THE A B C OF SOFTWARE ENGINEERING RESEARCH

KLAAS-JAN **STOL**

Lero, University College Cork

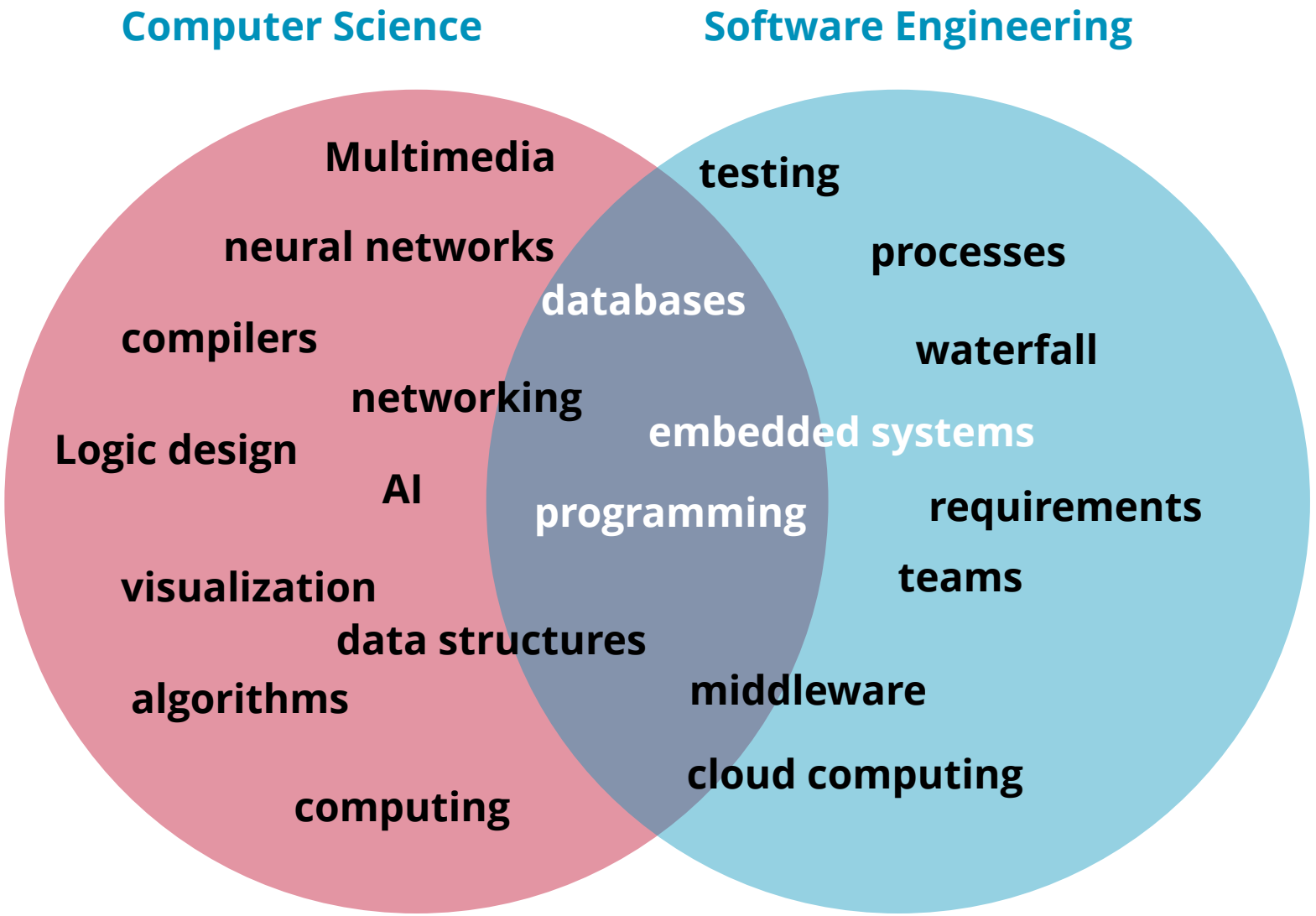
BRIAN **FITZGERALD**

Lero, University of Limerick

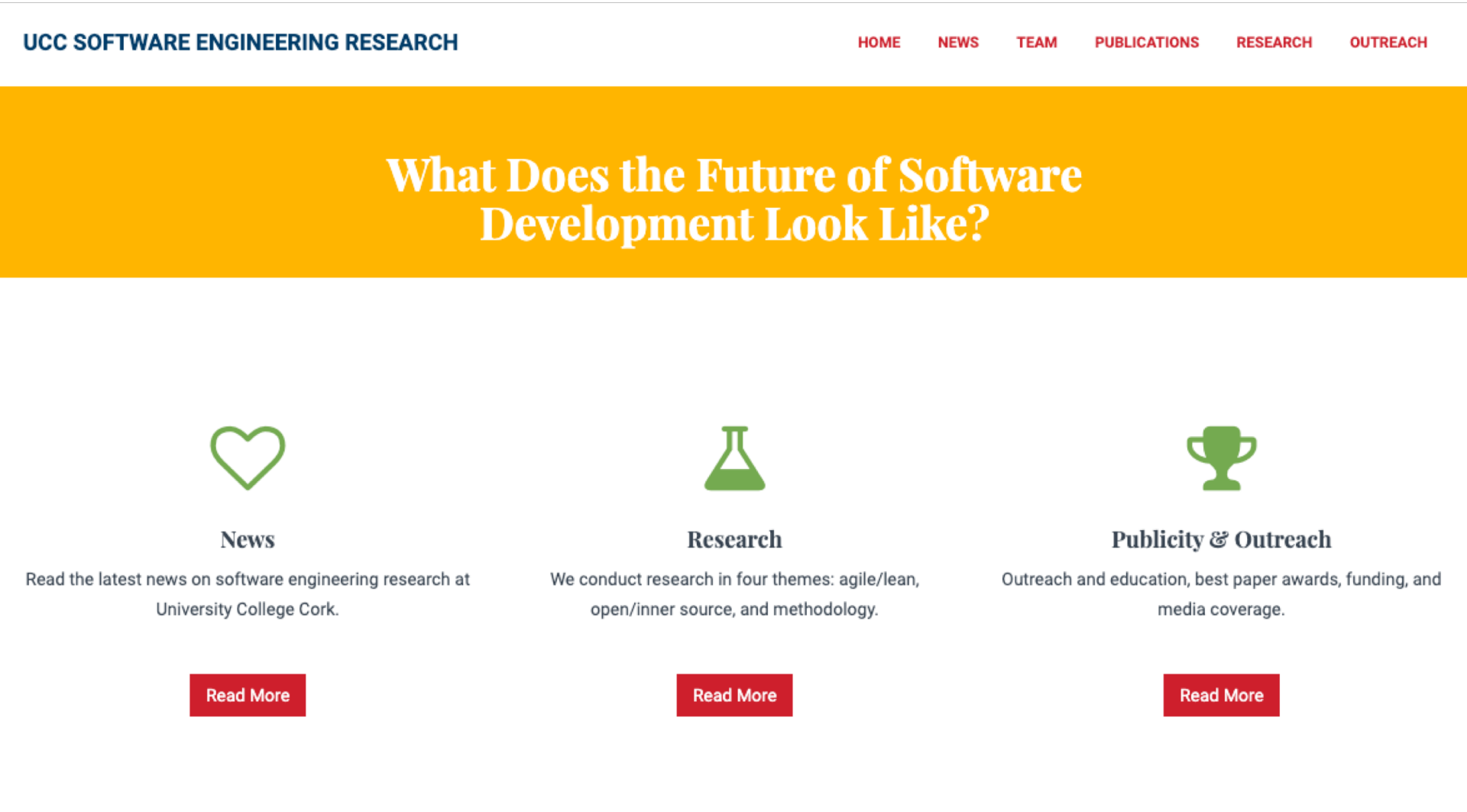
> “The proper place to study elephants is the jungle, not the zoo.”
>
> *—Ephraim McLean*

> “The proper place to study bacteria is the laboratory, not the jungle.”
>
> *—Keng-Leng Siau*

Computer Science & Software Engineering



UCC SOFTWARE ENGINEERING RESEARCH
user-group.github.io



Motiv.	Norms	Comm.	faction	Commitm
1.000	0.077	0.180	0.173	0.123
0.167	**0.755**	0.221	0.254	0.408
0.101	**0.791**	0.263	0.363	0.463
−0.014	**0.828**	0.270	0.355	0.521
−0.016	**0.726**	0.489	0.388	0.513
0.180	0.391	**1.000**	0.447	0.445
0.187	0.416	0.341	**0.830**	0.407
0.109	0.388	0.442	**0.900**	0.538
0.128	0.286	0.345	**0.833**	0.443
0.159	0.380	0.374	**0.806**	0.591

Generalizability over

Actors

e.g. surveys

Precision of measurement of

Behavior

e.g. controlled experiments

Capturing a realistic

Context

e.g. case studies

Common Review Comments

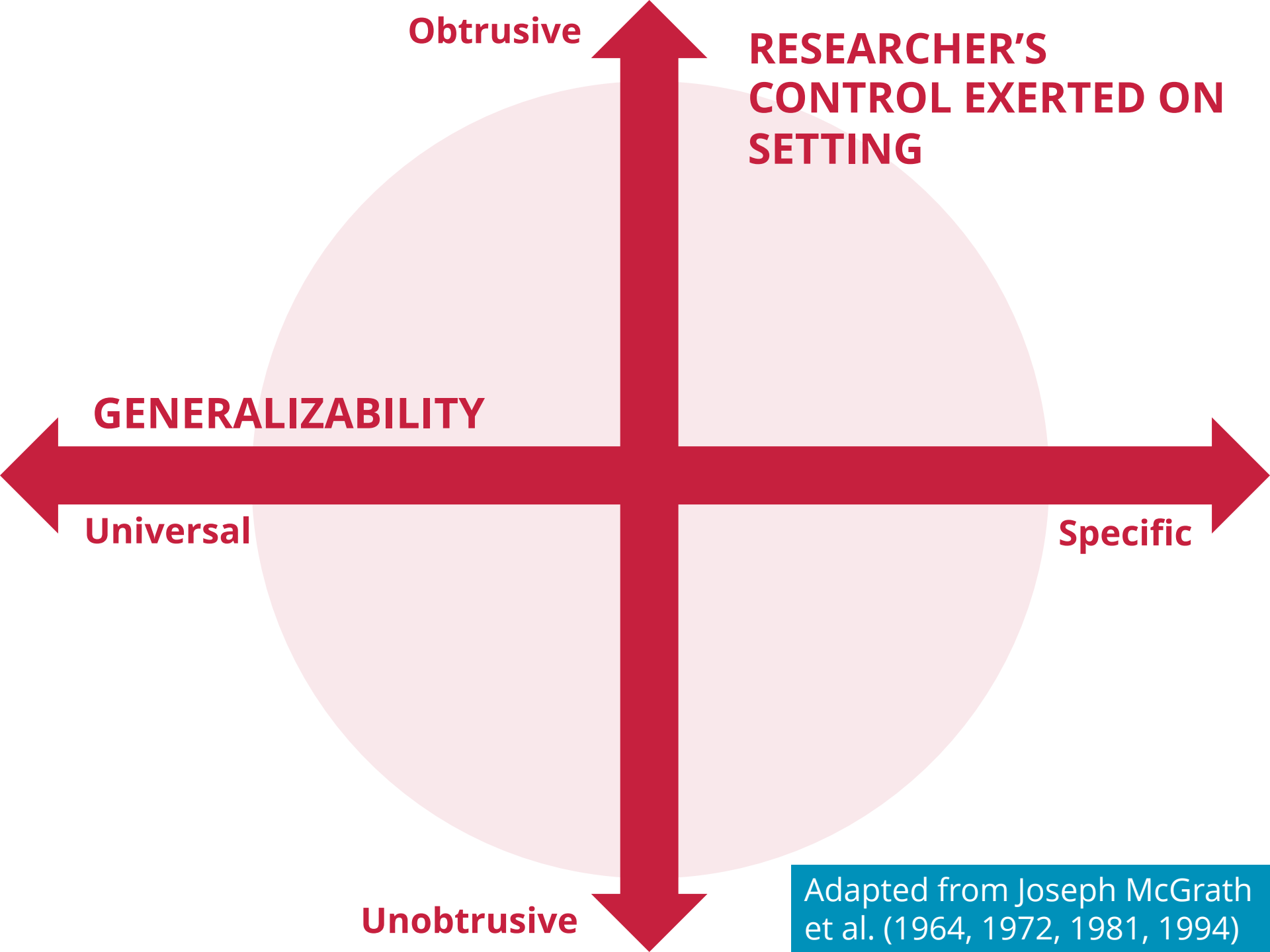
“.. unfortunately, your study presents only a single case, so the findings of the study are not generalizable.”

“This experiment was conducted with 42 undergraduate students, doing some trivial classroom task, so the research does not reflect a realistic setting.”

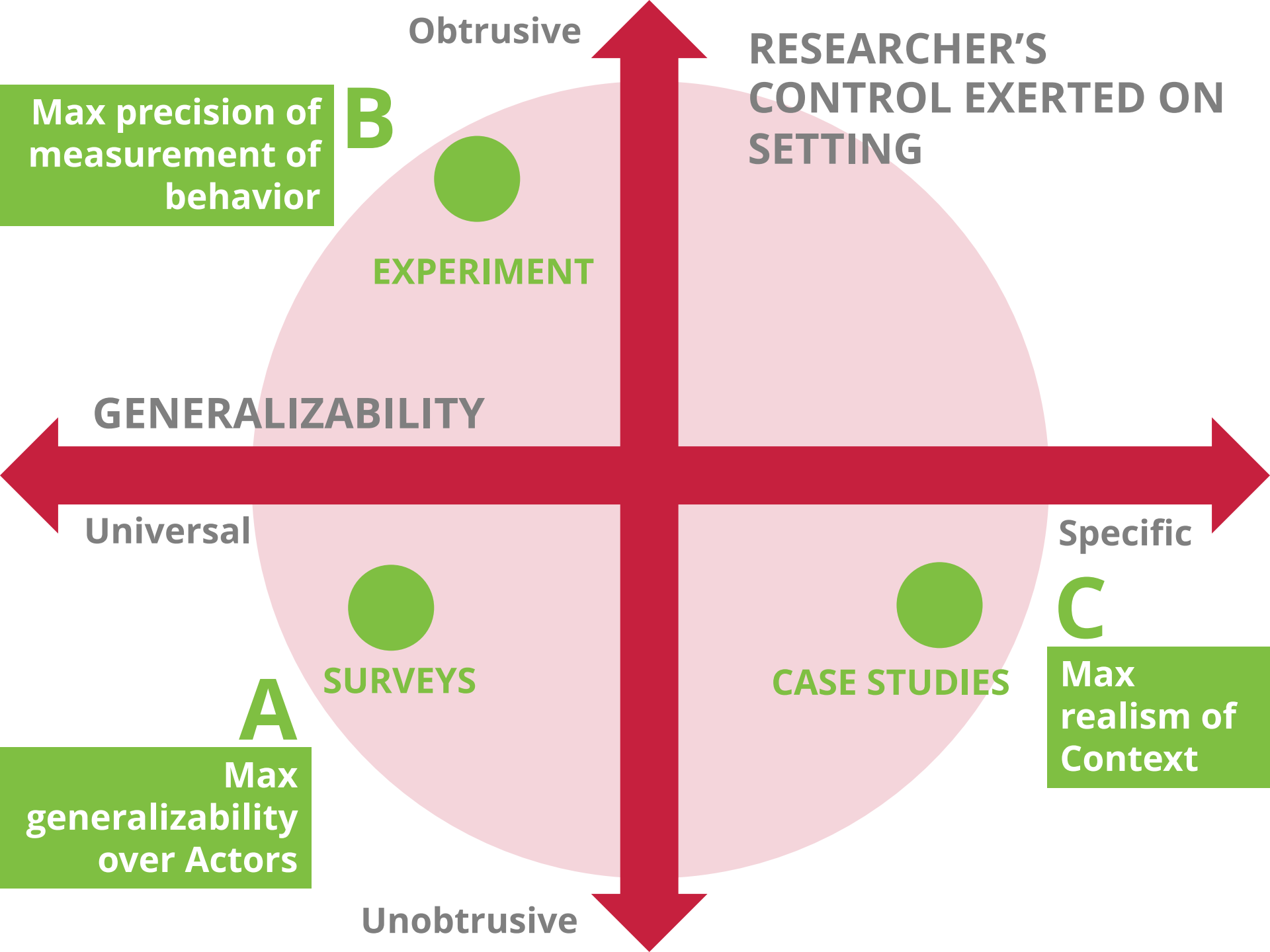
“Your simulation oversimplifies the real world – what can we learn when you limit the model to only these 4 parameters?”

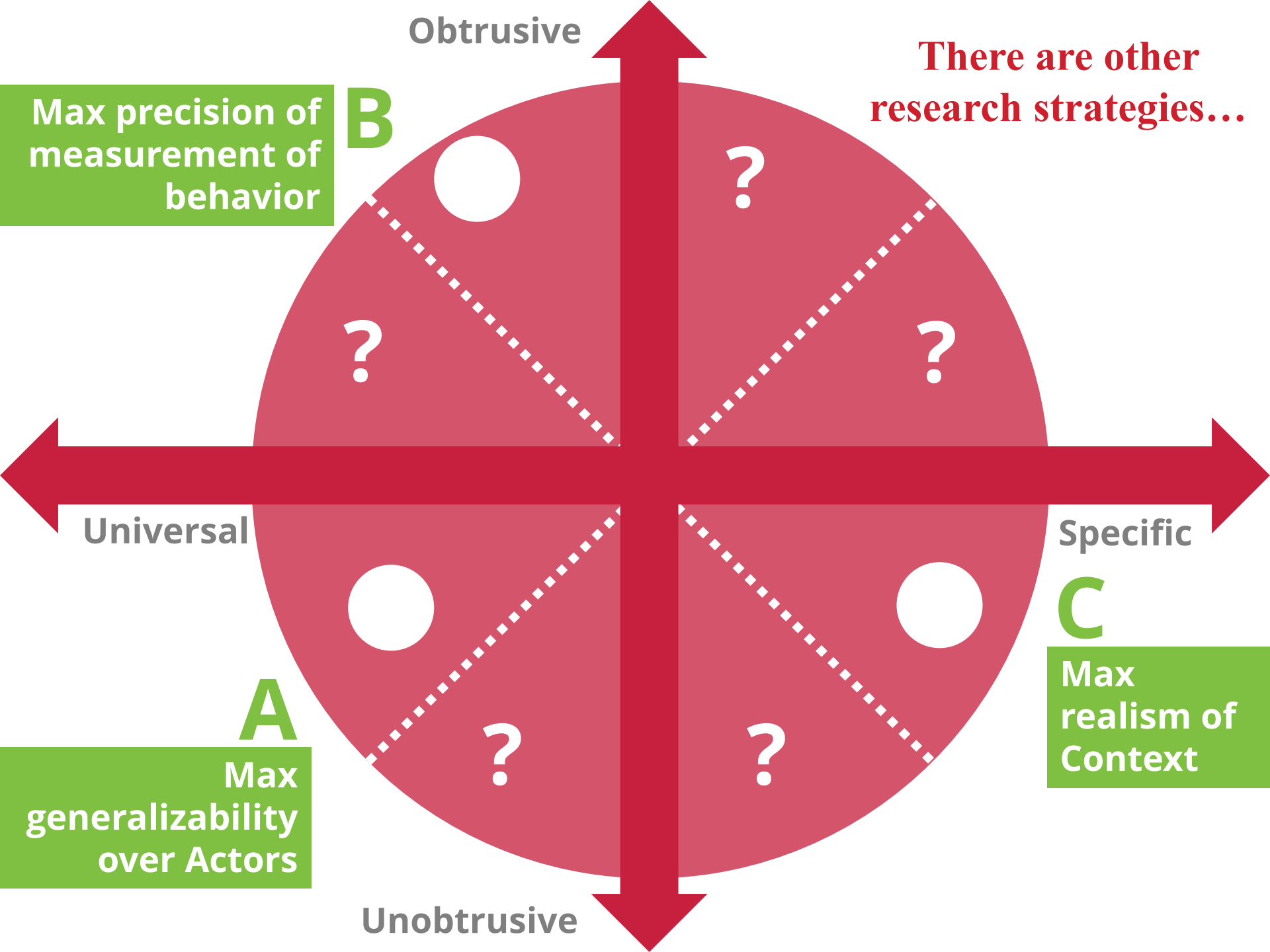
Common Review Comments

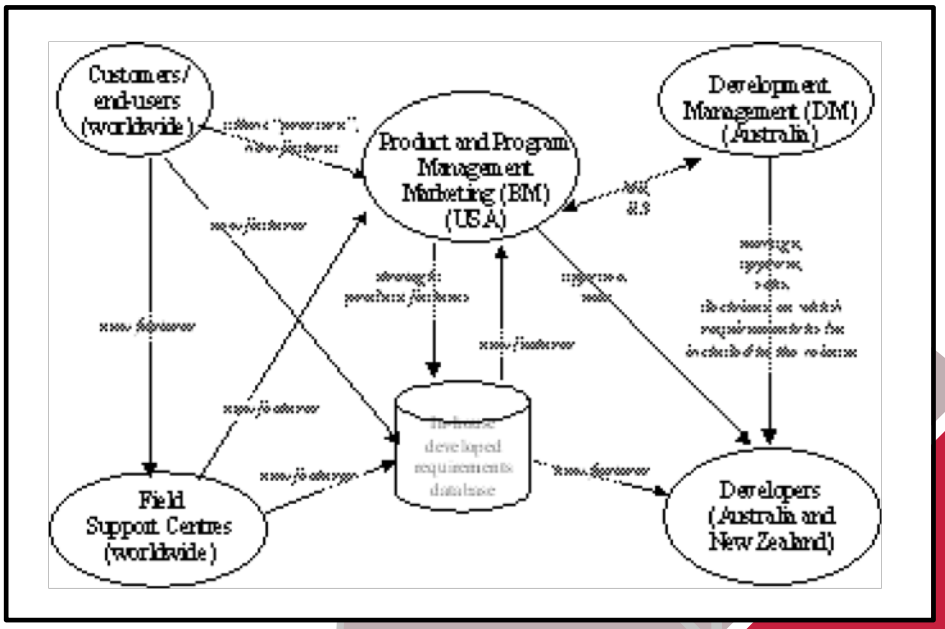
1. How generalizable are the findings of your study?
2. How realistic is the context of your study?
3. How precise is your measurement?



Adapted from Joseph McGrath et al. (1964, 1972, 1981, 1994)


Obtrusive
RESEARCHER'S CONTROL EXERTED ON SETTING
Max precision of measurement of behavior
B
EXPERIMENT
GENERALIZABILITY
Universal
Specific
SURVEYS
CASE STUDIES
C
Max realism of Context
A
Max generalizability over Actors
Unobtrusive


Obtrusive
There are other research strategies…
Max precision of measurement of behavior
B
?
?
?
Universal
Specific
C
Max realism of Context
A
Max generalizability over Actors
?
?
Unobtrusive



Field Studies

QUADRANT I
Natural Settings

FIELD STUDY

Damian and Zowghi: impact of distributed stakeholders on RE activities

Observations, interviews, docs

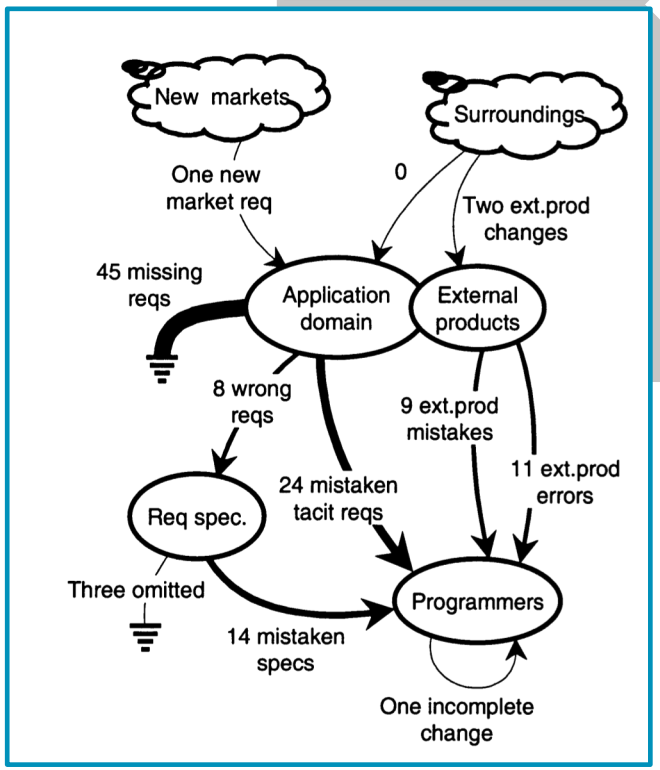
7 months on-site

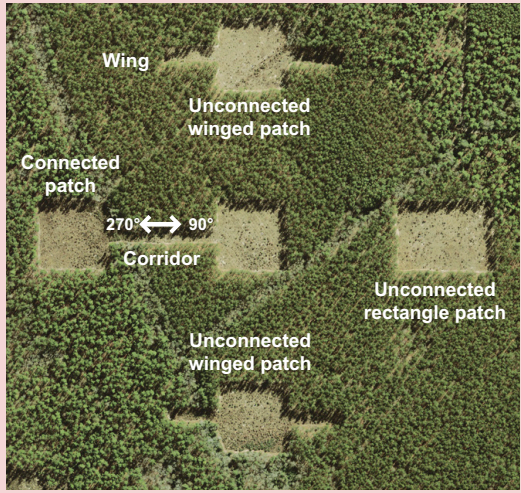
FIELD EXPERIMENT

Lauesen & Vinter:
a cost-effective way to avoid requirement defects

Evaluate new approaches with real products

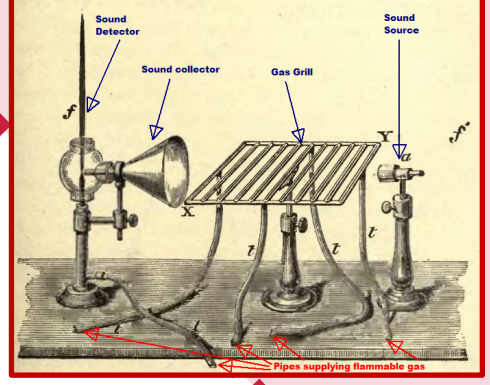
Action Research: realistic context, limited control





Field Experiments

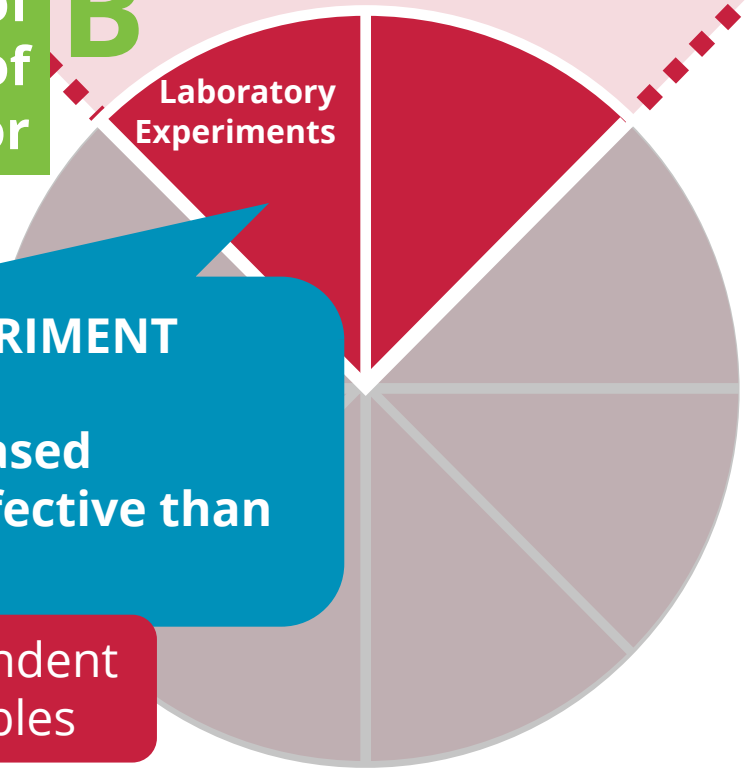
QUADRANT I
Natural Settings



QUADRANT II
Contrived Settings

Max precision of measurement of behavior

B

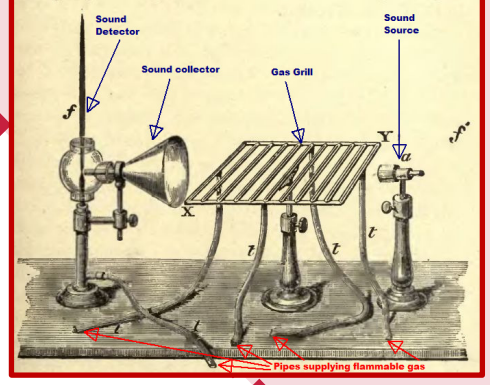


LABORATORY EXPERIMENT

Porter et al.: scenario-based inspections are more effective than ad hoc inspections.

classroom

4 dependent variables



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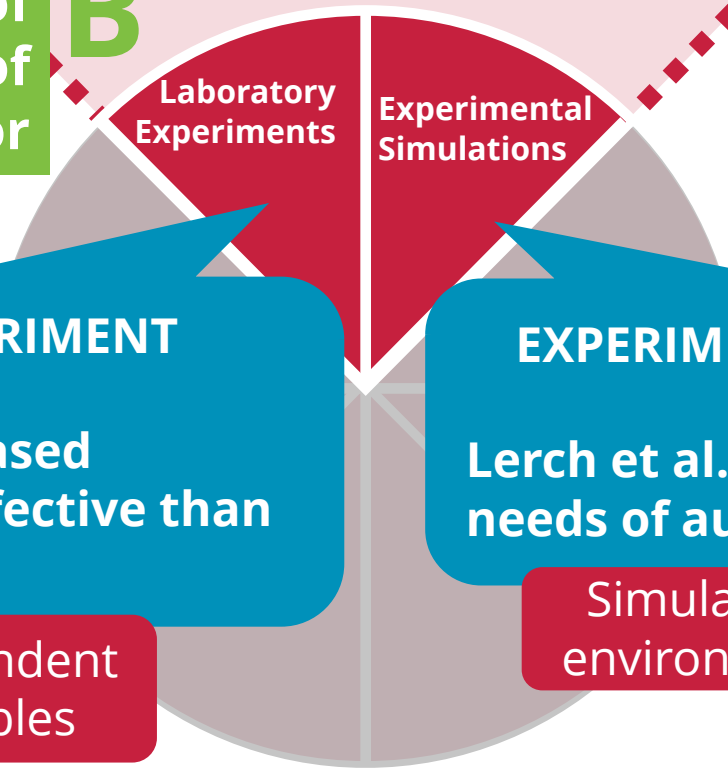


LABORATORY EXPERIMENT

Porter et al.: scenario-based inspections are more effective than ad hoc inspections.

classroom

4 dependent variables

EXPERIMENTAL SIMULATION

Lerch et al.: computer support needs of automation staff

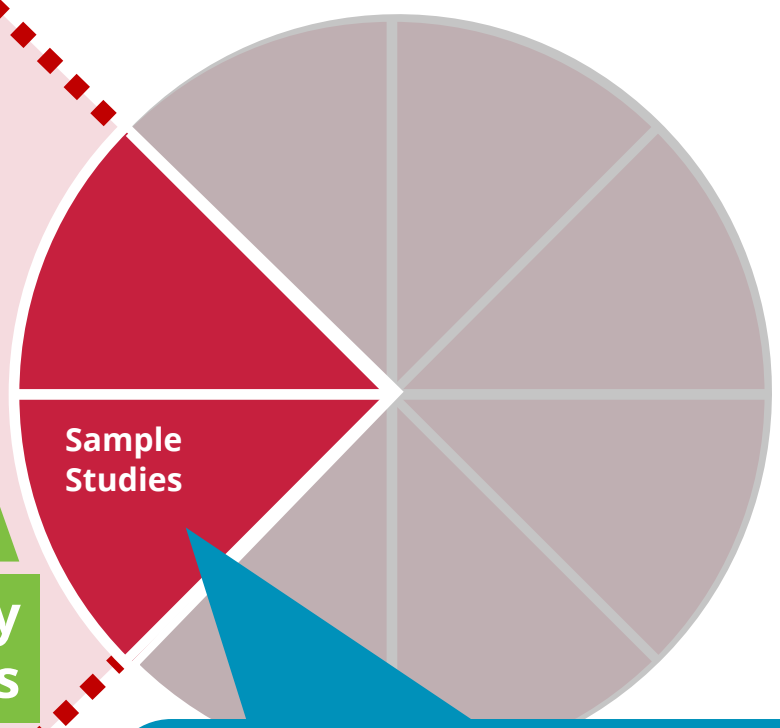
Simulation environment

Stimuli to participants

QUADRANT III
Neutral Settings

A

Max generalizability over Actors



SAMPLE STUDIES

LaPlante: state of practice of requirements engineering in industry

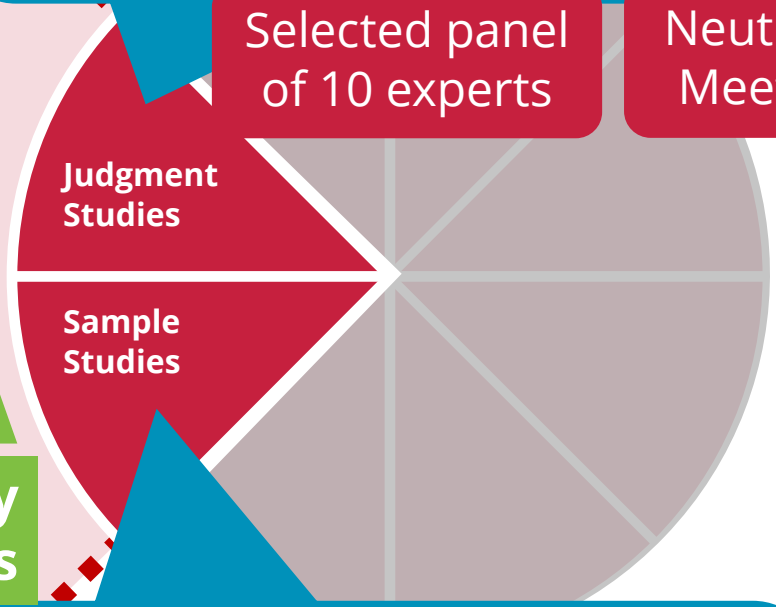
Limited set of 22 questions

Large number of 194 responses

QUADRANT III
Neutral Settings

A

Max generalizability over Actors



JUDGMENT STUDIES

Daneva: evaluated practices based on feedback by ERP practitioners

Selected panel of 10 experts

Neutral setting: Meeting room

SAMPLE STUDIES

LaPlante: state of practice of requirements engineering in industry

Limited set of 22 questions

Large number of 194 responses

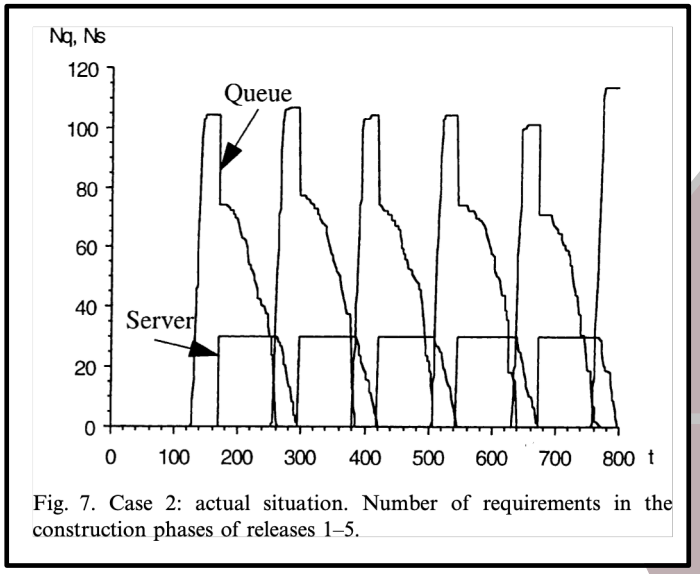


Fig. 7. Case 2: actual situation. Number of requirements in the construction phases of releases 1–5.

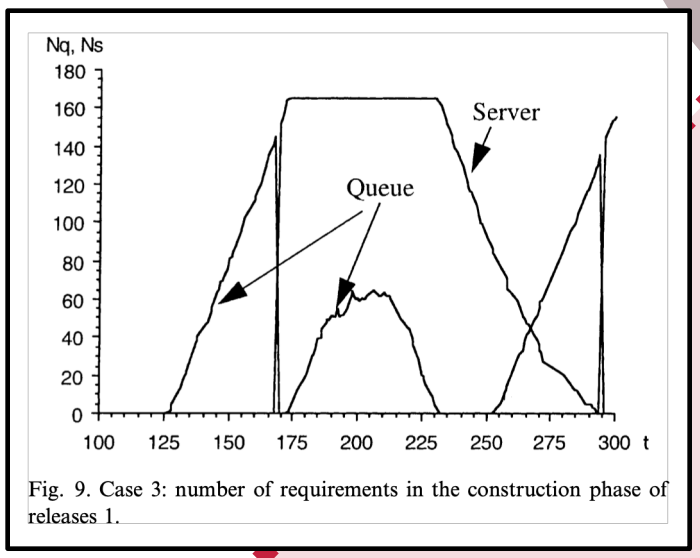


Fig. 9. Case 3: number of requirements in the construction phase of releases 1.

COMPUTER SIMULATION

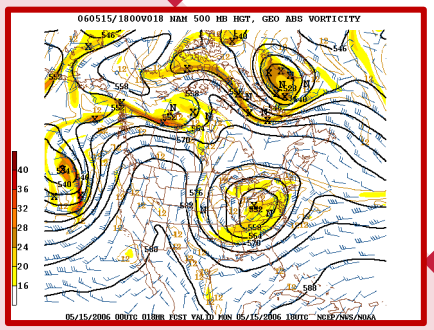
Höst et al.: bottlenecks and overload in RE processes

4 scenarios

Simulation in SDL

Computer Simulations

QUADRANT IV
Non-Empirical Settings



FORMAL THEORY

Nguyen & Shanks: Understanding the role of creativity in RE.

Compiling prior Literature

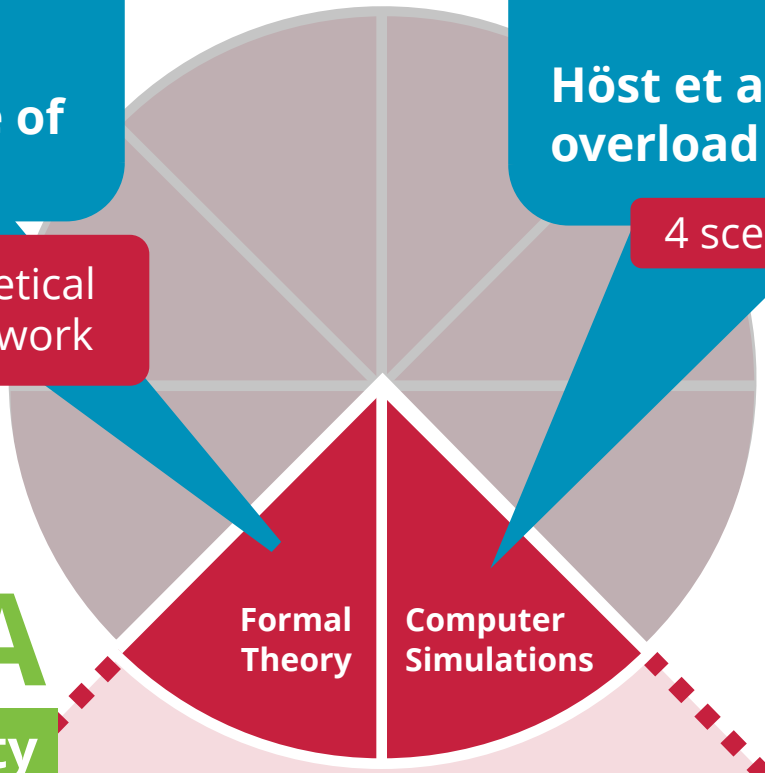
Theoretical framework

COMPUTER SIMULATION

Höst et al.: bottlenecks and overload in RE processes

4 scenarios

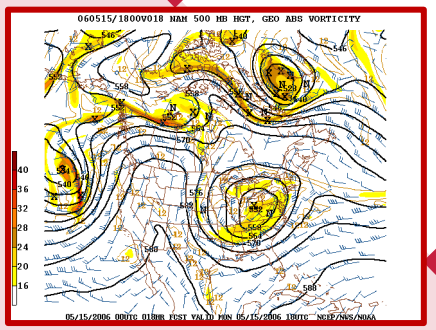
Simulation in SDL

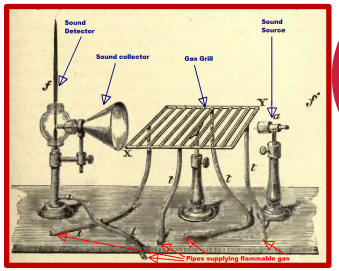


A

Max generalizability over Actors

QUADRANT IV
Non-Empirical Settings





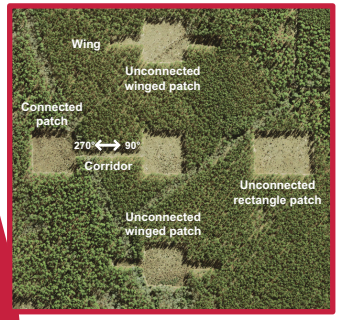
B

Laboratory Experiments

Experimental Simulations

Judgment Studies

Field Experiments



Sample Studies

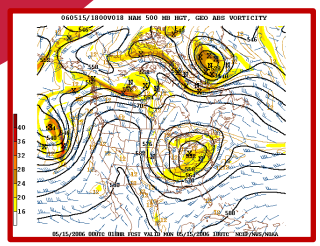
Field Studies

C

Formal Theory

Computer Simulations

A



Open Access: ACM TOSEM 27(3) *October 2018*

Find it: Google "ABC Software Engineering"

ABC Framework

1. A holistic overview of research strategies.

2. Positions 8 archetype strategies as trade-offs between the 3 ABC goals.

3. Offers terminology for studies that are vaguely labeled.

THE ABC OF SOFTWARE ENGINEERING RESEARCH

shameless plug

Diomidis Spinellis
@CoolSWEng

Following

The 51 page ABC of Software Engineering Research #TOSEM article should be mandatory reading for new software engineering PhD students. It's also a wonderful methodology reference for all software engineering researchers.
doi.org/10.1145/3241743