MATLAB EXPO

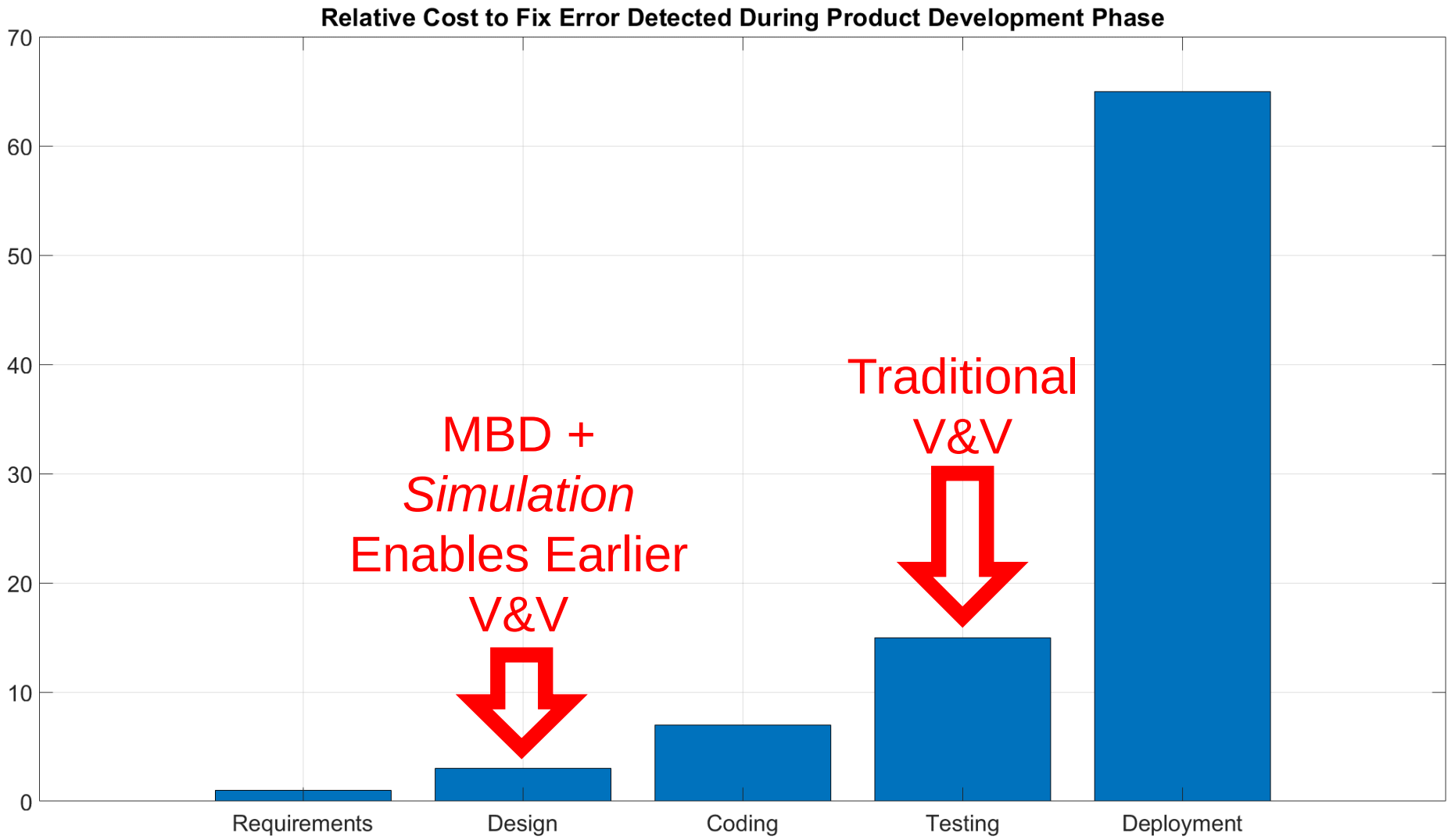
Formalizing Requirements and Generating Requirements-Based Test Cases

Dalton L'Heureux, MathWorks

MathWorks

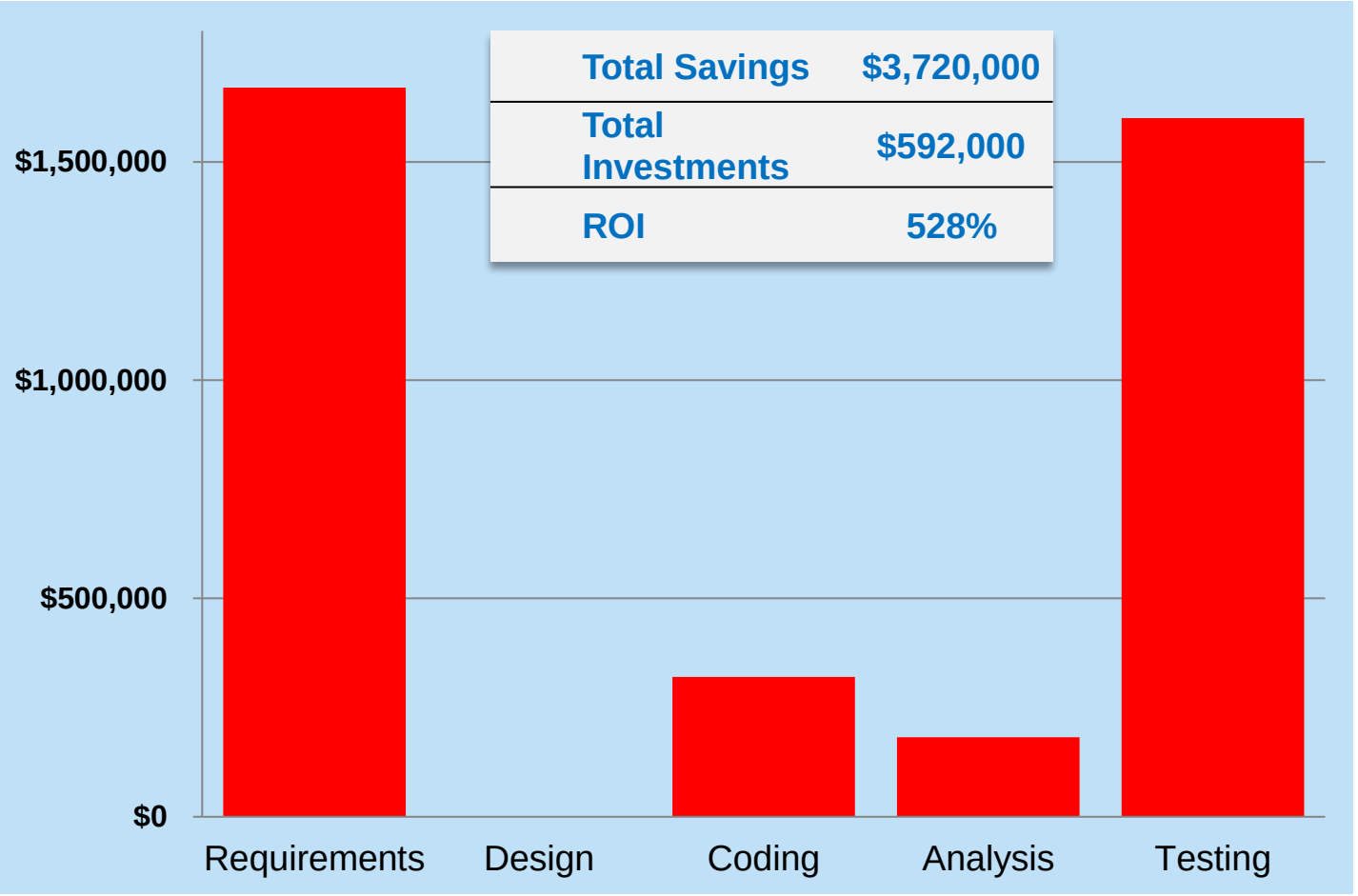
Why Model-Based ~~Design~~ Anything?

Model-Based Design: Detect Error Earlier to Minimize Costs

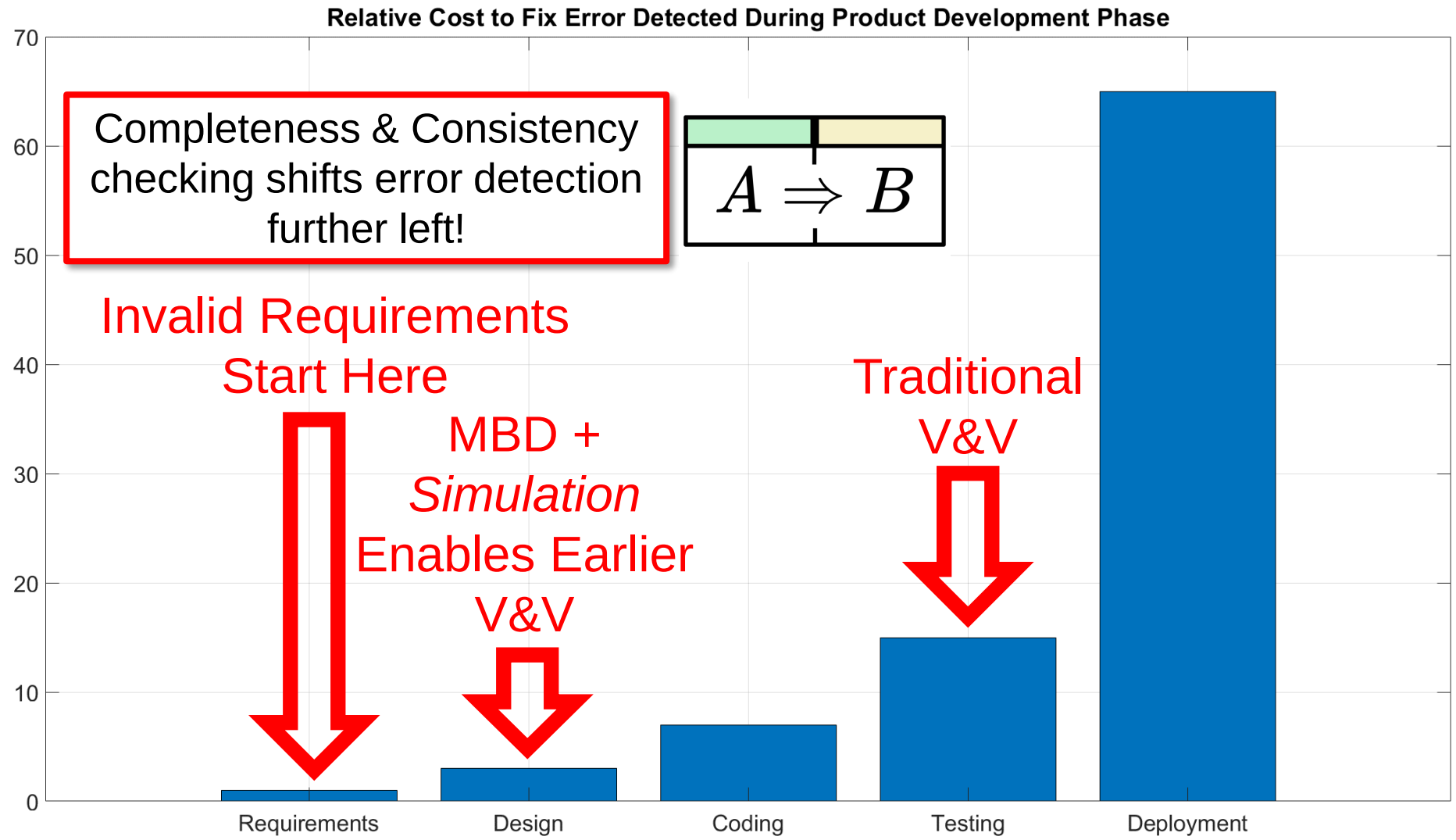


Data gathered by Hewlett Packard referred by XB in 2017
https://xbsoftware.com/blog/why-should-testing-start-early-software-project-development/

Model-Based Design ROI Calculation for Aerospace Applications

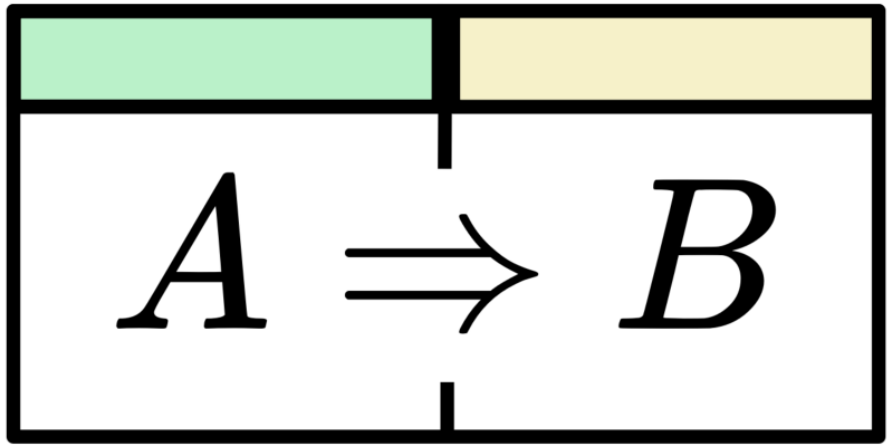


Can we Detect Errors Even Earlier?

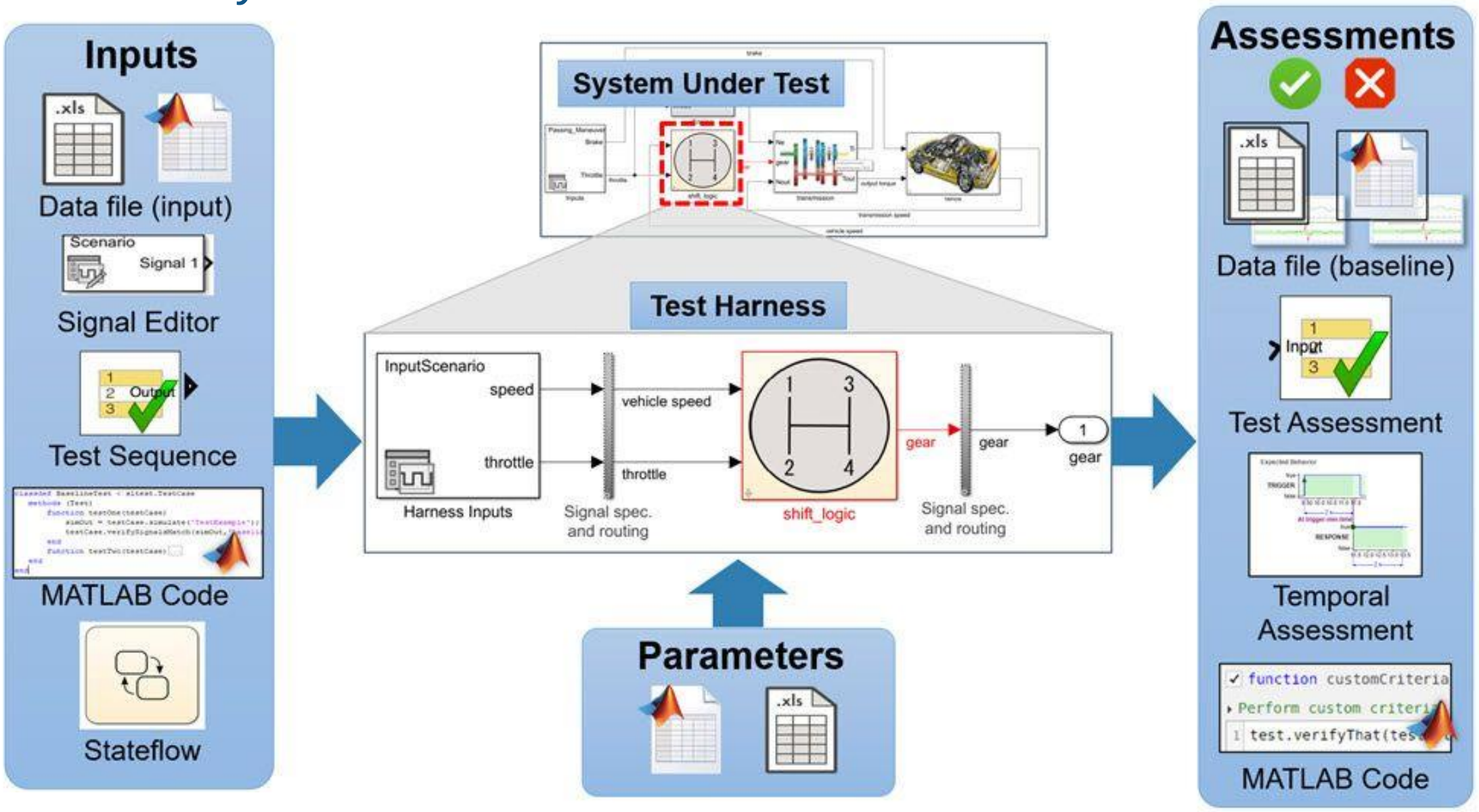


Data gathered by Hewlett Packard referred by XB in 2017
https://xbsoftware.com/blog/why-should-testing-start-early-software-project-development/

Let's Look at an Example!

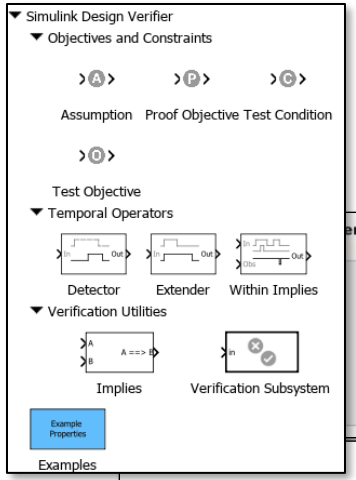


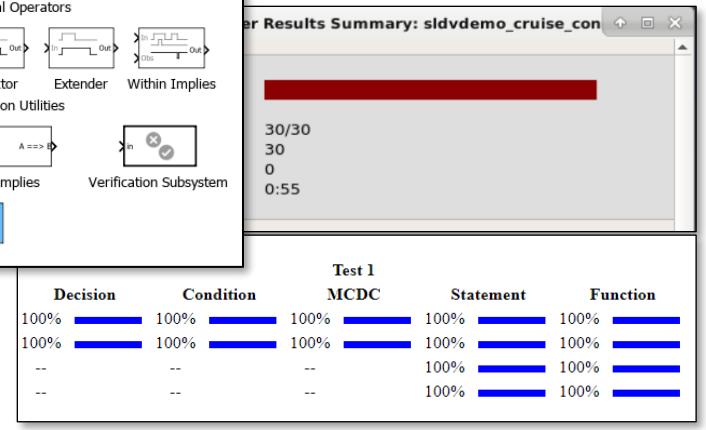
#1: Manually Author Tests with Simulink Test



#2: Generate Tests off Requirement Models Using Simulink Design Verifier Blocks

- Simulink Design Verifier can generate test cases that satisfy coverage objectives for your model, including Decision, Condition, MCDC, Relational Boundary, and Custom Objectives.

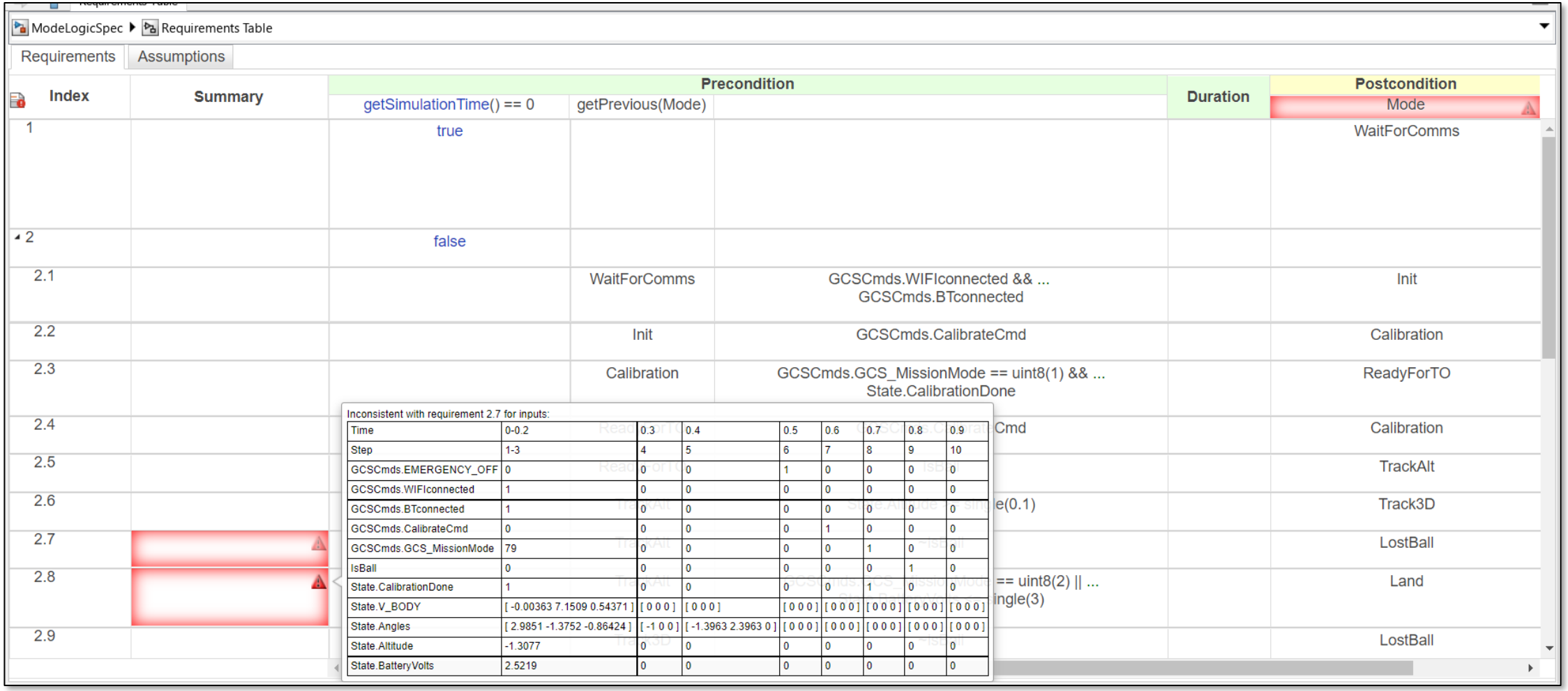




- Custom Objectives are modeled using the following constructs:
  - Test Objective - Define values of a signal a test case must satisfy
  - Test Condition - Constrain values of a signal
  - Verification Subsystem - Conceals logic/objectives from analysis

- What do your test cases *ACTUALLY* mean?
  - Structural Coverage Based Tests?
  - Low-Level Requirements Based Tests used to test generated code?
  - Requirements Based Tests generated from an *Independently* developed requirement model?
  - Requirements Based Tests generated from a Design Model? What about with *Independently* defined expected outputs?

#3: Generate Tests off Requirement Models Using the Requirements Table Block



Additional Resources

Product Page:

- Requirements Toolbox - MATLAB & Simulink (mathworks.com)

Documentation:

- Requirements Toolbox Documentation (mathworks.com)
- Requirements Definition (mathworks.com)
- Requirements Table Block (mathworks.com)
  - Use a Requirements Table Block to Create Formal Requirements (mathworks.com)

Examples:

- Requirements Toolbox — Examples (mathworks.com)
- Formalize Requirements in Simulink Models — Examples (mathworks.com)

MATLAB EXPO

Thank you