

Sizing System Tests for Estimating Test Execution Effort

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Agenda

- Motivation
- Sizing system tests
- Effort estimation
- Tool support
- Empirical study
- Conclusions

System Tests

- Concerned with the behaviour of the whole system
- Based on high level description of system behaviour
 - Requirements specification, use cases, business process, etc.
 - Black box testing

Test Planning

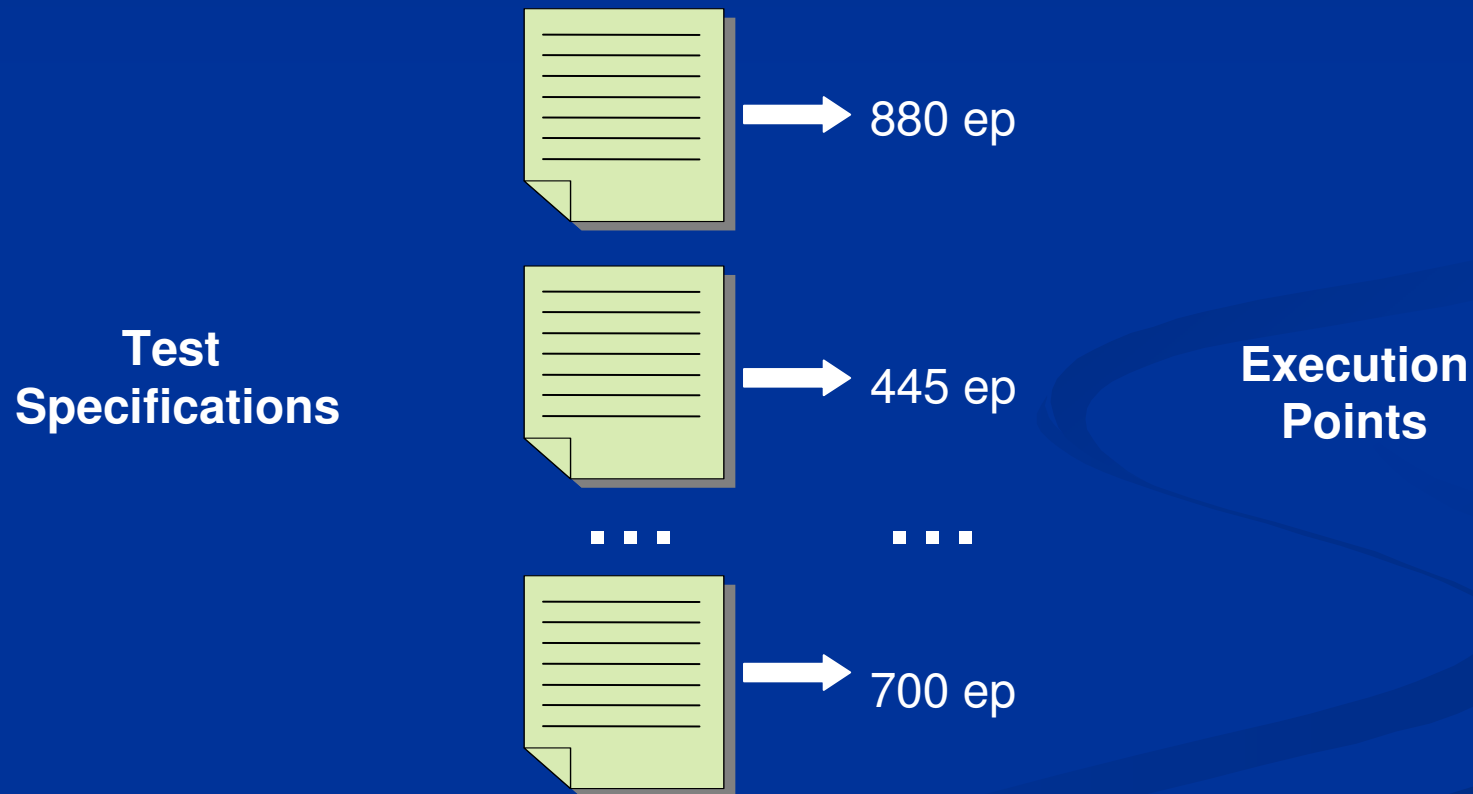
- System tests are often carried out by dedicated test teams
 - May support several development teams at the same time
 - How to estimate the effort to execute the tests?
- Most effort estimation models are based on project size
 - How to size tests?

Sizing System Tests

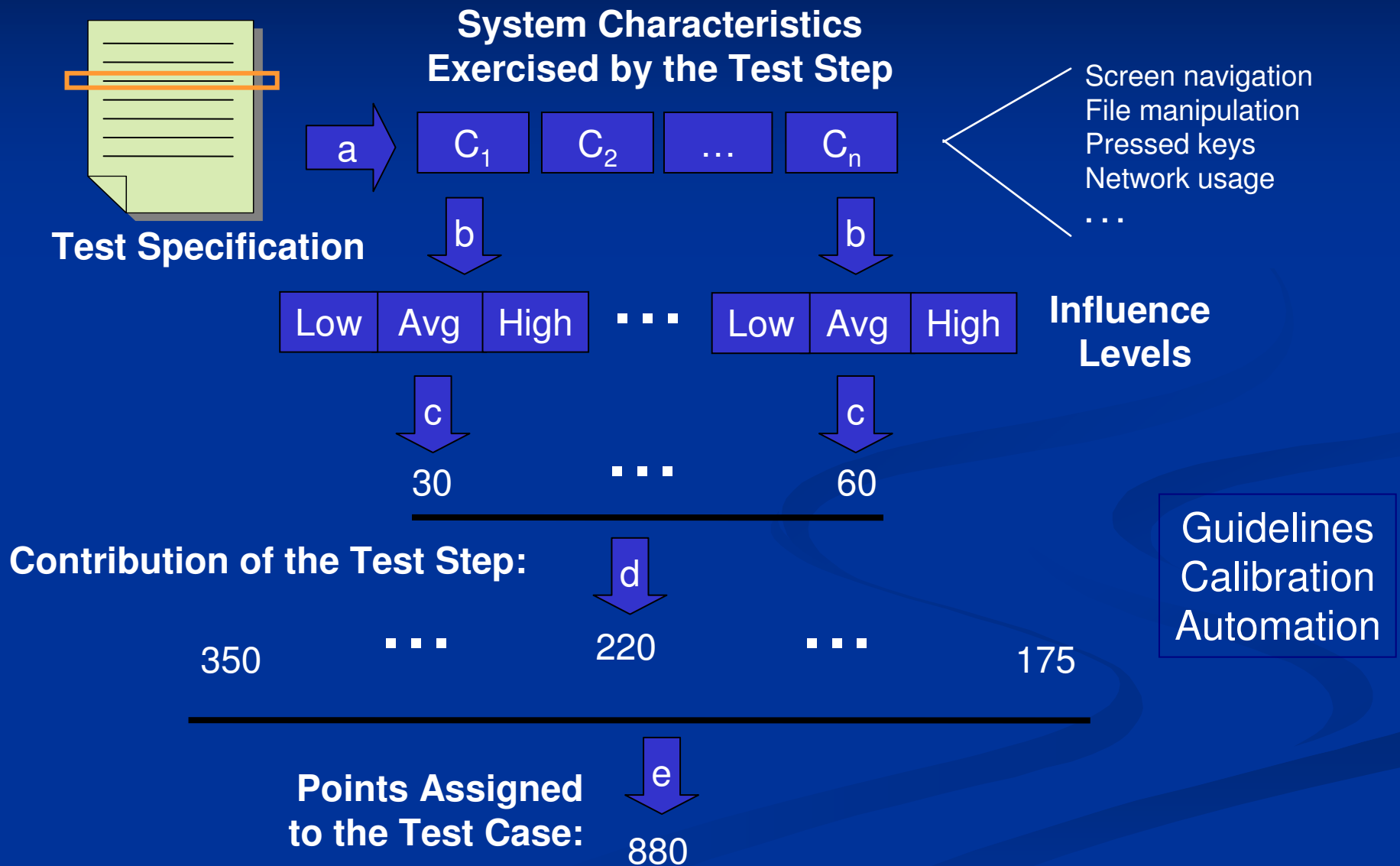
- Amount of steps required to execute the test
- Test execution complexity
 - Complexity of interaction between the tester and all the components of the system (software and hardware)

Execution Points

- Measure of test size and execution complexity



Measurement Method



Test Specification Language



NL – Natural Language
CNL – Controlled Natural Language

Calibration Techniques

- Identification of system characteristics
 - Delphi panel
 - Survey
- Guidelines
 - Delphi panel
 - Clustering algorithms
- Weights
 - Delphi panel
 - Analysis of Variance

Tool Support

- We developed a Test Effort Estimation Tool
 - Management of the exercised system characteristics, guidelines and weights
 - Process test specifications written in NL or CNL
 - Test actions identified by the main verb of each sentence of the specification
 - Measures the size and execution complexity of test specifications
 - Estimates execution effort based on risk factors

Test Execution Effort Estimation

- Based on the test size and execution complexity
- COCOMO-based model
 - Risk factors related to test execution effort
 - Equation defined by using regression analysis
- Others possible techniques
 - Analogy
 - Case-based reasoning
 - Regression trees
 - ...

Empirical Study on the Mobile Application Domain

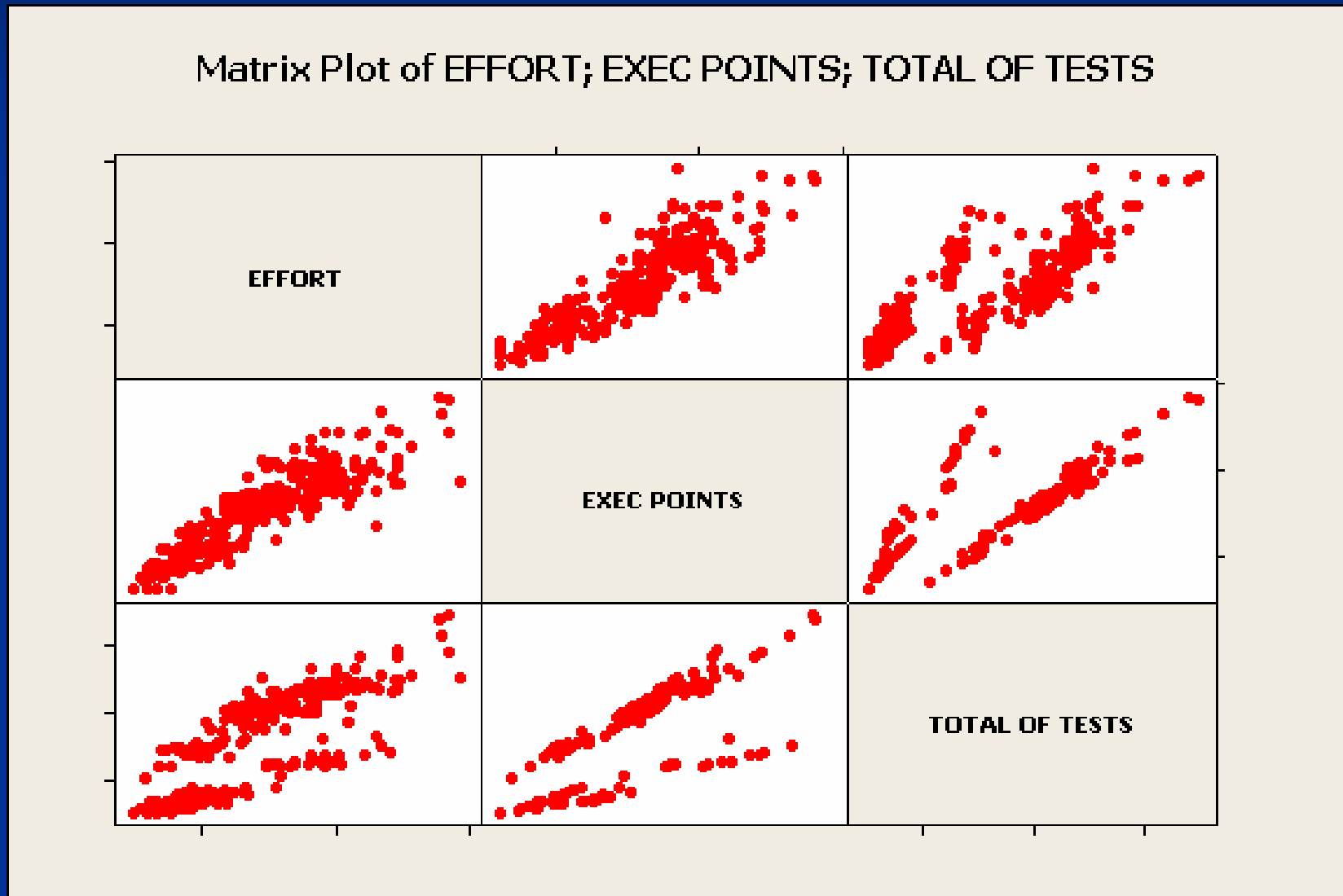
- Analysis of a historical database
 - 6-month database
 - More than 10 thousands of test executions
 - Tests executed by more than 50 testers
 - Several features involved
- Model calibration
 - Delphi panel with 6 experienced testers

The Test Specification Language

- 237 verbs were identified and analyzed in less than 4 hours

Step	Description	Expected Results
1	Start the <u>message center</u> .	The phone is in message center.
2	Select the <u>new message option</u> .	The phone is in message composer.

Correlation Between Effort, Execution Points and Number of Tests



Conclusions

- New measurement method for sizing tests based on:
 - The test specification
 - Number of test steps and their execution complexity
- We defined techniques to calibrate a model for a specific application domain
- A test effort estimation tool was developed
- We run an empirical studies in the mobile application domain
 - High correlation between effort and test size and execution complexity measure

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Questions?

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