Software Project Management

ASSIGNMENT-5

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PART I - Requirements:

Consider the data listed in the following matrix for a product of size 120KLOC

		Defect Origin							
Where Found		Requirement	Analysis	Design	Coding	Unit Testing	Integration Testing	System Testing	Field
	Requirement	120							
	Analysis	45	28						
	Design	27	45	210					
	Coding	97	61	61	338				
	Unit Testing	79	25	71	145	6			
	Integration Testing	21	17	41	41	-	5		
	System Testing	21	4	18	38	-	-	6	
	Field	2	1	2	2	-	-	-	4

1. Calculate the defect removal rate for every phase

Defects Removal Rate =
(Number of Defects removed in current phase /Total number of KLOC) defects/KLOC

Phase	Defects Removed	Total KLOC	Defects Removal Rate (defects/KLOC)
Requirement	120	120	1
Analysis	73	120	0.60833333
Design	282	120	2.35
Coding	557	120	4.64166667
Unit Testing	326	120	2.71666667
Integration Testing	125	120	1.04166667
System Testing	87	120	0.725
Field	11	120	0.09166667

2. Calculate the defect injection rate for every phase

Defects Injection Rate =
(Number of defects originated in current phase/ Total number of KLOC) defects/KLOC

Phase	Defects Originated	Total KLOC	Defects Injection Rate (defects/KLOC)
Requirement	412	120	3.43333333
Analysis	181	120	1.50833333
Design	403	120	3.35833333
Coding	564	120	4.7
Unit Testing	6	120	0.05
Integration Testing	5	120	0.04166667
System Testing	6	120	0.05
Field	4	120	0.03333333

3. Calculate the defect escape rate for every phase

Defects Escape Rate =
(Number of Defects Escaped/ Total number of KLOC) defects/KLOC

Phase	Defects originated	Defects removed	Defects Escaped	Total KLOC	Defects Escape Rate (defects/KLOC)
Requirement	412	120	412-120 = 292	120	2.43333333
Analysis	181	73	412+181-120-73=400	120	3.33333333
Design	403	282	412+181+403-120-73-282=521	120	4.34166667
Coding	564	557	412+181+403+564-120-73-282-557=528	120	4.4
Unit Testing	6	326	412+181+403+564+6-120-73-282-557-326=208	120	1.733333333
Integration Testing	5	125	412+181+403+564+6+5-12-73-282-557-326-125=196	120	1.63333333
System Testing	6	87	412+181+403+564+6+5+6-120-73-282-557-326-125-87=7	120	0.5833333
Field	4	11	412+181+403+564+6+5+6+4-120-73-282-557-326-125-87-11=0	120	0.0000

4. Calculate the overall defect removal effectiveness

Overall Defect Removal Effectiveness
= (Total No. of Defects removed in all the phases except field phase/Total number of defects removed in all the phase) * 100

= (120+73+282+557+326+125+87/1581) *100
= (1570 / 1581) * 100
= 0.99304238 *100
= 99.304 %

5. Which phase is the most effective in removing defects? Explain.

Defect Removal Effectiveness
= ((Defects Removed at this step/ (Defects existing on entry+Defect injected during development of this story)) defects/KLOC

Phase	Defects removed in this phase	Defects existing on entry + Defects Injected during development of this phase	Defects removal effectiveness (%)
Requirement	120	0+412=412	29.126%
Analysis	73	(412-120)+181=473	15.433%
Design	282	(473-73)+403=806	34.98%
Coding	557	(806-282)+564=1088	51.19%
Unit Testing	326	(1088-557)+6=537	60.70%
Integration Testing	125	(537-326)+5=216	57.87%
System Testing	87	(216-125)+6=97	89.69%
Field	11	(97-87)+4=14	78.57%

Most effective phase is removal of defects is the phase that has the maximum defect removal effectiveness rate.
The most effective phase in defect removal with is system testing with defect removal percentage ranging up to **86.69%.**

For testing phases we use the below formula:
We use Dunn's formula to calculate defect removal effectiveness

=(Defects removed at current phase/(Defects removed at current phase + Defects removed at subsequent phases)) defects/KLOC

Phase	Defects removed in this phase	Defects removed in this Phase + subsequent phases	Dunn's Defect removal effectiveness (%)
Unit Testing	326	326+(125+87+11)=549	59.38%
Integration Testing	125	125+(87+11)=223	56.05%
System Testing	87	87+(11)=98	88.75%

From results of Dunn's Formula, most effective phase in Defects removal is System Testing. Defect removal effectiveness of system Testing is **88.75%**

6. Do you think reviews and inspections were effective? Explain.

   Over all defect removal effectiveness is 99.304%
   Overall Inspection Efficiency = (defects removed in inspection / total defects) * 100
   = ((120+73+282+557)/1581)*100
   =65.27%
   Considering all the calculations we can say that reviews and inspection at coding were more effective as a greater number of defects were identified. As overall results matter more than the individual phase results we can state that reviews and inspection were effective in removing defects.
   From the above value, we can also interpret that the defect removal effectiveness is greater than CMM Level 5 which makes its maturity level having an outstanding quality.
   Therefore, the reviews and inspections were effective.

7. If the number of defects originated in design phase increased by 15% and defects detected in design review increased by 60%, would these changes increase or decrease the defects escaped to the coding phase? Explain your answer in detail (present data to support your answer).

Phases	**Requirement**	**Analysis**	**Design**	**Coding**	**Unit Testing**	**Integration Testing**	**System Testing**	**Field**	**Total**
Requirement	120								**120**
Analysis	45	28							**73**
Design	43.2	72	386.4						**501.6**
Coding	97	61	70.15	338					**566.15**
Unit Testing	79	25	81.65	145	6				**336.65**
Integration Testing	21	17	47.15	41		5			**131.15**
System Testing	21	4	20.7	38			6		**89.7**
Field	2	1	2.3	2				4	**11.3**
Total	**428.2**	**208**	**608.35**	**564**	**6**	**5**	**6**	**4**	

Defect escape rate:

Defect escape rate= Defects escaped/product size in KLOC

Product Size: 120 KLOC

Phase	Defects Detected	Defects Injected	Defects escaped	Defect escape rate
Requirement	120	428.2	428.2-120=308.2	2.56 defects/KLOC
Analysis	73	208	428.2+208-120-73=443.2	3.69 defects/KLOC
Design	501.6	608.35	428.2+208+608.35-120-73-501.6=549.95	4.58defects/KLOC
Coding	566.15	564	428.2+208+608.35+564-120-73-501.6-566.15=547.8	4.56 defects/KLOC

- Considering default values, we get the defect escape rate for coding phase is 4.4
- After increasing defects origin at design phase by 15% and defects detected in design review by 60%, we get the defect escape rate as **4.56**
- Hence by considering the following calculations we can consider that there is an **increase** in number of defects escaped to the coding phase