

The ABC of Software Engineering Research

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Software Engineering Research

- Researchers seek **better ways** to develop and evaluate software.
- Key objectives of the SE research are often **quality, cost, and timeliness** of software products.

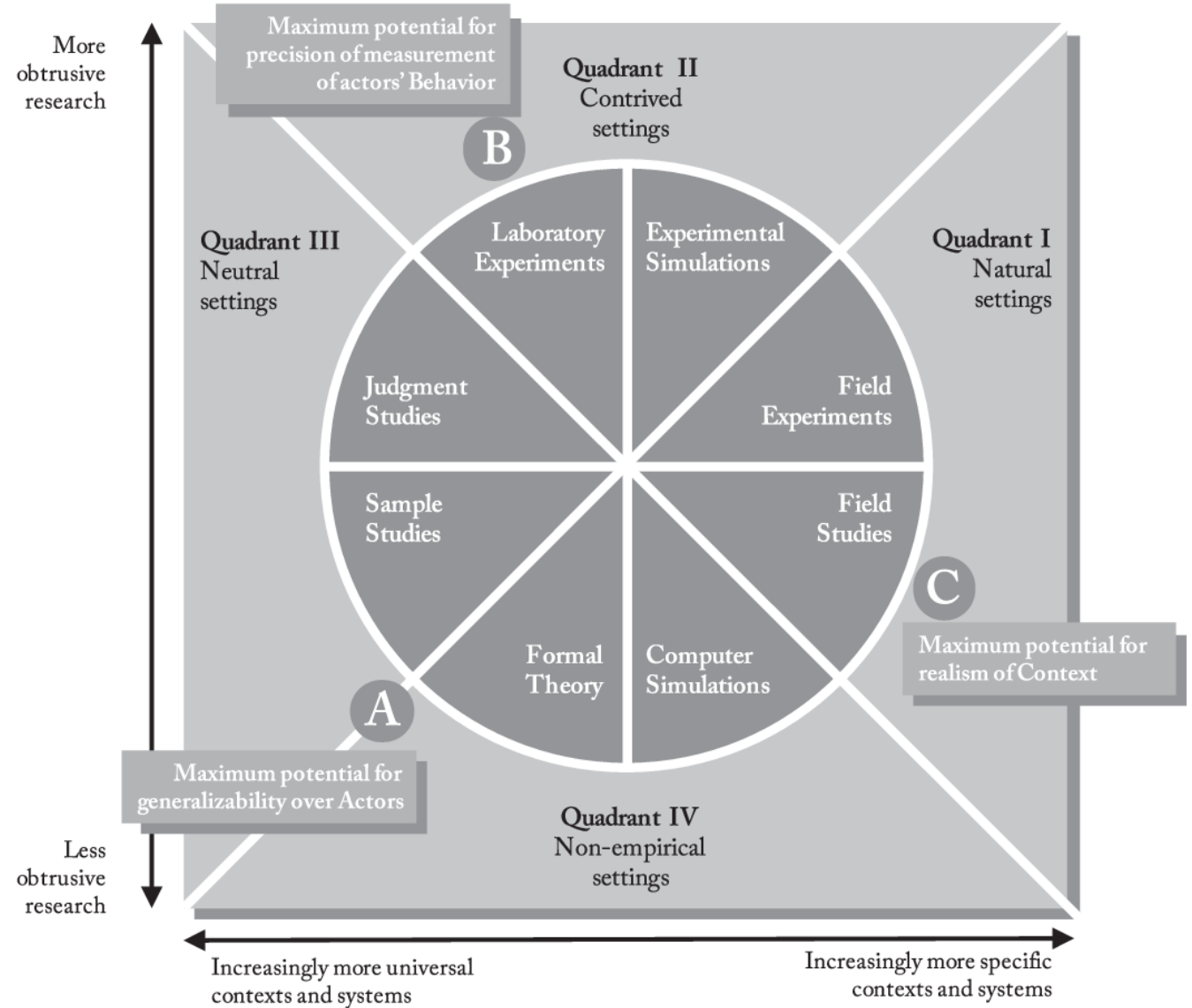
The ABC

- A **framework** for software engineering (SE) research.
- Offers **eight** archetypal research strategies
- This framework uses two **dimensions**
 - The level of **obtrusiveness**
 - The **generalizability** of research findings

The ABC framework

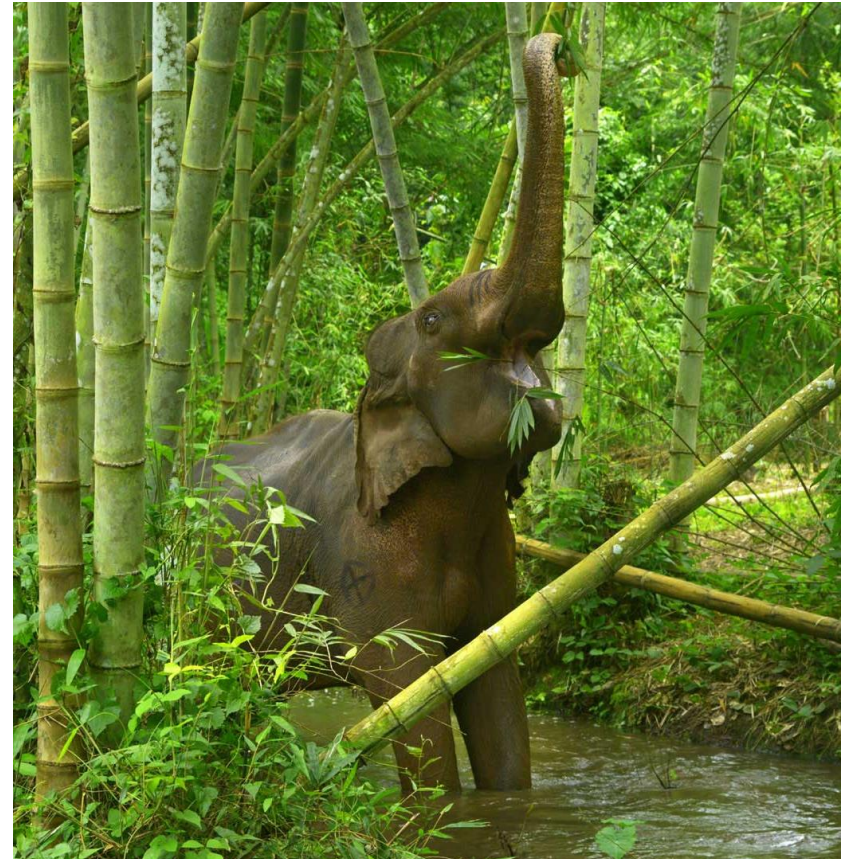
- Actors (A)
 - Managers, software **engineers**, users, software systems, software development artifacts incl. defects, **tools**, **techniques**, prototypes
- Their behavior (B)
 - System behavior, Software engineers' behavior (**productivity**, motivation and intention)
- The context (C) of a specific system or organization
 - Industrial settings, organizations, **software projects**, development teams, software laboratory

The ABC framework



Research Strategies: Field Studies

- QI - Context
- Metaphor: *Jungle*
- Cannot change variables of the system
- To investigate why coordination of distributed teams is so difficult



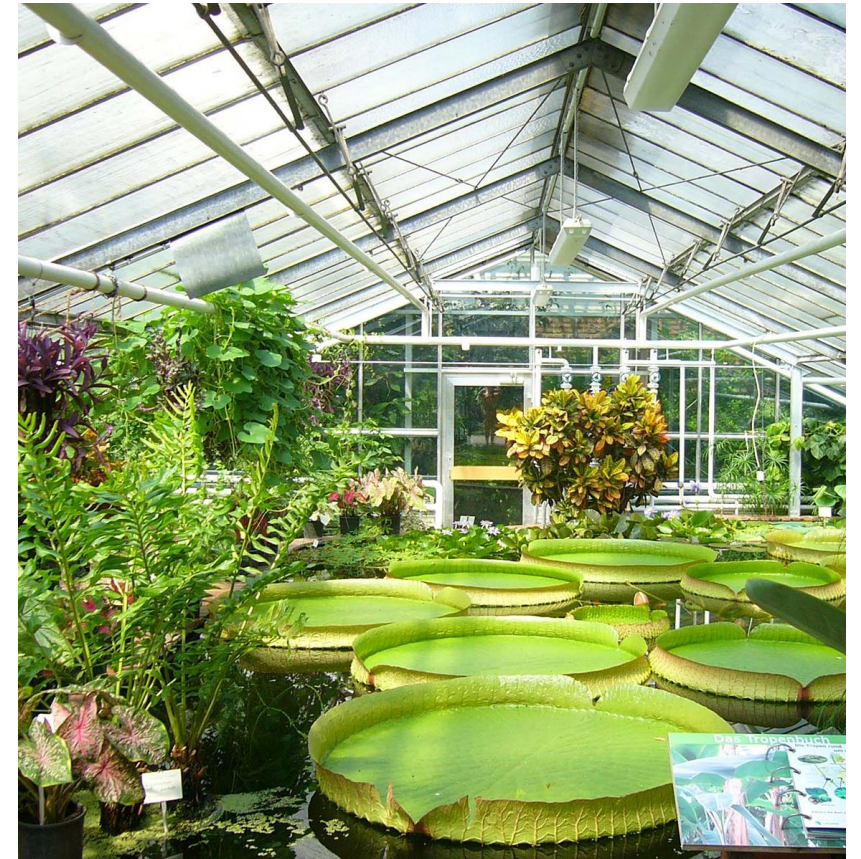
Research Strategies: Field Experiment

- QI – Context
- Metaphor: *Nature reserve*- flora and fauna can still thrive as normal.
- Placing fences so as to separate the wildlife.
- **Goal** was to investigate the **reproducibility** of software projects.



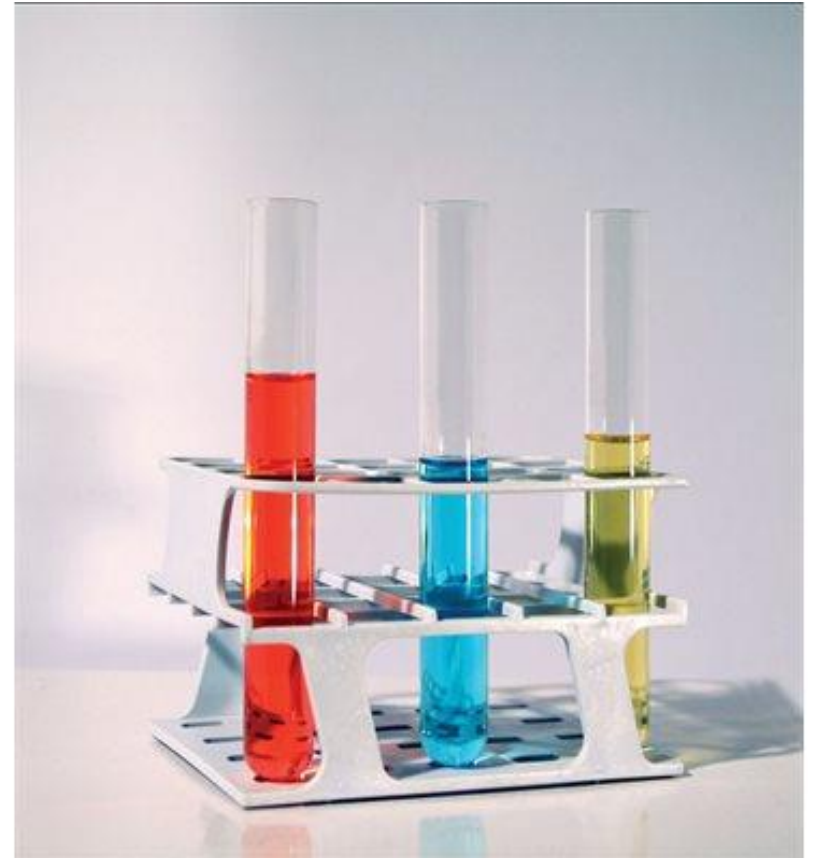
Research Strategies: Experimental Simulation

- QII - Behavior
- Metaphor: *Greenhouse* - Built to simulate a certain setting
- To study behavior of participants or systems.
- The researchers found strong evidence that collocated participants had a **strong tendency to collaborate** with one another, rather than with those who were not collocated.



Research Strategies: Laboratory Experiment

- QII – Behaviour
- Metaphor: *Test tube* - there is a high degree of control over what happens inside.
- Example: Study on **pair programming**.



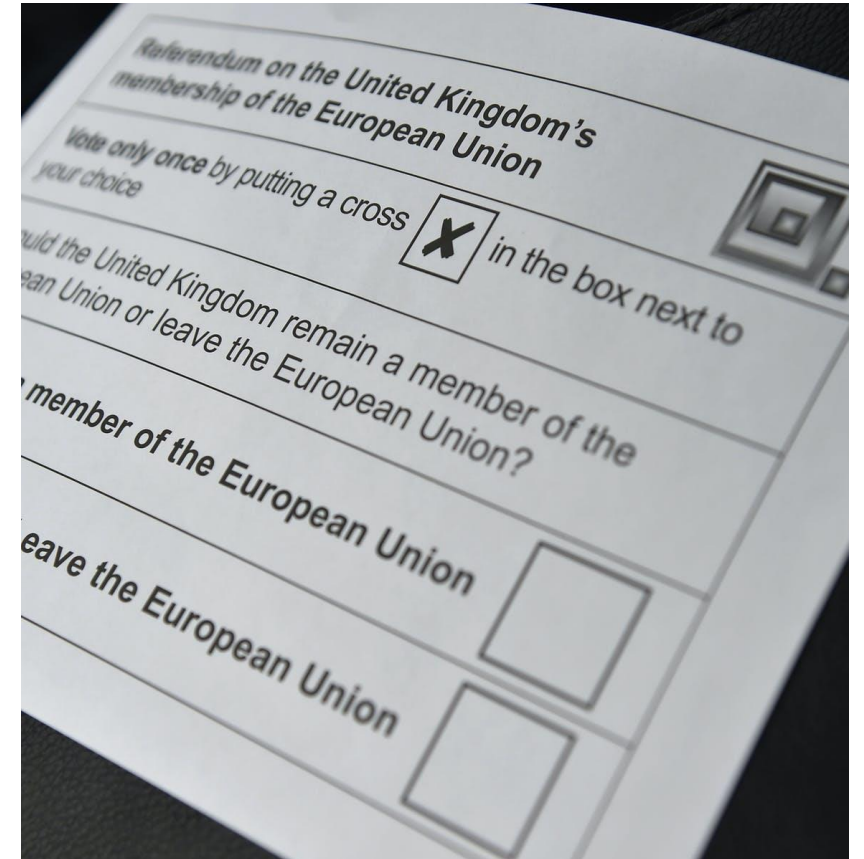
Research Strategies: Judgment Study

- QIII - Actors
- Metaphor: *Courtroom* : Evidence is presented, Jury returns **verdict**.
- *Experts are invited to judge or rate behaviors*
- **Investigation** of key characteristics for effective tailoring of **agile** methods.



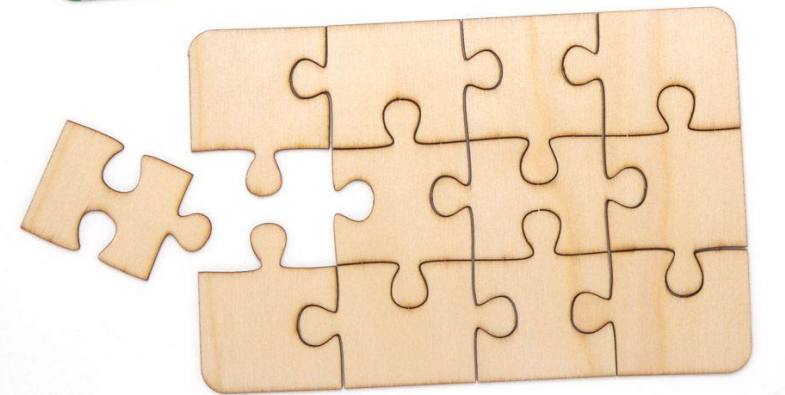
Research Strategies: Sample Studies

- QIII – Actors
- Metaphor: Referendum
- Aims to achieve **generalizability** over certain population of actors.
- To study **open-source software** projects



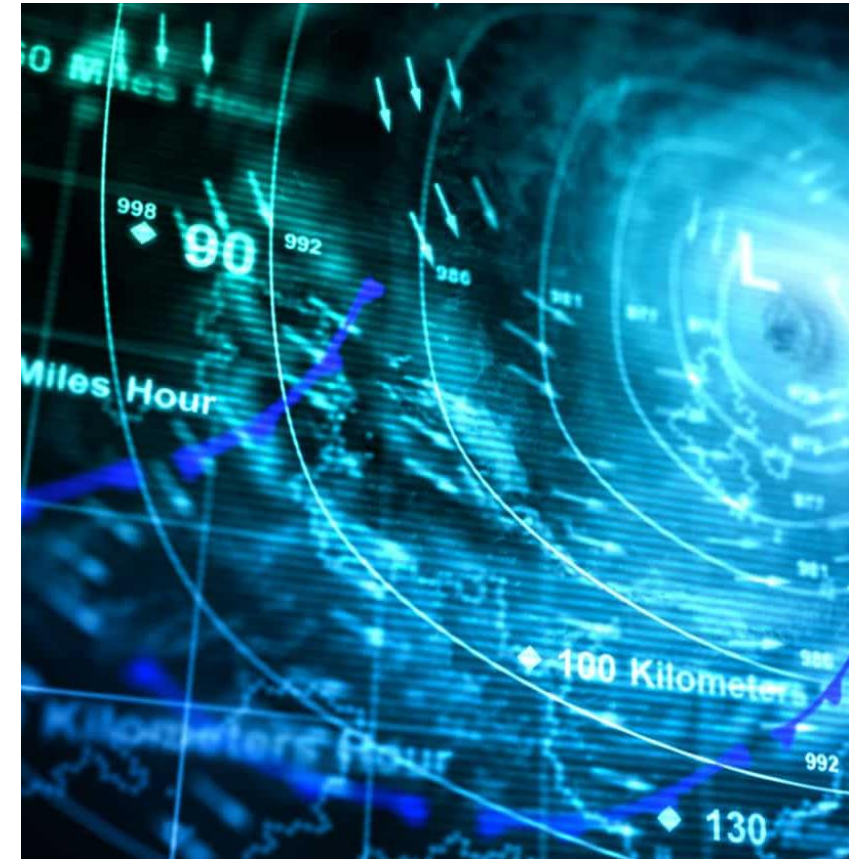
Research Strategies: Formal Theory

- QIV - Actors
- Metaphor: Jigsaw puzzle - can be done as a **solitary** or **team effort**. Goal is to fit all pieces together.
- Example: **General theory of software engineering (GTSE)**: Project managers can use the theory to inform their decision-making processes.



Research Strategies: Computer Simulation

- QIV - Actors
- Metaphor: *Forecasting system*
- The goal is to create a symbolic replica of a certain type of **concrete system** that can be executed by a computer.
- To evaluate the choice of **task allocation strategy** and its impact on **project duration**.



Distribution of Research Strategies

- Analyzed **75 articles** published in 2017 in *Springer's Empirical Software Engineering* journal.
- All studies can be mapped to the ABC framework

Distribution of Research Strategies(2)

Strategy	Count
Field Study	10
Field Experiment	0
Experimental Simulation	4
Laboratory Experiment	30
Judgment Study	3
Sample Study	38
Formal Theory	0
Computer Simulation	0

Limitations

- ABC framework does not provide guidance for **specific methods**.
- Researchers may design studies that **do not fall cleanly within** one of the octants of the framework
- ABC framework is an **alternative** view to software engineering research, not necessarily the **best view**.
- ABC framework applies to **primary studies only**, and specifically those that we have labeled knowledge seeking.

Questions ?

Thank you !