

How do System Architectures Affect Software Requirements?

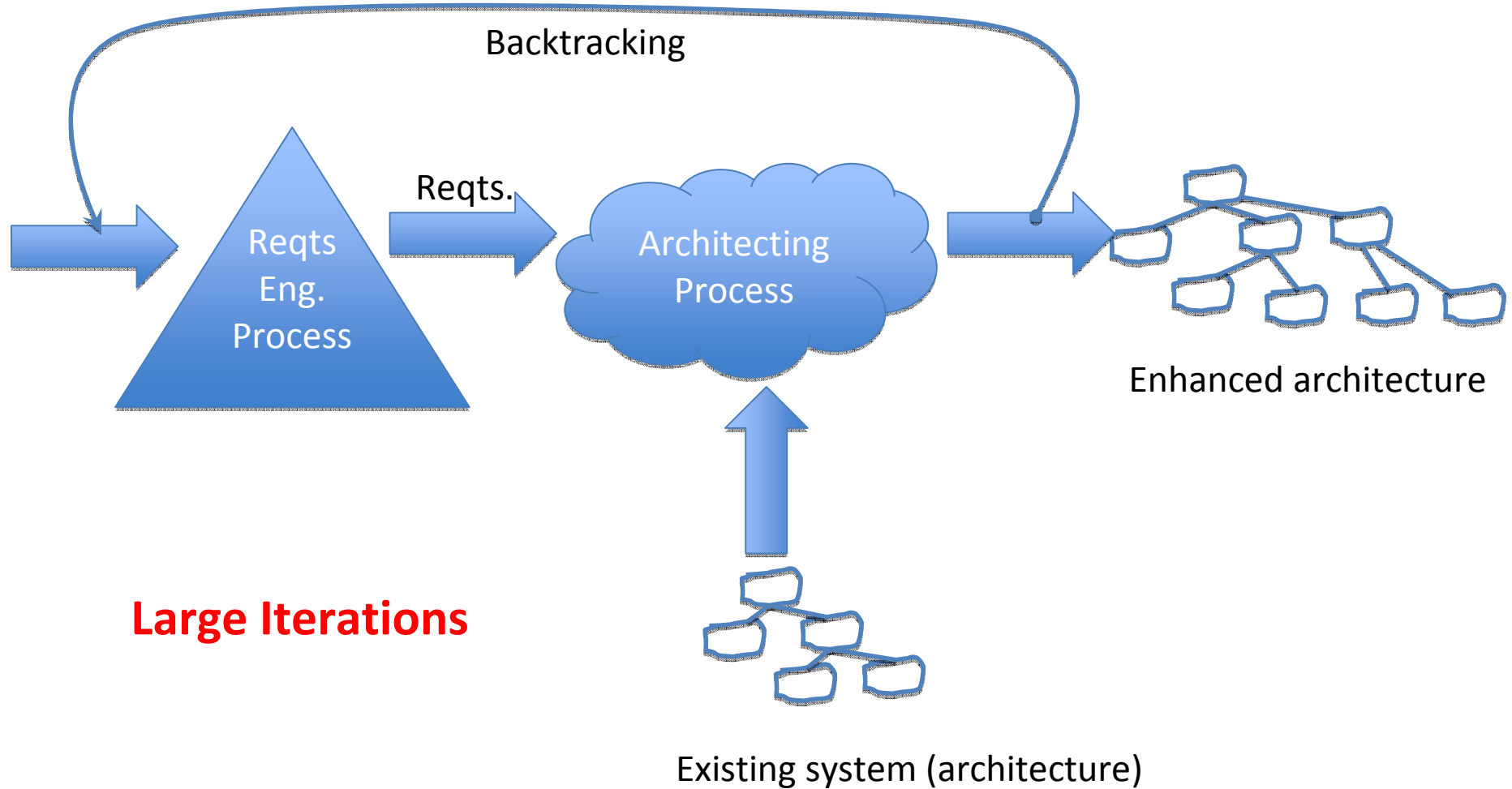
James Miller

Remo Ferrari

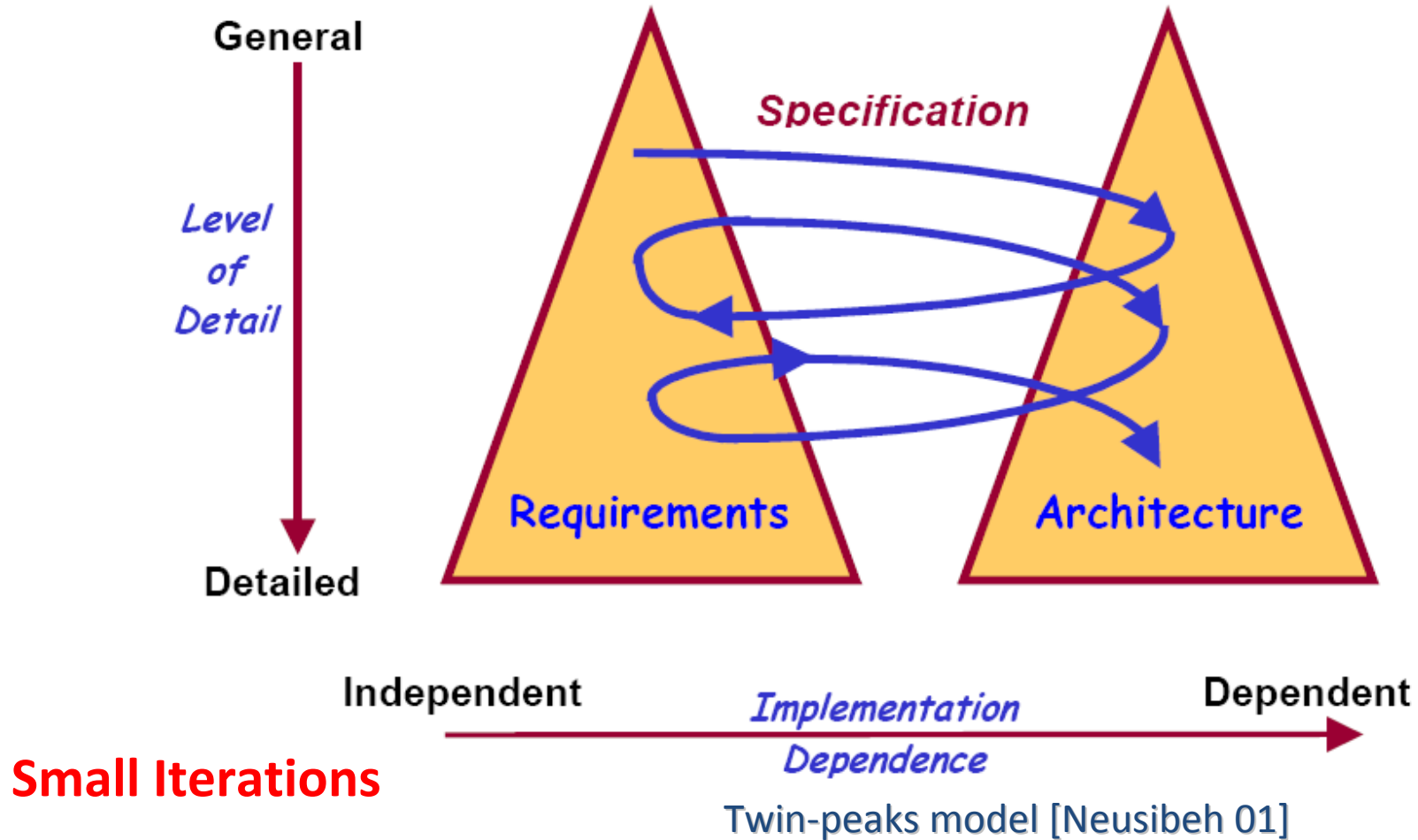
Nazim H. Madhavji

The University of Western Ontario

Introduction



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► Example concerns:

- “We still do not have a clear understanding of the role of software architecture in requirements engineering” [Shekaran 94]
- “Software architecture must be considered during requirements engineering to ensure that requirements are valid, complete, consistent, feasible, etc.” [Mead 94]
- “We need a better understanding of the impact of software architectural choices on the prioritization and evolution of requirements.” [Nusibeh and Easterbrook 00]

Study Overview

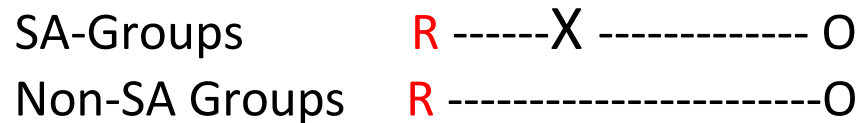
- Overall research question:
 - *Which requirement characteristics are affected, and to what extent, by the presence or absence of an existing System Architecture (SA)?*
- Investigated this question through a controlled empirical study.
- We decomposed the notion of a requirement into specific, measurable, characteristics.

Requirements Characteristics

- 1) *Focus on cost*
- 2) *Focus on time*
- 3) *Focus on quality*
- 4) *Focus on user's needs*
- 5) *Focus on client's needs*
- 6) *Focus on technological needs*
- 7) *Testability*
- 8) *Implementability*
- 9) *Importance*
- 10) *Architectural relevance*
- 11) *Level of abstraction*
- 12) *Requirement type*

These characteristics are rooted in the RE literature and practice.

Study Design



- R: random assignment.
- X: treatment (i.e., the existing SA)
- O: observation
- Statistically compared each requirement characteristic of both groups to determine differences.
 - Null hypothesis: *the presence of a SA has no impact on requirement characteristic of interest.*

Requirements Ratings

- Two researchers and one arbitrator rated each of the 12 characteristics for each of the 900+ requirements (10 000+ items).
- Rating process:
 - Examine reqt. title, description, rationale, etc.
 - Examine each characteristic w.r.t the reqt.
 - Assign appropriate rating.
- Ratings: 7-point Likert-scale.

Results

	Group	User-needs	Tech. Needs	Arch. Relevance	Importance
Mean	SA	3.26	4.12	4.59	5.63
	Non-SA	3.65	3.42	4.12	5.28
P-value	Chi-Square	0.050	0.003	0.001	0.008
Cohen's effect size		Large	Large	Large	Large

Implications

- The results have implications on:
 - RE process engineering,
 - Alignment with business goals,
 - Further empirical work in RE.

Example Implication - RE Process Engineering

- Findings raise interesting questions:
 - Should SA always be used in the RE process as promoted by the literature?
 - Could there be some conditions when it would be advisable “not” to use SA in RE?

Conclusions

- The role of SA on RE has not been extensively studied.
- In our initial findings, we found that:
 - *focus on technological needs,*
 - *architectural relevance,*
 - *Importance*
 - *focus on user needs*were significantly affected by the presence/absence of SA.
- On-going work continues with further analysis of more requirements characteristics.

The End

Any ??????? ?