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CS 587 Software Project Management.

Assignment 4:

Given Product Size is 120 KLOC.

Defect Origin										
Where Found		Requirement	Analysis	Design	Coding	Unit Testing	Integration Testing	System Testing	Field	Total
	Requirement	49								49
	Analysis	34	61							95
	Design	67	34	123						224
	Coding	13	23	77	241					354
	Unit Testing	39	21	67	78	13				218
	Integration Testing	23	4	3	98	-	9			137
	System Testing	14	8	5	29	-	-	7		63
	Field	7	5	4	6	-	-	-	8	30
	Total	246	156	279	452	13	9	7	8	**1170**

1. Calculate the defect removal rate for every phase

Formula Used: Defect Removed in a Phase / Product Size (120).

Phase	Defect Removed	Product Size	Defect Removal Rate
Requirement	49	120	**0.40833**
Analysis	95	120	**0.79167**
Design	224	120	**1.86667**
Coding	354	120	**2.95**
Unit Testing	218	120	**1.81667**
Integration Testing	137	120	**1.14167**
System Testing	63	120	**0.525**
Field	30	120	**0.25**

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2. Calculate the defect injection rate for every phase

Formula Used: Defects injected in the phase/Product Size (120).

Phase	Defects Injected	Product Size	Defect Injected Rate
Requirement	246	120	**2.05**
Analysis	156	120	**1.3**
Design	279	120	**2.325**
Coding	452	120	**3.76667**
Unit Testing	13	120	**0.10833**
Integration Testing	9	120	**0.075**
System Testing	7	120	**0.05833**
Field	8	120	**0.06667**

3. Calculate the defect escape rate for every phase

Defects Escaped Rate = Defect Escaped / Product Size (120).

Defects Escaped = Total Defects Injected – Total Defects Removed.

Phase	Defects Injected	Defects Removed	Defects Escaped	Product Size	Defects Escaped Rate
Requirement	246	49	197	120	**1.64167**
Analysis	402	144	258	120	**2.15**
Design	681	368	313	120	**2.60833**
Coding	1133	722	411	120	**3.425**
Unit Testing	1146	940	206	120	**1.71667**
Integration Testing	1155	1077	78	120	**0.65**
System Testing	1162	1140	22	120	**0.18333**
Field	1170	1170	0	120	**0**

4. Calculate the overall defect removal effectiveness

Overall Defects Removal Effectiveness = [1 - (Defects in Field / Total Defects)] * 100
= [1 – (30/1170)] * 100
= 97.44 %

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

Defects Removal Effectiveness for all phases except Testing =
[Defects removed at that step / (Defects existing at that entry + Defects injected during current phase)] * 100

Defects Removal Effectiveness for Testing Phase =
[Defects removed at current phase / (Defects removed at current phase + Defects removed at subsequent phase)] * 100

Phase	Defects Removed	Defects Injected	Defects Escaped	Defects Removal Effectiveness	Total (%)
Requirement	49	246	197	49/246 *100	**19.92%**
Analysis	95	156	258	95/ (197+156) *100	**26.91%**
Design	224	279	313	224/ (258+279) *100	**41.71%**
Coding	354	452	411	354/ (313+452) *100	**46.27%**
Unit Testing	218	13	206	218/ (218+137+63+30) *100	**48.66%**
Integration Testing	137	9	78	137/ (137+63+30) *100	**59.57%**
System Testing	63	7	22	63/ (63+30) *100	**67.74%**

As per as the above calculations and the formulas listed above. The system testing phase is the most effective in the case of defect removals, the defect removal effectiveness for system testing is **67.74% rounding off up to 2 decimals.**

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

Overall Inspection Effectiveness = (Defects removed by inspection/ Total Defects) * 100
= ((49+95+224+354)/ 1170) * 100
= **61.71 %**

Overall Testing Effectiveness = (137+218+63)/ (137+218+63+30) * 100
= **93.30 %**

Overall Defects Removal Effectiveness (Calculated above Q4) = 97.44 %

As we know peer review, inspections and walk-throughs helps removing defects in the stage of development itself. And above calculations clearly say that. 61.71% defects were removed the development phase itself, that's pretty big number if we are looking at Software Development Process. Also, the defective removal is greater than CMM level 5 which according to me will make an awesome product at the end of the cycle.

So, Yes Review and Inspections are always effective.

7. If the number of defects originated in design phase increased by 10% and defects detected in design review increased by 10%, do you think that will have a positive or negative impact on the defect removal effectiveness in

the coding phase? Explain your answer in detail (present data to support your answer).

Design Phase:

Current Defects = 279
Defects Detected = 224

After 10% increase:
Defect Origin, # of defects = (279 + ((279*10)/ 100)) = **306.9**
Defects detected in Review Phase = (224 + ((224*10)/ 100)) = **246.4**

Defects Existing in Review and Analysis (Before Design Phase Kicks in) = (246+156) – (49+95)
= **258**

Defects Removal Effectiveness in Design Phase = (246.4/ (258 + 306.9)) * 100
= **43.65 %**

The Defect Removal rate has increased:
Before: **41.71%**
Now: **43.65 %**
Increase of = 43.65 – 41.71
= 1.94% Increase.

Coding Phase

Current Defects = 452
Defects Detected = 354

Defects Existing in Review, Analysis and Design (Before Coding Phase Kicks in):
(246 + 156 + **306.9**) – (49 + 95 + **246.4**)
318.5

Defects Removal Effectiveness in Coding Phase = 354 / (452 + 318.5) * 100
= **45.94 %**

The Defect Removal Rate Has Decreased:
Before: **46.27%**
Now: **45.94 %**
Decrease of = (46.27 – 45.94)
= **0.33% (Decrease.)**

The above calculation clearly shows that this scenario has a negative effect on Defects Removal Effectiveness in Coding Phase.