

Temasek Defence Systems Institute

COMPARISON OF REQUIREMENTS UNDERSTANDING IN MODEL-BASED SYSTEMS ENGINEERING VERSUS TRADITIONAL METHODS

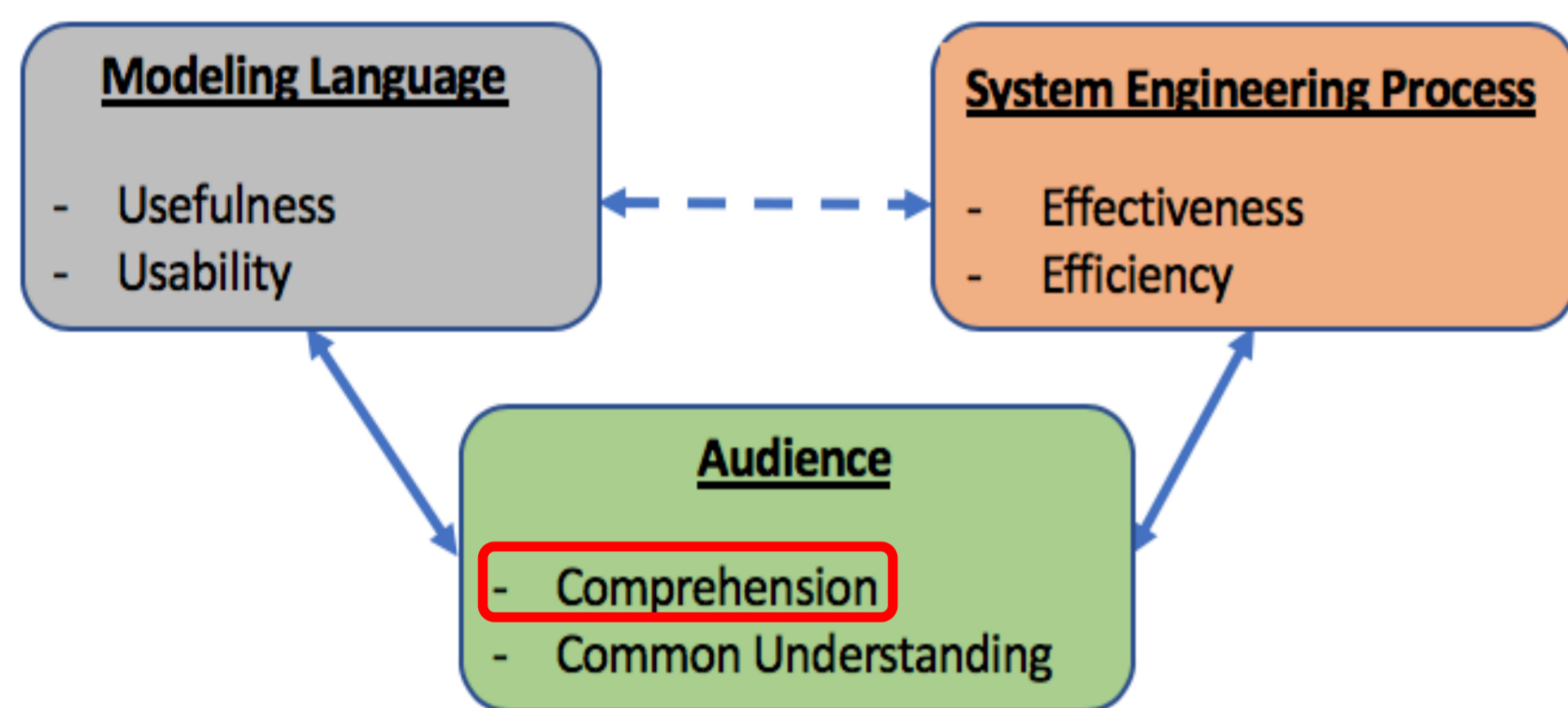
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Research Purpose: To study how well system engineers can understand requirements in a MBSE environment.

Research Question: To test whether system engineers using models understand the system requirements the same as or differently from system engineers using text-based requirements for the same system.

Experiment Goal: To measure the subjects' comprehension on model-based versus text-based tactical sling specifications based on the accuracy of the answers to the questionnaire. Then, evaluate the effectiveness and efficiency of the SE process, coupled with the usefulness and usability of the modeling language.

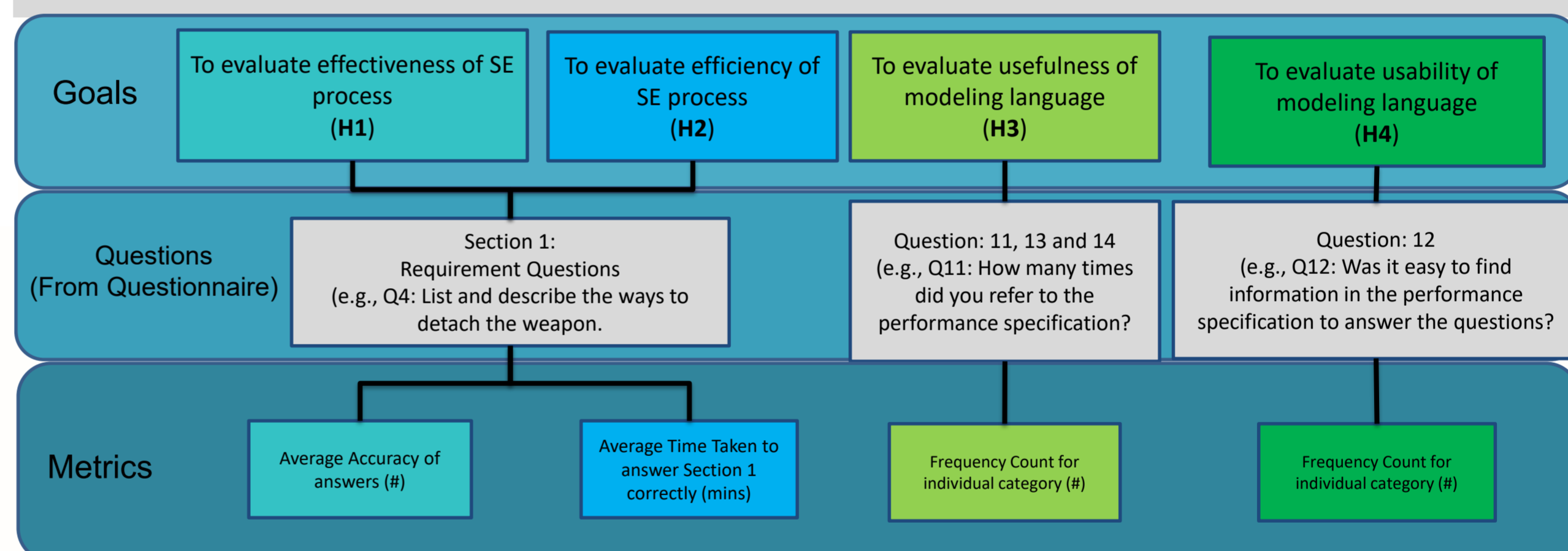
Research Model



Goal Question Metric

Definitions:

- Effectiveness:** The accuracy of the subject's response as compared to the model answer for Section 1 questions.
- Efficiency:** The time taken to answer Section 1 questions correctly.
- Usefulness:** The quality to represent and communicate the specifications to the subjects.
 - The more useful the specifications, the more number of times it will be referred to.
 - The more useful the specifications, the easier it is to understand the specifications.
- Usability:** The ease of using the modeling language to answer the questionnaire.



Research Results:

- Achieved the experiment goal.
 - Concluded the average accuracy for Multiple-Answer questions differs significantly
- Both types of specifications were similarly efficient, useful and usable.

Potential Benefits of Research:

Provide insights on a more responsive and flexible system engineering process to develop, test and deliver our defense systems. This reduces the need for expensive prototypes, early design lock during conceptual phase, and physical testing.

Recommendations for Future Work:

- Conduct the experiment on a more complex system (e.g., motorized platforms, aircraft and ship systems) to investigate further between the model-based and text-based system engineering approach.
- Conduct factor analysis to identify questions that are relevant to measure comprehension by analyzing their similarities and group them together.

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