

Introduction

- ◆ Goal : Integration of testing throughout the development life cycle
- ◆ Defect prevention not just defect detection
- ◆ Two major issues to address
 - ◆ Validating the requirements
 - ◆ Designing a necessary and sufficient set of test cases based on requirements
- ◆ Reasons and benefits
 - ✓ Earlier creation of tests in the development process
 - ✓ Test engineer can find inconsistencies and ambiguities in the requirements
 - ✓ Test data → independent of any particular implementation
 - ✓ Helpful in conformance testing where access to code is not provided
 - ✓ Reducing cost of fault detection and remediation
 - ✓ Reducing Software time to market
 - ✓ Improving the probability of successfully installing the right solution

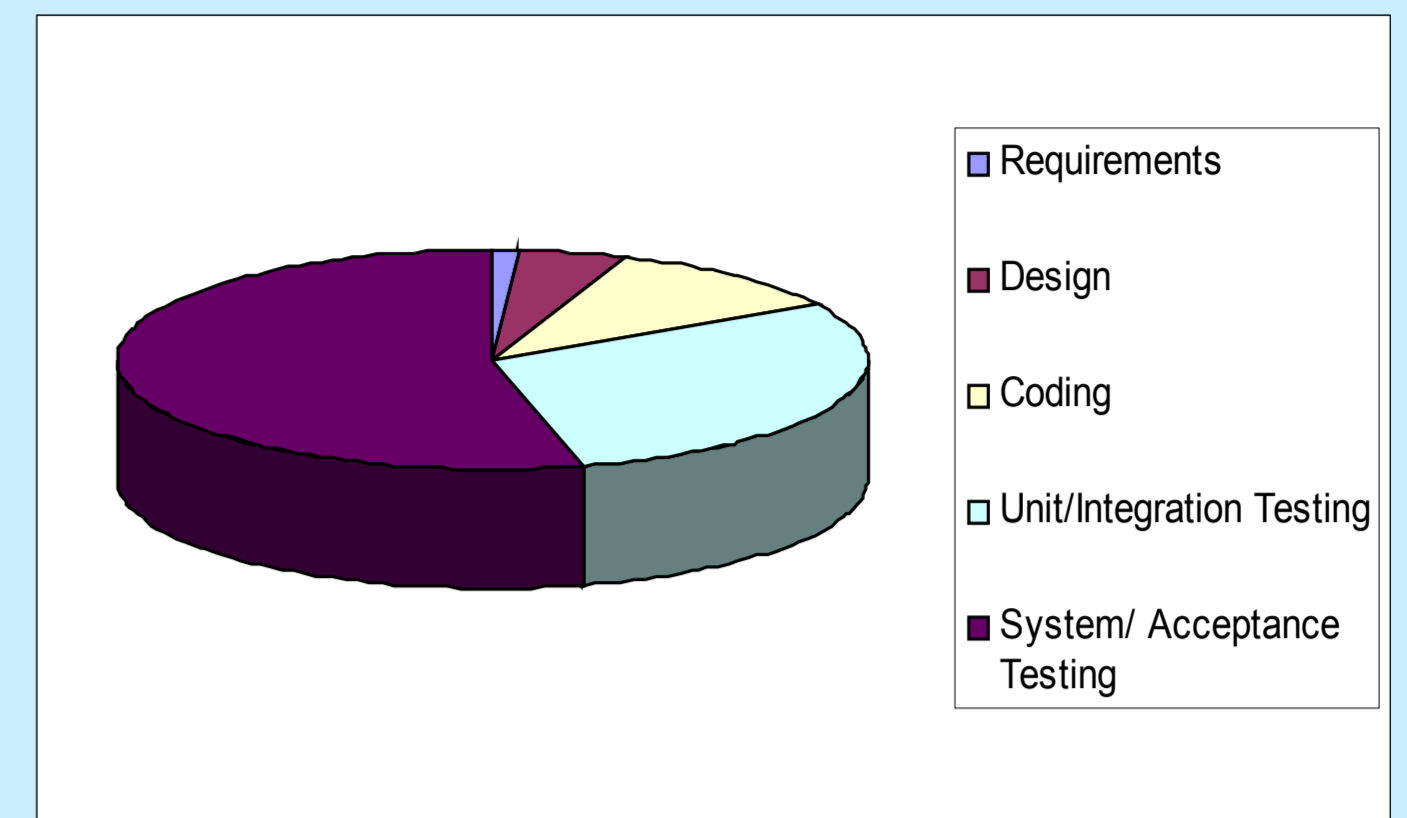
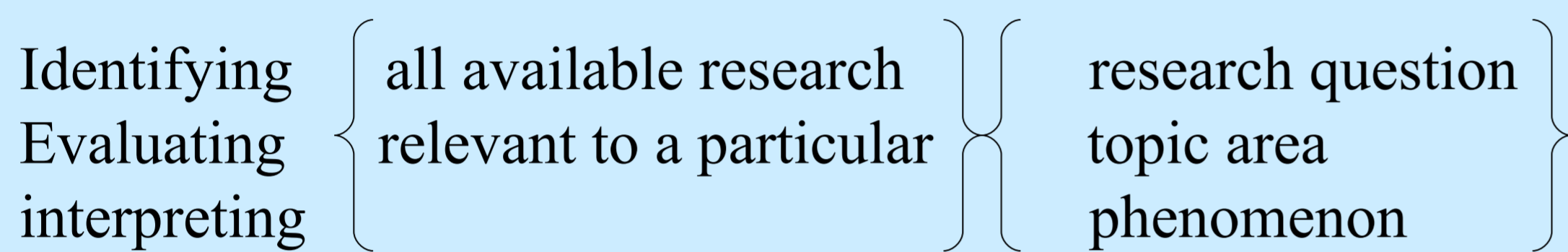


Figure1. Relative cost ratio to fix an error

1. Systematic Literature Review (SLR) on “Requirement Based Testing”

A systematic literature review is a means of:



- Primary study: individual studies contributing to a systematic review (e.g., a conference paper describing a testing technique based on textual requirements)
- Primary study identification: manual search + automatic search

2. Manual Search

- ◆ Related venues from 2006 to present
- ◆ Conferences : ICSE, ICST, ISSRE, ISSTA, RE, ASE, ESEM, ESEC/FSE, DSN, Models, QSIC, DASC, RTSS, RTAS and TestCom/ICTSS
- ◆ Journals: STVR, TSE, JSS, Empirical Software Engineering, IST, SoSym, TOSEM, RE
- ◆ Search scope: Titles and abstract (if necessary conclusions) of papers
- ◆ Relevant related works were added to the results as well.

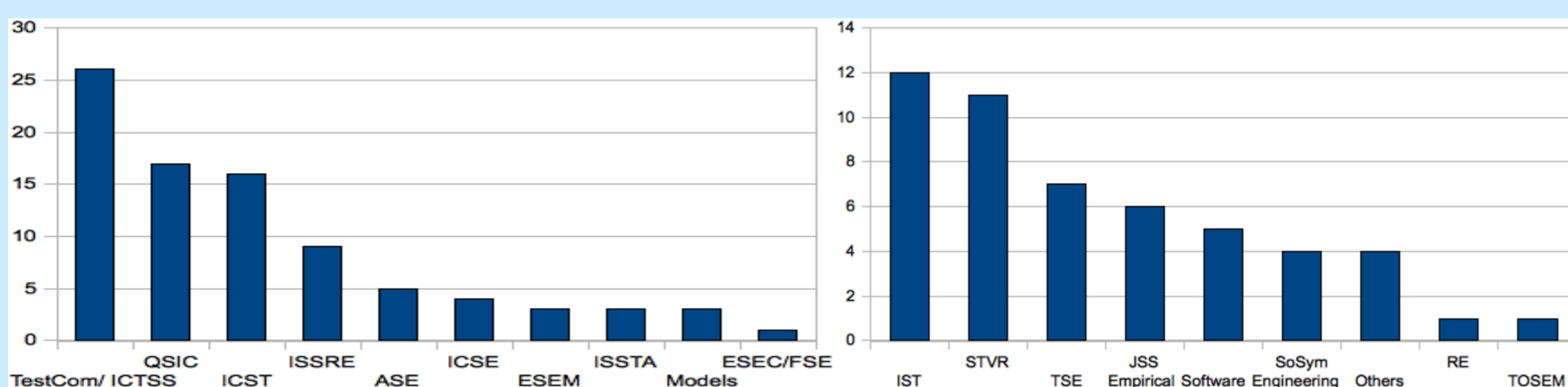


Figure2. Conference and journal papers resulting from manual search

3. Automatic Search

- Automatic → search engines embedded in digital libraries.
- Databases : IEEE-Xplore, ACM, INSPEC, Scopus and Springer.
- Publications from 1990 to present.
- Tools: reworks and EndNote
- Two series of queries:
 - ◆ Exact phrases like, “requirement based testing”, “specification based testing”, “requirement driven testing”, etc. → 100 papers
 - ◆ Modified queries: replacing keywords like “requirement” or “specification” with a specific requirement modeling method name (e.g. “Requirement based testing” → “use case” and testing)

4. Evaluation and Interpretation

- Problem: evaluating and interpreting identified papers
- Requires: comparison framework.
- Our solution: a set of attributes to compare different publications.
- Table1 presents an initial set of attributes

5. Future Work

1. Completing automatic search
2. Merging results of manual and automatic search
3. Removing duplicates → final set of primary studies
4. Interpreting and evaluating final set based on the comparison framework which is being developed incrementally
5. Performing a case study to compare two or more selected techniques experimentally

Title	Requirement Model	Level of automation	Testing Level or technique	Coverage Criteria	Software Domain	Experimental Results
A search based framework for automatic testing of <i>MATLAB/Simulink</i> Models	MATLAB/Simulink models	Partial	Structural and Mutation testing	Branch Coverage and strong mutation	Dynamic Systems	Four experimental studies (a total of 10 MATLAB models)
Testing functional requirements using B model specifications	B models	Partial	System testing	Decision coverage	Safety-Critical Systems	Small example (Process scheduler)
Automatic generation of test specifications for coverage of system state transitions	UML use case, sequence and statechart diagrams	Full	System testing	Transition Coverage	Object Oriented Systems	Four medium sized (2000-3000 LOC) applications

Table1. Comparison attributes