



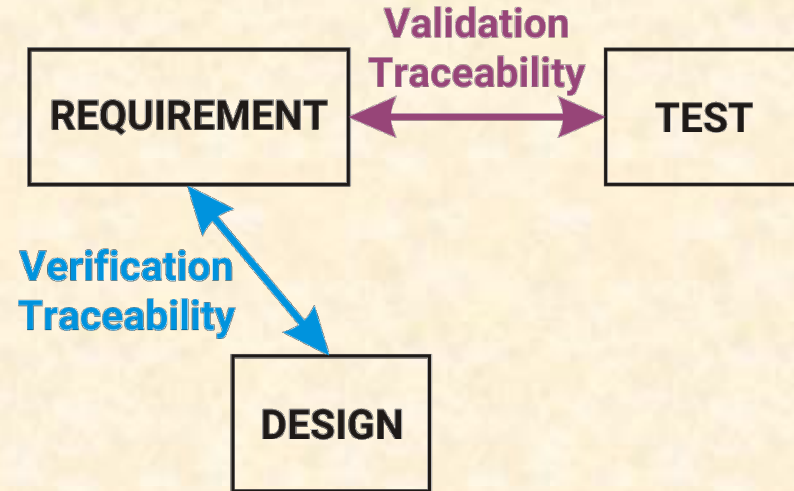
Prof. Philip Koopman

Traceability

There is never enough time to do it right the first time
... but there is always enough time to do it over.

■ Anti-Patterns:

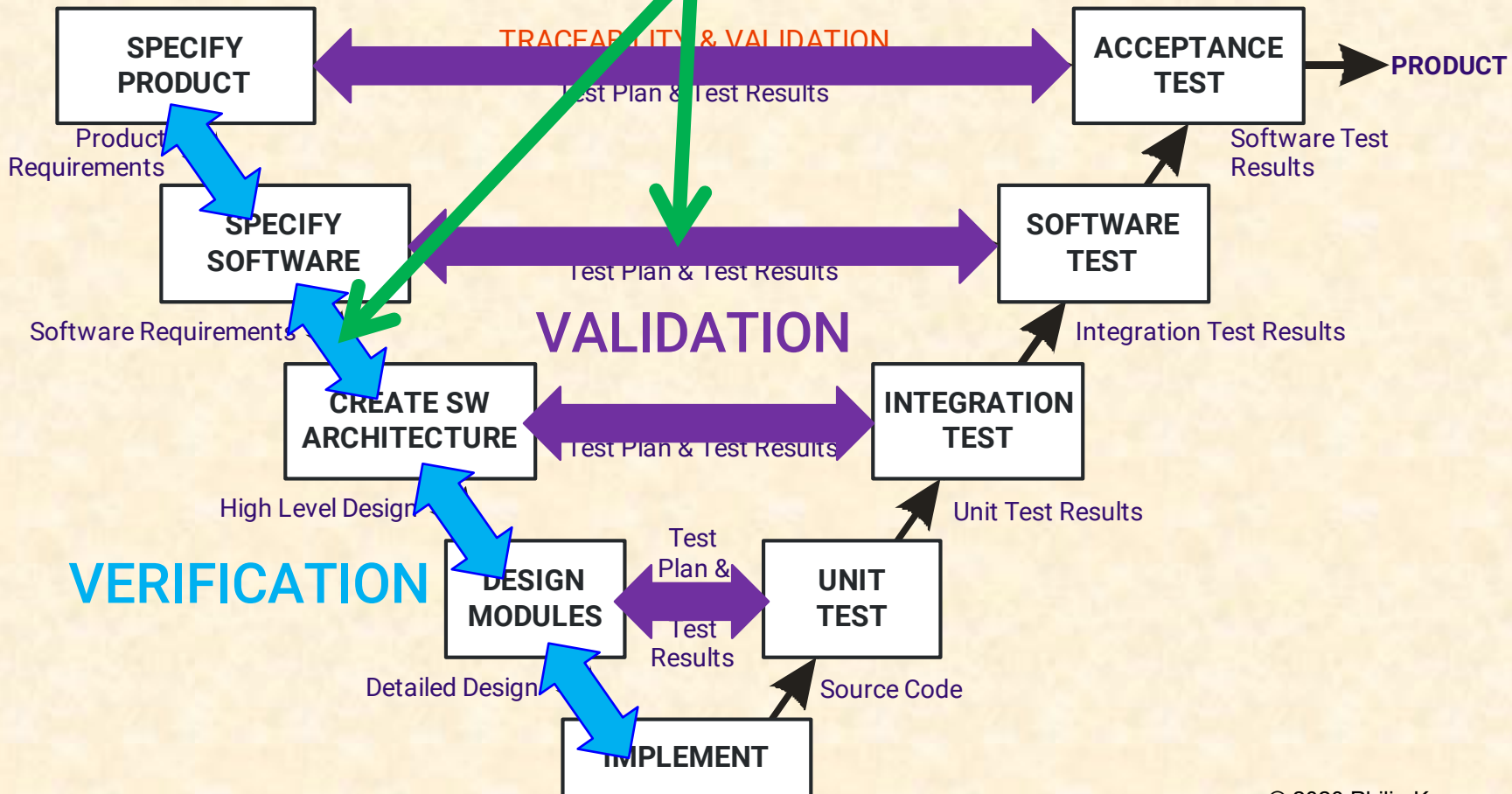
- Tests don't map to requirements
- Requirements aren't tested
- Reqts/design elements missing
- Gold plating (extra functionality)



■ Traceability

- Creating something traces to a quality check on the result
 - Verification: you did something the way you said you'd do it
 - Validation: the thing you created behaves the way it should
- Ensure nothing left out; nothing added that shouldn't be there

YOU ARE HERE



Traceability Examples

■ Design traceability

- Requirement → design → implementation
- Requirement → test

■ SQA traceability

- Confirm process is being carried out
- Process step → document/artifact → quality metric

■ Safety analysis traceability

- Confirm all hazards successfully mitigated
- Hazard → requirement → mitigation → validation

■ Defect traceability

- Ensure that all bugs are fixed
- Bug report → defect identified → fix task → code check-in → regression test

Requirements-to-Statecharts Traceability

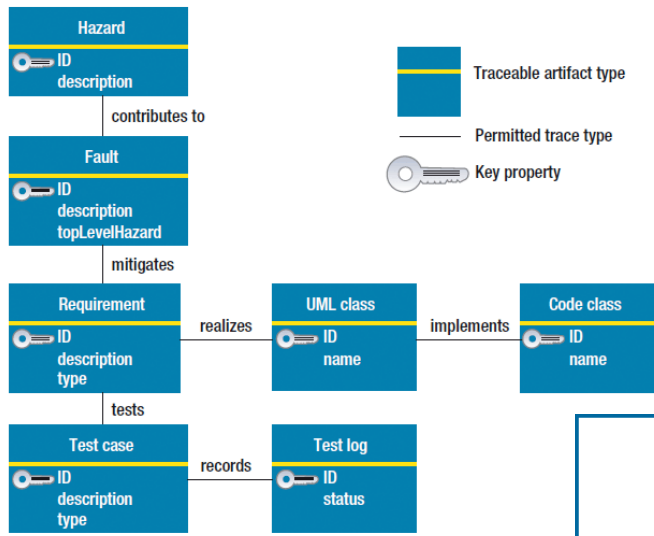
	Requirements					
States	R2.1	R2.2	R2.3	R2.4a	R2.4b	R2.5
S2.1 IDLE	x		x			x
S2.2 EMPTY	x	x				x
S2.3 VEND	x			x	x	
S2.4 FLASH_OFF	x			x	x	
S2.5 FLASH_ON	x			x	x	
Transitions						
T2.1				x	x	x
T2.2			x			
T2.3		x				
T2.4					x	
T2.5					x	
T2.6		x				
T2.7			x			

REQUIREMENTS TRACEABILITY MATRIX

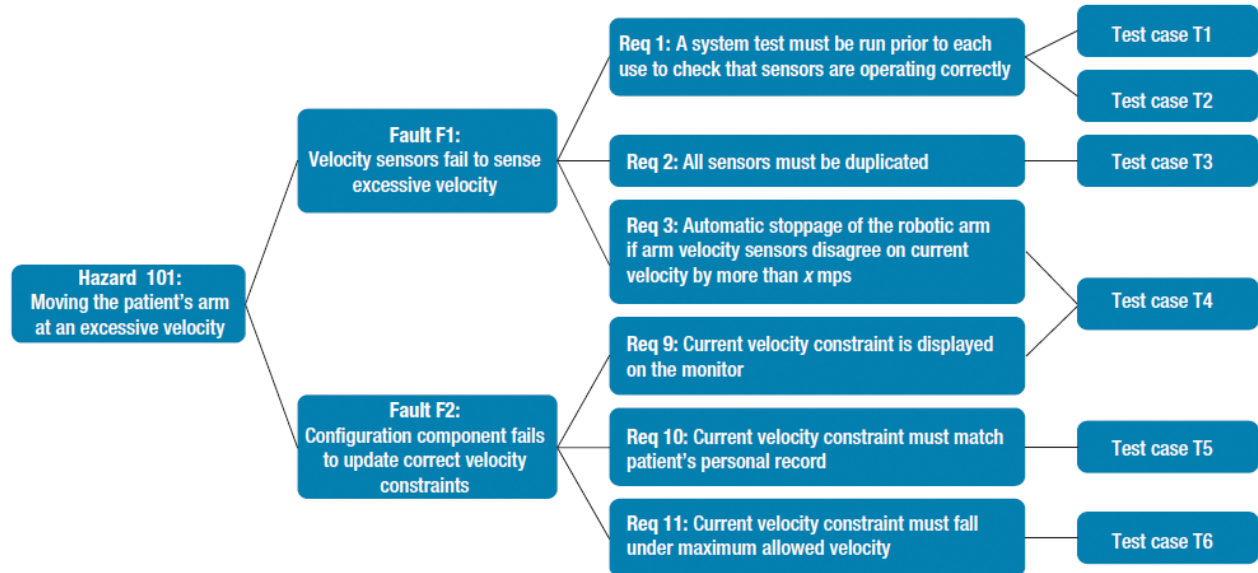
Project Name: Online Flight Booking Application

Business Requirements Document BRD		Functional Requirements Document FSD			Test Case Document
Business Requirement ID#	Business Requirement / Business Use case	Functional Requirement ID#	Functional Requirement / Use Case	Priority	Test Case ID#
BR_1	Reservation Module	FR_1	One Way Ticket booking	High	TC#001 TC#002
		FR_2	Round Way Ticket		TC#003 TC#004
		FR_3	Multicity Ticket booking	High	TC#005 TC#006
BR_2	Payment Module	FR_4	By Credit Card	High	TC#007 TC#008
		FR_5	By Debit Card	High	TC#009
		FR_6	By Reward Points	Medium	TC#010 TC#011

Traceability for Hazard Mitigation



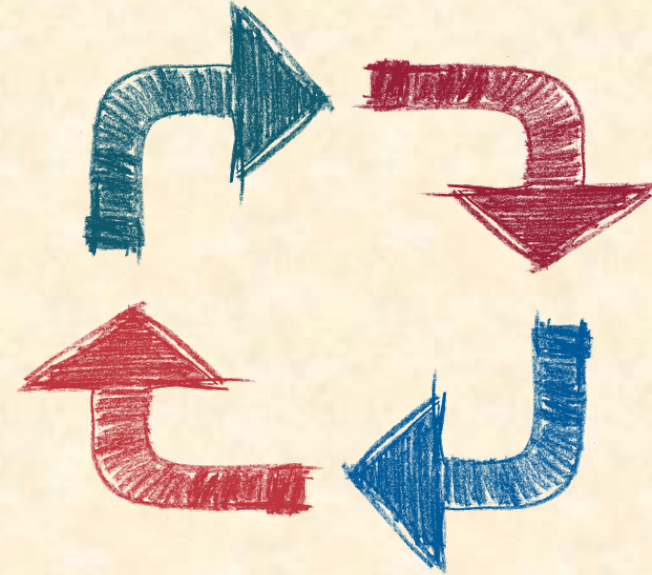
Mader et al. 2013:
<http://doi.ieeecomputersociety.org/10.1109/MS.2013.60>



Traceability Best Practices

■ Trace everything in design package

- Even simple traceability checks can find problems
 - **Gold plating**: design item not traced to a requirement
- Everything in design has an ID tag for traceability
 - Map left and right sides of V to each other
 - Map each layer of V upward and downward
- Trace changes to see what else they affect



■ Traceability pitfalls

- Making granularity of trace IDs too big causes problems
- Re-numbering breaks auto-generated document sections used as trace IDs
- Don't use the wrong tool
 - Spreadsheets don't scale to big projects
 - Big project tools might be overkill where a spreadsheet approach will do

I USED TO THINK
CORRELATION IMPLIED
CAUSATION.



THEN I TOOK A
STATISTICS CLASS.
NOW I DON'T.



SOUNDS LIKE THE
CLASS HELPED.
WELL, MAYBE.

