



Confounding Factors When Conducting Industrial Replications in Requirements Engineering

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Problem statement

Review of experiments in software engineering

(Sjøberg *et al.*, 2005)

- Only 9% of the subjects in software engineering experiments were practitioners
- Undergraduate students are used much more often than graduate students
- “Are there additional confounding factors that should be taken into consideration when replicating an experiment in industry?”



What we did

- Replicated an experiment (Wnuk *et al.*, 2012)
 - Both original experiment and replication published in Empirical Software Engineering
- Practitioner in industry reviewed the publication
 - Identified additional confounding factors that would apply in an industrial setting



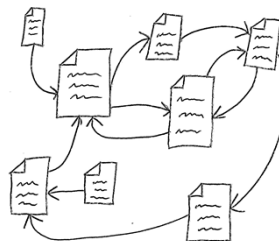
The experiment

- Background
 - Incoming requirements might originate from multiple sources (e.g. customers)
 - Challenging for an analyst to manage the inflow
 - Need to consolidate the incoming requirements



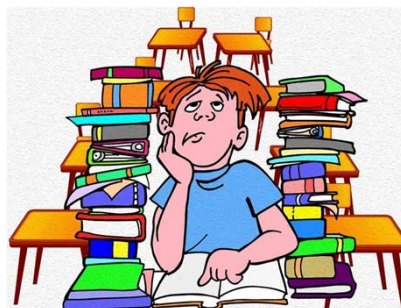
The experiment (2)

- Work task
 - Analyze requirements from two sources
 - Link related requirements
 - Cognitive task including search
- Study effect of tool support
 - Textual similarity analysis to support consolidation
 - Manual control group (limited to keyword search)



The experiment (3)

- Independent variable
 - Tool support vs. manual
- Controlled variable
 - Subject experience
- Dependent variables
 - #reqs. analyzed
 - #correct links
 - #missed links
 - #false positives
 - Precision
 - Accuracy



The experiment (3)

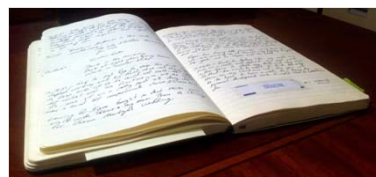
- Independent variable
 - Tool support vs. manual
- Controlled variable
 - Subject experience
- Dependent variables

	<u>Original</u>	<u>Replic.</u>
– #reqs. analyzed	Sign.	!Sign.
– #correct links	Sign.	Sign.
– #missed links	Sign.	Sign.
– #false positives	!Sign.	!Sign.
– Precision	!Sign.	!Sign.
– Accuracy	!Sign.	!Sign.



Reported confounding factors

- Well-known from the software engineering literature
 - History threat
 - Maturation threat
 - Instrumentation threat
 - Selection threat
 - Social threat
 - Subject incentives
- Subjects' level of English



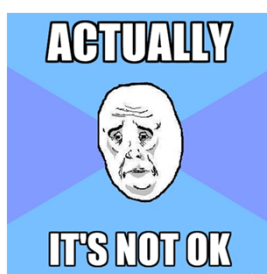
Review by industrial practitioner

- Stressed that more confounding factors apply in industry
- Most important additions
 - Developers read at different speed
 - » Known to vary an order of magnitude
 - Developers differently good at searching
 - » Formulation of search terms
 - » Interpretation of search results
 - Solution strategies undertaken
 - Subject personalities



Review by Industrial Practitioner

- Time for experiment was fixed to 45 minutes
 - Far less than in industrial practice
- None of the student subjects had sufficient experience
 - Would not participate in such a task in industry



Conclusion

- Industrial practice may focus on aspects that are not reflected by academic practice
- Must be considered before replications in industry are conducted



Thanks!

