

# Putting Software Testing Terminology to the Test

## M.A.Sc. Seminar

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Department of Computing and Software

Fall 2024

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- The Need for Standardized Terminology
- The Lack of Standardized Terminology

## 2 Project

- Research Questions
- Methodology

## 3 Discrepancies

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# The Need for Standardized Terminology

- Engineering is applied science
- Scientific fields use precise terminology



SOFTWARE  
ENGINEERING

# The Need for Standardized Terminology

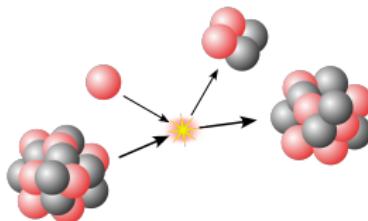
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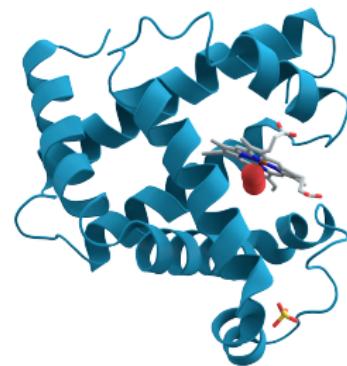
SOFTWARE  
ENGINEERING



Penubag and Ramey (2010)



Kjerish (2016)



AzaToth (2008)

# The Lack of Standardized Terminology

## "The Problem"



(ISO/IEC and IEEE, 2022, Fig. 2)

# The Lack of Standardized Terminology

## "The Problem"



Adapted from (ISO/IEC and IEEE, 2022, Fig. 2)

# The Lack of Standardized Terminology

## “The Problem”

ISO/IEC/IEEE 29119-4 describes the **experience-based test design technique** of error guessing. Other **experience-based test practices** include (but are not limited to) exploratory testing (see [4.4.3.3](#)), tours, attacks, and checklist-based testing.

Adapted from (ISO/IEC and IEEE, 2022, p. 34)

# The Lack of Standardized Terminology

“The Problem” (cont.)

## What: by Object Under Test (OUT) – System Testing

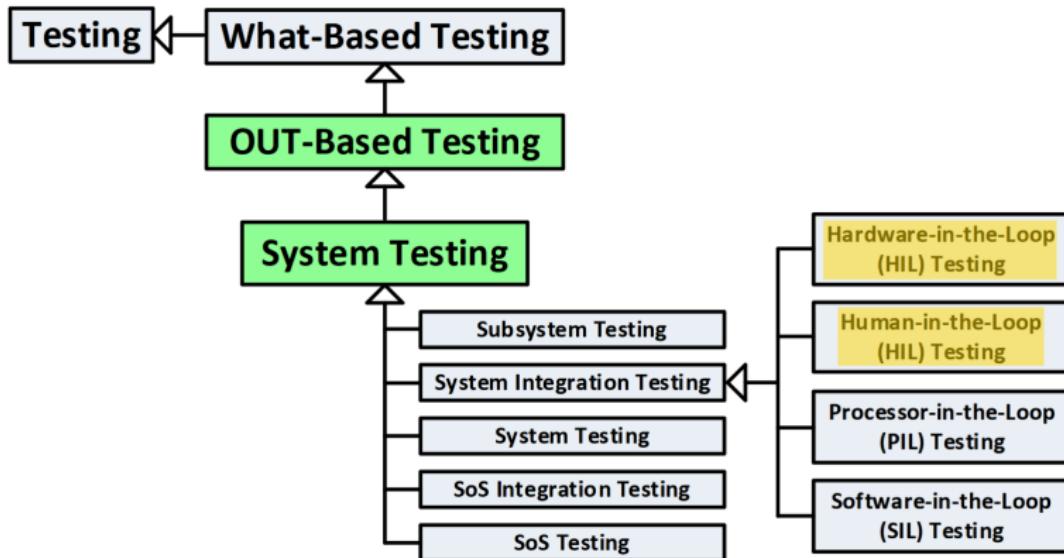


(Firesmith, 2015, p. 23)

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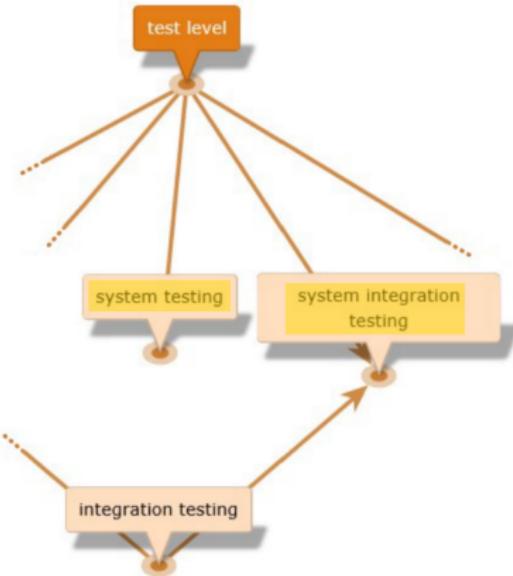
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Adapted from (Hamburg and Mogyorodi, 2024)

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## "The Problem" (cont.)

- Alpha testing is the “first stage of testing before a product is considered ready for commercial or operational use” (ISO/IEC and IEEE, 2017, p. 17) performed by:
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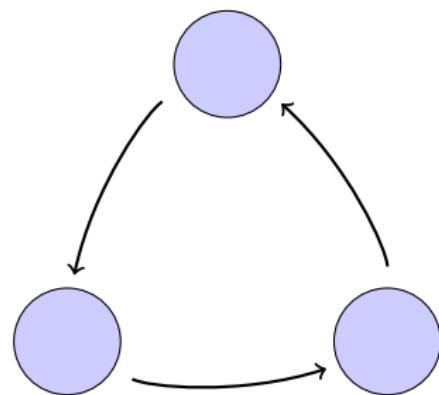
“Okay testing team, we want to conduct alpha testing on our product. What’s our timeline? Budget? Sample size?”

# Barriers to Effective Communication

“The Problem” (cont.)

## Interorganizational

Schools, companies, etc.

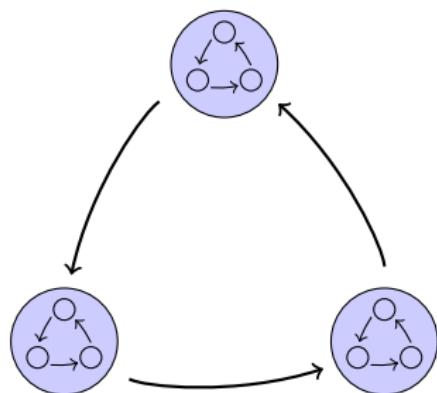


# Barriers to Effective Communication

“The Problem” (cont.)

## Interorganizational

Schools, companies, etc.



## Intraorganizational

“Complete testing” could require the tester to:

- discover every bug,
- exhaust the time allocated,
- implement every planned test,
- . . . (Kaner et al., 2011, p. 7)

# Taxonomies to the Rescue?

## “The Problem” (cont.)

- Existing software testing taxonomies:
  - Tebes et al. (2020)
  - Souza et al. (2017)
  - Unterkalmsteiner et al. (2014)

# Taxonomies to the Rescue?

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Focus on:  
The Testing Process  
Organizing Terminology  
Traceability between Stages

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# Research Questions

## Research Question 1

What testing approaches do the literature describe?

## Research Question 2

Are these descriptions consistent?

## Research Question 3

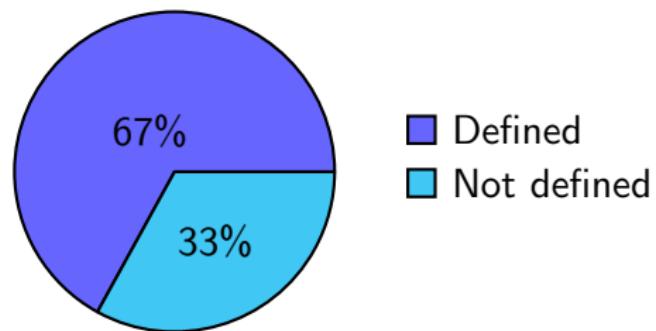
Can we systematically resolve any of these inconsistencies?

# Research Questions

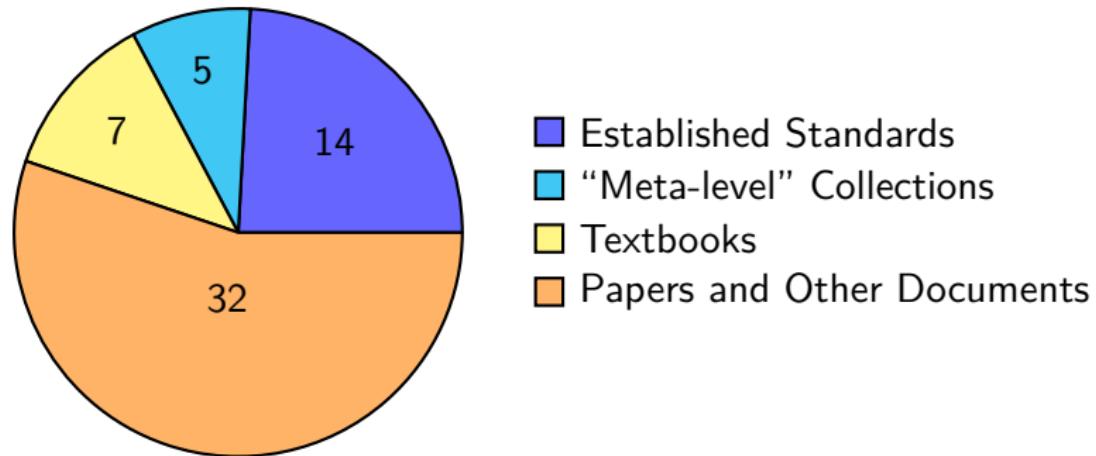
## Research Question 1

What testing approaches do the literature describe?

- 527 test approaches →
- 76 software qualities



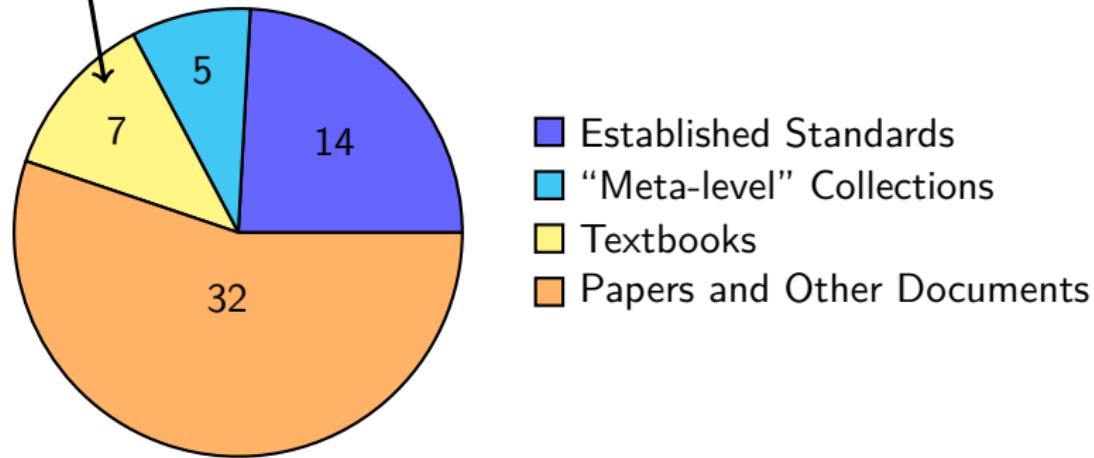
# Methodology: Sources



Summary of how many sources comprise each source category.

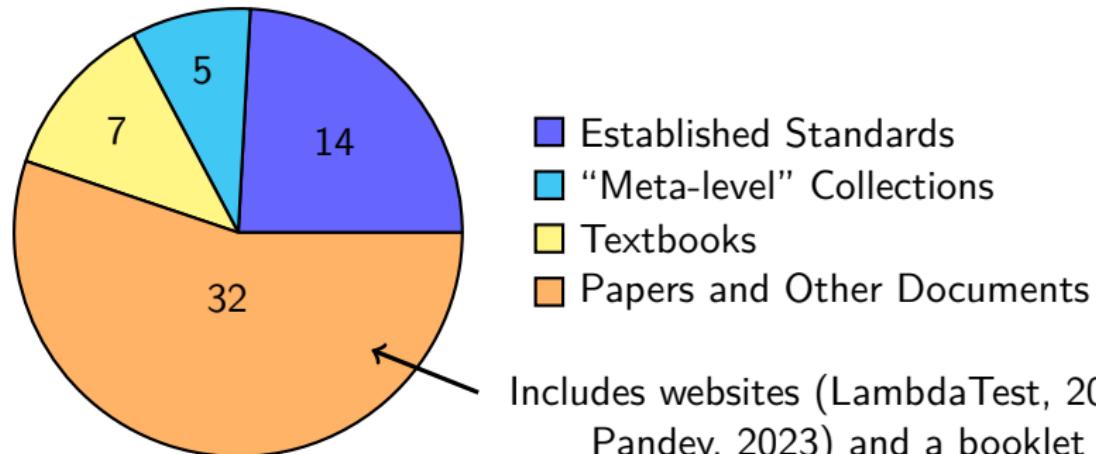
# Methodology: Sources

Textbooks trusted at McMaster were our ad hoc starting points  
(Patton, 2006; Peters and Pedrycz, 2000; van Vliet, 2000)



Summary of how many sources comprise each source category.

# Methodology: Sources



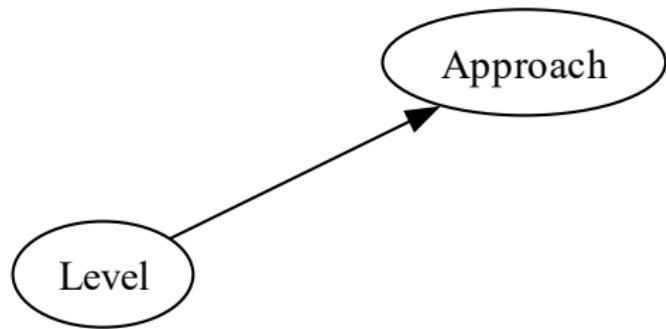
Summary of how many sources comprise each source category.

# Methodology: Categories

Approach

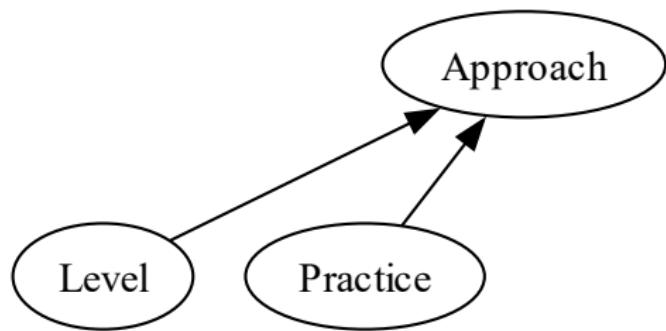
**Approach:** a “high-level test implementation choice” (ISO/IEC and IEEE, 2022, p. 10) used to “pick the particular test case values” (2017, p. 465)

# Methodology: Categories



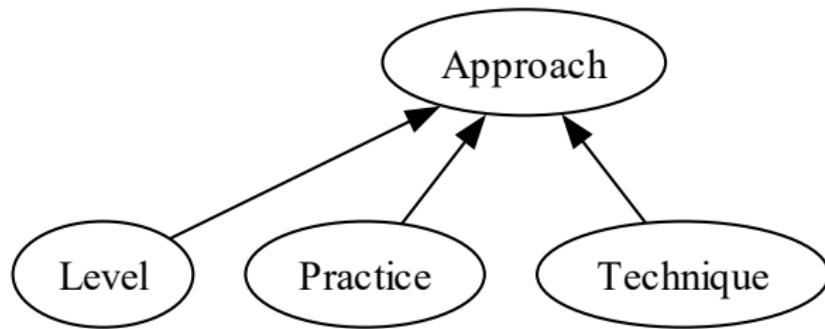
**Level:** a stage of testing with “particular objectives and ... risks”, each performed in sequence (ISO/IEC and IEEE, 2022, p. 12; 2021, p. 6)

# Methodology: Categories



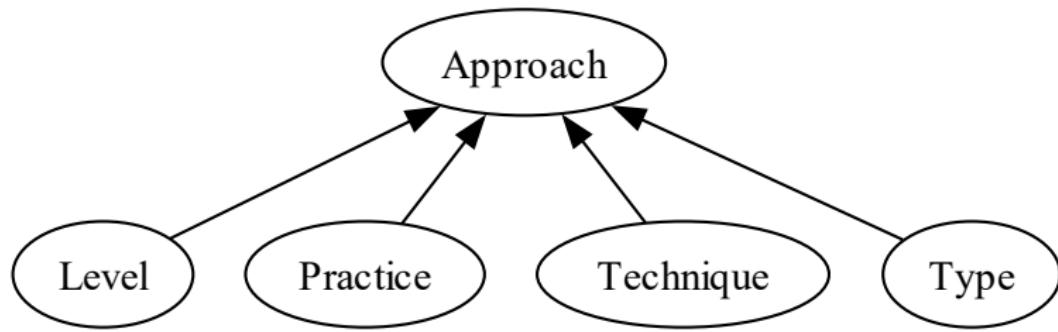
**Practice:** a “conceptual framework that can be applied to . . . [a] test process to facilitate testing” (ISO/IEC and IEEE, 2022, p. 14; 2017, p. 471)

# Methodology: Categories



**Technique:** a “defined” and “systematic” (ISO/IEC and IEEE, 2017, p. 464) “procedure used to create or select a test model, identify test coverage items, and derive corresponding test cases” (2022, p. 11)

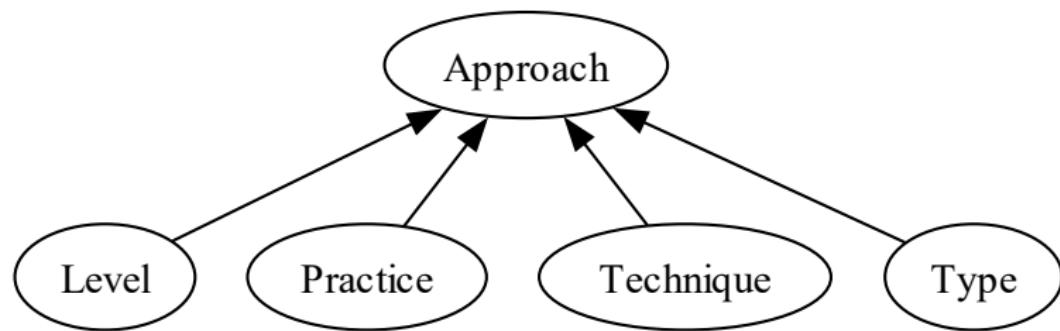
# Methodology: Categories



**Type:** “Testing that is focused on specific quality characteristics”  
(ISO/IEC and IEEE, 2022, p. 15; 2021, p. 7; 2017, p. 473)

# Methodology: Graph Notation

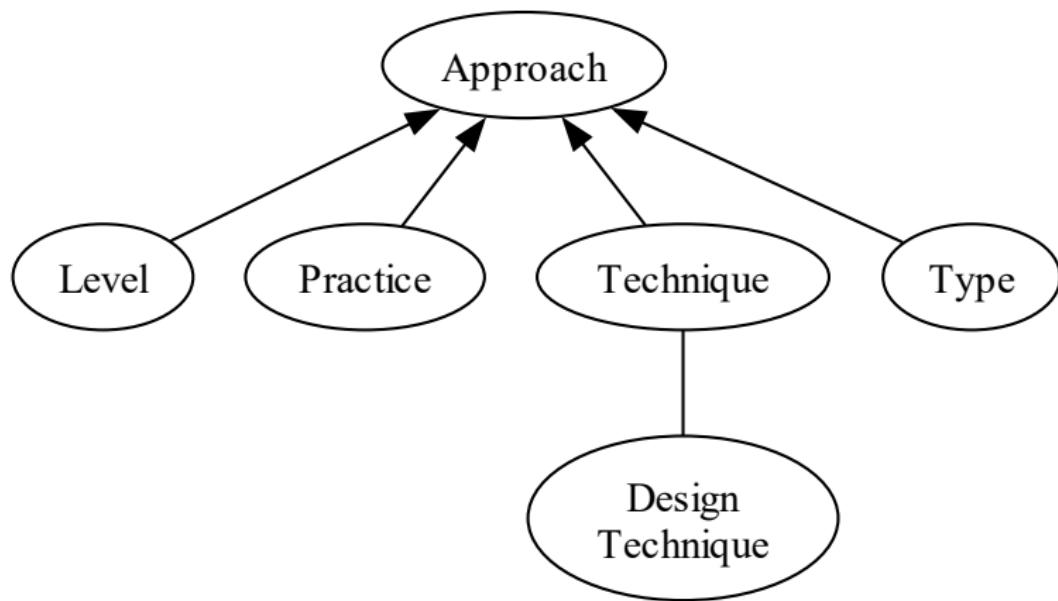
## Relations



Arrows point from a *child* node to a *parent* node.

# Methodology: Graph Notation

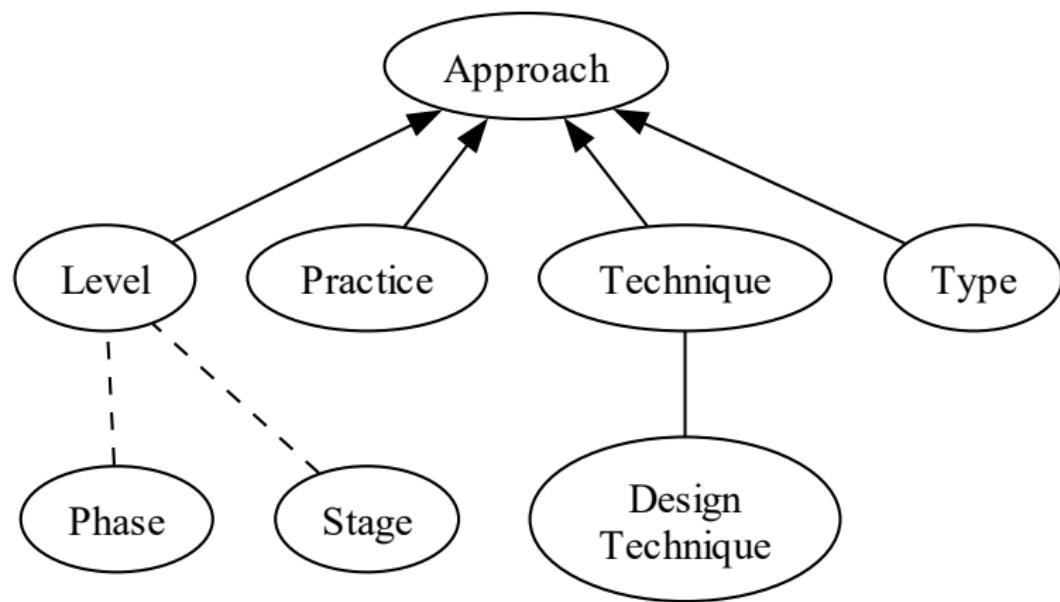
## Relations



Lines without arrowheads connect *synonyms*.

# Methodology: Graph Notation

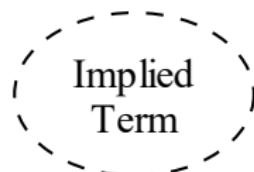
## Relations



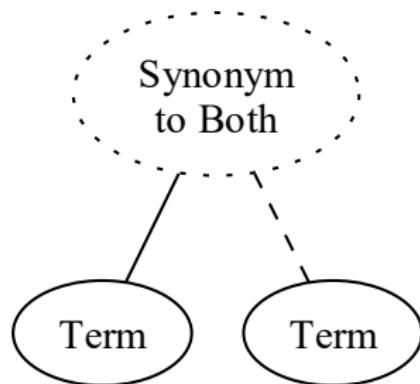
Dashed lines indicate a relationship is *implied*.

# Methodology: Graph Notation

## Terms



Dashed outlines indicate a term is *implied*.



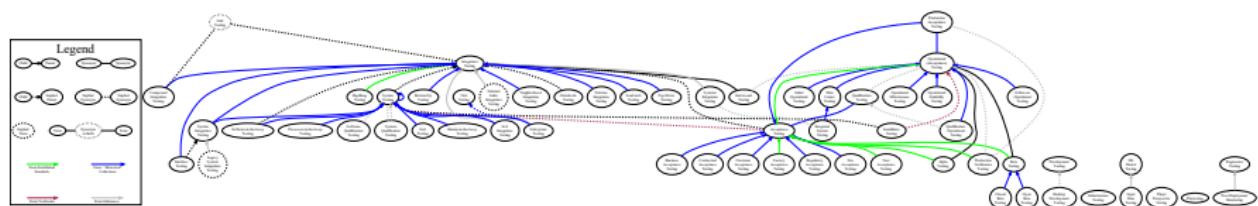
Dotted outlines indicate a term is a *synonym* to more than one term.

# Graph of Test Approaches

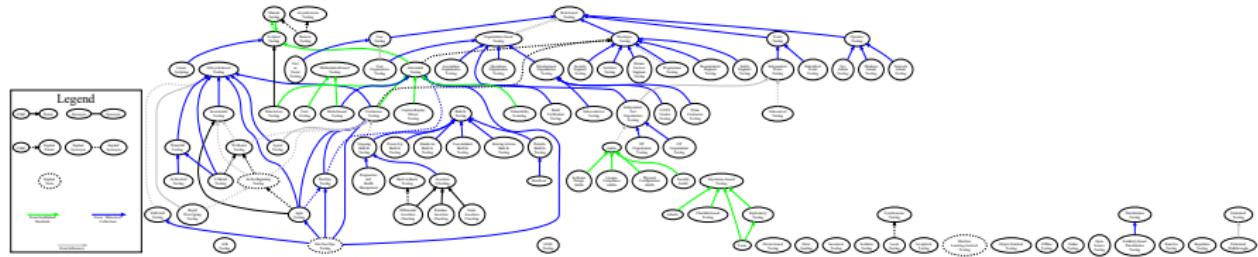
# Graph of Test Approaches

! Dimension too large.

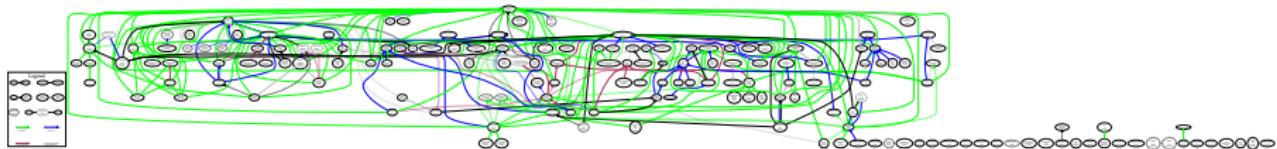
# Graph of Test Levels



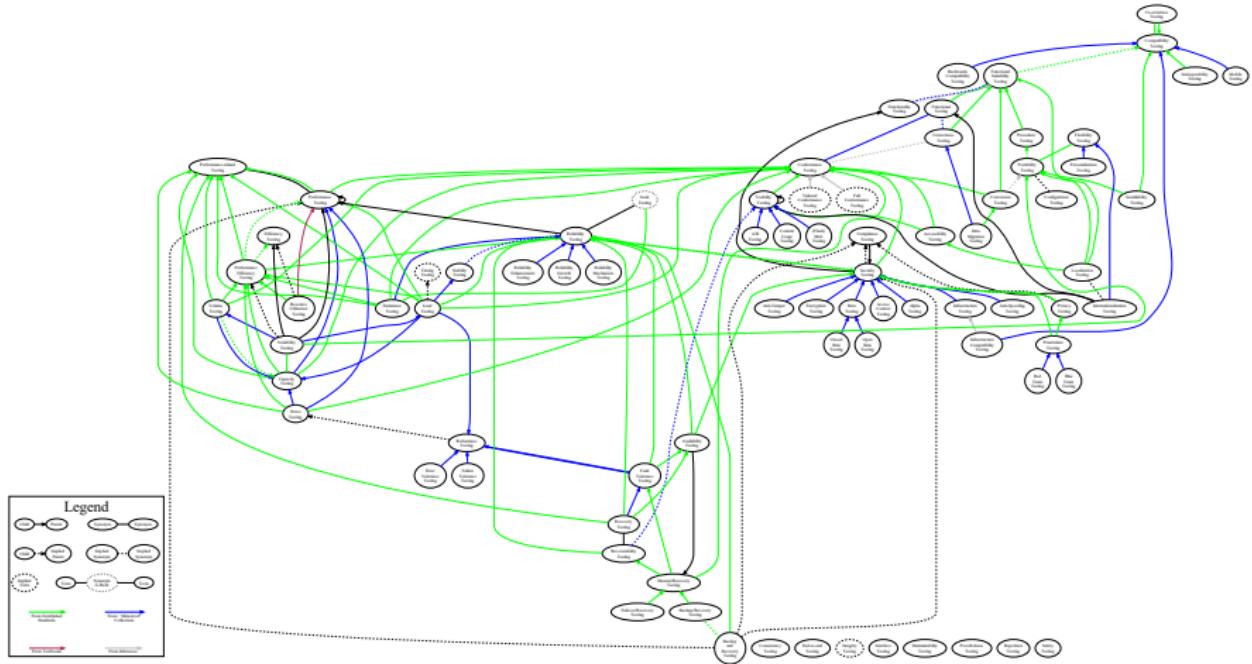
# Graph of Test Practices



# Graph of Test Techniques

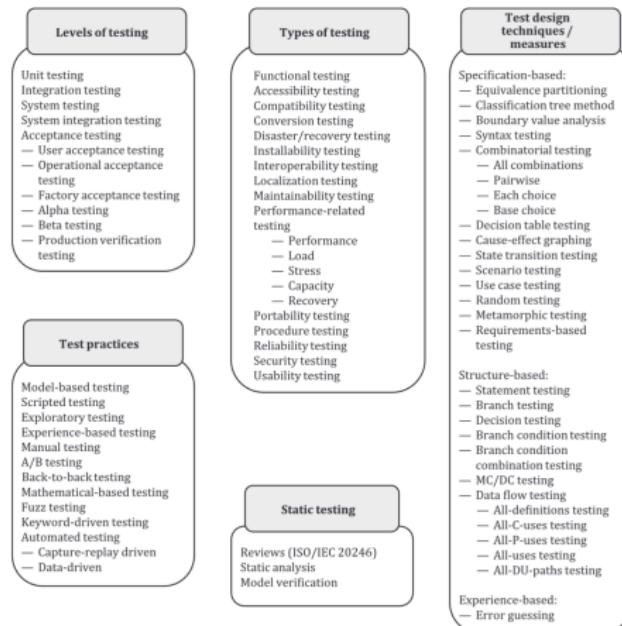


## Graph of Test Types



# Methodology: Graph Notation

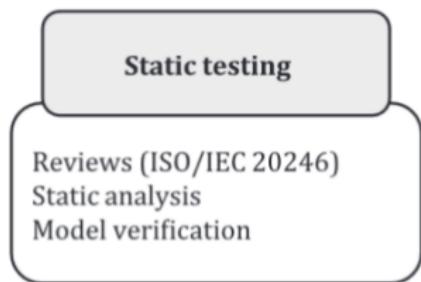
## Static Testing



(ISO/IEC and IEEE, 2022, Fig. 2)

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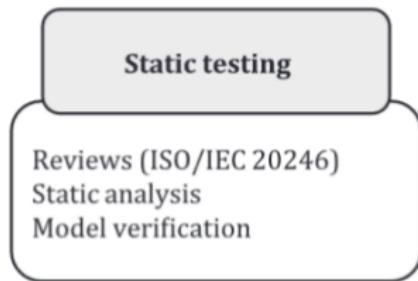
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Adapted from (ISO/IEC and IEEE, 2022, Fig. 2)

# Methodology: Graph Notation

## Static Testing

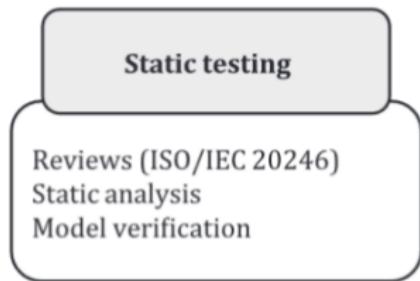


- Quite distinct but not necessarily orthogonal

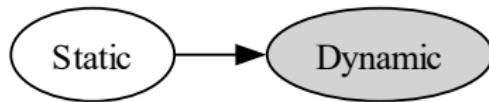
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# Methodology: Graph Notation

## Static Testing

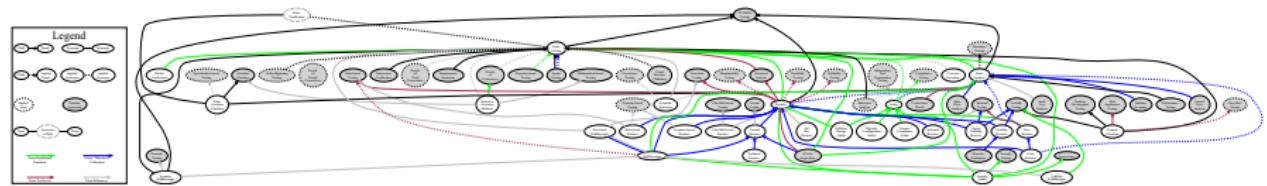


- Quite distinct but not necessarily orthogonal
- When considering static testing in isolation, related *dynamic approaches* have gray backgrounds



Adapted from (ISO/IEC and IEEE, 2022, Fig. 2)

# Graph of *Static* Test Approaches



# Methodology: Procedure

## Approaches

- A row is created for each test approach, such as the following which is based on (ISO/IEC and IEEE, 2022)

Name	Category	Definition	Parent(s)	Synonym(s)
A/B Testing	Practice (p. 22)	Testing “that allows testers to determine which of two systems or components performs better” (p. 1)	Statistical Testing (pp. 1, 35), ...	Split-Run Testing (pp. 1, 35)

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- This information is gathered from sources by looking for
  - Glossaries
  - Testing-related terms
  - Terms described *by* other approaches
  - Terms that *imply* other approaches

# Methodology: Procedure

## Other Information

- It seems that the existence of a software quality implies the existence of a test type associated with it

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- Some test approaches use shared or complicated terminology

# Methodology: Procedure

## Other Information

- It seems that the existence of a software quality implies the existence of a test type associated with it
- Some test approaches use shared or complicated terminology
- For each of these, we record its
  - Name
  - Definition
  - Precedence for a related test type (only for qualities)
  - Synonym(s)

# Methodology: Procedure

- Recording these data in a consistent format allows for graphs to be generated according to a certain logic

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## Research Question 2

Are these descriptions consistent?

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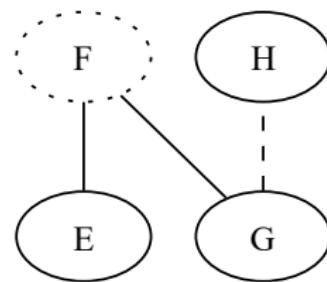
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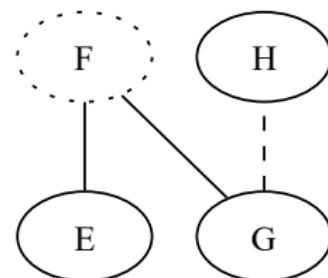
Name	Synonym(s)
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G	F (Author, 0002), H (implied by 0000)
H	X



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H	X



- The following four are the most prominent examples of the ten identified automatically:

# Automated Discrepancies

## ① Invalid Testing:

- Error Tolerance Testing (Kam, 2008, p. 45)
- Negative Testing (Hamburg and Mogyorodi, 2024; implied by ISO/IEC and IEEE, 2021, p. 10)

## ② Soak Testing:

- Endurance Testing (ISO/IEC and IEEE, 2021, p. 39)
- Reliability Testing (Gerrard, 2000a, Tab. 2; 2000b, Tab. 1, p. 26)

## ③ User Scenario Testing:

- Scenario Testing (Hamburg and Mogyorodi, 2024)
- Use Case Testing (Kam, 2008, p. 48) (although “an actor can be a user or another system” (ISO/IEC and IEEE, 2021, p. 20))

## ④ Link Testing:

- Branch Testing (implied by ISO/IEC and IEEE, 2021, p. 24)
- Component Integration Testing (Kam, 2008, p. 45)
- Integration Testing (implied by Gerrard, 2000a, p. 13)

# Acknowledgment

- Dr. Smith and Dr. Carette have been great supervisors in the past and have, both then and now, provided me with valuable guidance and feedback
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- The past and current Drasil team have created a truly amazing framework!

Thank you!  
Questions?

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