Root Cause Analysis for Software Defects

Cognitive Reflection Template

Defect ID	Date recorded	Defect description	Error-Prone Scenario analysis	Cognitive Stage[1]	Performance Level[2]	Cognitive Modes[3]	Confidence level[4]
			Describe according to the structure of Error-Prone Scenario if a HEM is assigned				

1. Taxonomy for Cognitive Stage

1) Requirements
2) Design
3) Coding
4) Review/testing

2. Taxonomy for Performance Level

1) Skill-based Performance (SK)
2) Rule-based Performance (RB)
3) Knowledge-based Performance (KB)
4) Metacognition (Meta)

3. Taxonomy for Cognitive Modes

(Classical) Human Error Mode (HEM)	**SK1**	Perceptual Confusions	People tend to mistakenly use one item for another because these two items share some similarities.
	SK2	Omissions following interruptions	Original sequence of activity is picked up one or two steps further along after an interruption.
	RB1	Applying "strong-but-now-wrong" rule	In a context that is similar to past circumstances, people tend to behave in the same way, neglecting the signs of exceptional or novel circumstances. The more frequently and successfully the rule has been used before, the more likely it is to be recalled and used.
	RB2	Rule Encoding Deficiencies	Features of a particular situation are either not encoded at all or misrepresented in the conditional component of the rule
	KB1	Lack of knowledge	Software vulnerabilities are introduced when one lacks knowledge, or even does not realize some other knowledge is required. This error

			mode is liable to appear especially when the problem belongs to an unfamiliar application domain.
	KB2	Difficulties with exponential developments	Humans tend to underestimate the rate of change, either growth or decline, and tend to construct linear models, when exponential models are required to understand a situation in reality.
	KB3	Selectivity	Psychologically salient, rather than logically important information is paid attention to
	KB4	Biased review	Humans tend to believe that all possible courses of action have been considered, when in fact only a subset have been considered. When programmers generate test cases, they may fail to take all conditions into consideration, e.g. exception and boundary conditions
	KB5	Confirmation bias	Psychologically salient, rather than logically important information is paid attention to
	KB6		
	PCE	Post-Completion Error	If the ultimate goal is decomposed into sub-goals, a sub-goal is likely to be omitted under the following conditions: the sub-goal is not a necessary condition for the achievement of its super-ordinate goal, and the sub-goal is to be carried out at the end of the task.
New Cognitive Modes (discovered in data)	**CM1**	Forgetting something has been done	
	CM2	Problems with complexity	
	….	….	**Encourage you to add more!**
Others	**O1**	Lack of security requirements	
	….	…	
Unknown	**Unknown**	Couldn't classify causes because lack of information	

4. Confidence Level

1) Low

2) Median

3) High

You are encouraged to assign unknown if confidence level is low!