

A Review of Traceability Research at the Requirements Engineering Conference (RE@21)

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SCOPE OF THE STUDY

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Traceability – Degree to which a relationship can be established

An important topic @RE



Traceability



Purpose of the study

- Insights into traceability research @ RE
- How has RE contributed
- Aspects for further research



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RESEARCH QUESTIONS

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Aim – Evaluate how traceability research at the RE conference has contributed to the area

RQ1 - What topics within the traceability area have been studied?

RQ2 - What specific challenges have been addressed?

RQ3 - What contributions have been made to address the challenges?

RQ4 - What tool features have been developed to support traceability?

RQ5 - What types of systems have been considered?

RQ6 - What types of artifacts have been traced?

RQ7 - What empirical methods have been applied?

RQ8 – Which authors and institutions have conducted the research?

RESEARCH METHOD




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A Literature Review @RE – Past 20 years proceedings

- Automatic search - “traceability” in the title, abstract, or keyword – 76 Papers
- Exclusion criteria – No answer for RQ3 (Contribution)
- 6 papers excluded – A final total of 70 papers
- Data extracted
 - Bibliographic information
 - Data related to the RQs
- Defined categories for RQ1-6 - Discussed & agreed by all authors




LIMITATIONS5

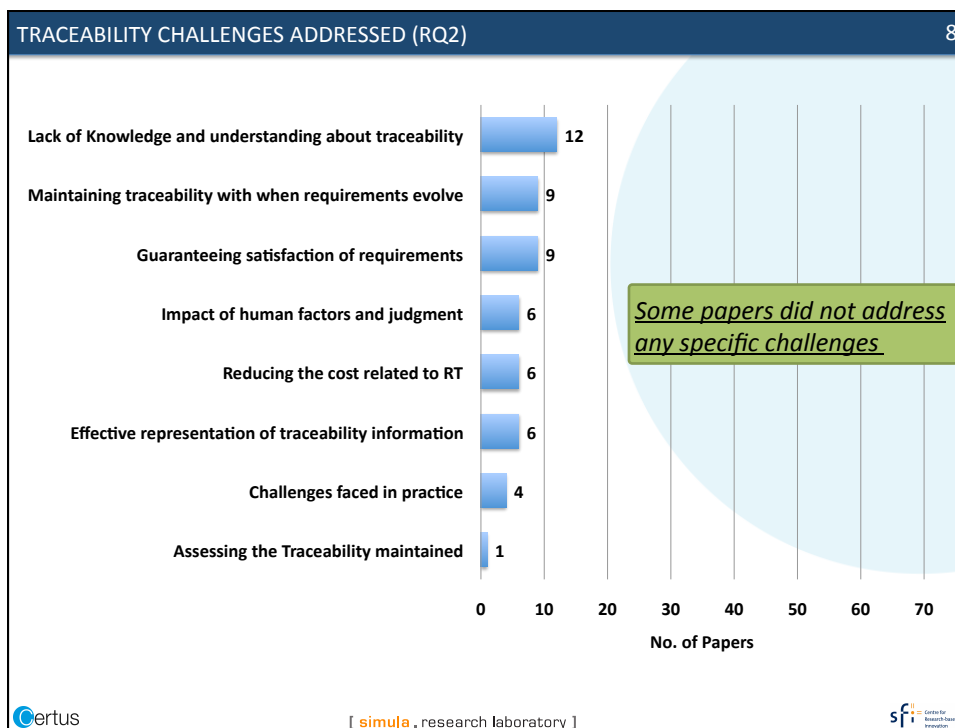
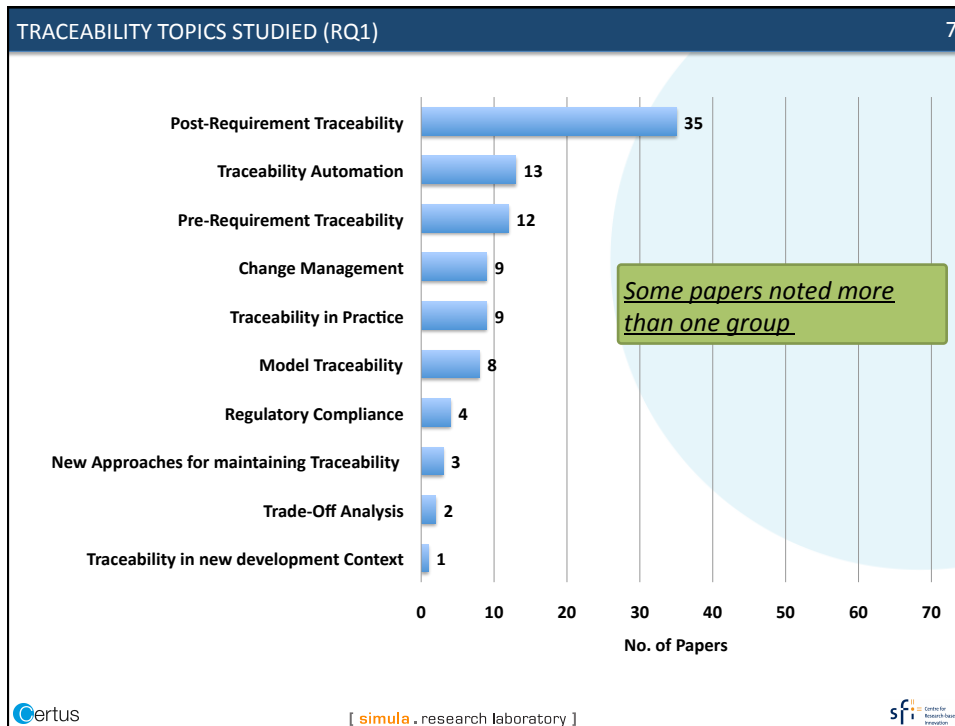
- Missing possible studies
 - Mitigation - A broad search term
- Empirical method – Lack of detail
 - Mitigation – Pre-agreed definitions
- Missing information
 - Mitigation – experience in SLR, RE & traceability

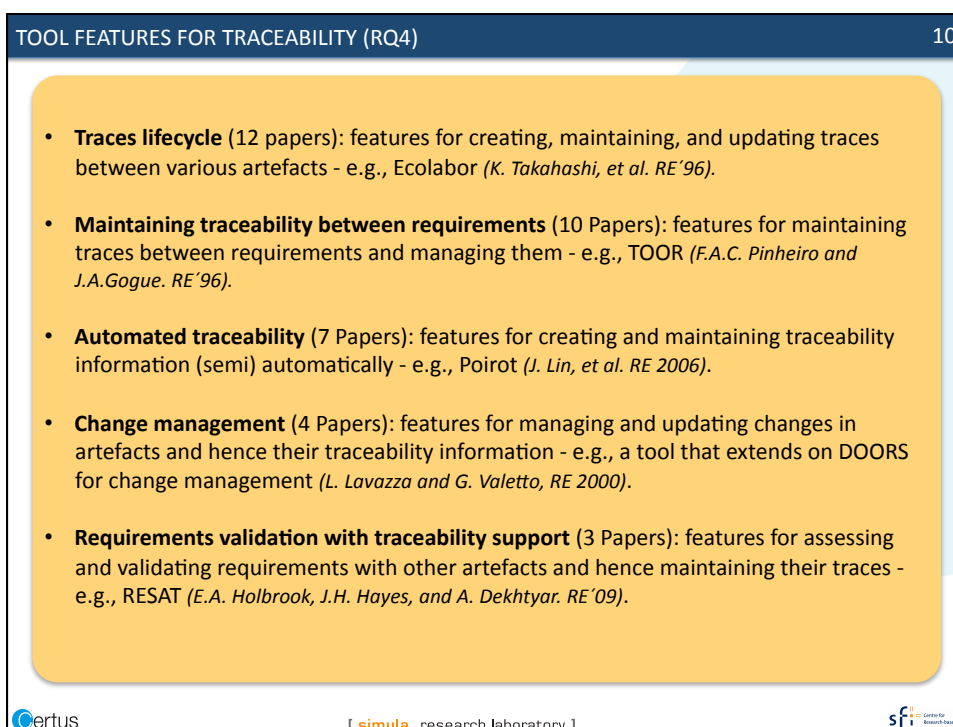
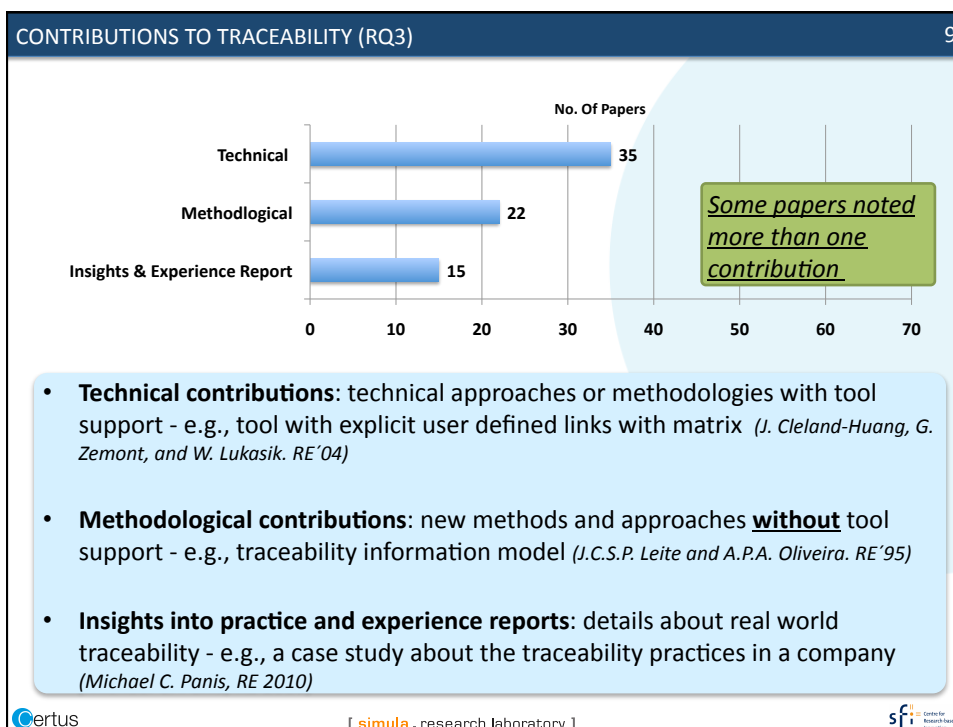
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Results

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TOOL FEATURES FOR TRACEABILITY (RQ4)

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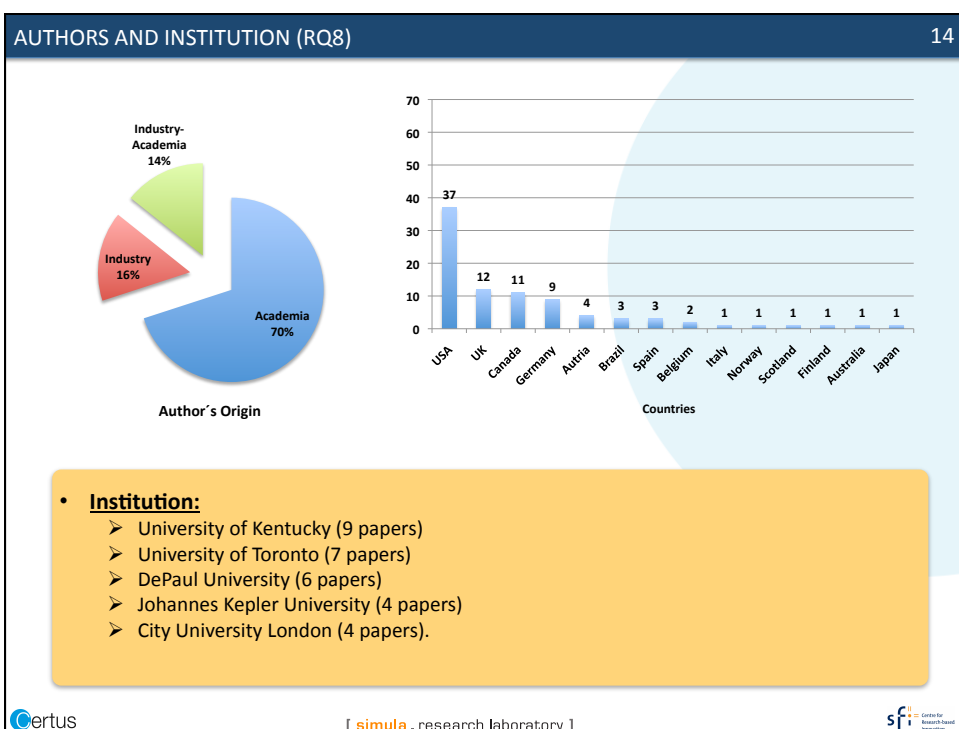
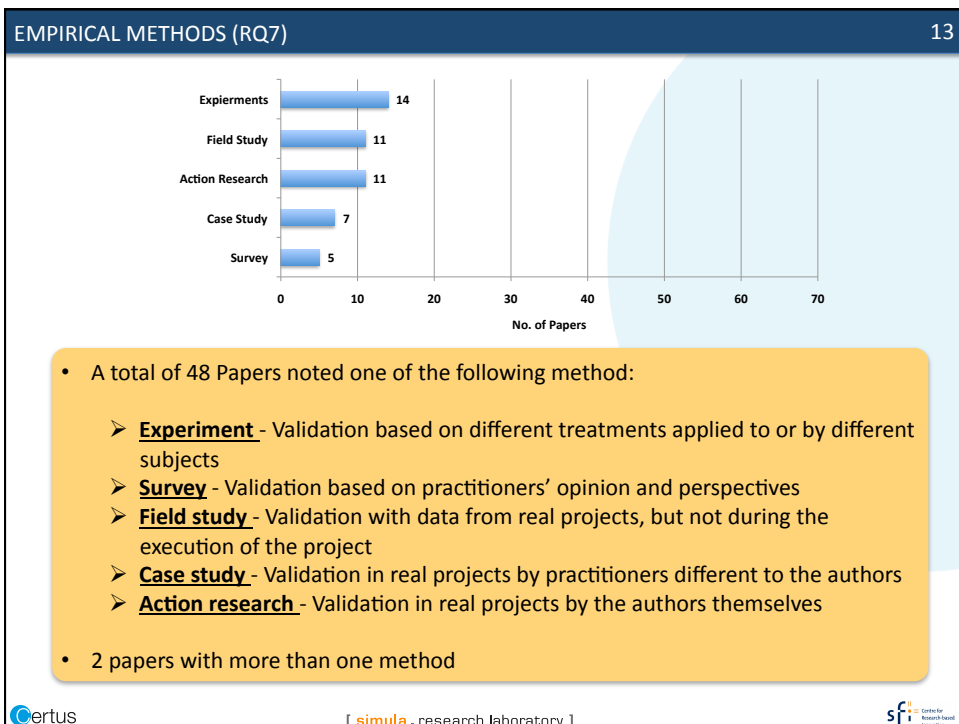
- **Model management with traceability support** (3 Papers): features for creating and maintaining traces between and in models used in the development process - e.g., a tool for model merging and verification (*E.A. Holbrook, J.H. Hayes, and A. Dekhtyar. RE'09*).
- **Support for regulatory compliance** (1 Paper): features for maintaining traceability towards compliance purposes - e.g., for compliance with DOD-STD-2176A (*M. Sabetzadeh, et al. RE'07*).
- **Project management** (1 Paper): features for controlling and monitoring a project - e.g., charts generation (*T.J. Smith. RE'93*).
- **Traceability visualization** (1 Paper): features for visualizing the traces maintained between artefacts - e.g., CREWS-EVE (*P. Haumer, et al. RE'99*).

TYPES OF ARTEFACT TRACED (RQ6)

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- **Traces between requirements specification artefacts** (42 papers):
 - high-level and low-level requirements
 - requirements and source
 - requirements and rationale
 - Etc... *
- **Traces between requirements specification artefacts and other types of artefacts** (41 Papers):
 - Design
 - Testing artefacts
 - Code
 - Etc... *
- **Traces between other types of artefacts** (10 Papers):
 - design and code
 - design and testing
 - design components
 - Etc... *

*Please refer to the paper for more details



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Discussion

TRACEABILITY RESEARCH EVOLUTION @ RE 16

All editions Vs last 6 editions (2007 onwards)

- Since 2007
 - 32 papers published (46% of all the papers published)
 - No paper in the context of new approaches for maintaining traceability
 - 10 out of the 13 papers on traceability automation
 - Challenge related to assessing the traceability maintained
 - Tool features specifically targeted at model management
 - 72% of the experiments identified were conducted in the last six years
 - Industry-academia collaboration – 7 papers

COMPARISON WITH OTHER SECONDARY STUDIES

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- To evaluate RE's contribution
 - To compare the maturity of traceability research @ RE with other RE areas
-
- Results from the review coincide with results reported in other studies
 - Similar challenges reported in other studies
 - Similar ranking of institutions and countries reported in other studies (*A. Davis and A. Hickney, REFSQ 2009*)
 - Results suggest:
 - RE conference provides excellent overview of the area
 - Has significantly contributed to its progress
 - Has been the source of input for other studies
 - Not much focus on Model-driven Traceability
 - Higher frequency of the use of empirical methods @ RE

ASPECTS FOR FURTHER RESEARCH

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- **Traceability Visualization**
- **Consideration of more artefacts**
- **Traces semantics for impact analysis**
- **Advanced empirical evaluation**
- **Advanced tool support**

CONCLUSION

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- Greatly focused on post-requirement traceability
- Challenging about understanding
- Most research support
- Traceability research
- 69%
- North America has led research production
- Increasing interest in automated traceability & industry-academia collaboration



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Comments and Questions ?