DEFECT DETECTION IN A DISTRIBUTED SOFTWARE MAINTENANCE PROJECT

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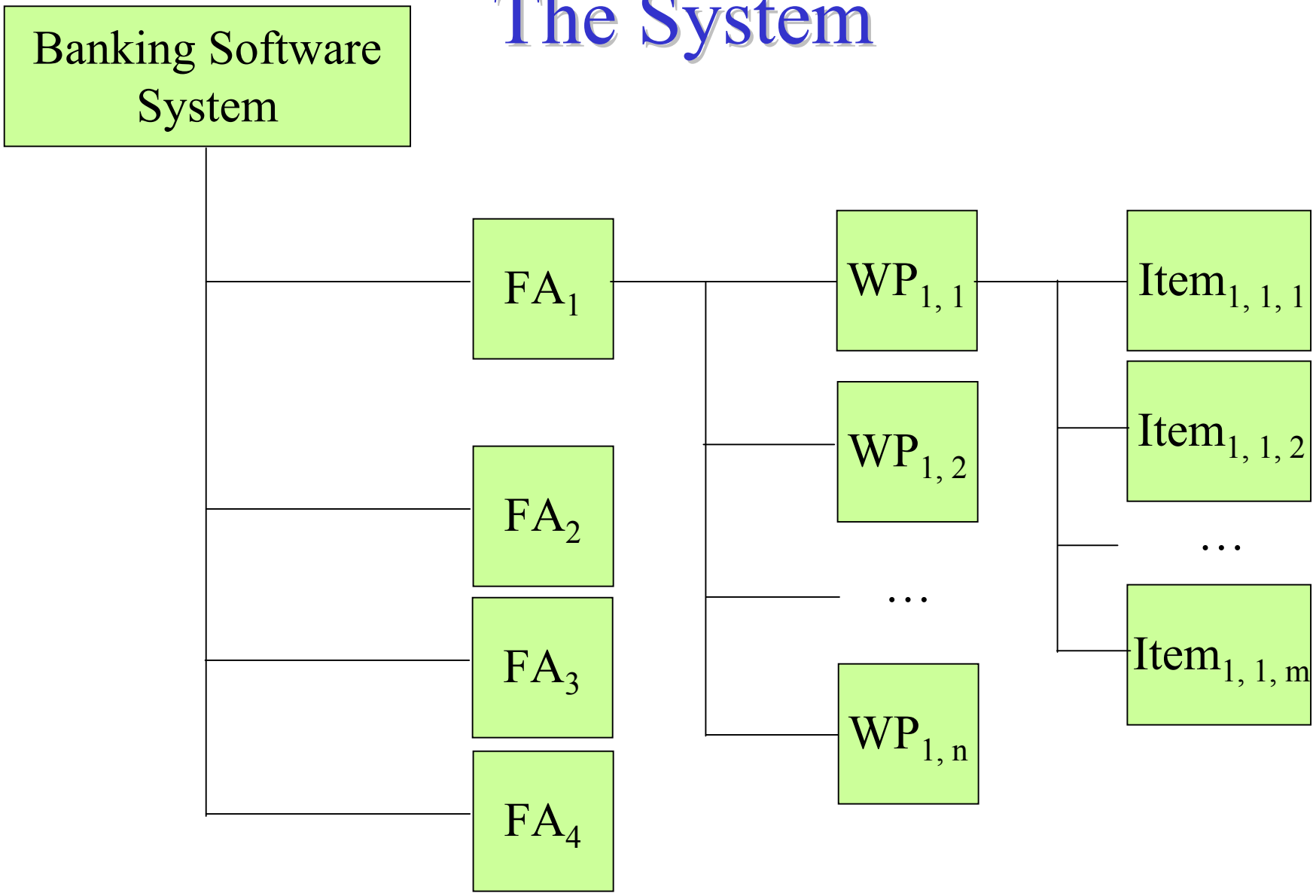
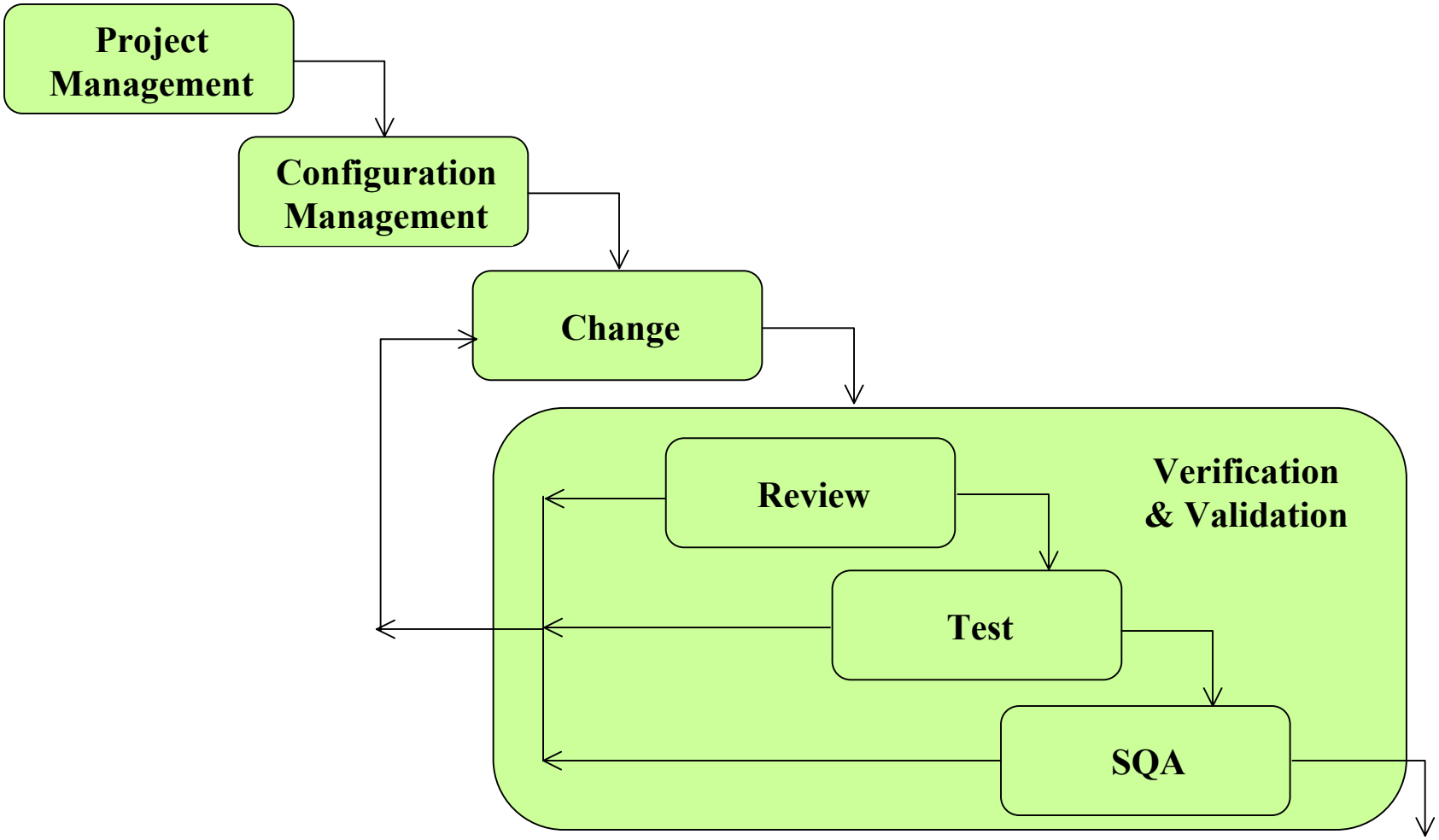
Case Study

- Post mortem analysis on a maintenance project carried out in EDS Italia
- Massive maintenance
  - of a large banking software system
  - to solve the Y2K problem

The System


Banking Software System
FA1
FA2
FA3
FA4
WP1, 1
WP1, 2
…
WP1, n
Item1, 1, 1
Item1, 1, 2
…
Item1, 1, m

The Maintenance Process …



… The Maintenance Process

- Process execution started on Site 1 for all WPs
- Depending on rework needs and currently available resources, Change and V&V phases were switched for some WPs to Site 2
- Both sites were settled in Italy
- The Collocated project includes WPs entirely executed at Site 1
- The Distributed project includes WPs executed at both Site 1 and Site 2

Previous Results*

- There are not statistically significant differences between collocated and distributed projects for
  - Duration
  - Effort
  - Staff
  - Reworking cycles
- There are statistically significant differences between collocated and distributed projects for
  - Number of reports
  - Number of meetings

* A. Bianchi, D. Caivano, F. Lanubile, F. Rago, G. Visaggio, "An Empirical Study of Distributed Software Maintenance", *Proc. of the IEEE Intl. Conf on Sw Maint.*, 2002

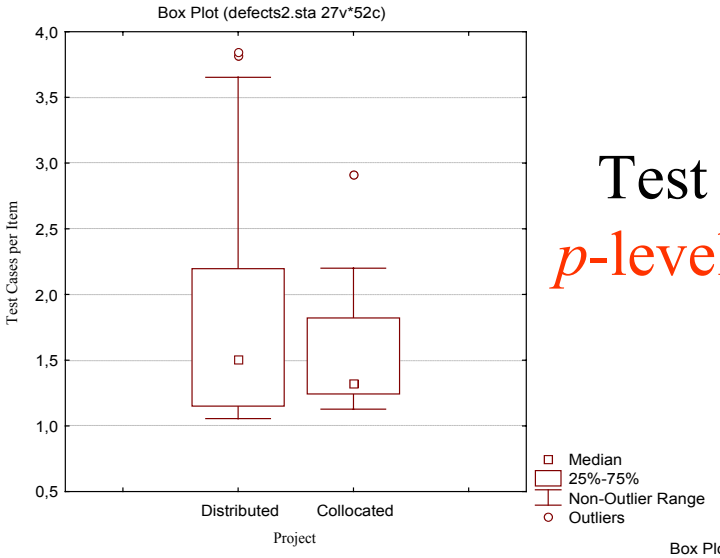
Further Analysis: Defect Metrics

- Research Question: Does the distribution among sites affect defect metrics?
- Therefore, for each defect metric M_i the following are posed
  - H_{i0}: There is no difference between the values of defect metric M_i for collocated WPs and for distributed WPs
  - H_{ia}: There is a difference between the values of defect metric M_i for collocated WPs and for distributed WPs

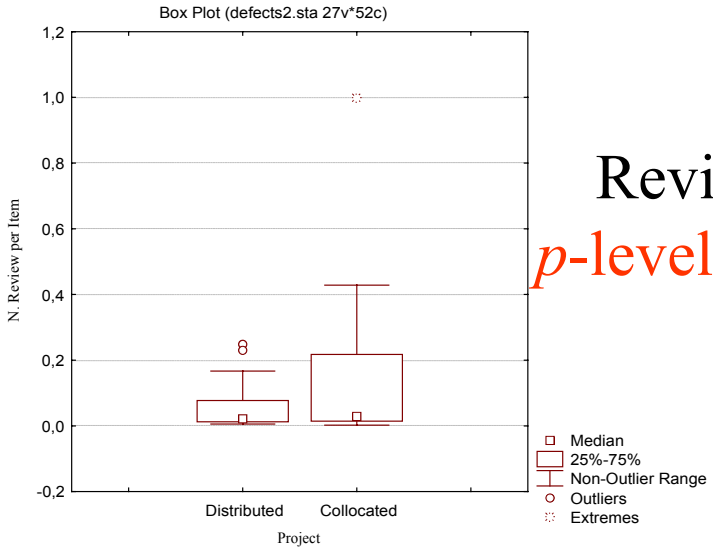
Observed metrics

- # executed test cases & # of faults that caused failures (*faults from testing*)
- # reviews & # of found defects (*faults from review*)
- # audits & # of found issues (*non conformities from audits*)
- WPs Size (# items)

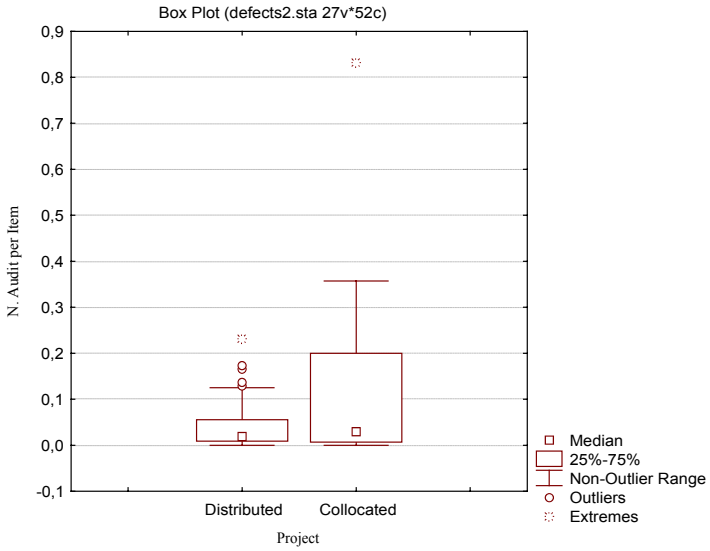
Results …



Test Cases
p-level=0.633



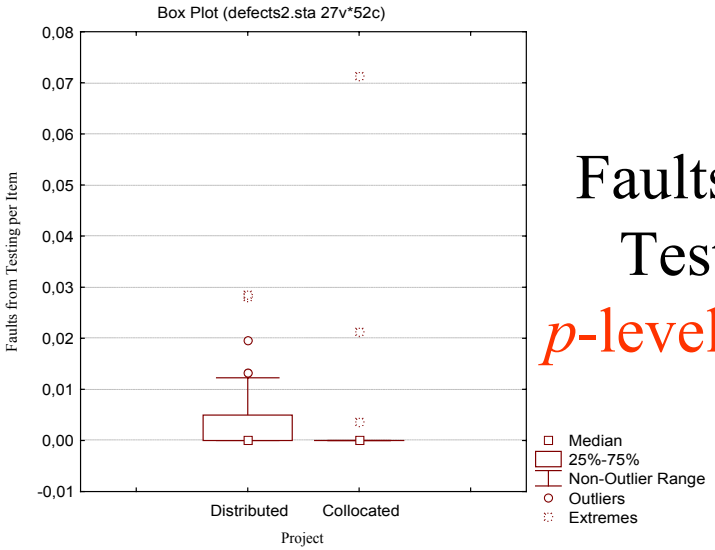
Reviews:
p-level=0.359



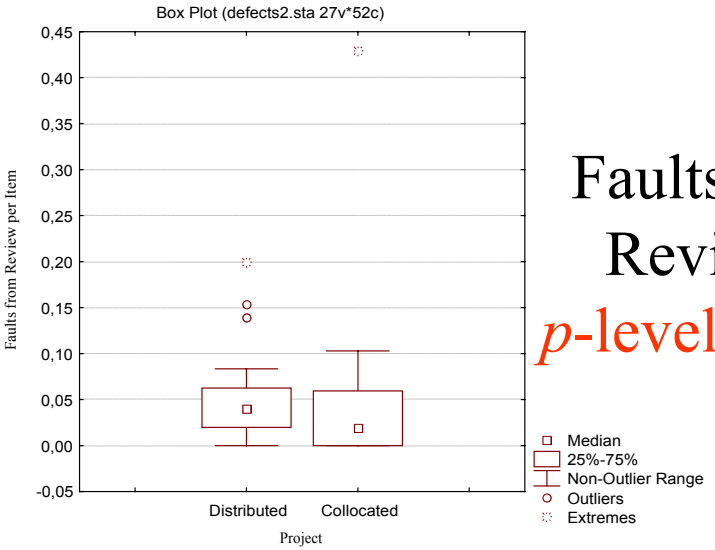
Audits:
p-level=0.453

V&V activities are comparable

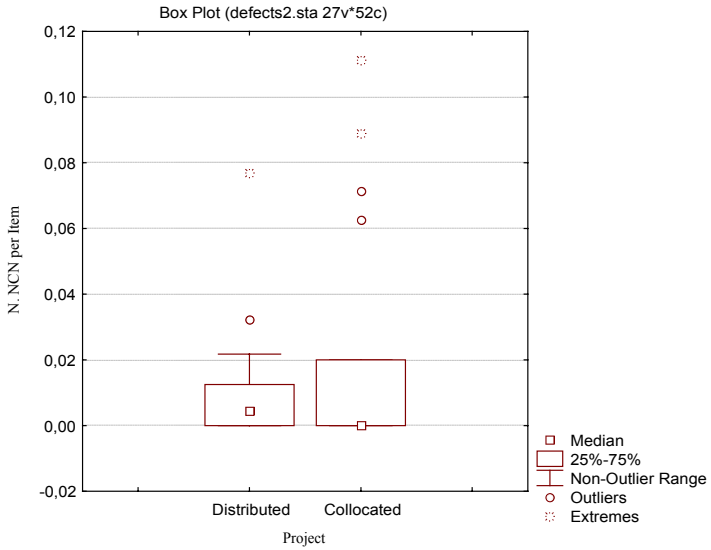
…Results



Faults from Testing: *p*-level=0.489



Faults from Review : *p*-level=0.212



Non-conformities: *p*-level=0.633

A significant difference DOES NOT exist

Hypotheses for Lack of Differences

- The specific project management
- The tasks are independent of each other
  - They can be executed concurrently
- The application domain is well-known by both sites
- Homogeneity of behavior of sites
  - because both belonging to the same company, certified CMM 3

Lessons Learned

- Need of an adequate management of:
  - strategic issues
  - cultural issues
  - technical issues

  to make effective distribution of software process
- This allows to
  - execute independent tasks
  - exploit proper skills wherever they are