A Study on the effectiveness of Test-Categories based test analysis

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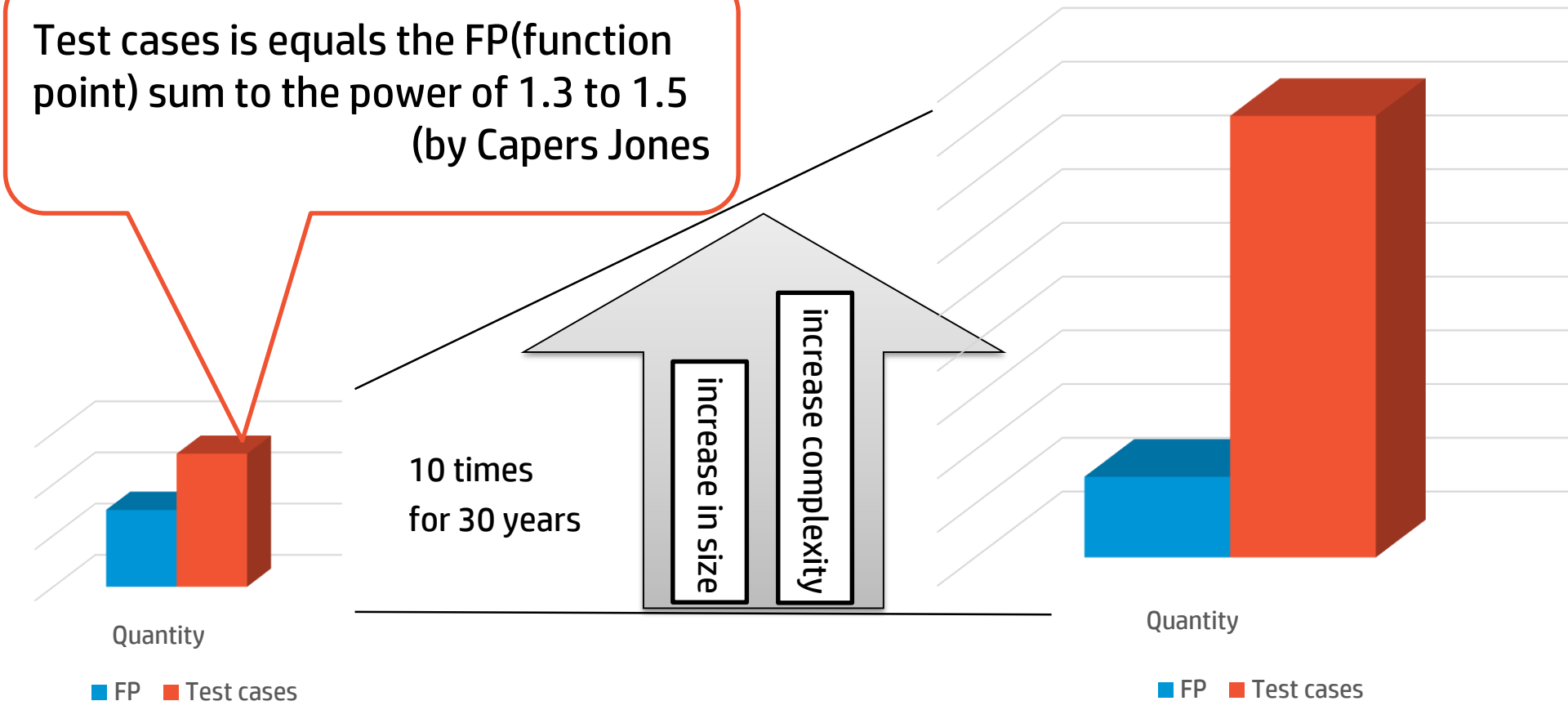
Agenda

1. INTRODUCTION
2. VARIABILITY OF TEST ANALYSIS RESULTS
3. AN APPROACH OF TEST CATEGORIES BASED TESTING
4. REMARKS FROM THE VERIFICATION EXPERIMENT
5. CONCLUSION

1. Introduction

Along with a rapid increase in the size and complexity of software today, the number of required test cases is also increasing.

Test cases is equals the FP(function point) sum to the power of 1.3 to 1.5 (by Capers Jones



2. VARIABILITY OF TEST ANALYSIS RESULTS

Generally, a significant number of testers should be assigned to a project in order to manage this increase of test cases.

Therefore, there are no clearly defined general rules for test development process (see next page).

- **They are developed according to the individual's own judgment.**

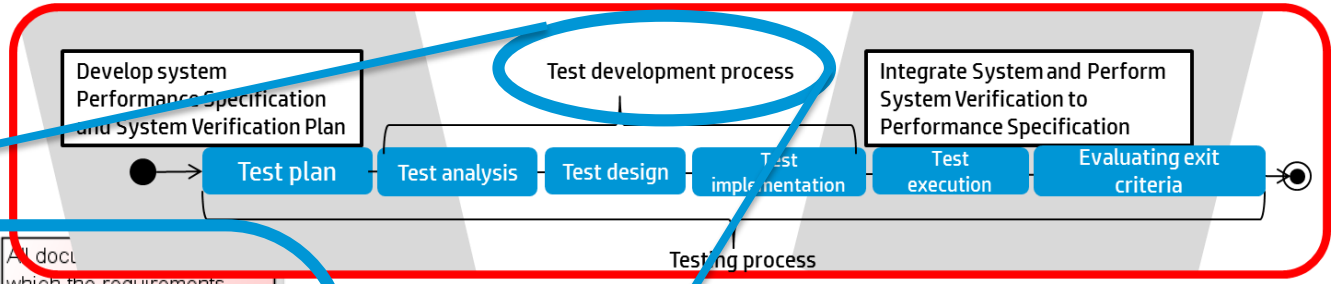
pattern	description	quantity	
Spec-item	Specification of the test object. e.g. when XX is input , result will be XX2	18	Analyzed
Test case	Precondition, action, expected result	19	Implemented
P-V Parameters and values	e.g. P:date V:10th Apr. 11th Apr.	17	Analyzed
Scenario	e.g. 1. Input XXX to the field A 2. Click the button B 3. Check the screen will be change to C	3	Implemented

This has the potential to cause the lacking or duplication of test cases

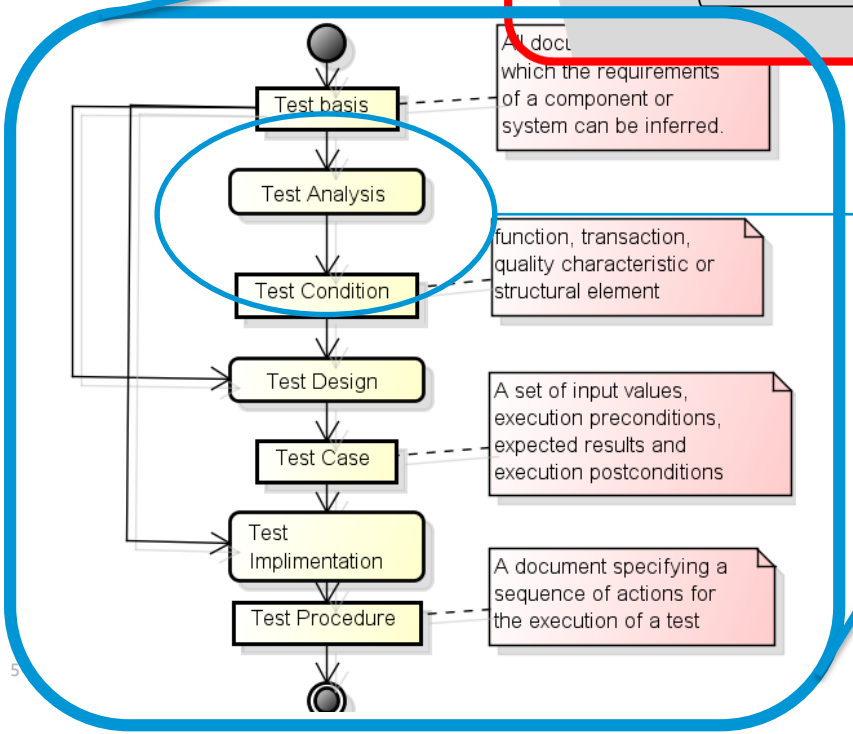
2. VARIABILITY OF TEST ANALYSIS RESULTS(Cont.)

Definition of Test development process and Test analysis

- Testing performed at each level depicted in the V model has a process similar to the development process, and three activities, test analysis, test design, and test implementation in the test process are called Test development process.



A part of V-model



Test analysis
An activity of selecting and organizing items to be covered by the test .

3. AN APPROACH OF TEST CATEGORIES BASED TESTING

A set of rules for a test analysis method for black box testing utilizing Test-Categories based on the Application Under Test (AUT) and fault knowledge have been proposed.

Overview of the method

The logical structure of a feature

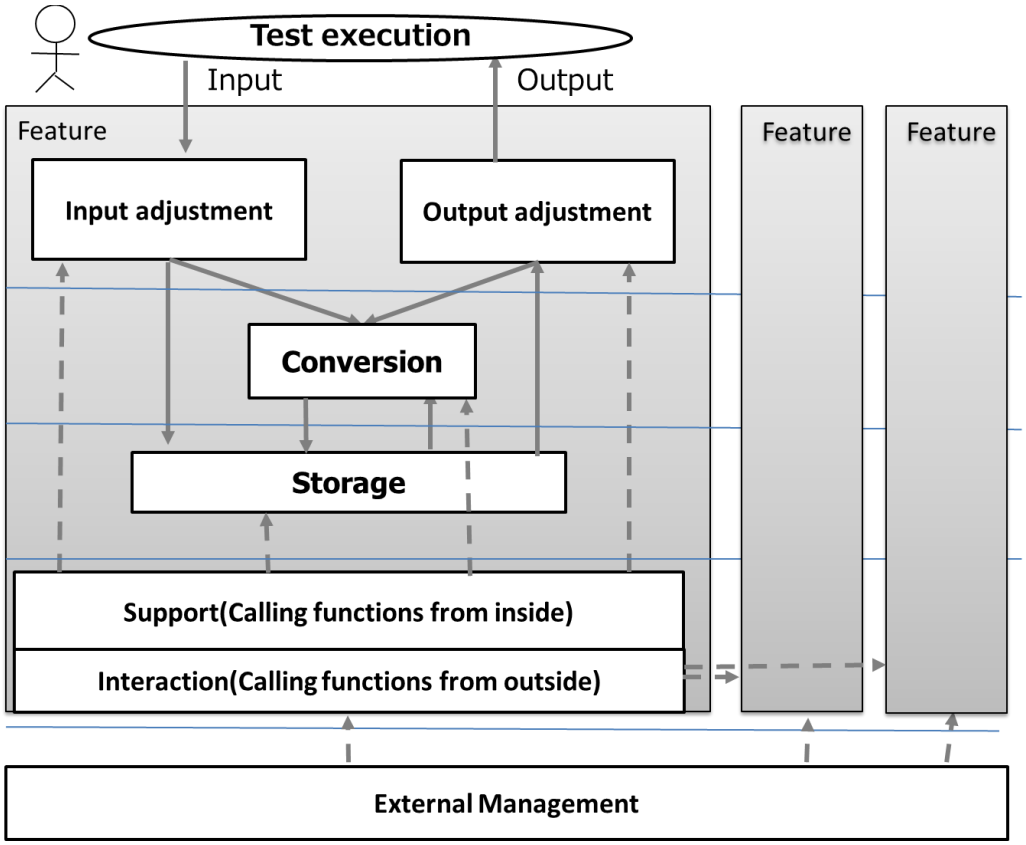
Test –Category

The procedure and document format

3. AN APPROACH OF TEST CATEGORIES BASED TESTING

The logical structure of a feature

- **It can be used to test the feature in a MECE way . Each box in the logical structure can be a useful guide to determine the required test conditions.**



Logical Structure... a MECE way to find test conditions from features.

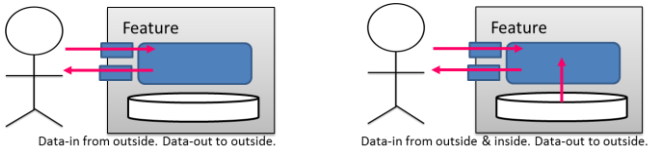
3. AN APPROACH OF TEST CATEGORIES BASED TESTING

The logical structure of a feature

- **It can be used to test the feature in a MECE way . Each box in the logical structure can be a useful guide to determine the required test conditions.**

Tests for single function

- These can be analyzed based on patterns of input and output data (I/O data pattern)

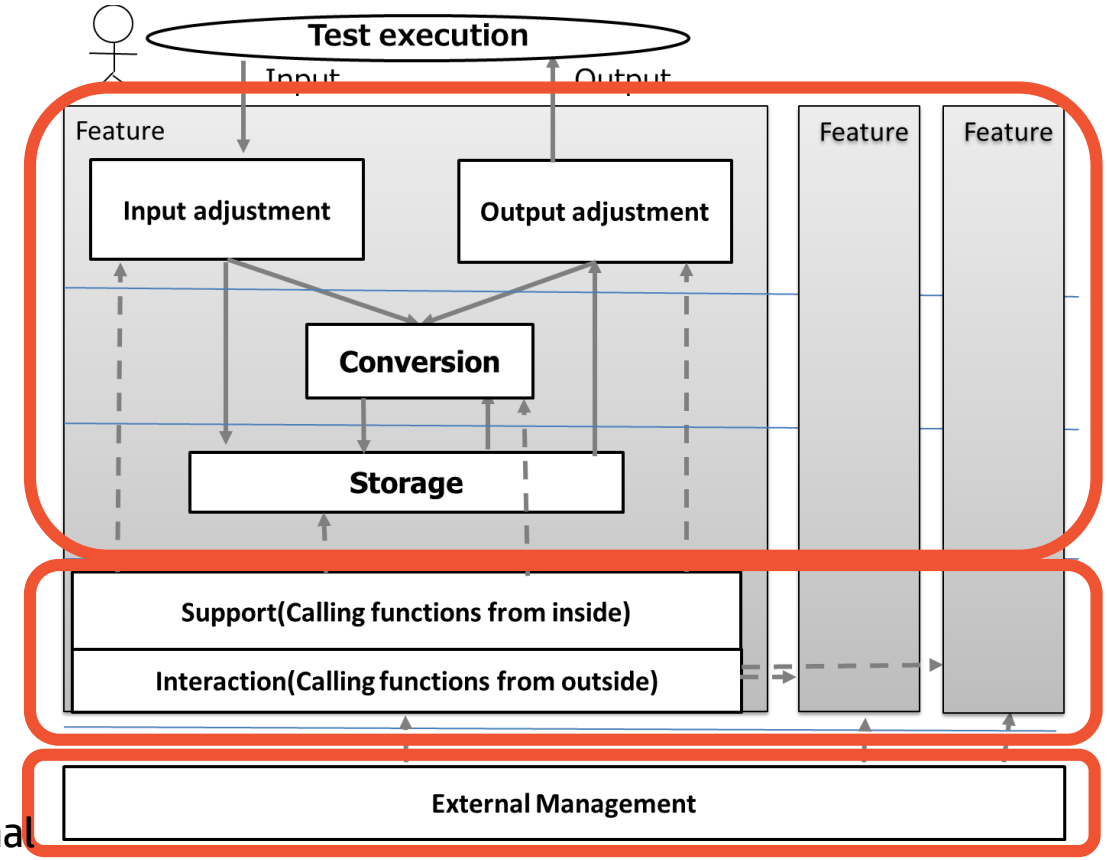


Tests for combination of functions

- These can be analyzed based on patterns of State transitions, or data sharing etc.

Tests for external factors

- These can be analyzed for non-functional testing.

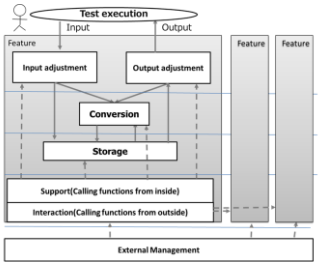


Logical Structure... a MECE way to find test conditions from features.

3. AN APPROACH OF TEST CATEGORIES BASED TESTING

Test-Category

- **In order to have a consistent interpretation of determining test conditions, a name specialized for the AUT is put in each box of the logical structure.**
- **In order to ensure for clearly understanding the meaning of Test-Category , potential failures and/or faults which may arise for Test-Category are discussed.**



Knowledge of AUT

Knowledge of faults experienced in the past

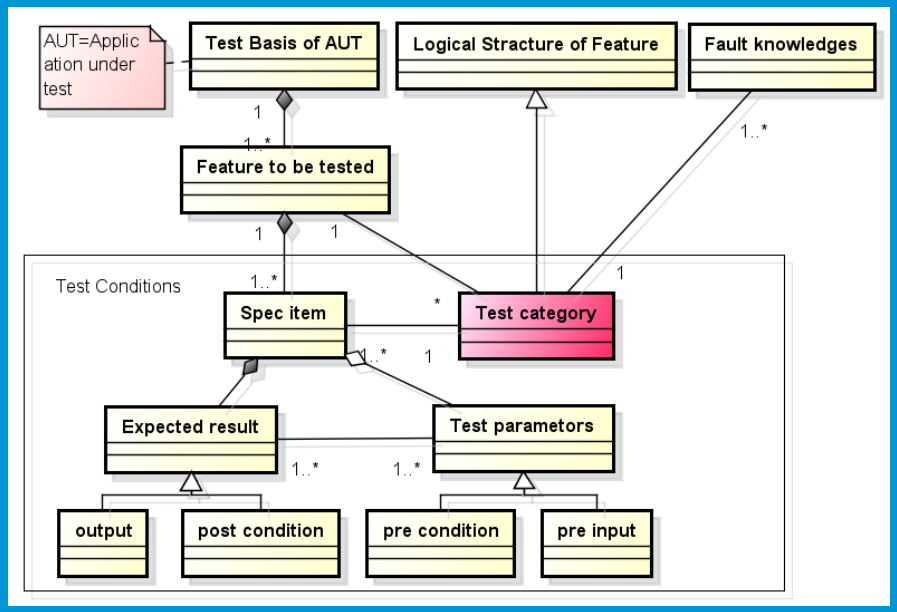
Logical Structure	Test categories	Meaning (fault assumed)
Input adjustment	UI input	Validation rules to the input form. Screen control
	Operation	Rules of screen transition, Start process
Output adjustment	UI display	Results displayed, Output control
	Printing	Printed information, Format
Conversion	Execution conditions	Business rules
	Calculation	Fee calculation
Storage	Data search	Filter combinations, Search results
	Data Insert/Update/Delete	Data handling
Management	Reflection	Data handling reflected on other functions
Support	Error handling	Error message, Recovery operations

Building consensus on the decided Test-Categories

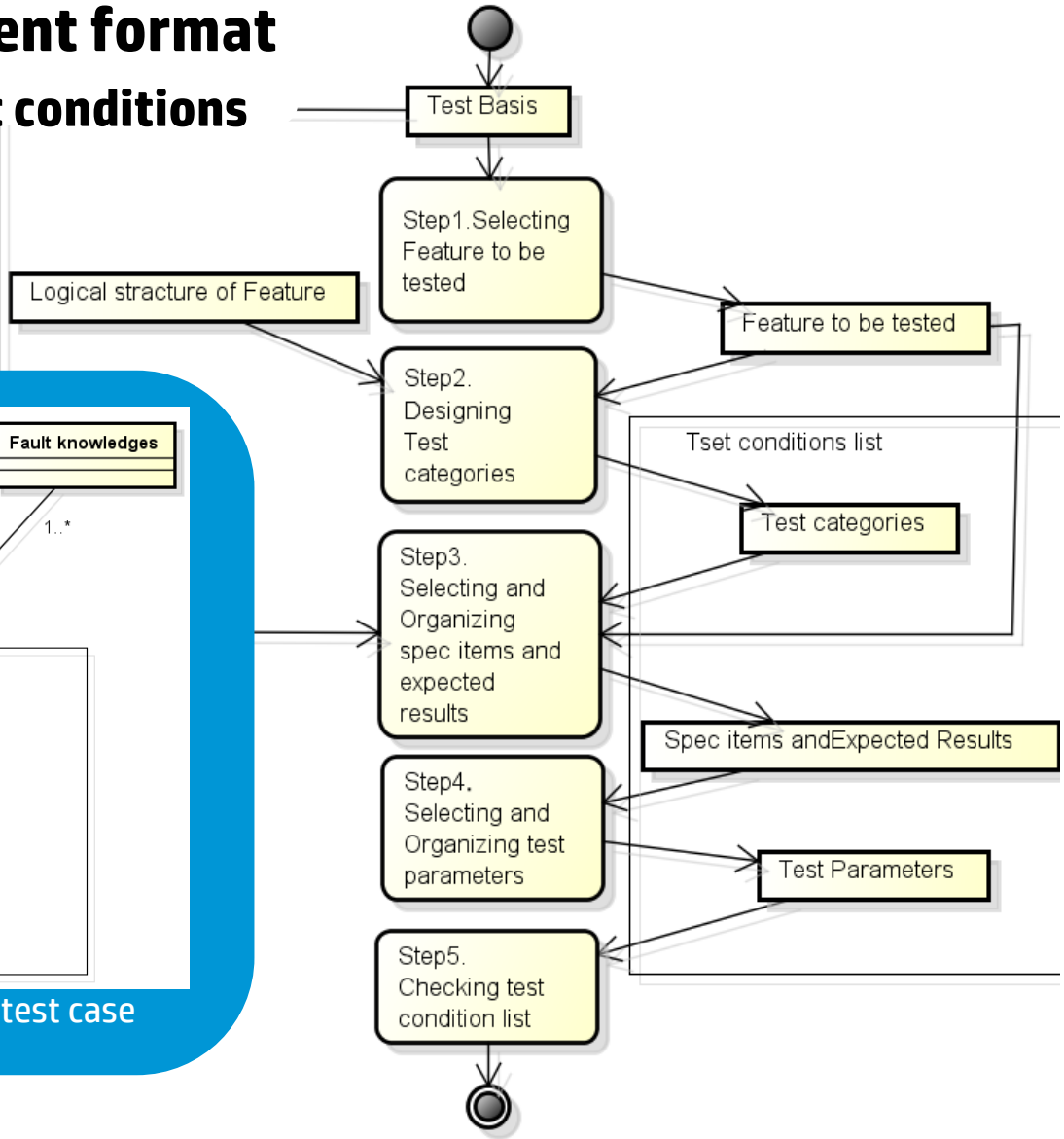
3. AN APPROACH OF TEST CATEGORIES BASED TESTING

The procedure and document format

- **Things used to determine test conditions from a test basis are defined.**



Document format is designed based on the test case structure.



3. AN APPROACH OF TEST CATEGORIES BASED TESTING (Cont.)

The Main benefit of this method

- **Higher test coverage overall, delivering higher quality testing**
  - **By implementing the set of rules it will be easier to determine the necessary test conditions.**

Our hypothesis

The following issues currently make determining the necessary test conditions difficult:

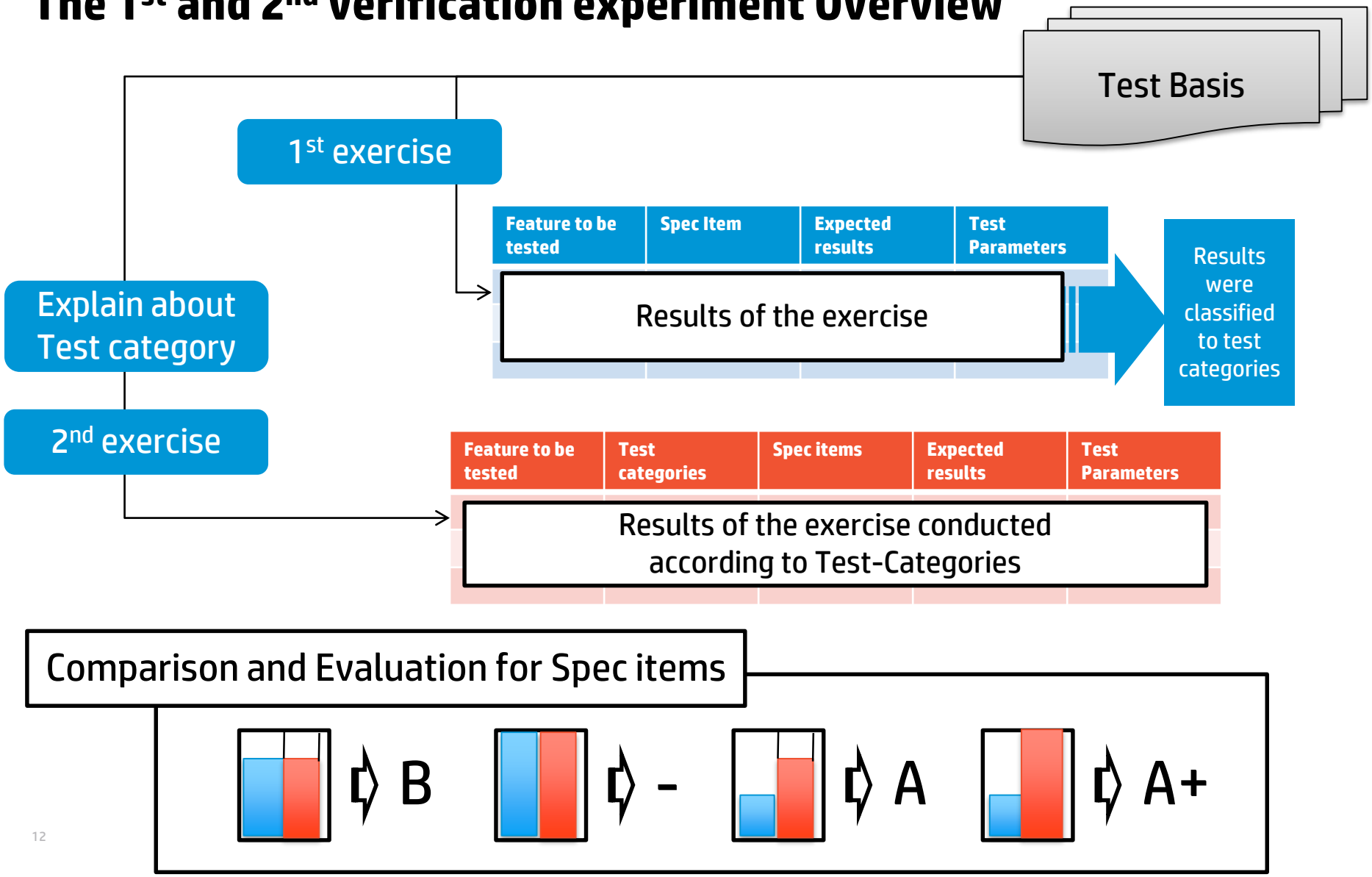
1. Certain aspects of specification are not written if they are thought to be obvious.
2. Specification is not completely written within single target section in a document. (for example: a behavior about a combination of functions)

  - **When many testers are involved in test development and proceed according to the procedure and document format, all of the testers can carry out their work according to the same set of rules.**

The developed suite of test conditions are more comprehensive and do not contain duplicates

4. REMARKS FROM THE VERIFICATION EXPERIMENT

The 1st and 2nd verification experiment Overview



4. REMARKS FROM THE VERIFICATION EXPERIMENT (Cont.)

Evaluation results of the verification experiment

- Eight comparison results table were taken from the two verification experiments.
- There was a measurable improvement resulting from implementing the Test-Categories method for seven out of eight teams.
- However, there was no indication as to exactly which categories received the greatest benefit from implementing the method.

Music reproduction equipment

Logical Structure	Team					
	TM1	TM2	TM3	TM4	TM5	TM6
Conv	B	A	B	B	B	B
Input						
Output	-	-	-	-	-	A+
Storage	-	A+	-	A+	A+	-
Support	B	B	B	B	B	B
Intreraction	B	A	A	A+	A	A+

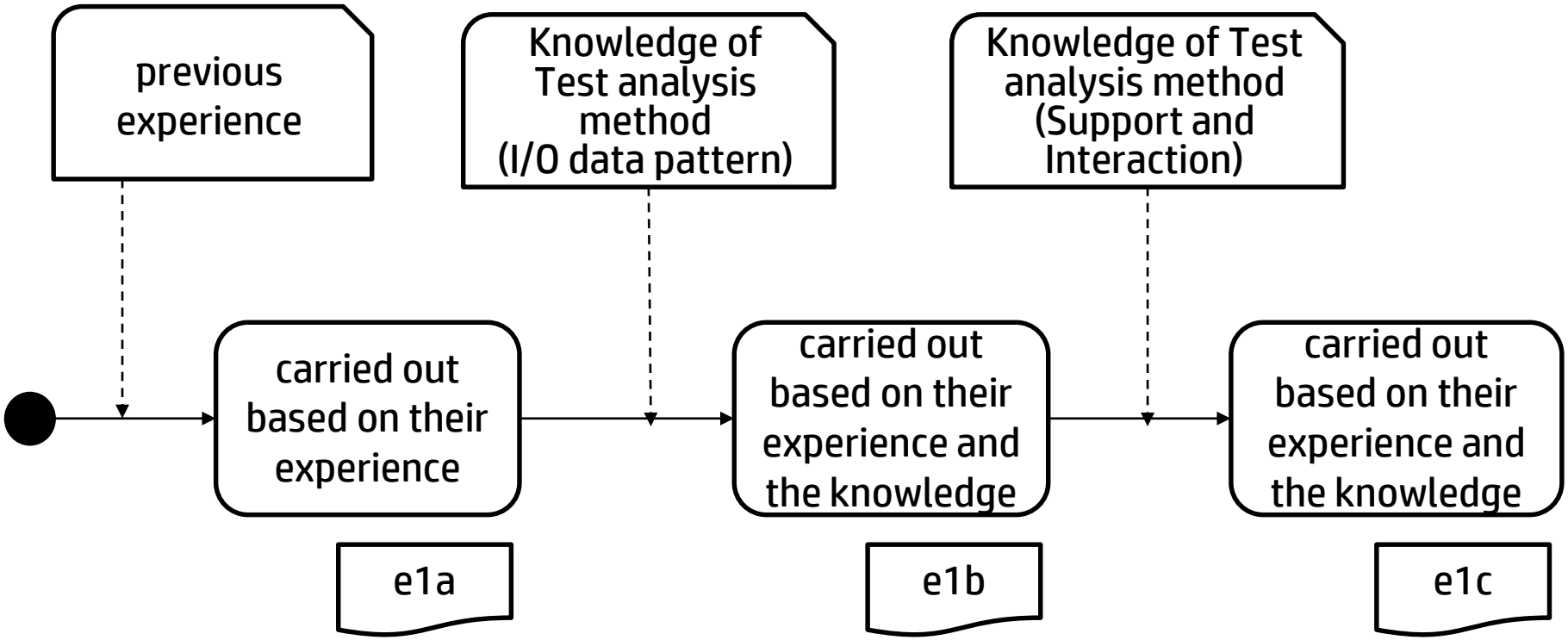
Flight Booking Application

Logical Structure	Team	
	TM1	TM2
Conv	A	A
Input	A	B
Output	A	A
Storage	A	A
Support	B	A
Intreraction	B	A

4. REMARKS FROM THE VERIFICATION EXPERIMENT (Cont.)

The 3rd verification experiment Overview

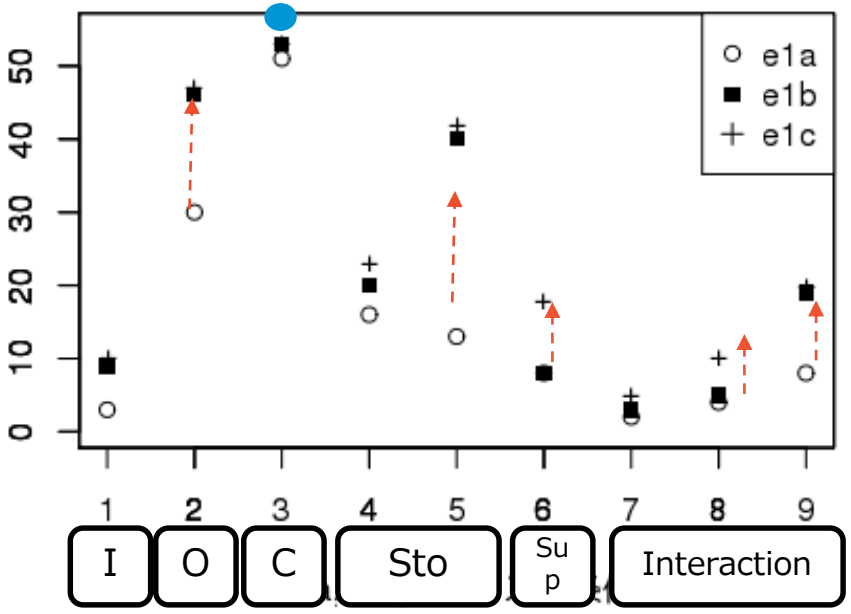
- Experiment results ware taken from each attendants(57).
- Implementation knowledge of test analysis method are divided.



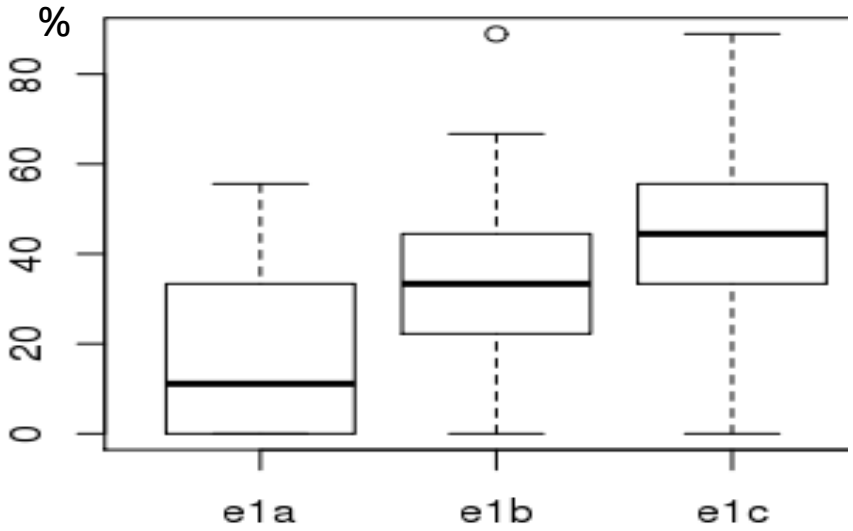
4. REMARKS FROM THE VERIFICATION EXPERIMENT (Cont.)

Evaluation results of the verification experiment

- Test conditions that many attendants can identify：Conversion 51->53)
- Test conditions that many attendants improve by test category based test analysis：
  - Output(32->43), Storage(9->41), Interaction(5->7)
  - Support(9->15), Interaction(8->19)



Test conditions specified number per participant.



Test conditions specified percentage per participant.

4. REMARKS FROM THE VERIFICATION EXPERIMENT (Cont.)

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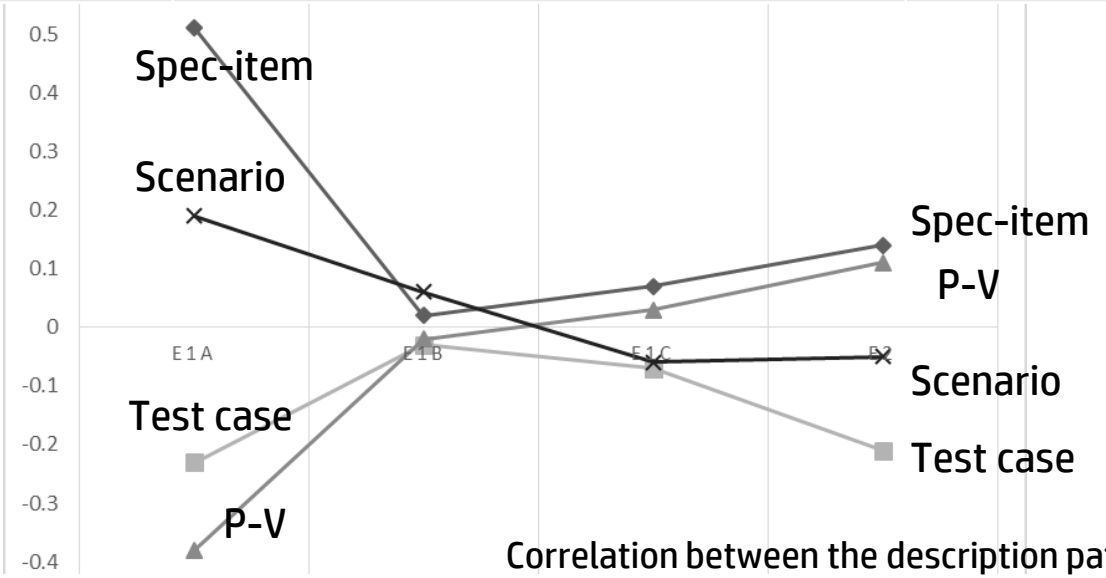

Correlation between the description pattern

Conclusion

- Through these verification experiments, it has been observed that after briefly explaining this proposed method to participants, there was a measurable improvement in quantity and consistency of spec-item which they were able to determine.

- Further verification experiments are necessary in order to carry out trend analysis with higher accuracy.

- Conducting further experiments and deepening our understanding of the tendencies and factors relating to effectiveness of the proposed method, rules for creating Test-Categories based on the AUT knowledge and fault knowledge can be more refined.

Thanks

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