Putting Software Testing Terminology to the Test

M.A.Sc. Seminar

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The Need for Standardized Terminology

- Engineering is applied science
- Scientific fields use precise terminology
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  - Force
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The Need for Standardized Terminology

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- Imagine if other fields used unclear, inconsistent, and incorrect terminology:
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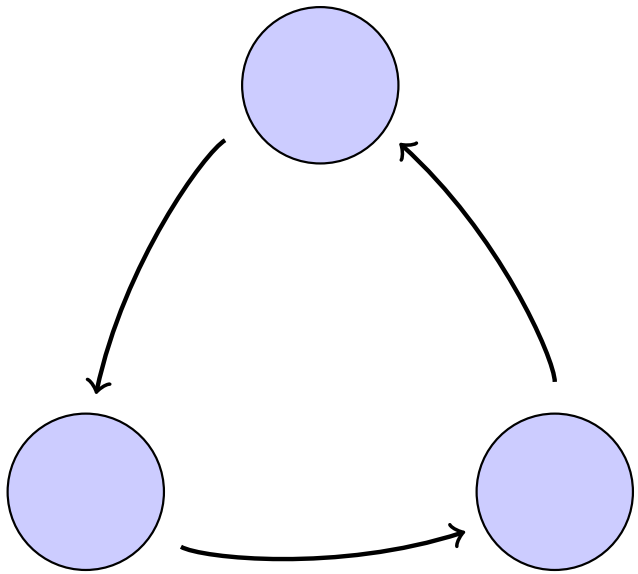
If software engineering holds code to high standards of clarity, consistency, and robustness, the same should apply to its supporting literature!

Improved Communication

Interorganizational

Schools, companies, etc.



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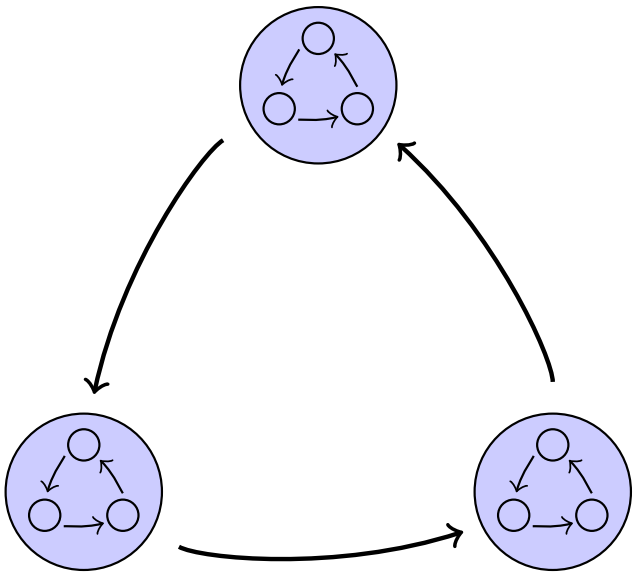

Intraorganizational

Kaner et al. (2011, p. 7) say "complete testing" could require the tester to:

- discover "every bug",
- exhaust the time allocated,
- implement every planned test,
- ...

The Lack of Standardized Terminology

"The Problem"

- Unfortunately, a search for a systematic, rigorous, and complete taxonomy for software testing revealed that the existing ones are inadequate:
  - Tebes et al. (2020) focus on *parts* of the testing process (e.g., test goal, testable entity),
  - Souza et al. (2017) prioritize organizing testing approaches over defining them, and
  - Unterkalmsteiner et al. (2014) focus on the "information linkage or transfer" (p. A:6) between requirements engineering and software testing.

Unstandardized Standards

"The Problem" (cont.)

- Tours "guide[] testers through the paths of an application" by following a structure that is:
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- Load testing is "conducted to evaluate the behaviour of a test item under anticipated conditions of varying load" (ISO/IEC and IEEE, 2022, p. 5; 2017, p. 253), such as:
  - loads "between anticipated conditions of low, typical, and peak usage" (2022, p. 5)

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  - loads "between anticipated conditions of low, typical, and peak usage" (2022, p. 5)
  - loads that are as large as possible (Patton, 2006, p. 86)

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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:
  - "users within the organization developing the software" (p. 17)

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"Okay testing team, we want to conduct alpha testing on our product. What's our timeline? Budget? Sample size?"

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Research Questions

Research Question 1

What testing approaches does the literature describe?

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Research Question 3

Is it possible to resolve/reduce any of these discrepancies systematically?

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Research Question 1

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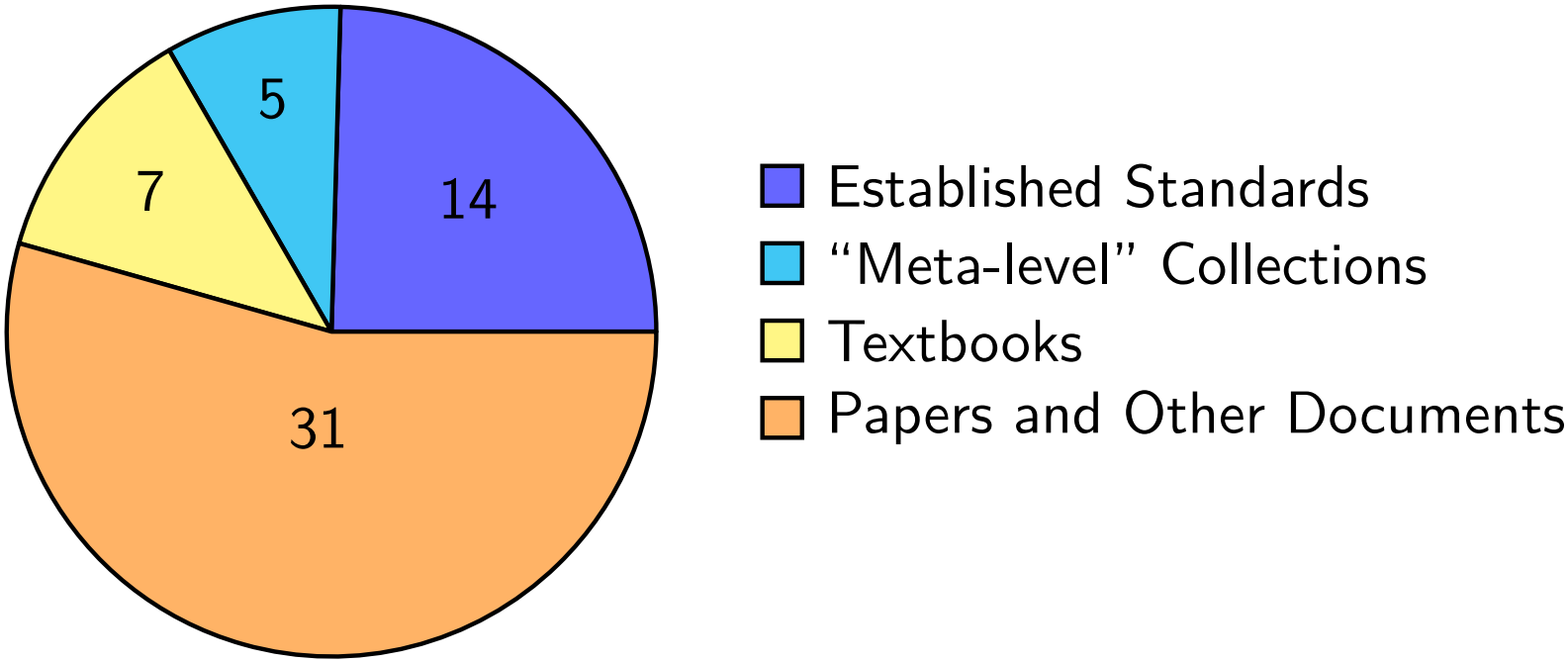
Literature Review Time!

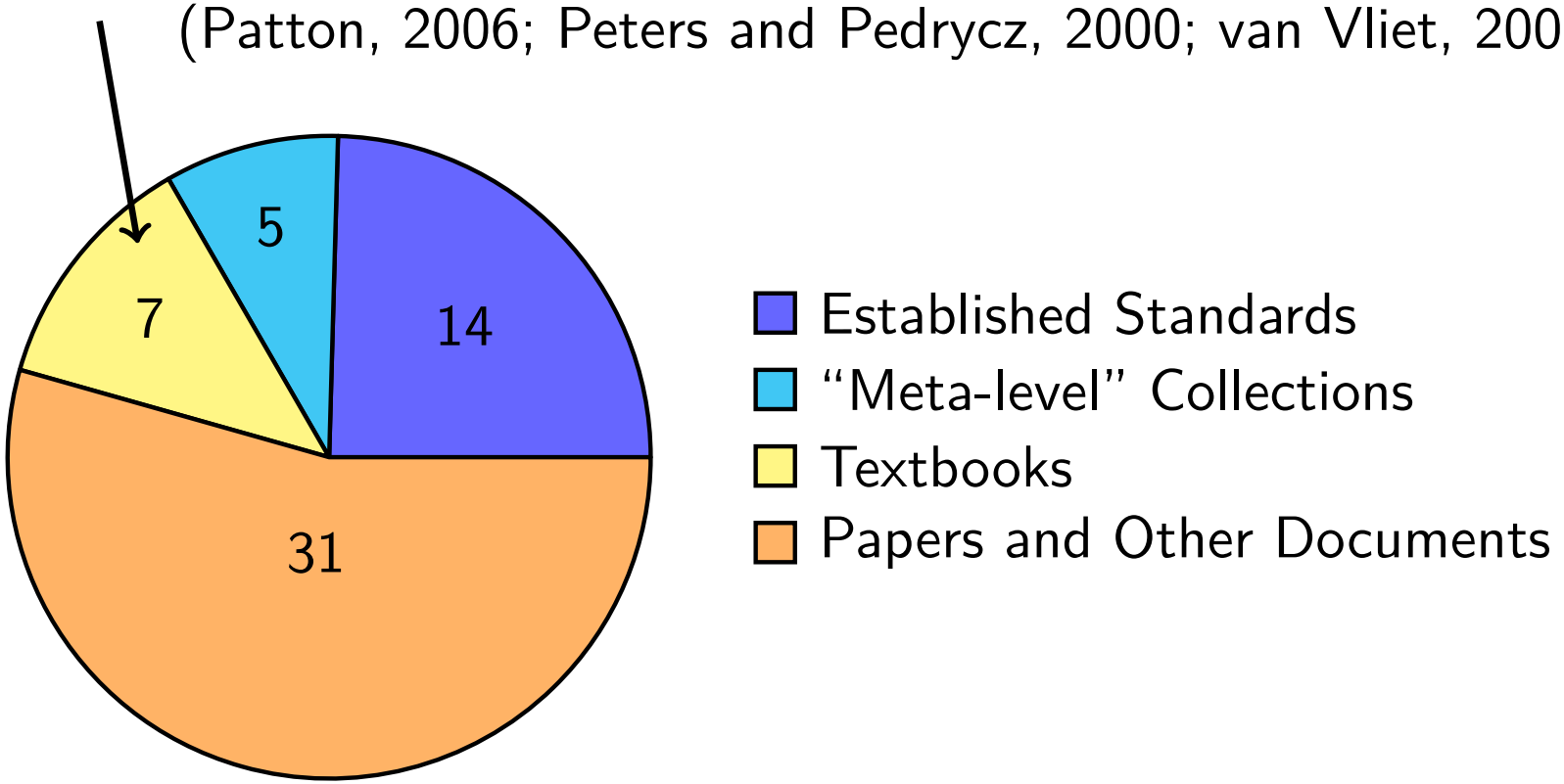
Methodology: Sources



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)



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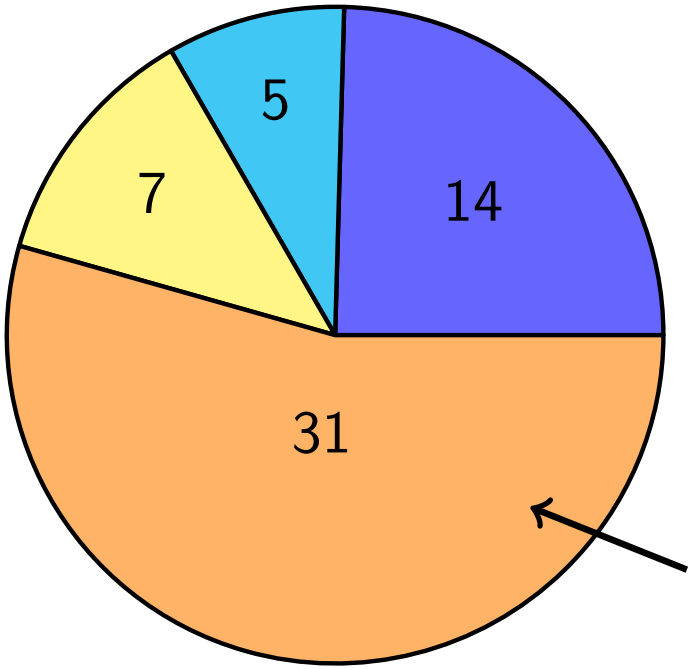
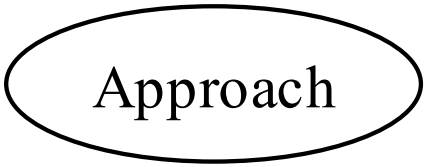


- Established Standards
- "Meta-level" Collections
- Textbooks
- Papers and Other Documents

Includes websites (LambdaTest, 2024; Pandey, 2023) and a booklet (Knüvener Mackert GmbH, 2022)

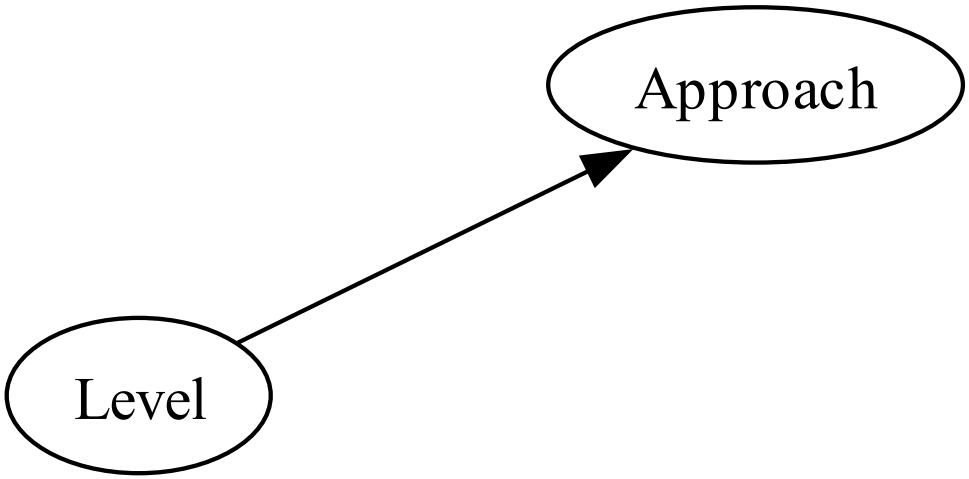
Summary of how many sources comprise each source category.

Methodology: Categories



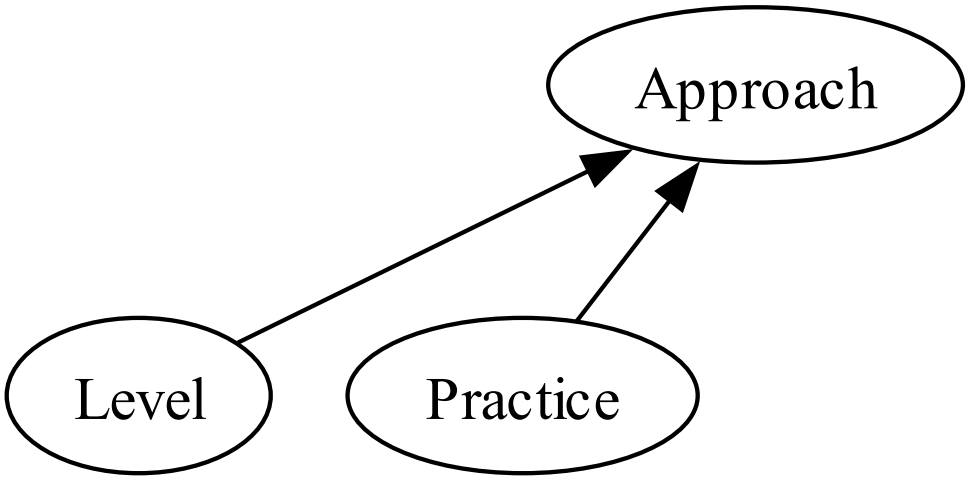
Approach: a "high-level test implementation choice" (ISO/IEC and IEEE, 2022, p. 10) used to "pick the particular test case values" (2017, p. 465)

Methodology: Categories



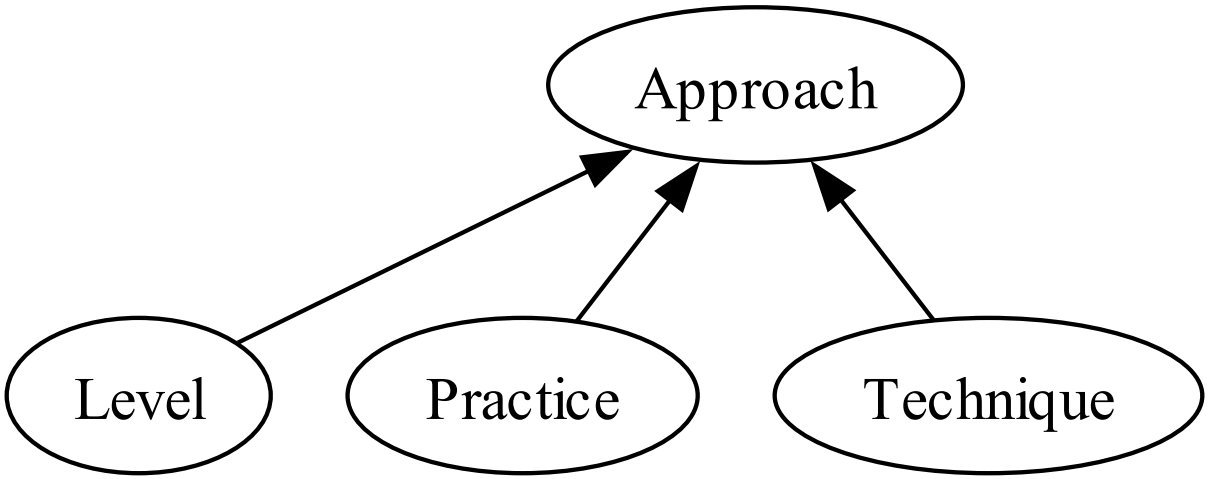
Level: a stage of testing with "particular objectives and . . . risks", each performed in sequence (ISO/IEC and IEEE, 2022, p. 12; 2021, p. 6)

Methodology: Categories



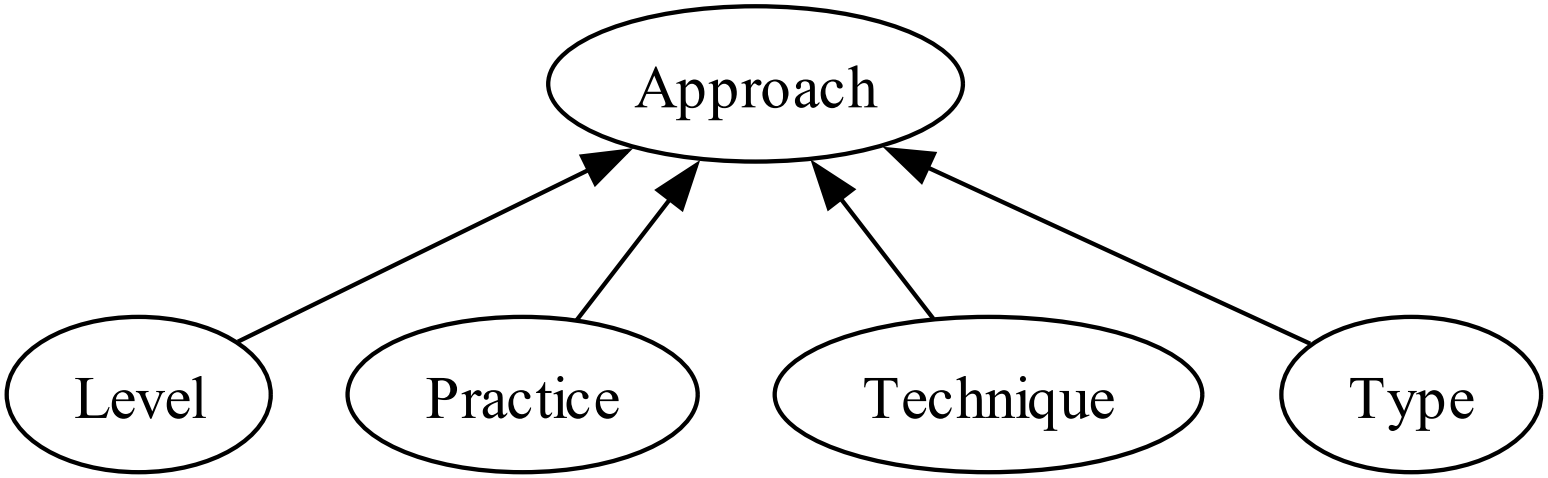
Practice: a "conceptual framework that can be applied to . . . [a] test process to facilitate testing" (ISO/IEC and IEEE, 2022, p. 14; 2017, p. 471)

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)

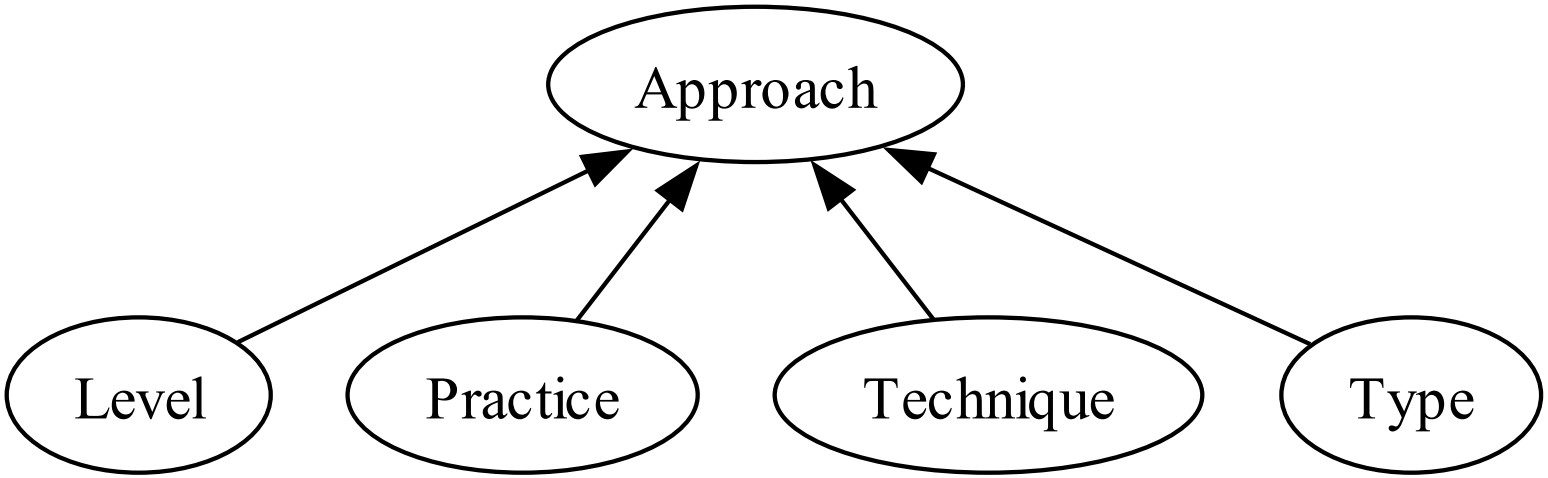
Methodology: Categories



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

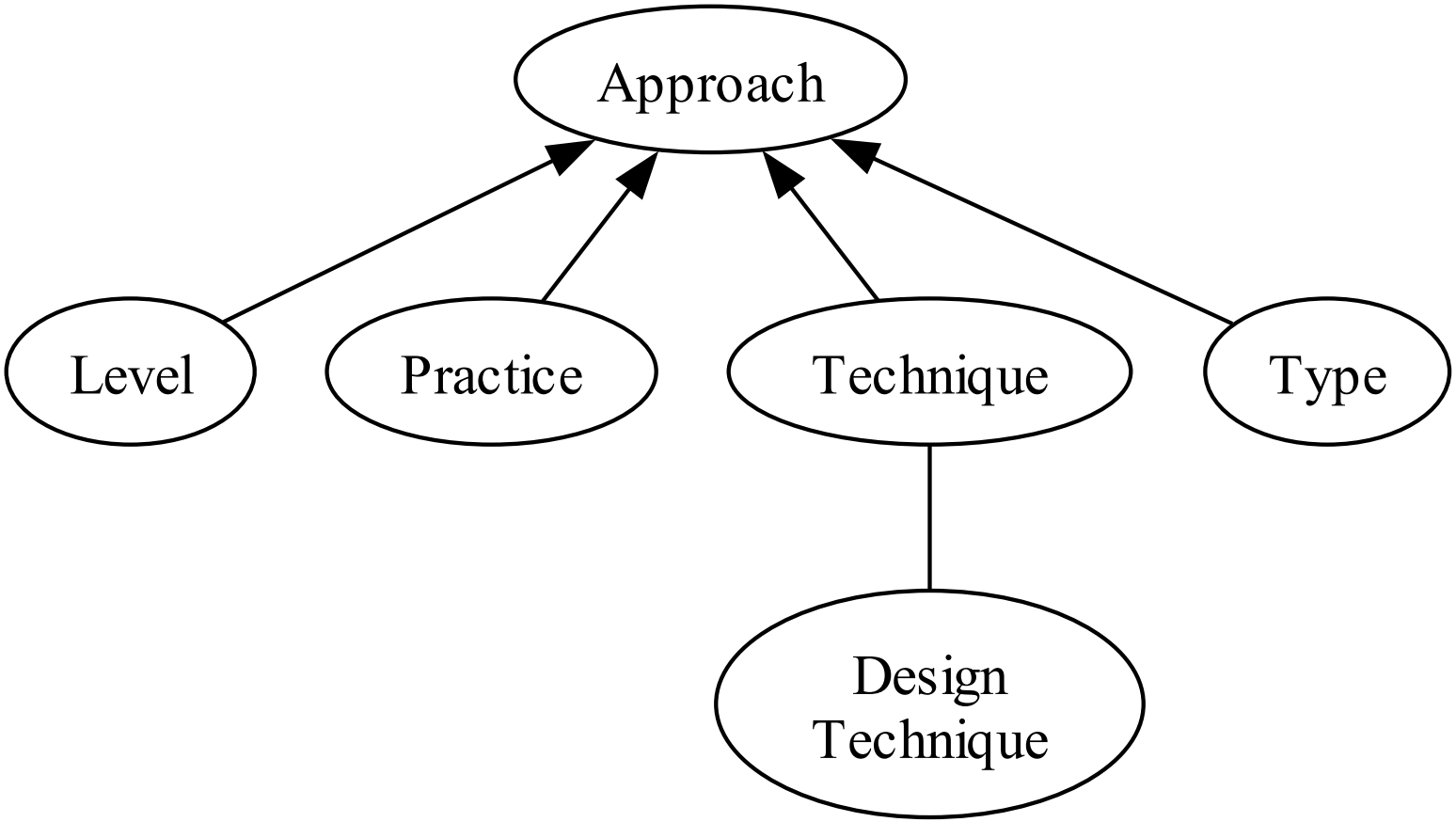
Relations



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

Methodology: Graph Notation

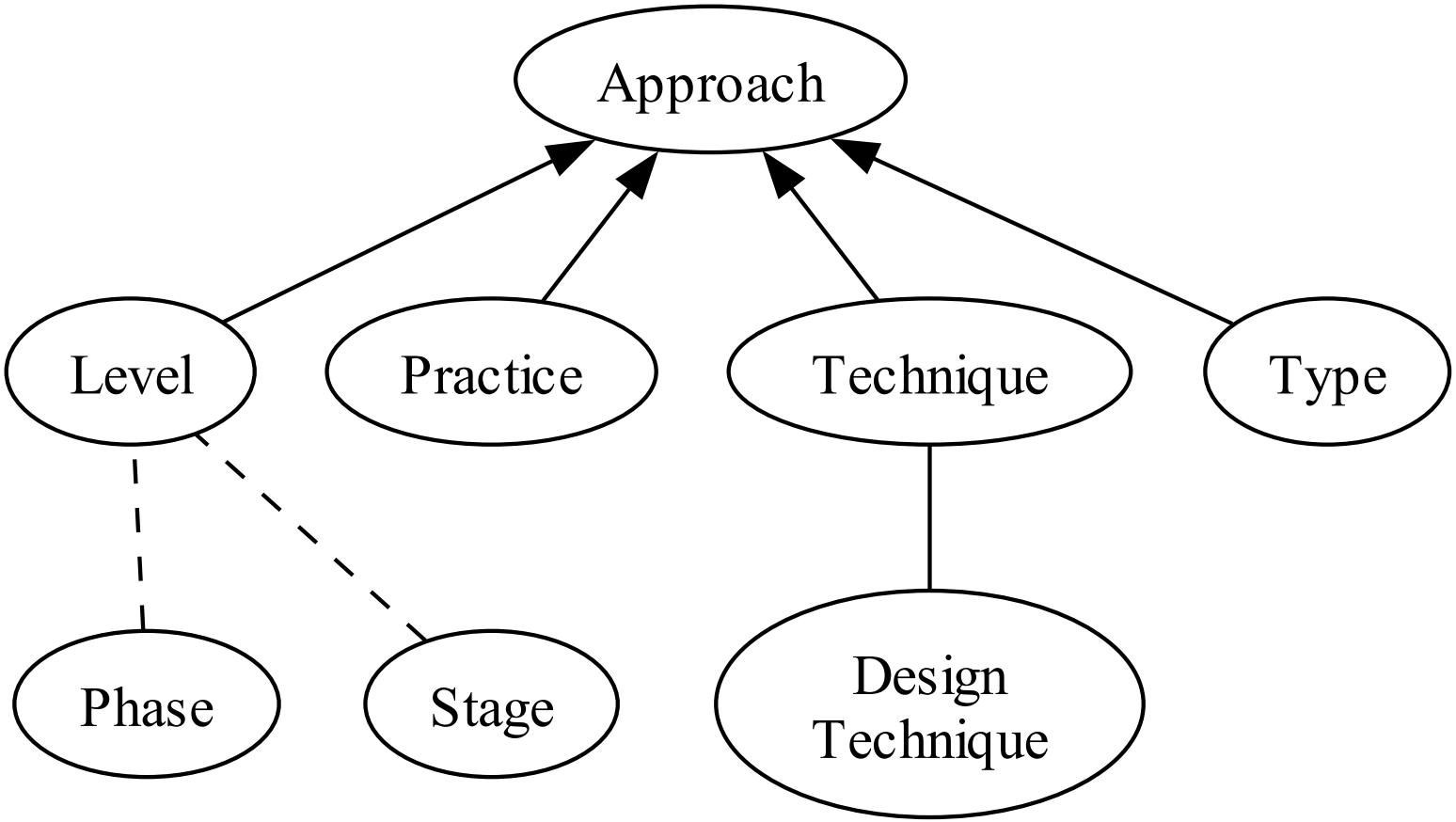
Relations



Lines without arrowheads connect *synonyms*.

Methodology: Graph Notation

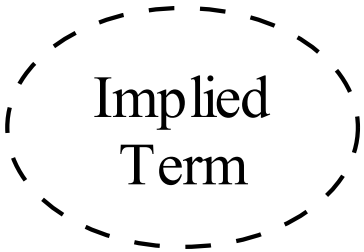
Relations



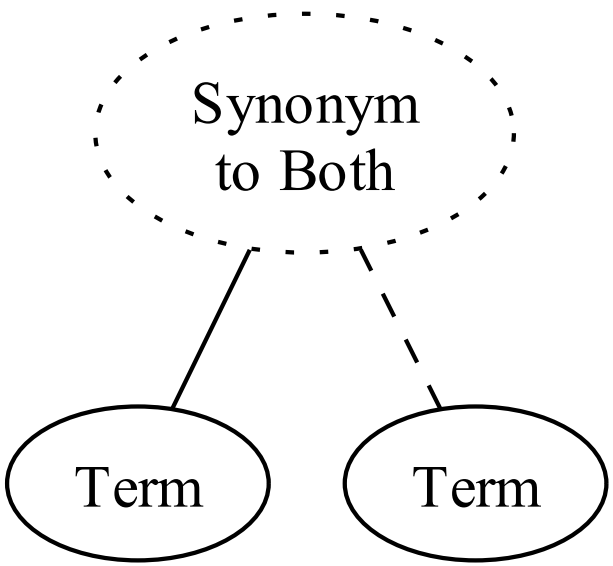
Dashed lines indicate a relationship is *implied*.

Methodology: Graph Notation

Terms



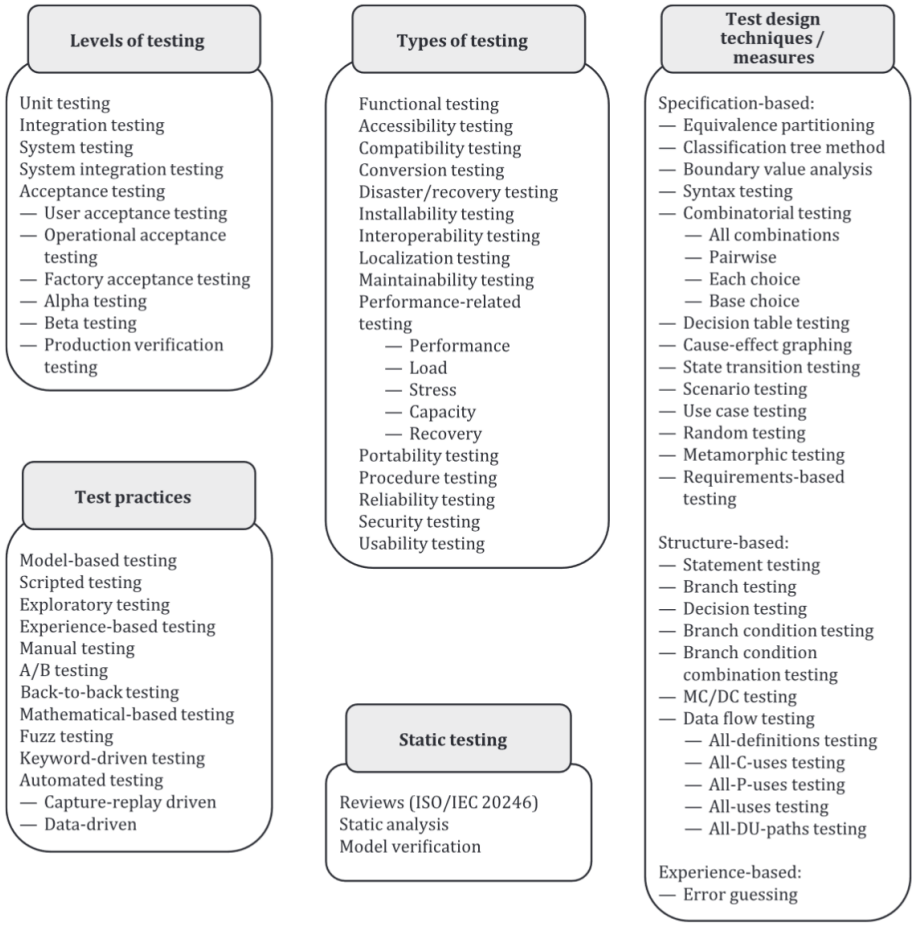
Dashed outlines indicate a term is *implied*.



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

Methodology: Graph Notation

Static Testing



Example test approach choices (ISO/IEC and IEEE, 2022, Fig. 2).

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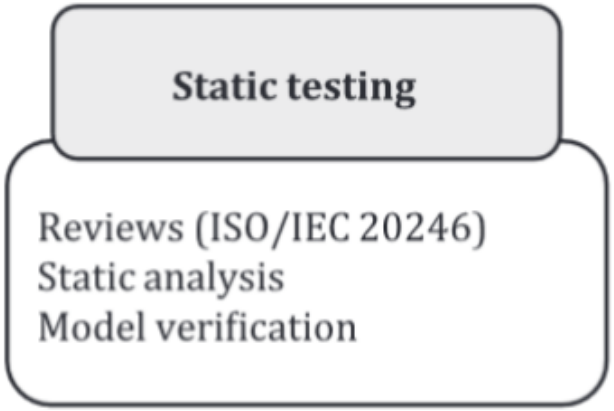

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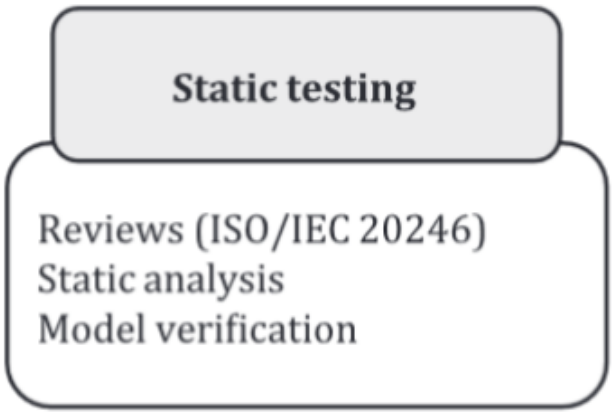

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- While our focus is on dynamic testing, we include static testing in our research for completeness

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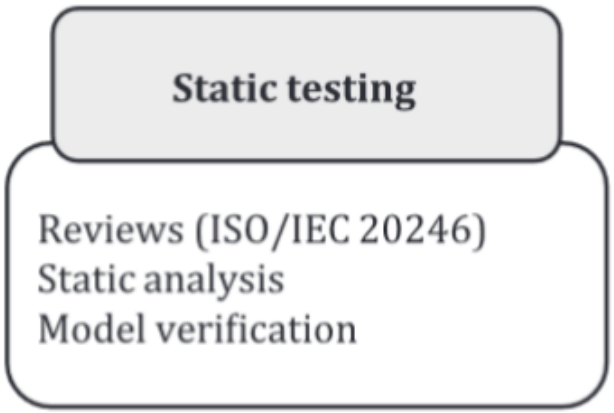

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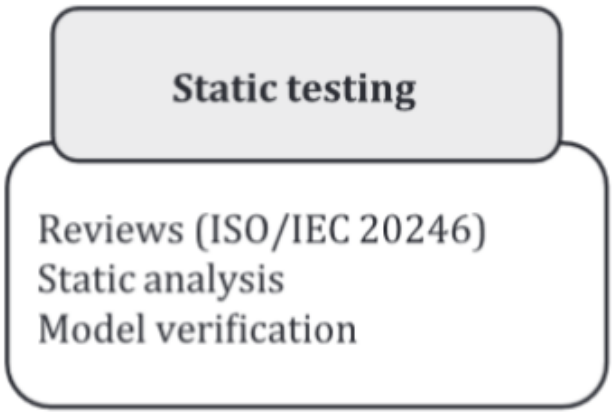

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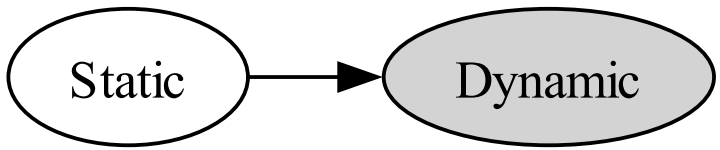
- When considering static testing in isolation, terms with gray backgrounds are related *dynamic approaches*



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

Methodology: Procedure

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Methodology: Procedure

Other Information

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- 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)

Acknowledgment

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- The past and current Drasil team have created a truly amazing framework!

Thank you!

Questions?

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