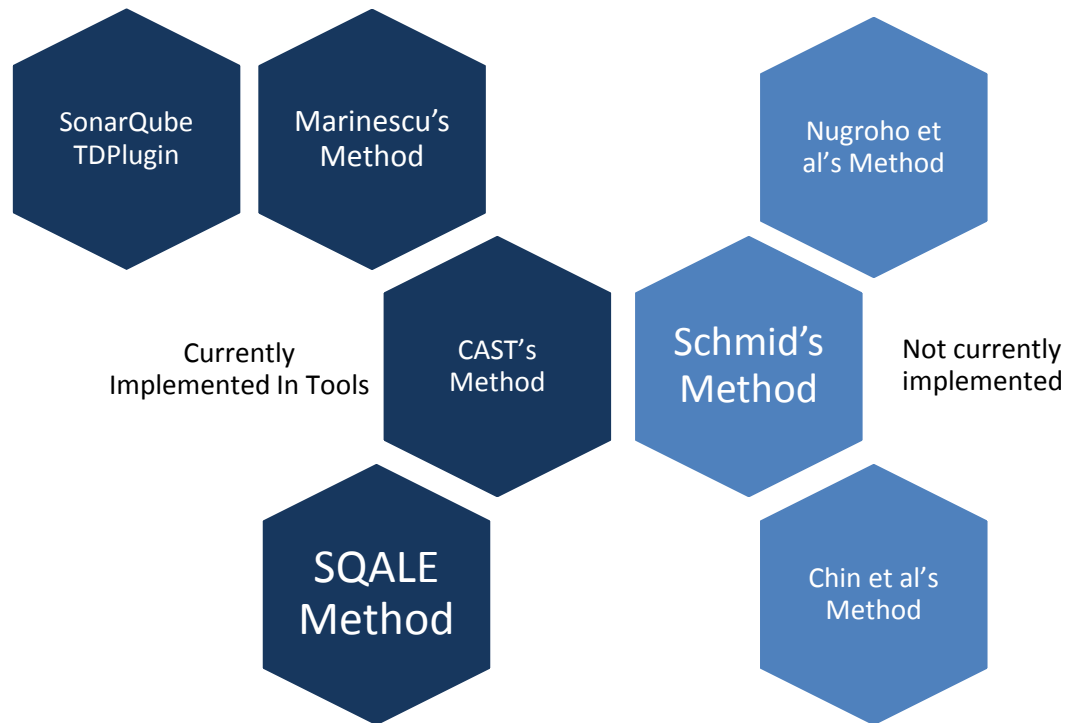
MTD 2014 - Victoria

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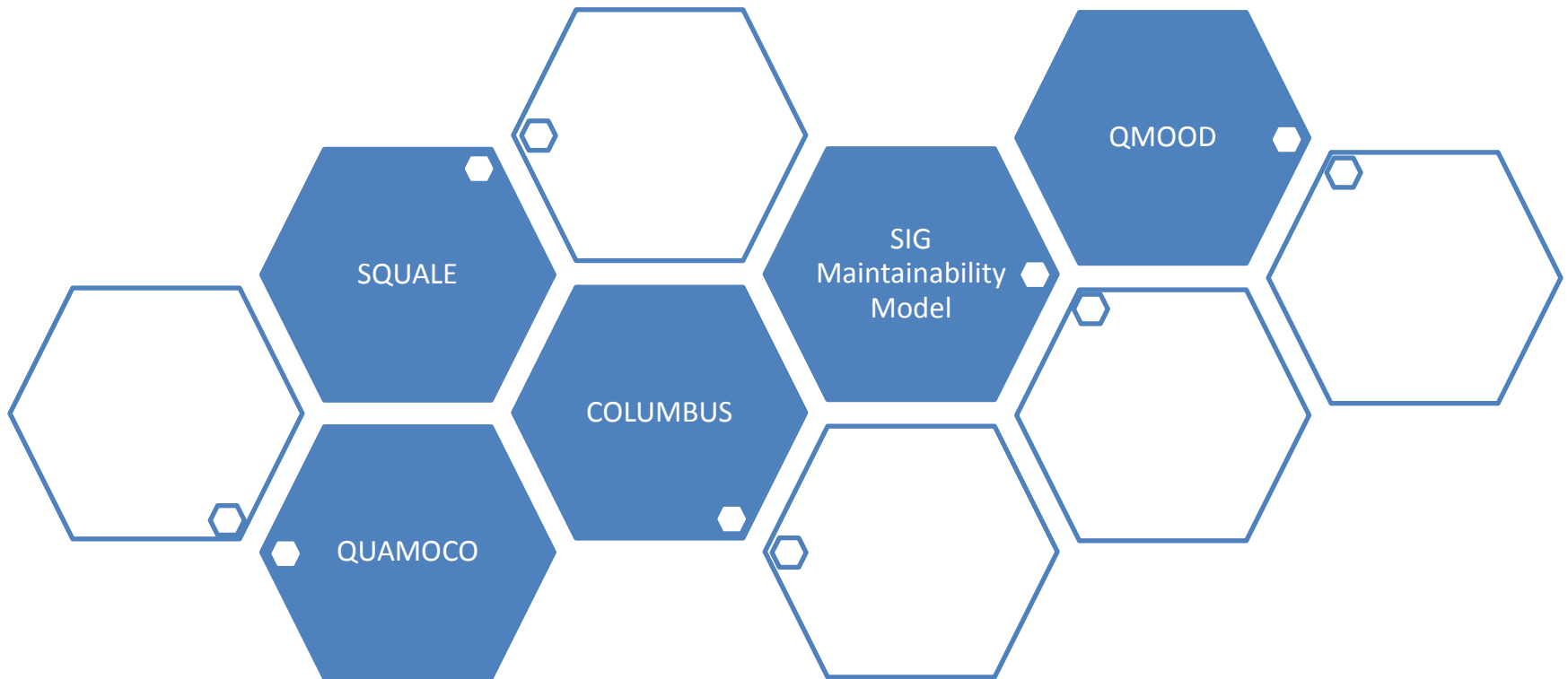


Technical Debt Estimation Approaches



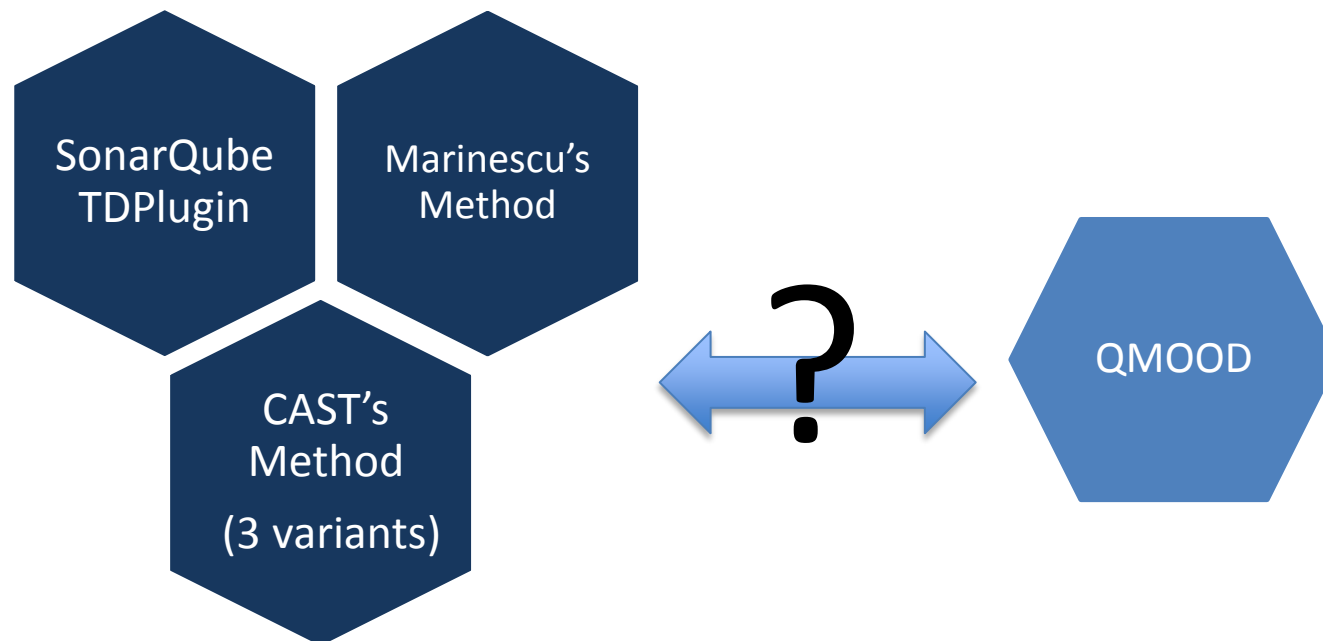
How do each of these methods represent the relationship between Quality and Technical Debt?

Quality Models



Technical Debt and Quality

- We selected those methods we considered most widely available or accessible



- and a quality model which we were sure none of the methods employed

Research Questions

1.1 What is the strength of the relationship between technical debt estimates and quality attributes?

1.2 How does the strength of each relationship compare?

$H_{1,1}$: There is a relationship between each technical debt estimate and each quality attribute

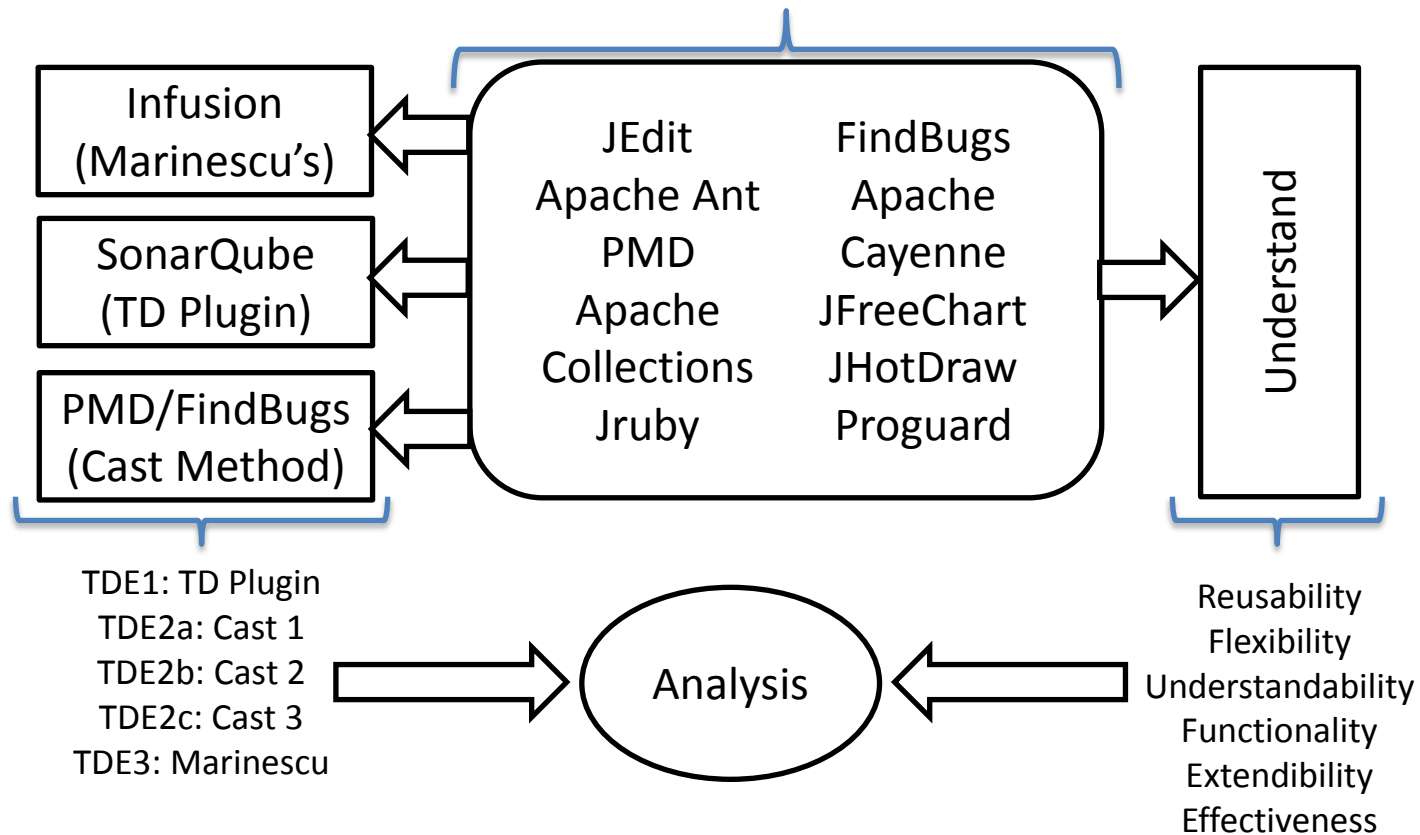
Research Questions

2.1 What is the estimated effect of a change in the technical debt estimate on each of the quality attributes?

$H_{2,1}$: There is a relationship between each technical debt estimate and each quality attribute when accounting for differences between systems

Method

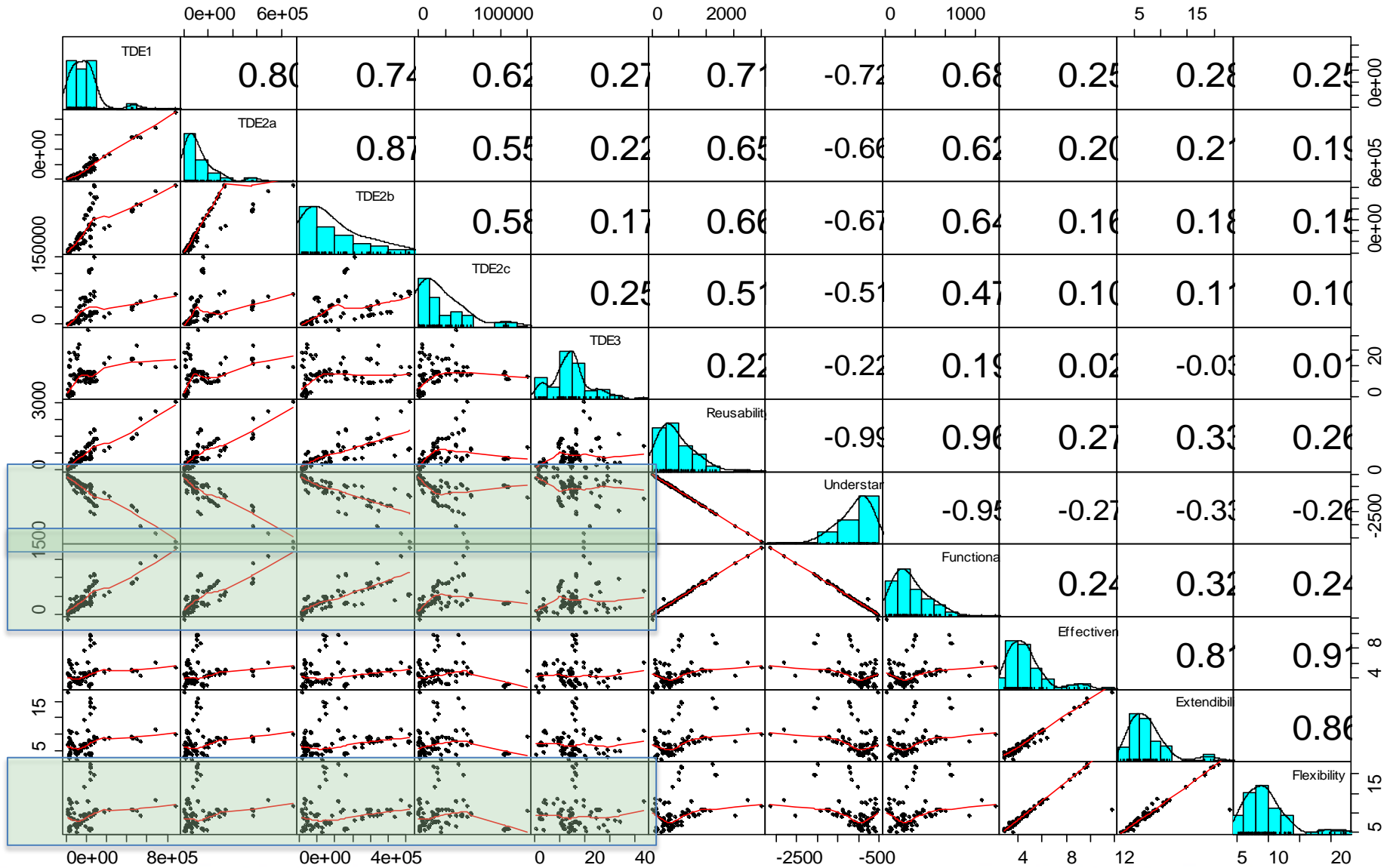
10 Systems with 10 Versions each
between 25 and 250 KLOC



Kendall's τ Correlation Analysis

Quality	Technical Debt Estimates				
	Sonar	CAST 1	CAST 2	CAST 3	Marinescu
Reusability	0.7146	0.6483	0.6636	0.5059	0.2206
Flexibility	0.2538	0.1908	0.1481	0.0955	0.012
Understandability	-0.715	-0.658	-0.673	-0.506	-0.219
Effectiveness	0.2522	0.1964	0.1554	0.0988	0.0156
Functionality	0.6846	0.6175	0.6363	0.4748	0.1948
Extendibility	0.2805	0.211	0.1805	0.1105	-0.03

Correlation Matrix



MLR Analysis

Quality	Technical Debt Estimate				
	Sonar	CAST 1	CAST 2	CAST 3	Marinescu
Reusability					
Flexibility				-1.701e-05	
Understandability					
Effectiveness				1.508546e-13	
Functionality					
Extendibility					

Threats to Validity

- Content -> QMOOD and TD Estimation Methods
- External -> Case Study
- Construct -> QMOOD

Conclusions

- Results suggest that these techniques do not represent the relationship between quality (as measured by QMOOD) and TD
- Suggests further analysis of methods should be conducted
- Suggests practitioners should consider evaluating technical debt estimation techniques against their quality measurement approach

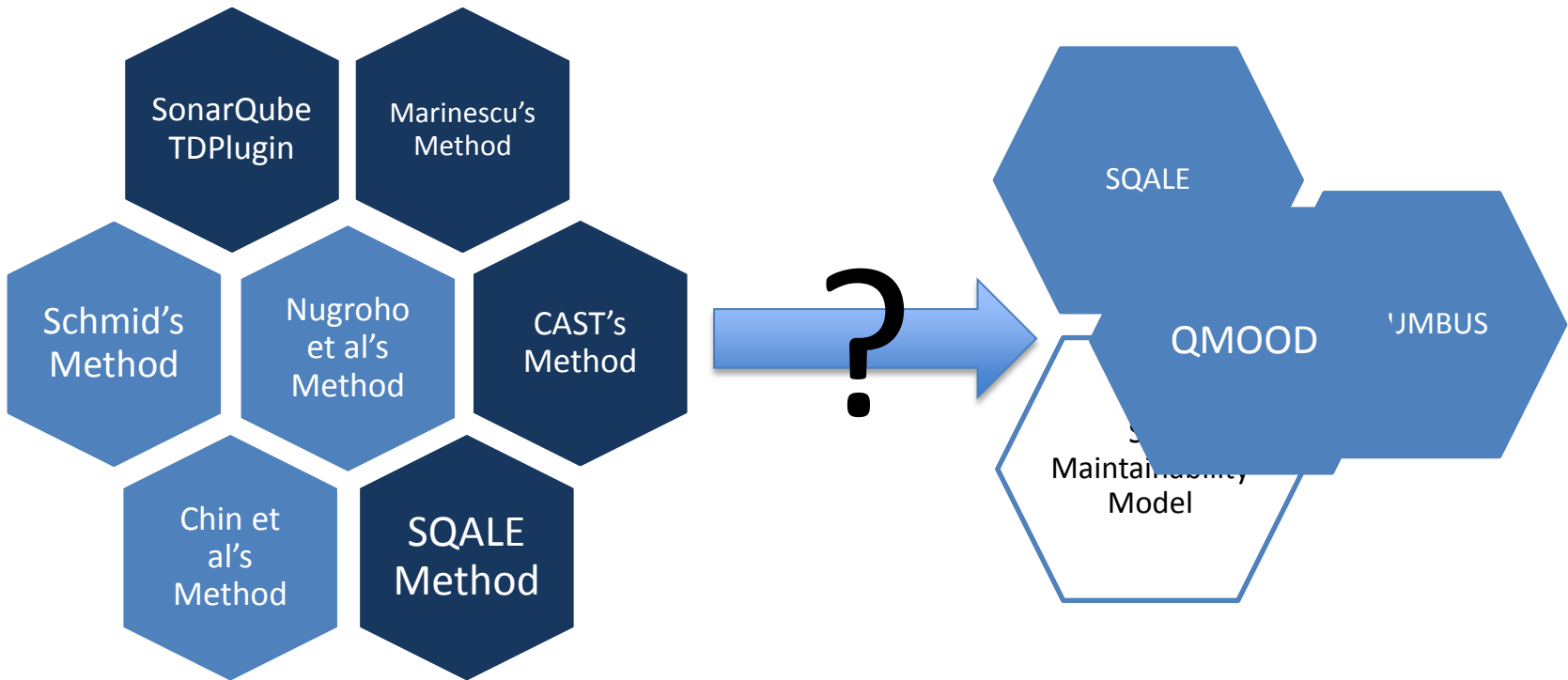
Practical Implications

- Although many tools are based on the same theoretical models, their formulaic calculations and aggregation rules are different
- Although many tools are based on ISO 9126, many are not.
- Reporting of remediation is done in different scales
- It is dangerous to use *closed* tools without understanding the underlying quality model they implement

Aspirational Goal for our Community

Can we come together and agree on a common standard for these practical models and their respective implementations?

Future Work



Thank you.

Are there any questions?