Use of the Air Force HSI Requirements Pocket Guide to Improve Writing and Interpretation of Human-Centered Requirements

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Outline

Motivation

Research Questions

Background

Data Collection Workshop
Design
Results

Conclusions/Future Work

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Motivation-HSI

HSI requirements include, but are not limited to, any requirement pertaining to one or more domains of HSI, or the integration of those domains. Broadly, the term encompasses any requirement that contributes to the integration of human considerations into the system being developed.

Air Force HSI Office (2009). Human Systems Integration Requirements Pocket Guide.

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Research Questions

Hypothesis: Human Systems Integration effort can be estimated as a function of total Systems Engineering Effort

Human Systems Integration effort can be estimated by counting "number of HSI requirements"

Existing counting rules can be adapted to better account for Human Systems Integration requirements

Research Question: How can existing COSYSMO decomposition guidelines be modified to improve counting of HSI requirements?

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Background-Cost Model

Size Drivers

Requirements
Interfaces
Scenarios
Algorithms
+
3 Volatility Factors

Effort Multipliers

- Application factors
-8 factors
- Team factors
-6 factors
- Schedule driver

COSYSMO

CONSTRUCTIVE SYSTEMS ENGINEERING COST MODEL

SE Effort

Calibration

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Workshop Research Design

Research Question: How can existing COSYSMO decomposition guidelines be modified to improve counting of HSI requirements?

Method:
- Provide sample requirements related to example system
- Ask participants to analyze using existing guidelines

Contribution:
- Identify improvements to COSYSMO decomposition guidelines
- Assess impact of HSI requirements on SE effort

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Criteria Used to Judge Requirements

1.Determine the system of interest.

2. Decompose system objectives, capabilities, or measures of effectiveness into requirements that can be tested, verified, or designed.

3. Provide a graphical or narrative representation of the system of interest and how it relates to the rest of the system.

4. Count the number of requirements in the system/marketing specification or the verification test matrix for the level of design in which systems engineering is taking place, given the desired system of interest.

5. Determine the complexity of requirements.

→ Is the requirement at the level of the system-of-interest?

→ Can the requirement be tested, verified or designed?

→ Does the HSI requirement decompose to none, one, or many requirements?

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Requirements Counting Workshop

16 Participants
Split into 8 groups of 2

3 Phases
8 requirements/phase

Cautions and Warnings. Method for displaying system warnings, cautions, and alarms must be appropriate given the importance of the situation (**Threshold**).

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Hypothesis #1

Research Question: How can existing COSYSMO decomposition guidelines be modified to improve counting of HSI requirements?

Hypothesis #1: Using the cost estimation decomposition steps will produce requirements counts with high reliability across respondents.

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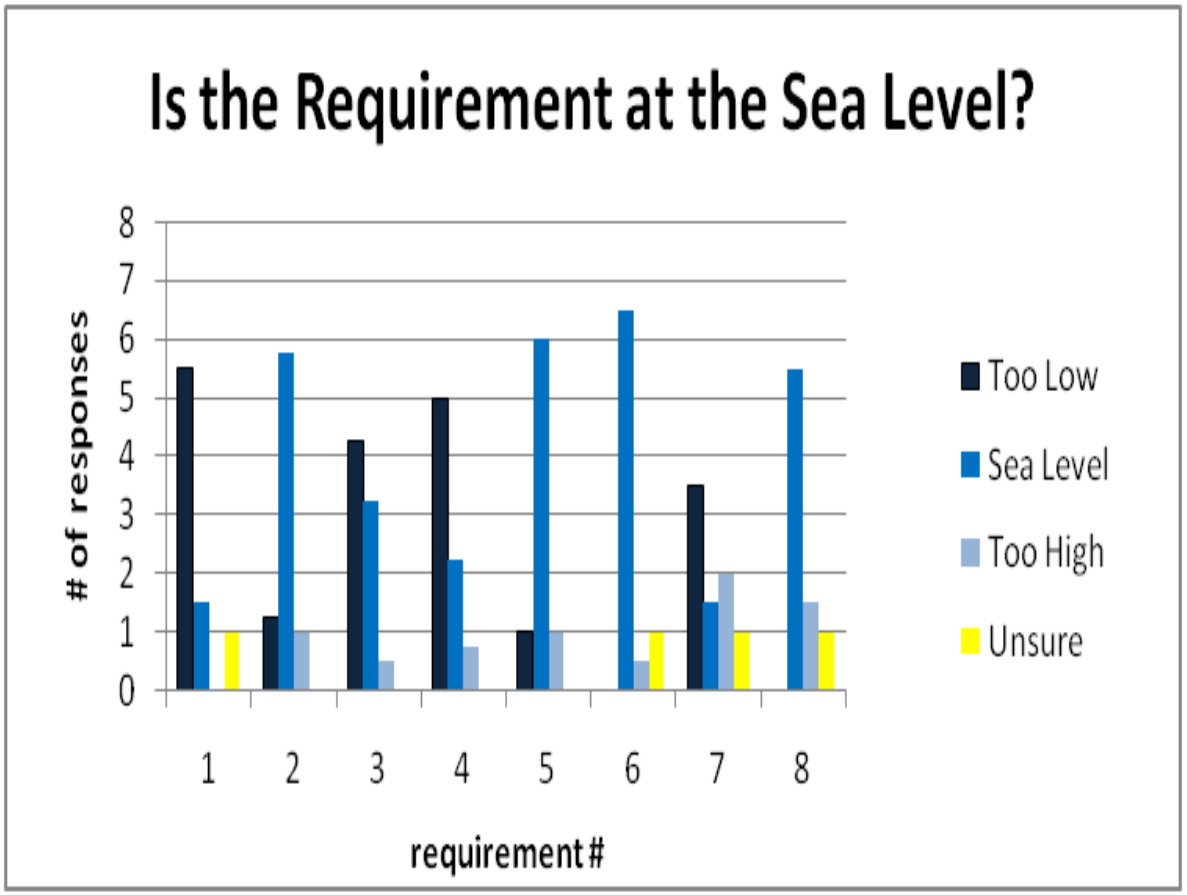
Workshop-Question 1



adapted from Cockburn (2001). Writing effective use cases

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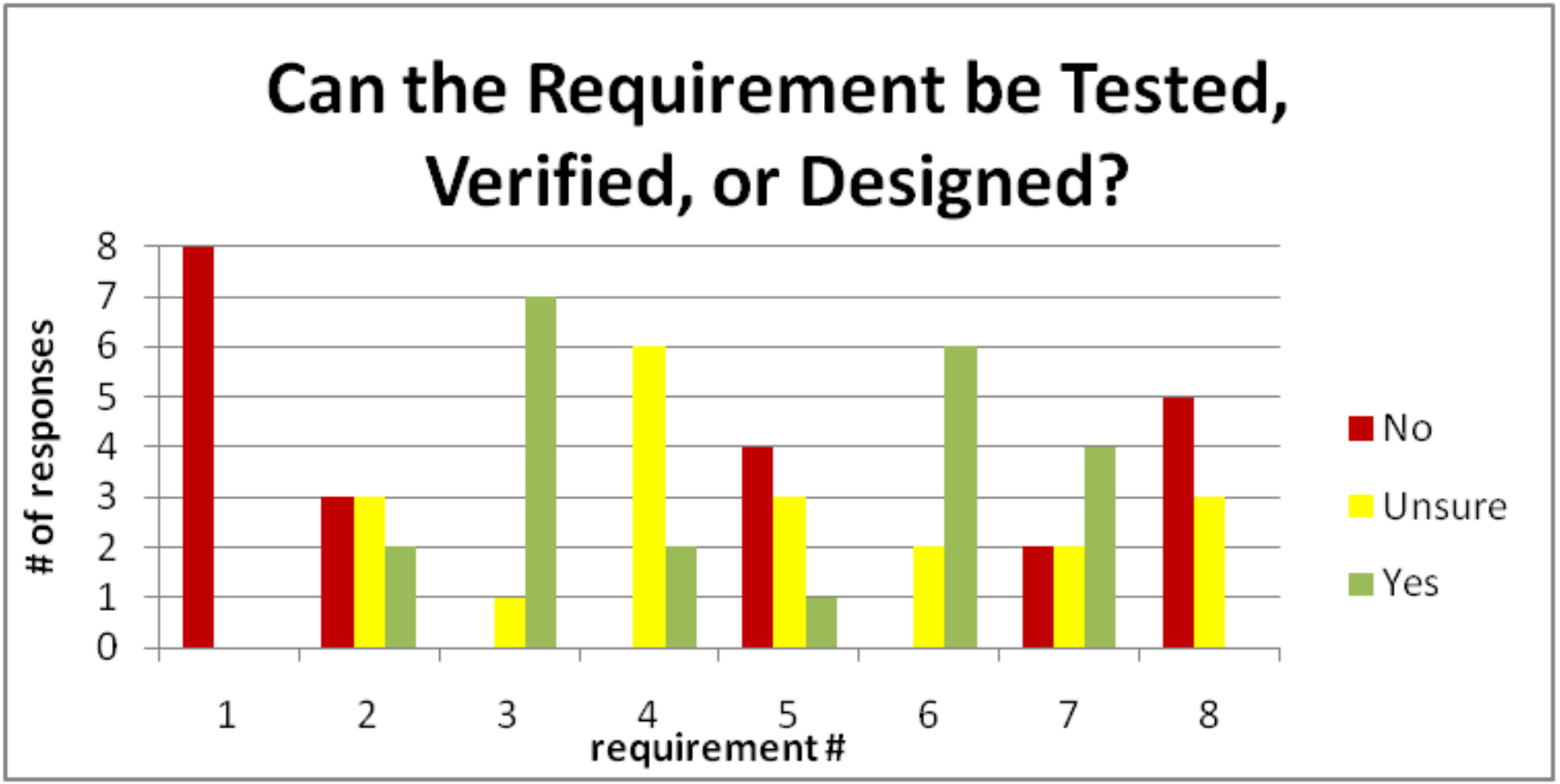
Workshop-Question 2



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Conclusions #1

Hypothesis: Using the cost estimation decomposition steps will produce requirements counts that are common across users.

Partially supported

Discussion:

- Understanding of “sea level”
- Differences in test and verify
- How to deal with “bad” requirements

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Hypothesis #2

Research Question: How can existing COSYSMO decomposition guidelines be modified to improve counting of (HSI) requirements?

Hypothesis #2: The cost estimation decomposition steps will help users quantify the number of HSI requirements to be input into COSYSMO.

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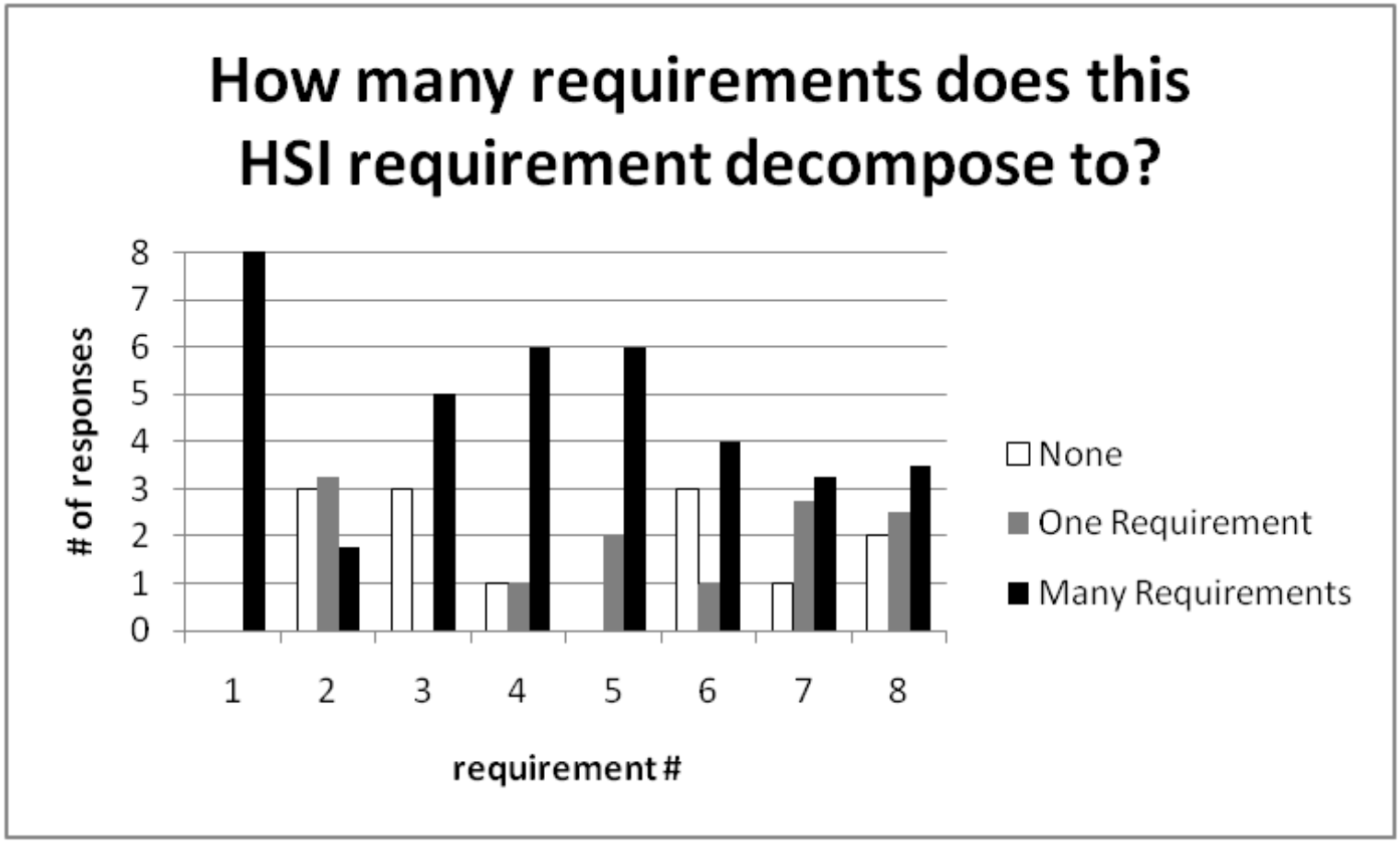
Workshop-Question 3



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Conclusions #2

Hypothesis: The cost estimation decomposition steps will help users quantify the number of HSI requirements to be input into COSYSMO.

Partially supported

Discussion:

- HSI requirements could be a major driver of cost.
  Many respondents answered “many requirements”

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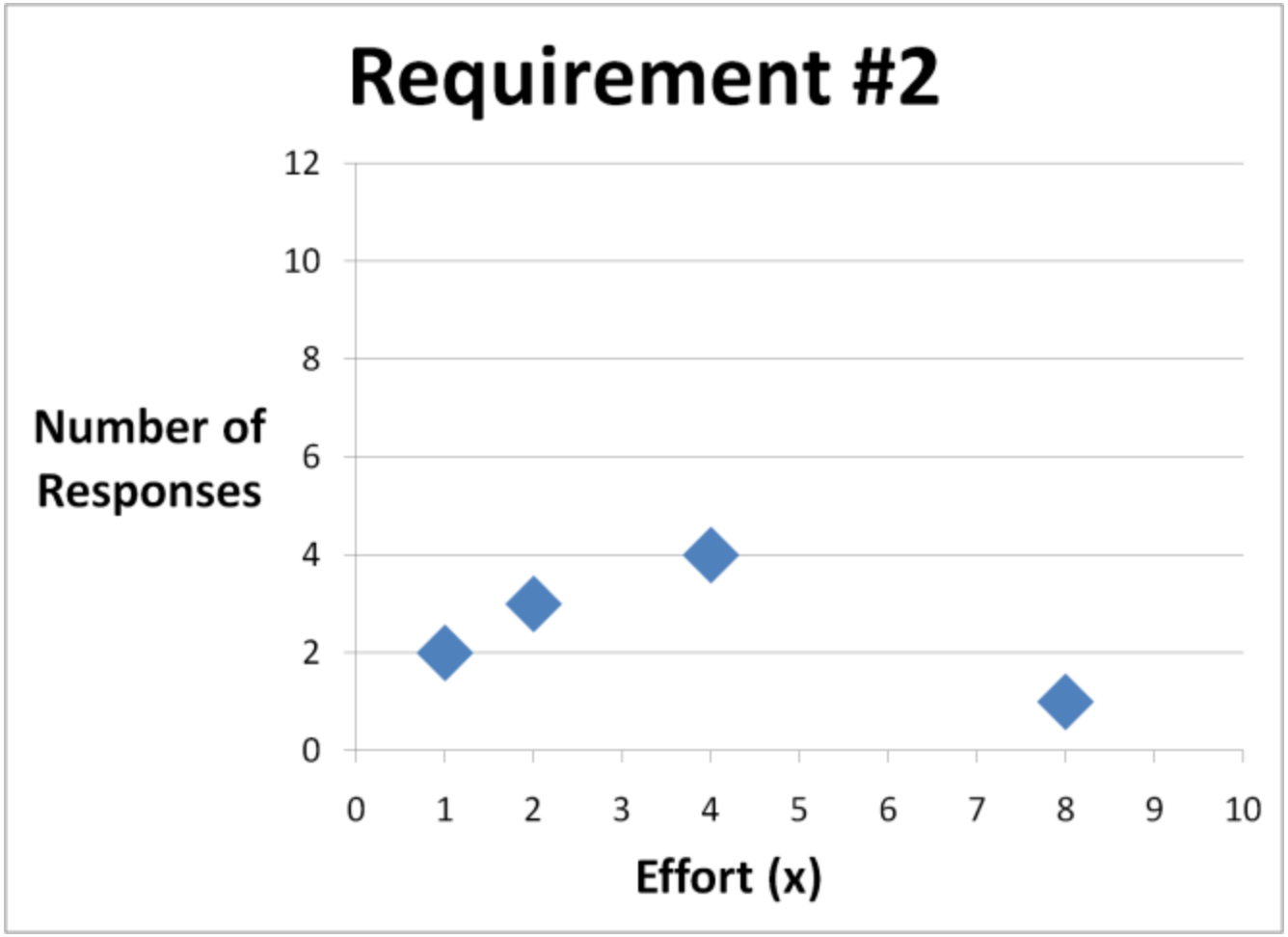
What is the impact of the HSI requirement compared to a nominal requirement?



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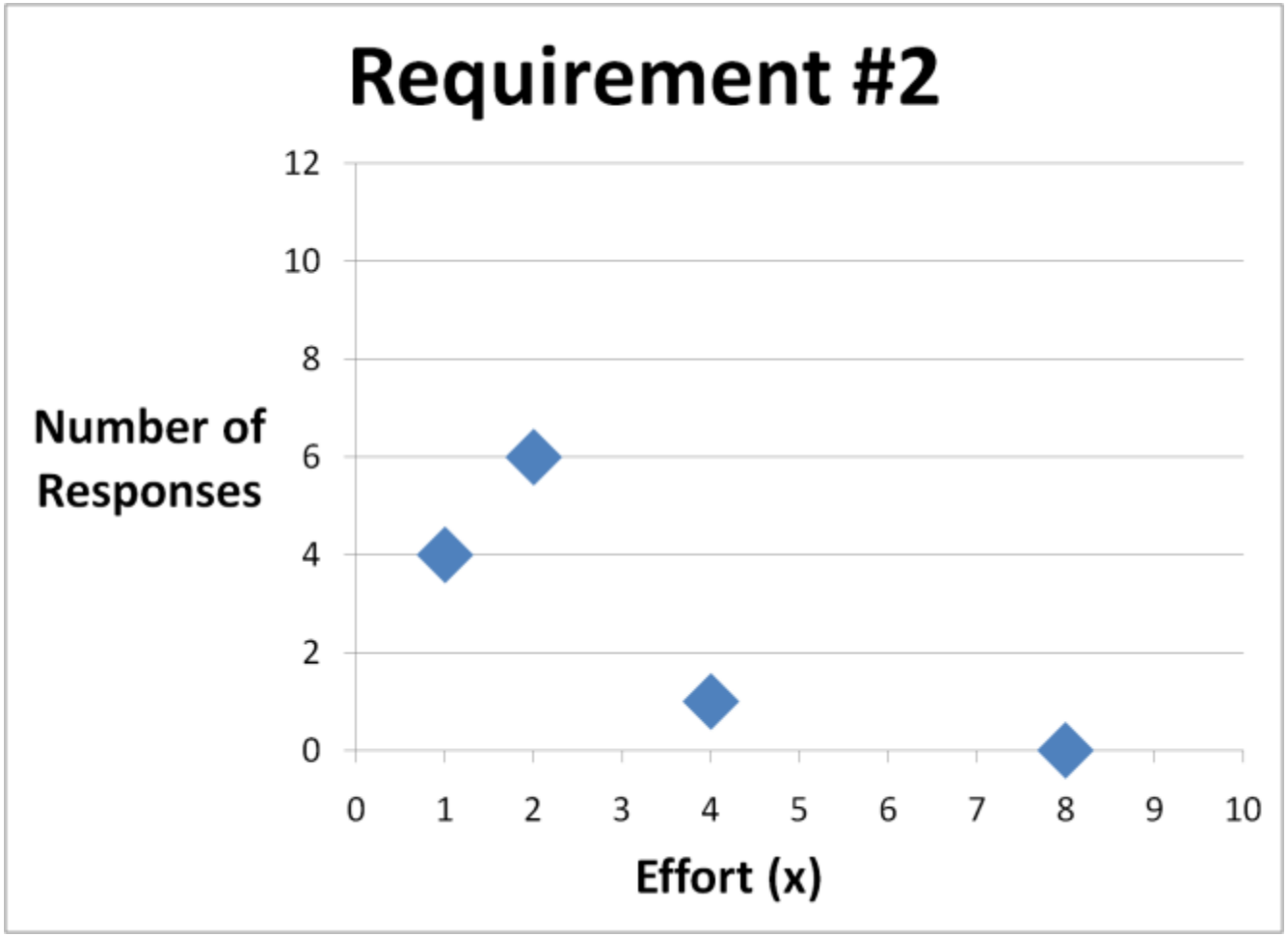

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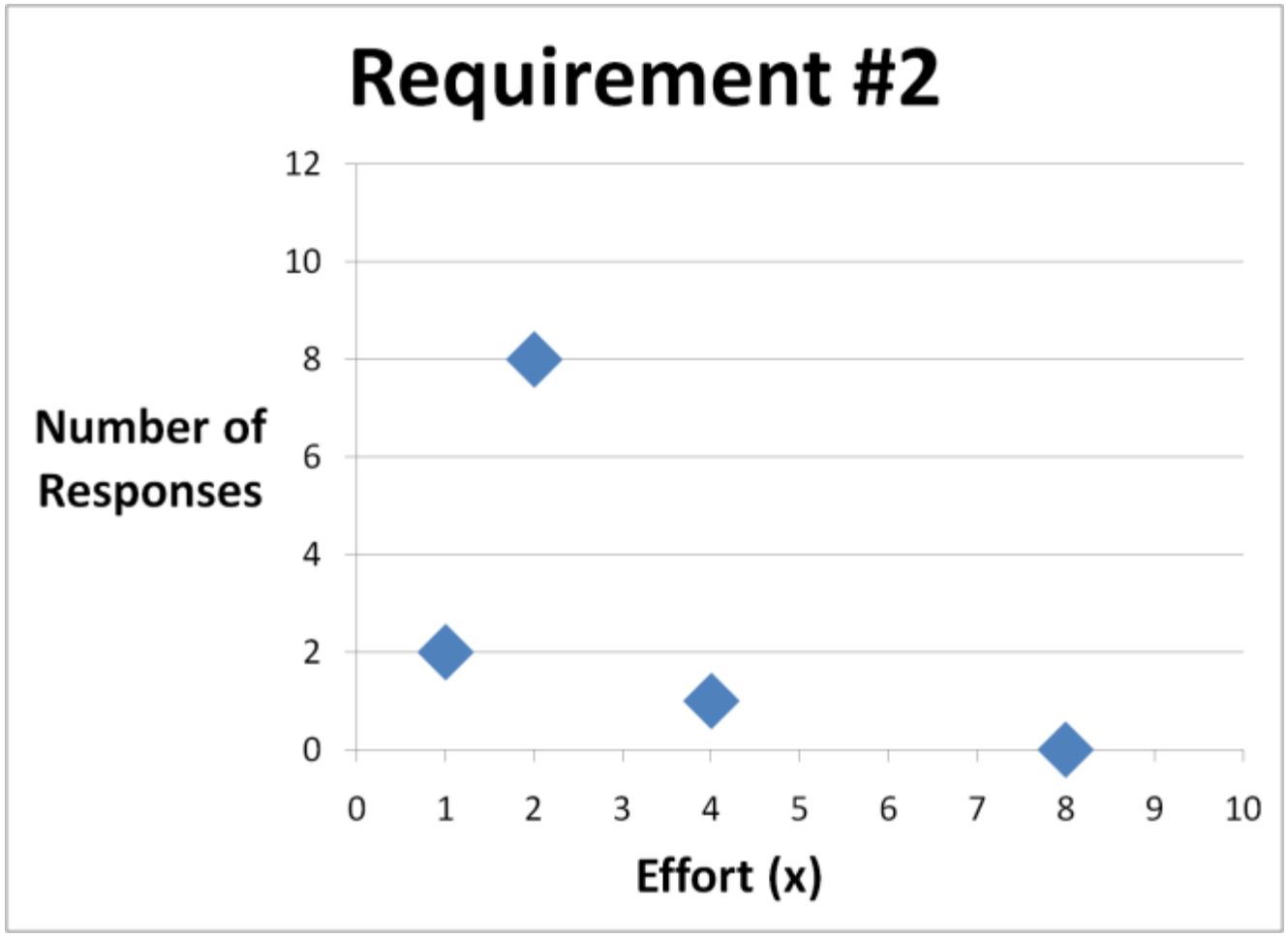

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Conclusion

Next Steps

- Provide more guidance on "sea level"

- Adopt Defense Acquisition Guide definition of "verify", remove "test"

- Perform additional analysis of impact of nonfunctional/HSI requirements

Guide book available at: http://www.wpafb.af.mil/afrl/711HPW/