Software Engineering Case Studies

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Software Engineering Reading Group
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Overview

- Case study paper (Kitchenham et al)
  - Overview of case study methodology
  - Good case studies are powerful.
    They are also rare
  - How to do an effective case study

- HP inspection paper
  (Grady and Van Slack)
  - Case study of 15 years of Fagan inspection effort at HP
Case Study Paper Summary

 tipos of empirical experiments (Basili et al)

- Single-project studies
- Multi-project studies
- Replicated-project studies
- Blocked subject-project studies

Extensions for formality

- Single project => case study
- Multi-project => case study or formal experiment
- Many teams, many projects => survey
To Case Study or Not To Case Study

- Case studies are easier to plan than experiments but harder to interpret and difficult to generalize.

- When is a case study the right kind of experiment?
  - Broadly generalizable results are not needed
  - Changes are wide-ranging
  - Effects of the change can’t be identified immediately
  - A “how or why” question is being asked about a set of events over which the investigator has little control.
How to do an Effective Case Study?

- Seven steps in designing and administering case studies
  - Define the hypothesis
  - Select the pilot projects
  - Identify the method of comparison
  - Minimize the effect of confounding factors
  - Plan the case study
  - Monitor the case study against the plan
  - Analyze and report the results
Case Study
Pitfalls and Pointers

“The more clearly you define your hypotheses, the more likely you are to collect the right measures, test them properly, and achieve construct validity.”

- Select case studies that are typical of your organization.
- Minimize confounding factors
  - Learning to use a method or tool as you assess its benefits
  - Using staff who are overly enthusiastic or skeptical
  - Comparing different application types
- Audit conformance of experiment to case study plan
Doing Good Case Studies

Good Case Studies Involve:

- Specifying the hypothesis under test
- Using state variables for project selection and data analysis
- Establishing a basis for comparisons
- Planning case studies properly
- Using appropriate presentation and analysis techniques to assess the results.
Case Study Paper Review

- **Good**
  - Good prescriptive advice/recipe for doing a case study
  - Puts role of case study in context
  - Simple examples show case study structure and pitfalls
  - Case studies are a useful tool that CS Ph.D. graduates should be able to use

- **Bad**
  - Case study examples overly simplistic
  - No discussion of qualitative case studies
  - No discussion of case study as teaching tool
HP Paper Summary

- HP started doing inspections 15 years ago
- Overall, they have shown inspections have a good ROI
- They’ve learned some lessons along the way
Three Stages of Inspection Adoption at HP

- Experimental
  - Early adopters, high ROI
- Initial guidelines
  - Broader adoption throughout org.
- Widespread belief and adoption
  - Even conservative curmudgeonly managers say “just do it”
Lessons Learned - Experimental Stage

- Visionary people needed to take others’ ideas and implement locally
- Company must foster risk-taking and not punish failures
- Early success is critical and fragile
Lessons Learned - Initial guidelines

- Communicating successes speeds adoption and improvement
- Clear definition of responsibility for process improvement speeds adoption of best practices
- Management training helps insure management support
- High-level, visionary goals help insure management sponsorship
- Readily available training is necessary but not sufficient
Lessons Learned - Widespread Belief and Adoption

- Consulting support that tailors approach to group maturity was necessary to expand use of inspection program.
  - One size doesn’t fit all
  - Organizational needs changed as their use of the process improved
HP Inspection Paper Review

- **Good**
  - Real-life lessons
  - Good mix of qualitative and quantitative analyses
  - Evidence for value of inspections
- **Bad**
  - Business buzzword bingo
  - Economic analysis questionable
  - Unclear how generally applicable results are outside of HP
Could These Papers be Useful in an SE Curriculum?

Case study paper:
- Case study is an important SE tool
- Good prescriptive overview of how to design a case study

HP inspection paper
- Real-life lessons
  » Gotcha avoidance
- Inspections can be very valuable
- Changing big organizations is slow, complex, difficult, and subtle.