



Empirical Evaluation of
Impact, Efficiency & Effectiveness of
Defect-detection Techniques in
the Event-driven Software Domain:
***Code Reading
and
Functional Testing***

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Experiment Process Report

ØExperiment Definition

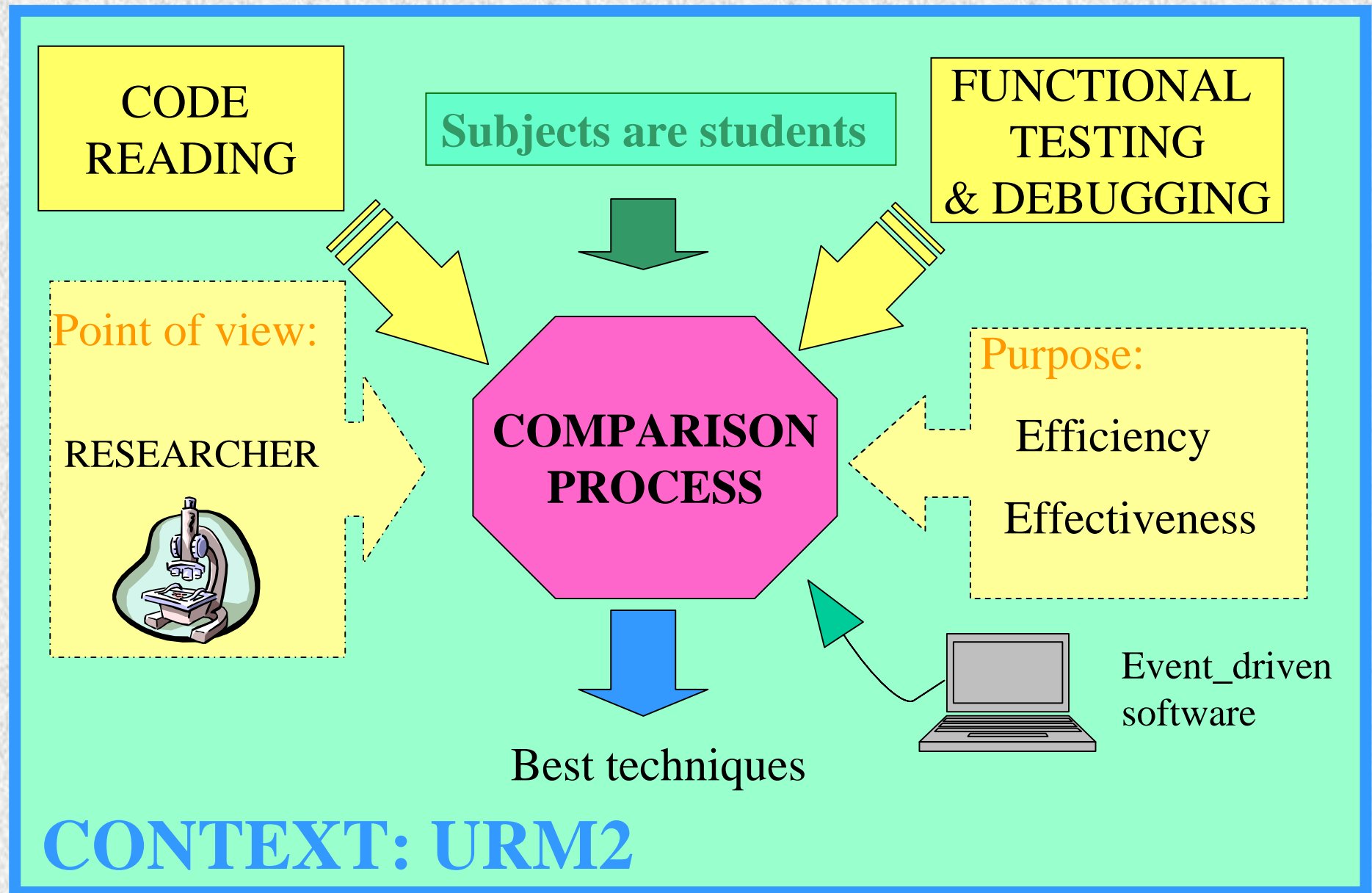
ØExperiment Planning

ØOperation

ØStatistical Analysis Approach

ØSummary and Future Planes

Experiment Definition



Experiment planning

Retrospect,
initial
HYPOTHESES

H0: There is no significantly difference between Code Reading and, Functional Testing & Debugging

H1: There is significantly difference between Code Reading and, Functional Testing & Debugging

Independent variables

Elements:

Code Reading
Functional Testing
& Debugging

Factors

Limited time
Faults seeded

**COMPARISON
PROCESS**

Dependent variables

Efficiency

Effectiveness

Low level experience

Experiment planning

Independent Variables:

1. Faults spread according to previously defined categories

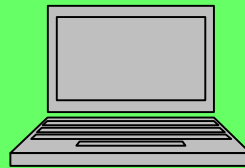
<i>fault category</i>	<i>examples</i>	<i># seed</i>
Initialization	wrong initialization of attributes	7
Computing	wrong computations of variables	6
Control	wrong definitions of logic variables	5
B&U complex structures of data	elements unrelated	5
Graphical interface	wrong settings of interface windows	6
Functionality	wrong realization	6
Events managing	wrong management	1
Exceptions handling	unforeseen produced exception	2

Total
38

Experiment planning

Measurement Instruments

Application:

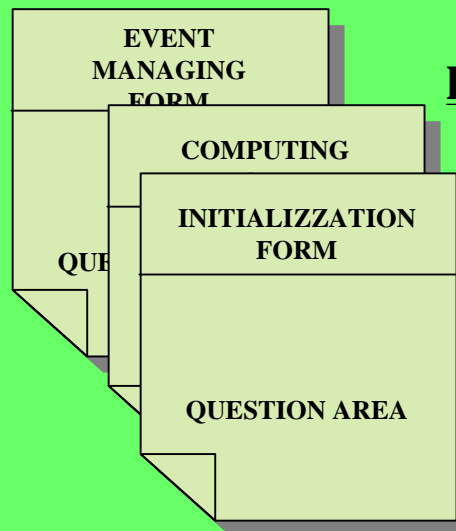


Event_driven software

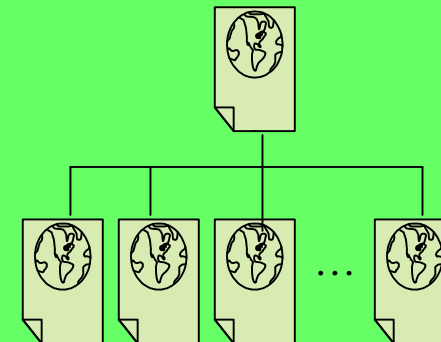
Form

&

Web-Site:



<http://160.80.100.250/Esperimento/>



Training

Automated Data Collection System



Why automating data collection?

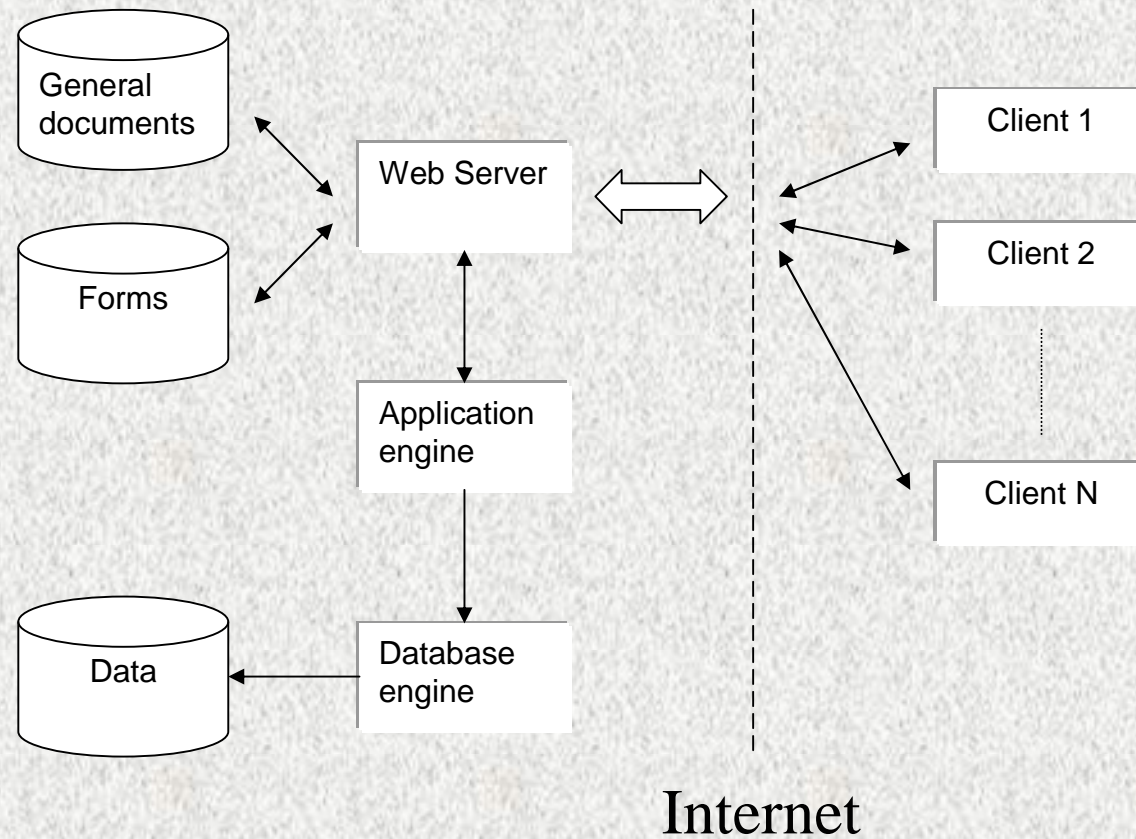
To run the experiment
we just need machines
connected to the internet

Avoid data collection
mistakes and boredom

Automated Data Collection System



System implementation



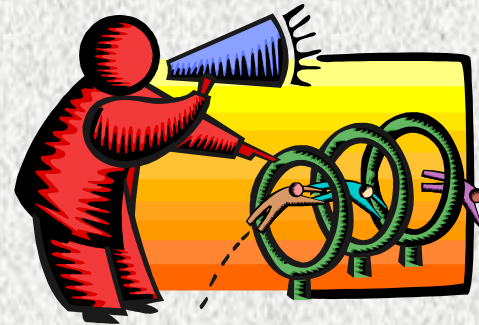
Automated Data Collection System

Summary

- Ø Automated data collection guarantees correct data and site independency
- Ø Data collected are stored directly into a database, ready for processing
- Ø Easy experiment replication

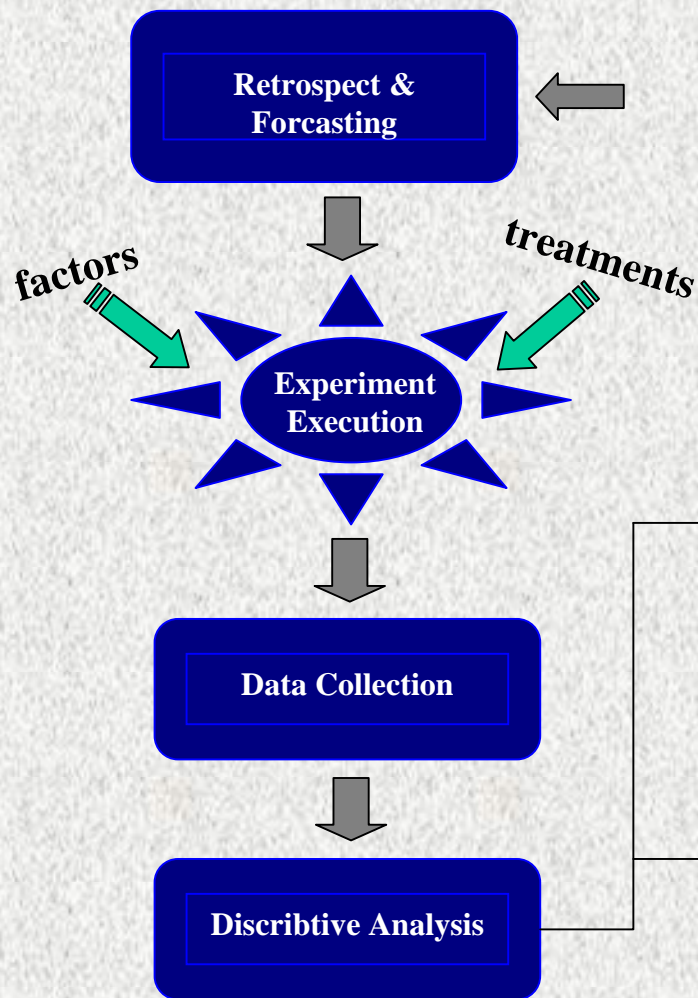
Operation

Preparation

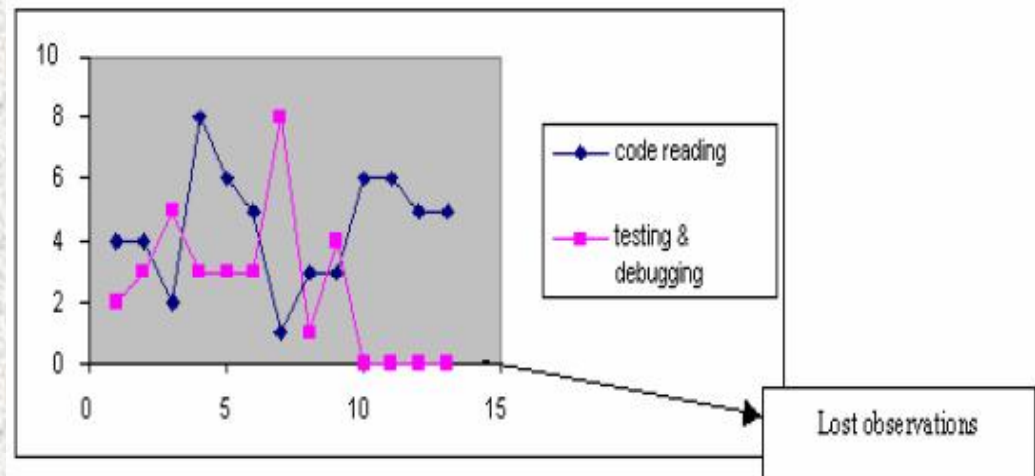


Execution

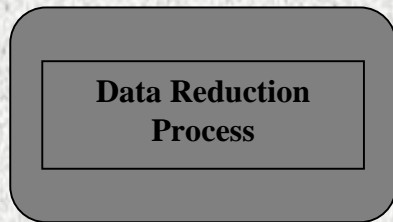
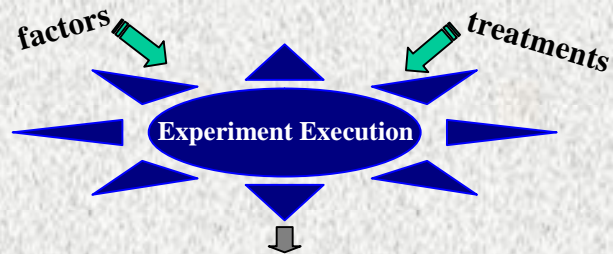
Descriptive statistics



Code reading		Testing & debugging	
Average of total errors detected	Average time related Per minute	Average of total errors detected	Average time related Per minute
4	92 min	2	56 min



Data reduction & enhancement



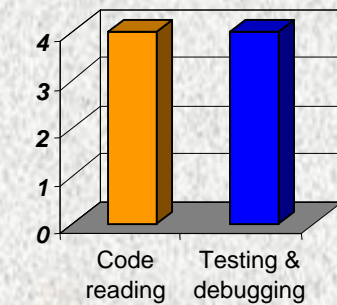
Code reading		Testing & debugging	
Average of total errors detected	Average time related Per minute	Average of total errors detected	Average time related Per minute
4	92 min	2	56 min

Code reading		Testing & debugging	
Average of total errors detected	Average time related Per minute	Average of total errors detected	Average time related Per minute
4	92 min	4	79 min

Average number of error detected



Average number of error detected



Data Reclassification

Data Collected



Average of detecting faults

Code reading

EQUAL

Testing & Debugging

???



Matching &
validation Process



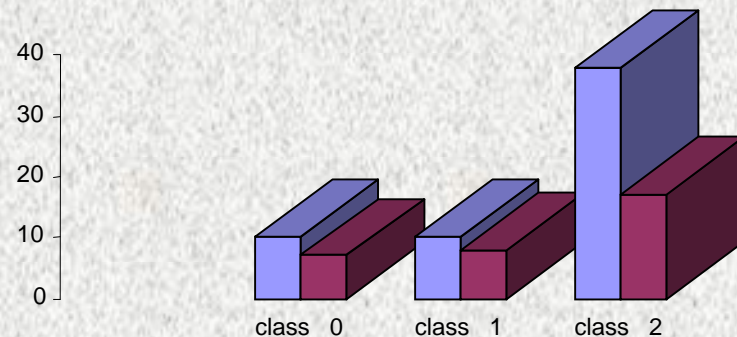
Reclassification

Classification type	Errors detected using Code reading	Percentage %	Percentage out of 38 seeded errors	Errors detected using Testing & debugging	Percentage %	Percentage out of 35 seeded errors
0	10	17 %	26 %	7	22 %	19 %
1	10	17 %	26 %	8	25 %	21 %
2	38	66 %	100 %	17	53 %	45 %
Total	58	100 %		32	100 %	

Class 0
data

Class 1
data

Class 2
data



■ Faults detected using Code reading
■ Faults detected using Testing & debugging

Analysis and statistical approaches

Q hypothesis testing

Ü1 - Difference between code reading and, testing & debugging

ØAccording to total faults detected

No Significant Difference

ØAccording to right type 2 error detected

No Significant Difference

Ü2 – Relationships between faults detected and time effectiveness for both techniques
(According to right type 2 error detected)

ØCode Reading Technique

Strong Significant Relation

ØTesting & Debugging Technique

Weak Significant Relation

Q Conclusion

ÜExperiment results effected directly by Experiment subjects experience

ÜMore experiments should be organized

Conclusions & Future Plans

