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

Computer Science
- Multimedia
- Neural networks
- Compilers
- Logic design
- Visualization
- Algorithms
- Computing

Software Engineering
- Testing
- Processes
- Waterfall
- Embedded systems
- Requirements
- Teams
- Middleware
- Cloud computing
UCC SOFTWARE ENGINEERING RESEARCH
user-group.github.io

What Does the Future of Software Development Look Like?

News
Read the latest news on software engineering research at University College Cork.

Read More

Research
We conduct research in four themes: agile/lean, open/inner source, and methodology.

Read More

Publicity & Outreach
Outreach and education, best paper awards, funding, and media coverage.

Read More
episodic volunteers’ intention to remain active in a FLOSS context. Finally, we conducted a cluster analysis to explore unobserved heterogeneity.

In addition we also discuss moderating measures are reliable and valid, allowing us to assess the constructs in our model capture different phenomena.

To summarize, we have established that the construct ratios are significantly different from 1.0. This suggests that

A. Structural Model Evaluation

B. Intentional to Remain

C. Extensibility

D. Contribution Type


<table>
<thead>
<tr>
<th>Item Item description</th>
</tr>
</thead>
<tbody>
<tr>
<td>s1 I enjoy my volunteer experience.</td>
</tr>
<tr>
<td>s3 My volunteer experience is worthwhile.</td>
</tr>
<tr>
<td>s5 I am likely to continue to volunteer for this project.</td>
</tr>
<tr>
<td>cc6 Many of the people that I know expect me to continue as a volunteer.</td>
</tr>
<tr>
<td>cc7 It is important to my friends and relatives that I continue volunteering.</td>
</tr>
<tr>
<td>ir1 I care about the community for which I volunteer.</td>
</tr>
<tr>
<td>ir2 I will recommend that others volunteer for this community.</td>
</tr>
<tr>
<td>ir3 If there was a serious problem in the community, the people could get together to solve it.</td>
</tr>
<tr>
<td>ir4 I hope that volunteering is a part of my life for years to come.</td>
</tr>
<tr>
<td>ir5 My experience with this community has been positive, and I look forward to continuing to volunteer.</td>
</tr>
<tr>
<td>ir6 It is important to me that the community I volunteer for continues to exist.</td>
</tr>
<tr>
<td>ir7 I feel a sense of obligation to continue volunteering.</td>
</tr>
<tr>
<td>ir8 I care about the community for which I volunteer.</td>
</tr>
<tr>
<td>ir9 It is important to me that the community I volunteer for continues to exist.</td>
</tr>
<tr>
<td>ir10 I feel a sense of obligation to continue volunteering.</td>
</tr>
<tr>
<td>ps1 Many people who I meet tell me that I should continue volunteering.</td>
</tr>
<tr>
<td>ps2 It is important to my friends and relatives that I continue volunteering.</td>
</tr>
<tr>
<td>ps3 My experience with this community has been positive, and I look forward to continuing to volunteer.</td>
</tr>
<tr>
<td>ps4 It is important to me that the community I volunteer for continues to exist.</td>
</tr>
<tr>
<td>ps5 I feel a sense of obligation to continue volunteering.</td>
</tr>
<tr>
<td>ps6 Many of the people that I know expect me to continue as a volunteer.</td>
</tr>
<tr>
<td>ps7 It is important to my friends and relatives that I continue volunteering.</td>
</tr>
<tr>
<td>ps8 My experience with this community has been positive, and I look forward to continuing to volunteer.</td>
</tr>
<tr>
<td>ps9 It is important to me that the community I volunteer for continues to exist.</td>
</tr>
<tr>
<td>ps10 I feel a sense of obligation to continue volunteering.</td>
</tr>
<tr>
<td>ps11 I care about the community for which I volunteer.</td>
</tr>
<tr>
<td>ps12 I will recommend that others volunteer for this community.</td>
</tr>
<tr>
<td>ps13 If there was a serious problem in the community, the people could get together to solve it.</td>
</tr>
<tr>
<td>ps14 I hope that volunteering is a part of my life for years to come.</td>
</tr>
</tbody>
</table>

In order to determine whether path coefficients are statistically significant, bootstrapping can differ slightly from the path coefficient value of 5 [80].

Based on the bootstrap results, three hypotheses were found moderate support for H1 (HTMT 27 = 0.726) G1 = 0.726. This involves drawing a large number (typically 5,000) of these sets of coefficients form a bootstrap distribution, which can be considered as an approximation of the sampling distribution. From this, a standard error and standard deviation can be calculated directly from the sample; this variability is captured

This table contains the factor loadings and discriminant validity values for the constructs in our model. The loadings are the correlations between the indicators and the underlying construct. Discriminant validity is assessed by comparing the average variance extracted (AVE) with the square of the correlation between constructs. If the AVE is greater than the correlation squared, then discriminant validity is supported. The table shows that the AVE for each construct is greater than the square of the correlation between constructs, indicating discriminant validity.
“.. 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?
GENERALIZABILITY

Unobtrusive

Obtrusive

RESEARCHER’S CONTROL EXERTED ON SETTING

Universal

Specific

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

- Obtrusive
- Universal
- Unobtrusive
- Specific

RESEARCHER’S CONTROL EXERTED ON SETTING

- Max precision of measurement of behavior

SURVEYS
- Max generalizability over Actors

CASE STUDIES
- Max realism of Context

EXPERIMENT
There are other research strategies…
FIELD STUDY
Damian and Zowghi: impact of distributed stakeholders on RE activities

Observations, interviews, docs
7 months on-site
Lauesen & Vinter: a cost-effective way to avoid requirement defects

Evaluate new approaches with real products

Action Research: realistic context, limited control

FIELD EXPERIMENT

QUADRANT I
Natural Settings

Evaluate new approaches with real products

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

QUADRANT I
Natural Settings

Evaluate new approaches with real products

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

The natural image is a diagram with various elements labeled, such as 'New markets', 'Surroundings', 'Application domain', 'External products', 'Req spec.', 'Programmers', '45 missing reqs', '8 wrong reqs', '24 mistaken tacit reqs', '14 mistaken specs', 'Three omitted', 'One incomplete change', 'Two ext.prod changes', '9 ext.prod mistakes', '11 ext.prod errors'. The diagram also includes a section titled 'Field Experiments' and references to 'Lauesen & Vinter: a cost-effective way to avoid requirement defects'.
Porter et al.: scenario-based inspections are more effective than ad hoc inspections.
QUADRANT II
Contrived Settings

Max precision of measurement of behavior

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

EXPERIMENTAL SIMULATION
Lerch et al.: computer support needs of automation staff

Simulation environment
Stimuli to participants

B

4 dependent variables
LaPlante: state of practice of requirements engineering in industry

Limited set of 22 questions
Large number of 194 responses
Judgment Studies

LaPlante: state of practice of requirements engineering in industry

Daneva: evaluated practices based on feedback by ERP practitioners

Sample Studies

JUDGMENT STUDIES

Selected panel of 10 experts

Neutral setting: Meeting room

Neutral Settings

Max generalizability over Actors

SAMPLE STUDIES

Limited set of 22 questions

Large number of 194 responses
Höst et al.: bottlenecks and overload in RE processes

4 scenarios
Simulation in SDL

Computer Simulations

QUADRANT IV
Non-Empirical Settings

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.
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

Max generalizability over Actors
Dispersal patterns (Fig. 3) are affected by corridors and the shapes of patches, altering seed wind dynamics (Fig. 2). It also illuminates three distinct effects of habitat openings on increased turbulence and uplift probabilities (Fig. 2; habitat openings relative to the surrounding closed forest, causing the model predicts that, in general, wind speeds accelerate in among our experimental patch types across 12 y of community evaluating changes in species richness of wind-dispersed plants controlled landscape. We also tested the predicted implications by empirically measuring wind dynamics and LDD model that explicitly incorporates 3D heterogeneous habitat see mental landscape. We used the Regional Atmospheric Modeling a mechanistic model of wind-driven dispersal in our experi- affect wind and seed dispersal dynamics, we applied and tested At our study site, for example, wind-dispersed species constitute part by a large proportion of wind-dispersed plant species (22). verse plant communities in the world (22, 23) and is typified in Methods effects whereas unconnected

First, wind direction in all patches rotates toward the long axis ––––––––––

Second, a

Third, increased

A greater proportion of seeds dispersed in

Overall, modeled and observed dispersal kernels from all release

The spatial extent of this effect is longest in connected patches,

The redirection effect

before the wind reaches the patches; southeast, an effect that can begin even in the forested matrix

wind blows directly along the long axes of the patches (eastward)

Either is located on the downwind side of a patch [e.g., Fig. 2

A corridor of connected patches (Fig. 3

The centers of winged and rectangular patches at

A greater proportion of seeds dispersed in

A greater proportion of seeds dispersed in

A greater proportion of seeds dispersed in

A greater proportion of seeds dispersed in

A greater proportion of seeds dispersed in

A greater proportion of seeds dispersed in

A greater proportion of seeds dispersed in

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,

The spatial extent of this effect is longest in connected patches,
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 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