



Universiteit Leiden



Software Improvement Group



# What Is the Value of Your Software?

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# Outline



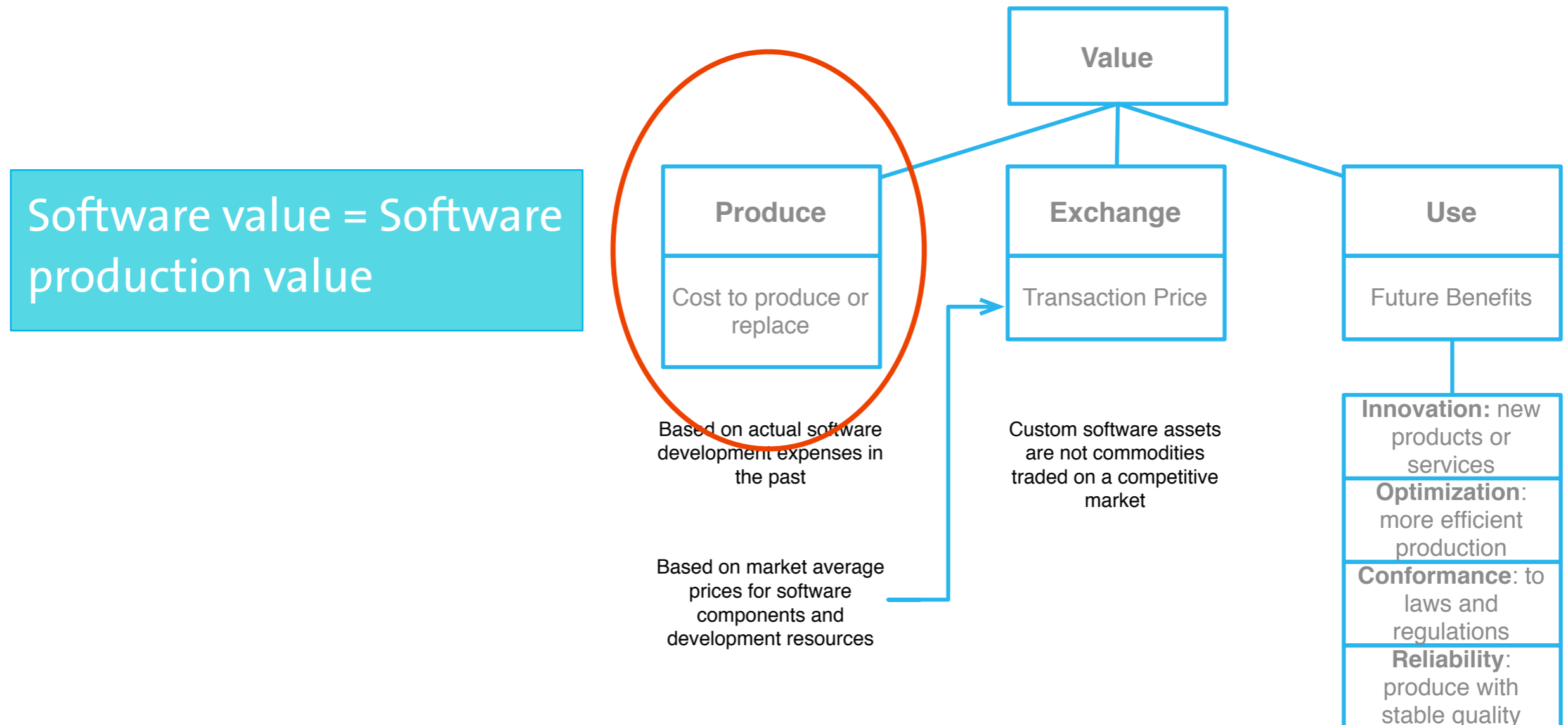
Background

Approach

Exploratory Study

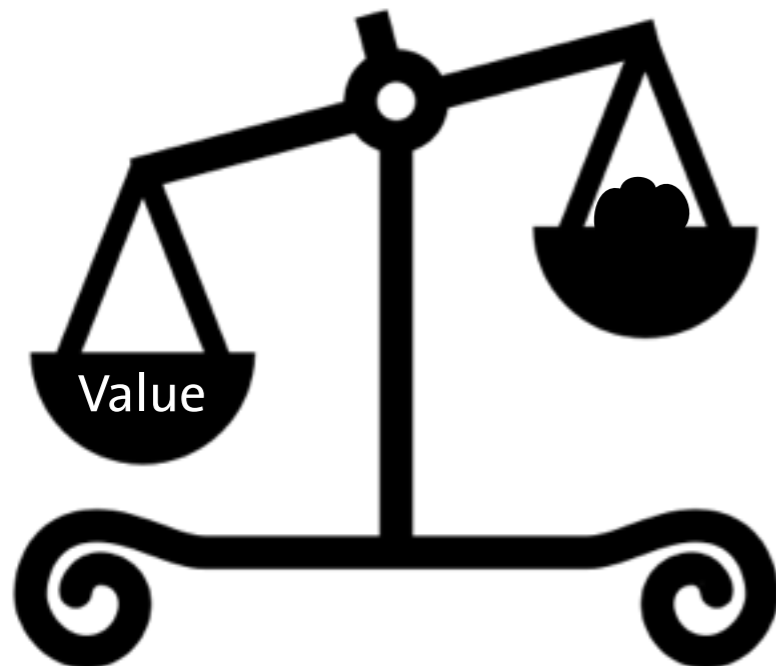
Conclusion

## Framing the notion of software value



## Issues related to software value

- Firms invest heavily on software, but often unsure of its value
- Accounting practice tends to over estimate software value

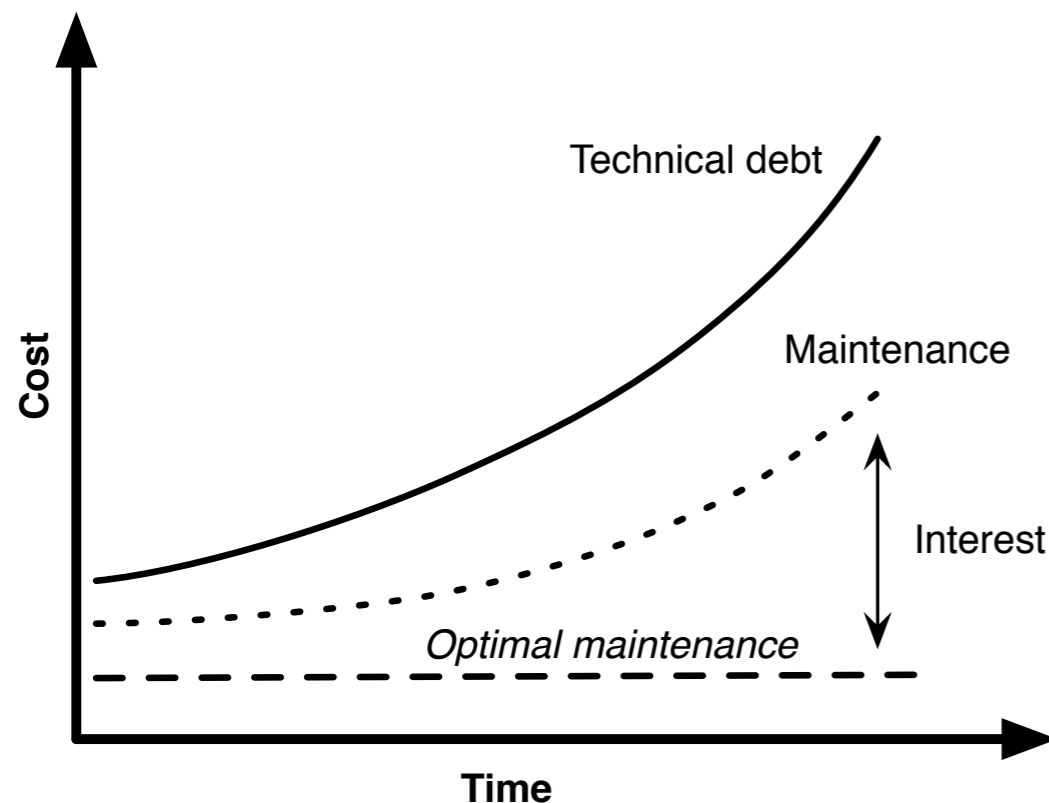


How can we determine software value more objectively?

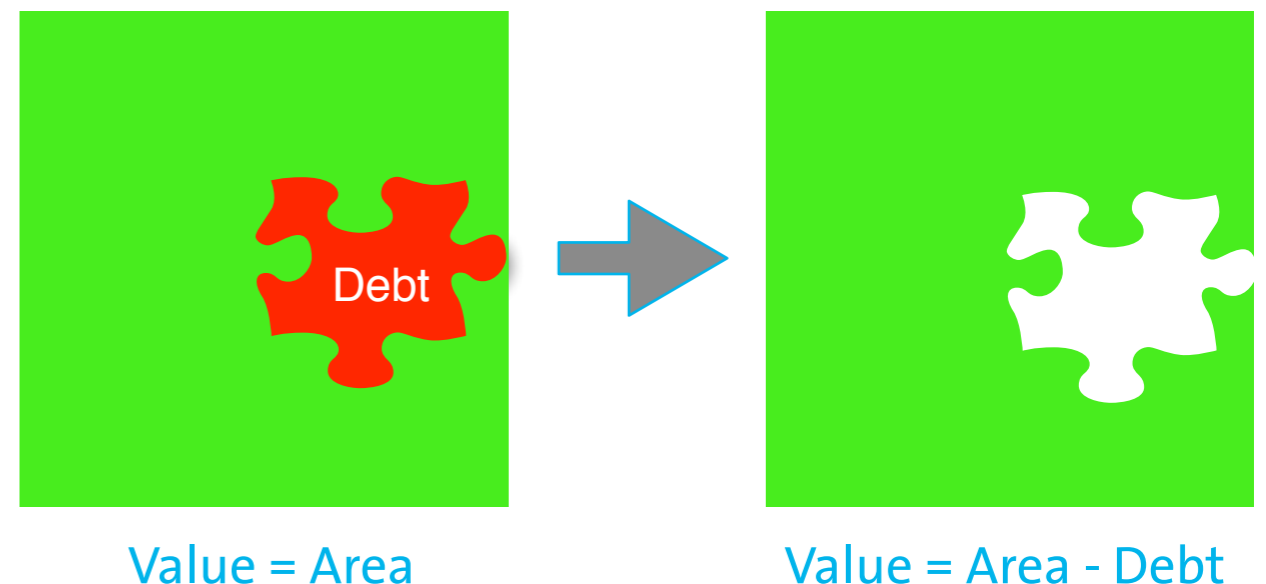
# Approach

## Technical debt as a component of software value

- Technical quality affects software value
- Poorly written code reduces value



*Impairment based on technical debt*

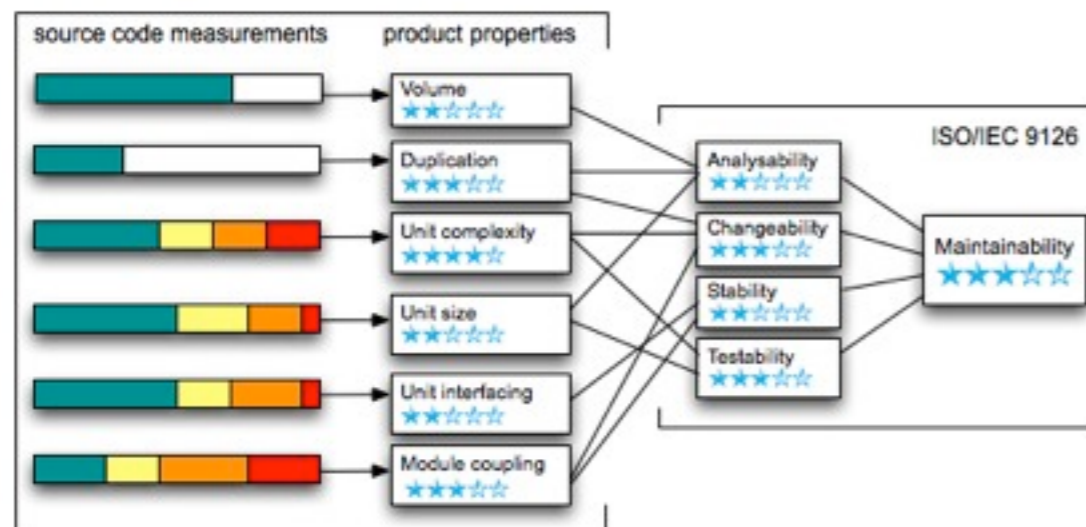


# Approach

## Measuring technical debt

- Based on SIG quality model of software maintainability
- Quality gap to the “ideal” level determines debt
- Debt estimate is based on more than 900 system snapshots

### SIG Quality Model



### Rework Fraction (RF)

	1-star	2-star	3-star	4-star	5-star
1-star					
2-star	<b>60%</b>				
3-star	<b>100%</b>	<b>40%</b>			
4-star	<b>135%</b>	<b>75%</b>	<b>35%</b>		
5-star	<b>175%</b>	<b>115%</b>	<b>75%</b>	<b>40%</b>	

## Proposed variants in measuring software value

- V1: Subtracts repair cost (technical debt) from rebuild value
- V2: Exclude parts that require rework from valuation
- V3: Subtracts extra maintenance cost (interest) from rebuild value



V1: Fix the problem



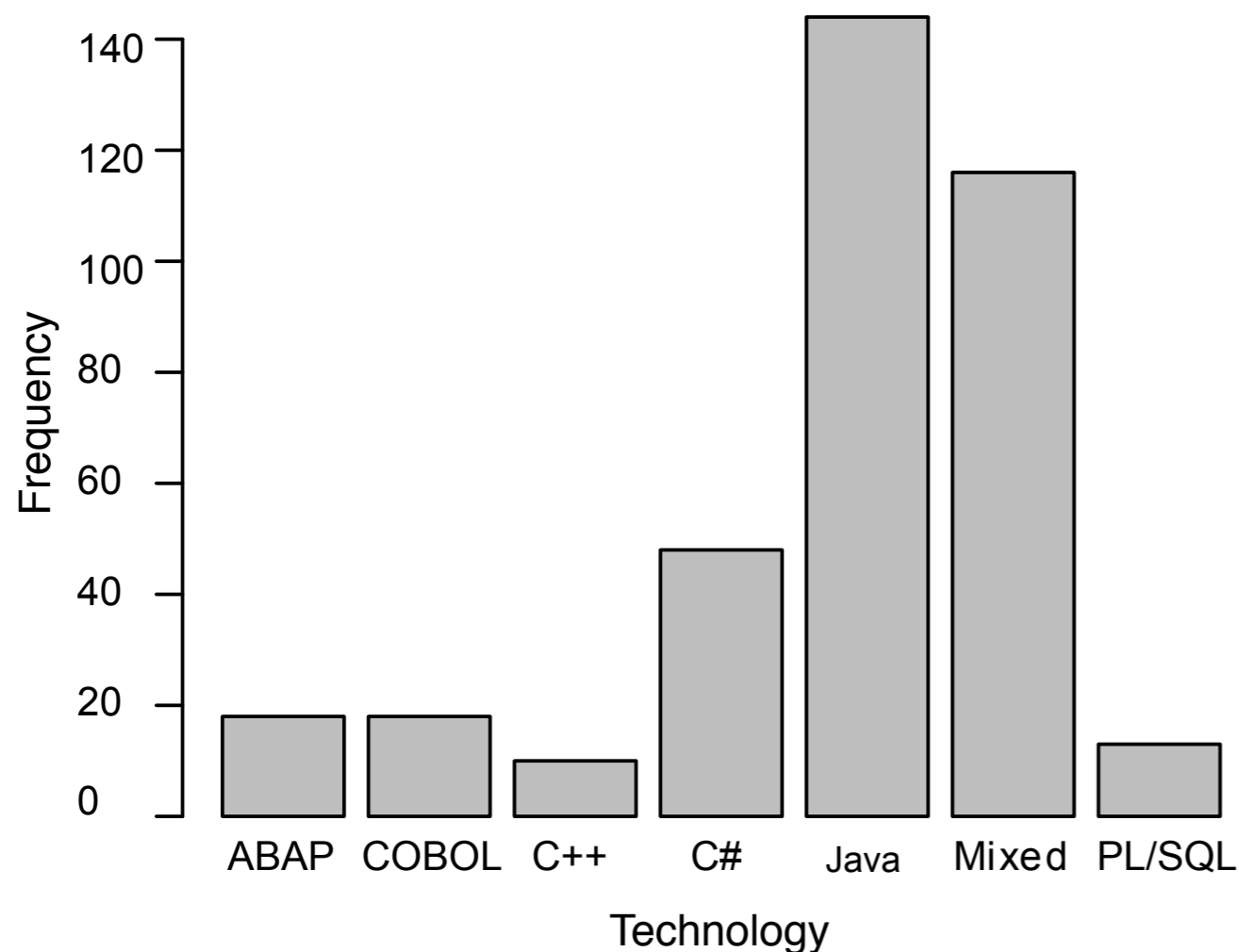
V2: Replace problematic parts



V3: Operate with higher cost

# Exploratory Study

## Applying the proposed valuation methods to 367 systems



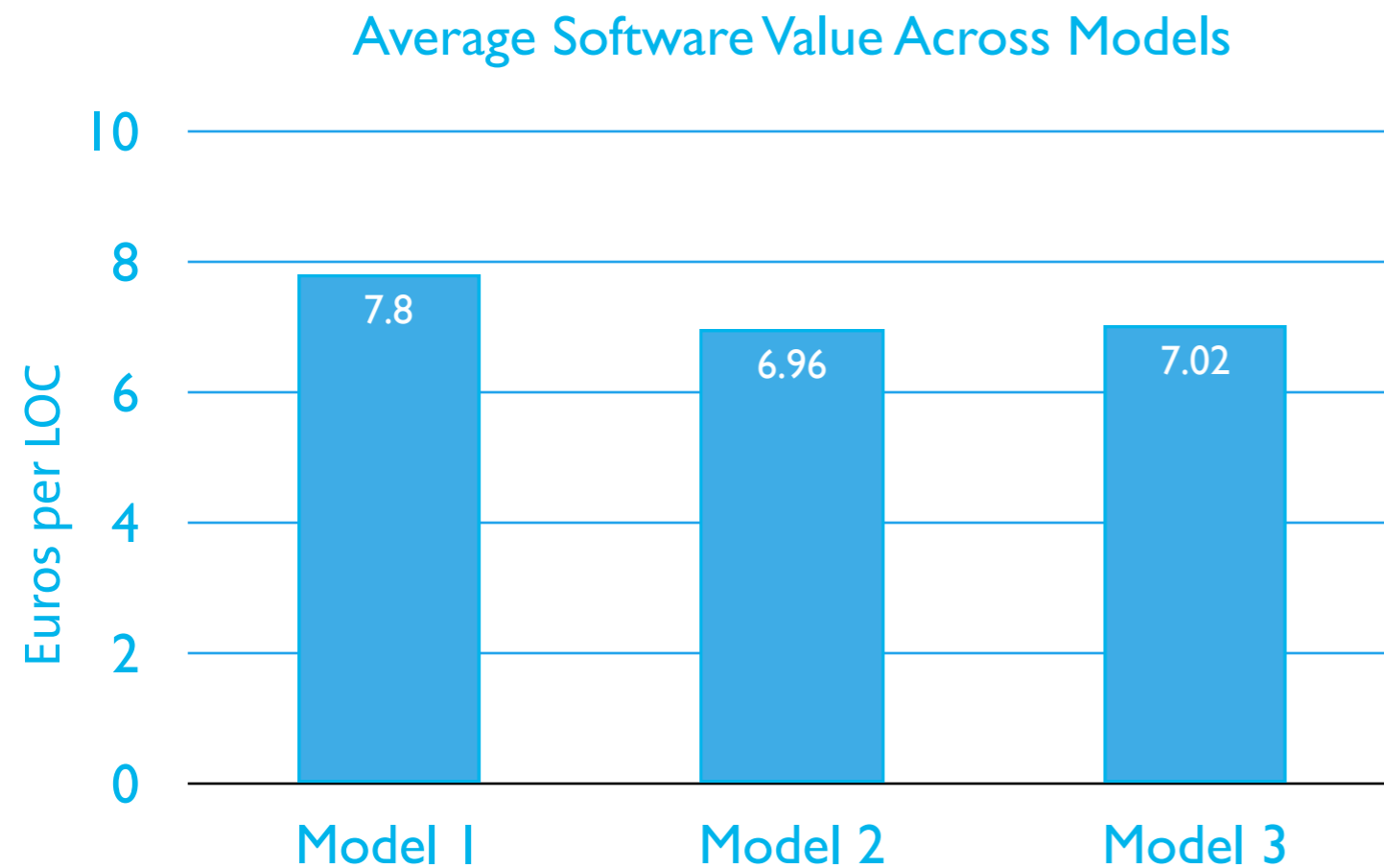
### Descriptive Statistics

Metrics	Median
Size (KLOC)	77.0
Quality (star rating)	3.0
Rebuild value (MY)	7.8
Rework Fraction (%)	35.0
Repair effort (MY)	1.9



# Explorative Study

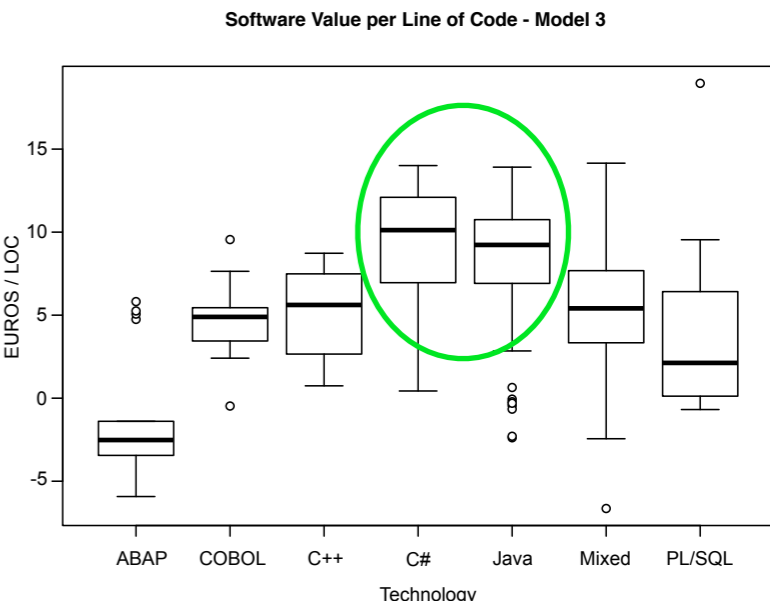
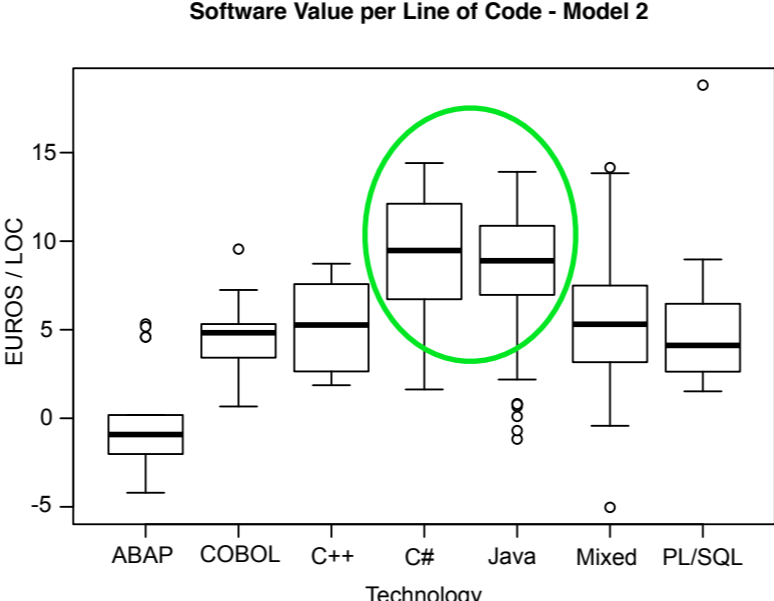
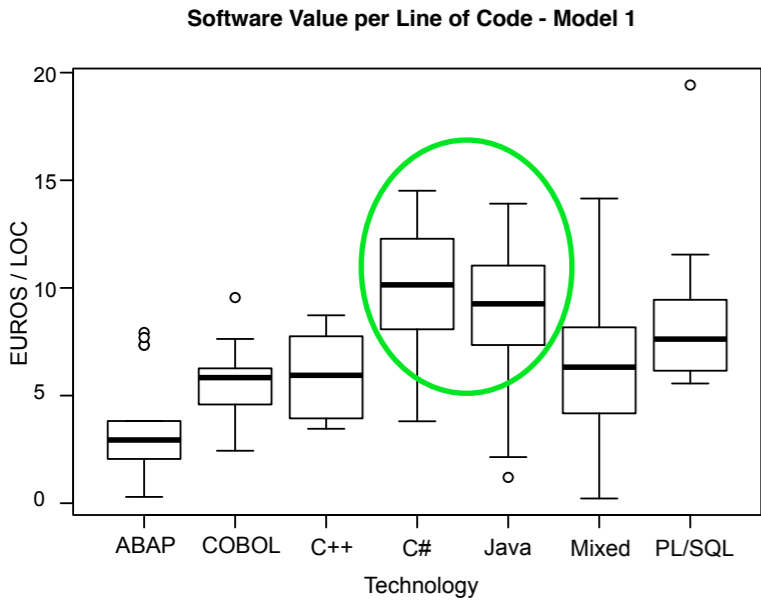
## Comparison of three valuation models



The three valuation models give similar values around €7 per LOC

# Explorative Study

## Software value across different technologies

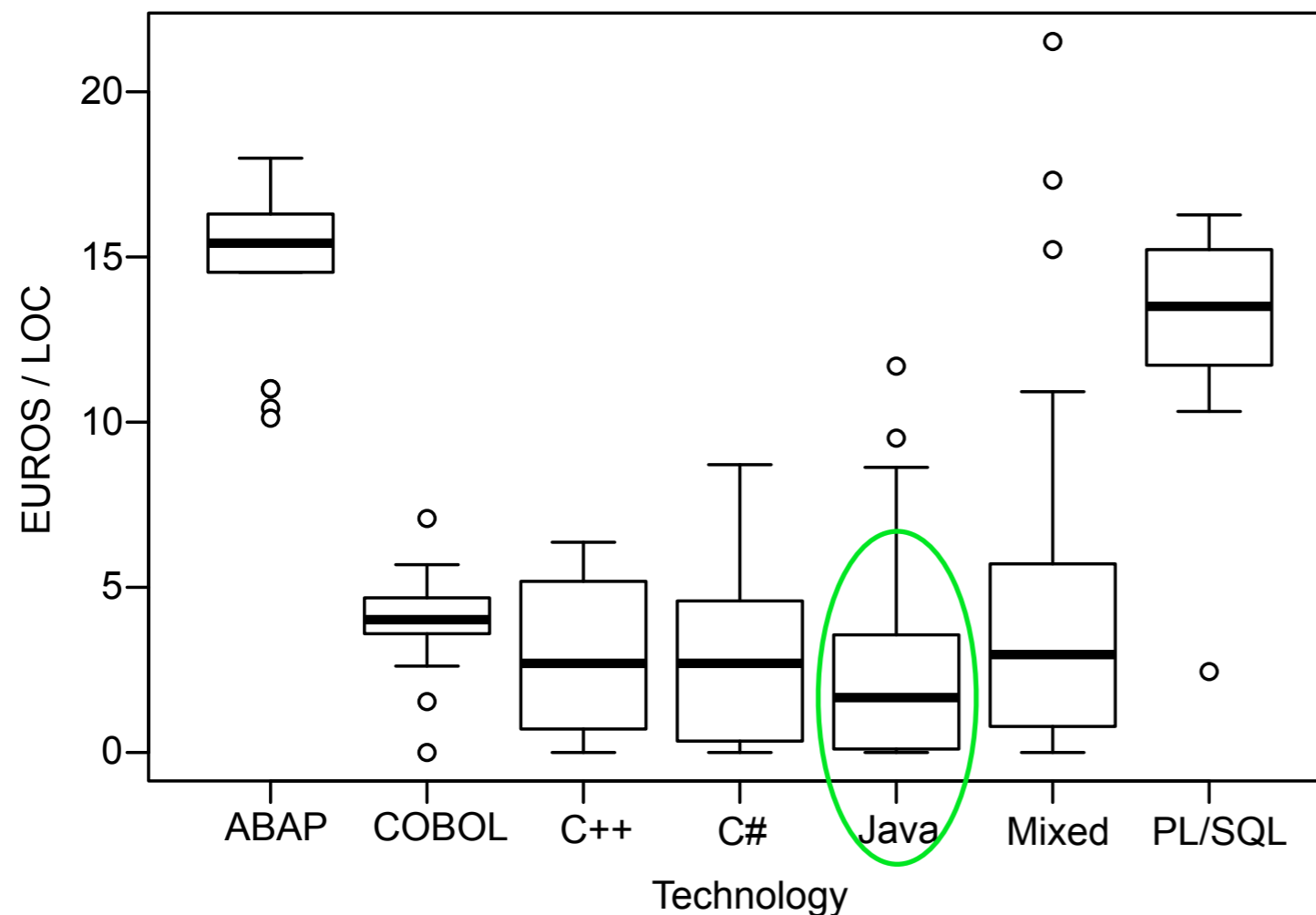


C# and Java systems have the highest value. ABAP systems have the lowest value.

# Explorative Study

## Technical debt across different technologies

Technical Debt per Line of Code



Java systems have the lowest technical debt averaging €1.6 per LOC

# Conclusion and Future Work

## Conclusion

- The notion of technical debt can be used to estimate the value of software that takes into account technical quality
- No significant difference in the results given by the proposed valuation models (RE-based, RF-based, Interest-based)
- C# systems have the highest value averaging €10 per LOC

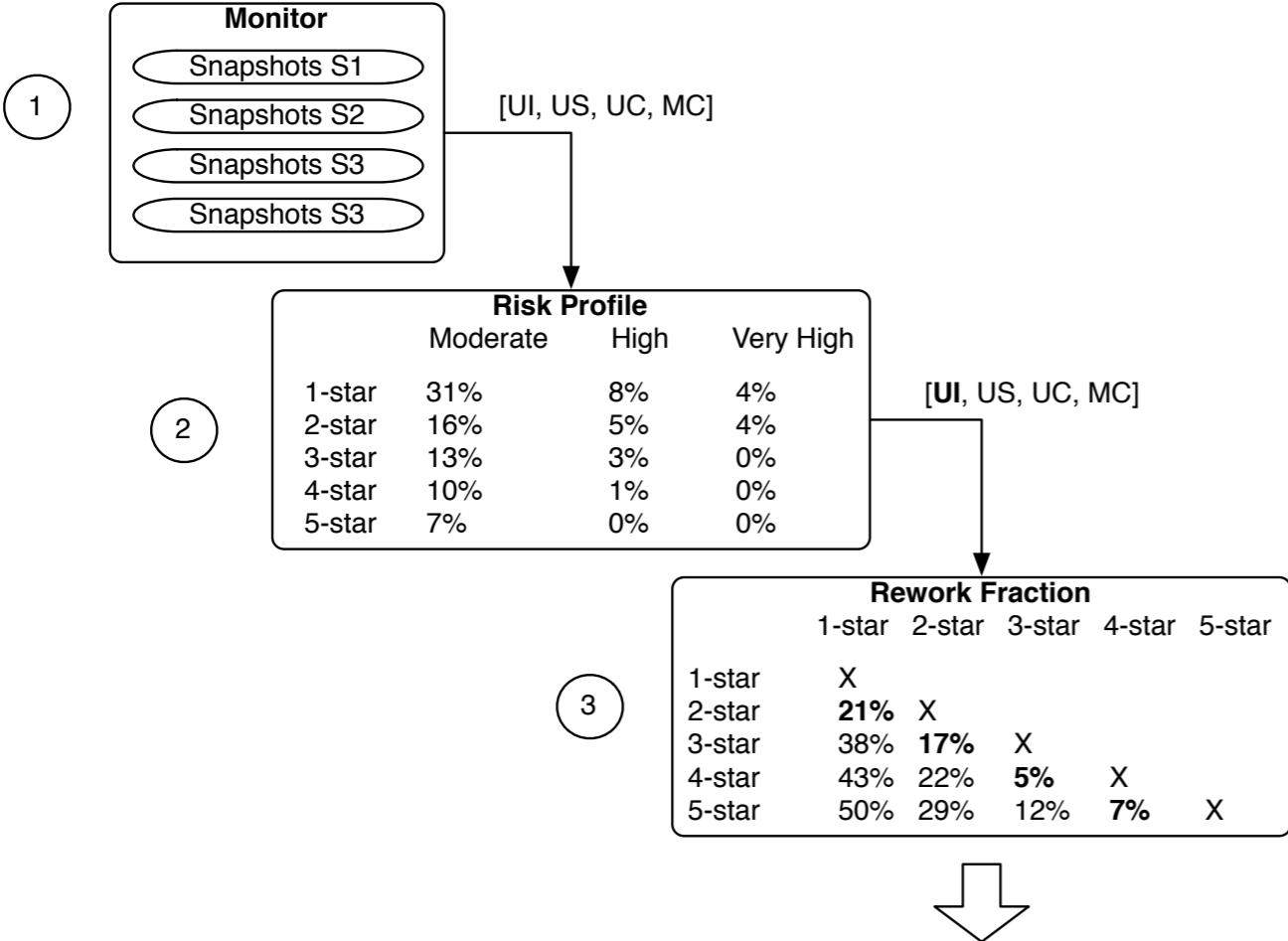
## Future Work

- Compare results with traditional valuation approaches
- Devise a method to estimate business value of software



# Estimating Rework Fraction

Rework fraction is determined based on more than 900 system



Rework Fraction (RF)

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For each quality leap:

$$RF = \text{MAX} (UI, US, UC, MC, Dup)$$