Q

Defect removal effectiveness and Defect removal efficiency – a refined approach

Mahesh Kuruba

Japan SEPG 2005

Background

Real life scenario

- Customer complains that

  “Development group has failed to deliver fully operational or acceptable level quality software”

Q

Idea!!!

Caper Jones suggests incorporating
‘Defect removal efficiency’ targets in the contract.

It’s a good idea!!!
How to make it work?
What are the consequences?

Q

Customer : The Defect removal efficiency has to be >=95%
Manager : OK

While signing contract

Manager:
Where is the
Problem?

While product delivery

Customer : The software is not up to the mark. There are critical defects
Manager : But, the Defect removal efficiency is 98%

Q Conventional Defect removal efficiency metric

$$\text{Defect removal efficiency} = \left(\frac{\text{Total defects detected during development}}{\text{Total defects detected}} \right) * 100$$

Using the above defect removal efficiency metric, reviewers/testers might uncover defects during software development that are not critical but still achieve higher defect removal efficiency.

In spite of high defect removal efficiency the customer might be unhappy, due to the presence of critical defects in the software.

Q

An Example

Testing			Production	
Severity of defect	No. of Defects		Severity of defect	No. of Defects
Critical	0		Critical	1
Major	2		Major	2
Minor	6		Minor	2
Total no. of defects	8			5

Defect data of a release by defect severity

Testing			Production	
Defect type	No. of Defects		Defect type	No. of Defects
Performance	2		Functionality	2
Functionality	2		Performance	2
Standards	4		Standards	1
Total no. of defects	8			5

Defect data of a release by defect type

$$\text{Defect removal efficiency} = \left(\frac{\text{Total defects detected during inspection and testing}}{\text{Total defects detected}}\right) * 100$$

Defect removal efficiency = 61.5

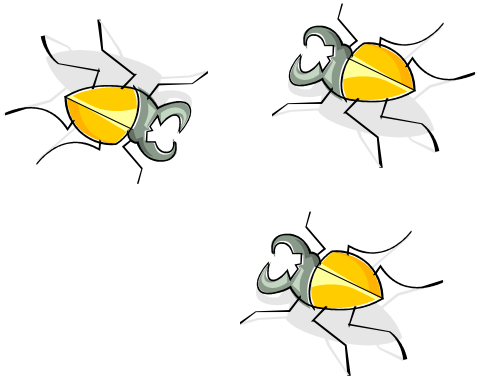
Relatively customer satisfaction is much lower than defect removal efficiency values

Definitions & Terminology in Literature

- Briand et.al, [1] distinguishes the difference between effectiveness and efficiency, by considering cost in the efficiency
- Caper Jones [2] computes defect removal efficiency as the percentage of software defects removed prior to delivery.
- Barnard and Price [3] computes defect removal efficiency as the percentage of coding faults found by code inspections
- Ravichandran and Shareef [4] defines test efficiency as ratio of number of bugs found up to and including system testing to the number of bugs found during and after testing
- Seimens [5] uses test effectiveness metric as number of failures per KDLOC (Kilo Delivered Lines of Code)
- The defect removal effectiveness of inspection process is being termed as inspection effectiveness [4] [6]. However, the test effectiveness is being defined differently in the literature.

Refined Approach

Defect removal techniques



Defects

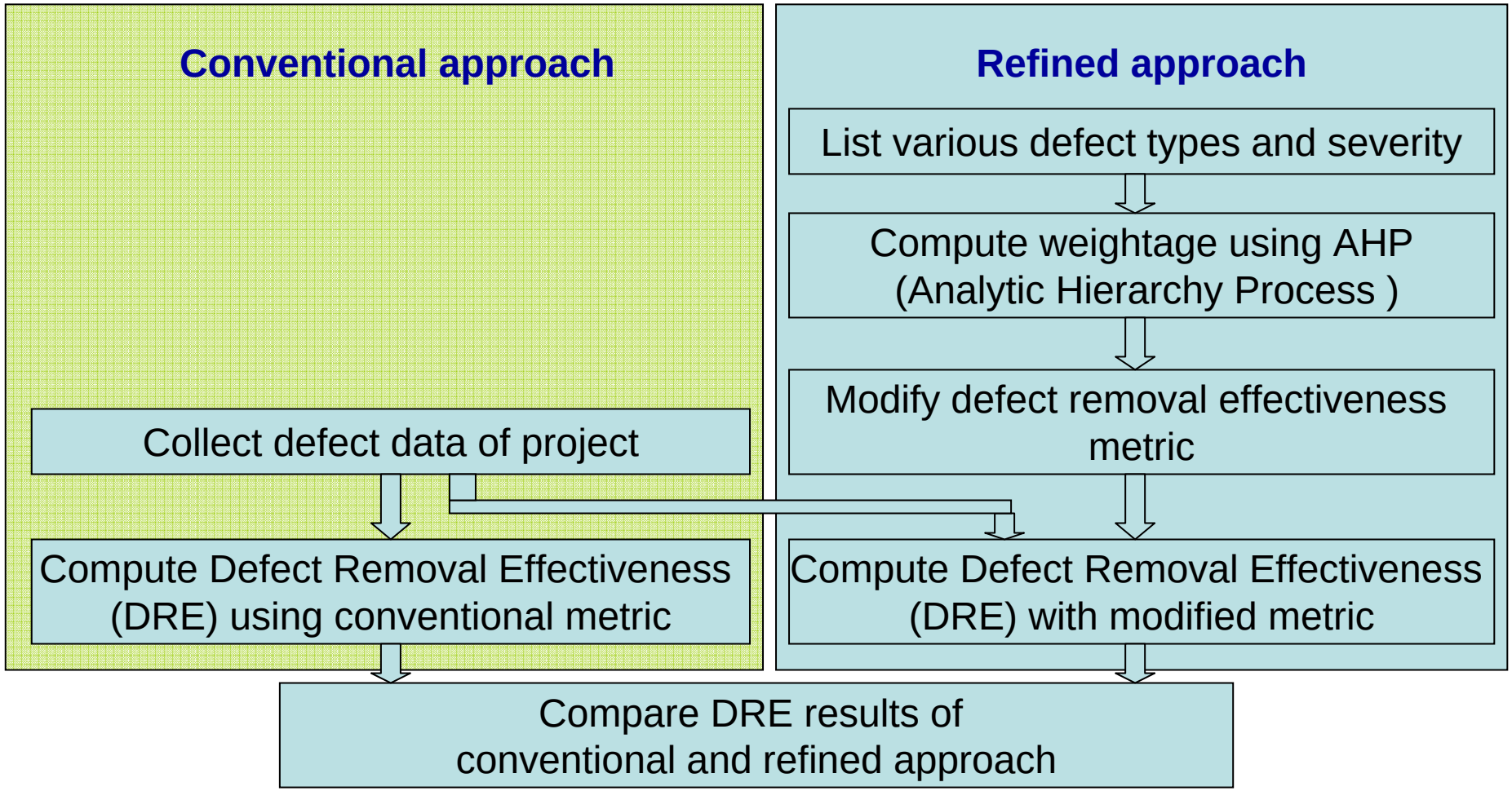
Testing

Review

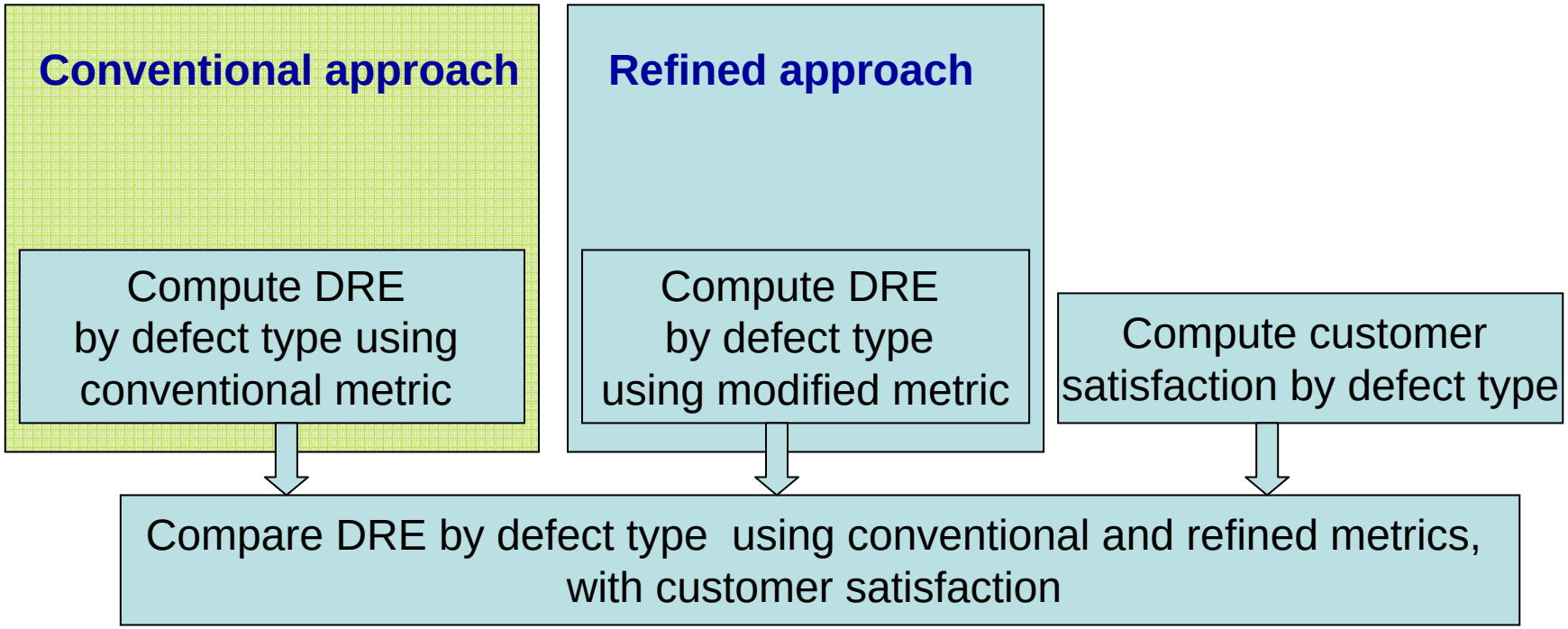
- Manual
- Automated
- Regression
- Performance
- Usability
- Compatibility
- …
- …

- Inspections
- Perspective Based Reading (PBR)
- Peer reviews
- Design reviews
- Desk checking
- Walkthroughs
- …

Refined approach



Analysis approach



Refined Defect removal effectiveness definition and metric

'Defect removal effectiveness' is defined as the percentage of defects uncovered from software by a defect removal technique to the total number of defects uncovered, which are significant to the end users.

Defect Removal Effectiveness (DRE) = $$\frac{\sum_{i=1}^{n_{DTS}} (D_{RT} * W_{DTS})}{\sum_{i=1}^{n_{DTS}} (D_T * W_{DTS})} * 100$$

Where

D_{RT} is the number of defects uncovered by a defect removal technique

D_T is the total number of defects uncovered, during and after using the defect removal technique

W_{DTS} is the weightage of defect type and severity, which is computed using AHP

n_{DTS} is the number of various combinations defect types and severities

Refined Defect removal efficiency definition and metric

'Defect removal efficiency' is defined as uncovering of defects effectively by defect removal techniques from the software product with the available resources.

Defect removal efficiency $(\eta_D) = (DRE * P)$

where DRE is the defect removal effectiveness

P is the normalized productivity of the defect removal team

Attributes	Notation	Release I	Release II
Size (in FP)	S	10	10
Effort in person-months	E	2	2
Defect removal effectiveness	DRE	90	80
Production rate (FP/pm) = (S/E)	p_i	5	5
Max. production rate (FP/pm)	p_{Max}	6	5
Normalised productivity = (p_i/p_{Max})	P	0.83	1
Defect removal efficiency	η_D	74.7	80

Defect removal efficiency value varies between 0 and 100.
Defect removal efficiency value of '0' represents inefficient defect removal technique and '100' represents the efficient defect removal technique .

Case study

- Product development team
  - Size of 60 people
  - Defect logging
  - Dedicated test team
  - Periodic Customer satisfaction index
- Study based on a release

Determining weightage of defects using AHP Step1

	AHP																						
	Functional - Fatal abort	Functional - Fatal erroneous	Functional - Nonfatal	Functional - suggestions	Requirements - Fatal abort	Requirements - Fatal erroneous	Requirements - Nonfatal	Requirements - suggestions	Usability - Fatal erroneous	Usability - Nonfatal	Usability - suggestions	Maintenanbility - Fatal abort	Maintenanbility- Fatal erroneous	Maintenanbility - Nonfatal	Maintenanbility - suggestions	Standards - Fatal abort	Standards - Fatal erroneous	Standards - Nonfatal	Standards - suggestions	Installability - Fatal abort	Installability- Fatal erroneous	Installability - Nonfatal	Installability - suggestions
Functional - Fatal abort	1.000	3.000	5.000	8.000	3.000	5.000	6.000	8.000	5.000	7.000	8.000	4.000	5.000	7.000	8.000	6.000	7.000	8.000	9.000	5.000	6.000	7.000	8.000
Functional - Fatal erroneous	0.333	1.000	3.000	5.000	0.167	4.000	5.000	7.000	3.000	5.000	5.000	0.167	4.000	5.000	6.000	0.200	5.000	6.000	7.000	0.250	5.000	6.000	7.000
Functional - Nonfatal	0.200	0.333	1.000	3.000	0.143	3.000	4.000	5.000	2.000	3.000	4.000	0.143	3.000	4.000	5.000	0.167	4.000	5.000	6.000	0.333	4.000	5.000	6.000
Functional - suggestions	0.125	0.200	0.333	1.000	0.125	2.000	3.000	2.000	0.333	2.000	3.000	0.125	2.000	3.000	4.000	0.143	3.000	4.000	6.000	0.500	3.000	4.000	5.000
Requirements - Fatal abort	0.333	6.000	7.000	8.000	1.000	3.000	5.000	7.000	4.000	7.000	8.000	3.000	4.000	6.000	7.000	5.000	6.000	7.000	8.000	4.000	6.000	7.000	7.000
Requirements - Fatal erroneous	0.200	0.250	0.333	0.500	0.333	1.000	3.000	5.000	3.000	5.000	5.000	0.167	3.000	4.000	5.000	0.200	4.000	5.000	6.000	0.200	5.000	6.000	6.000
Requirements - Nonfatal	0.167	0.200	0.250	0.333	0.200	0.333	1.000	3.000	0.333	3.000	4.000	0.143	0.333	3.000	4.000	0.167	3.000	4.000	5.000	0.167	4.000	5.000	5.000
Requirements - suggestions	0.125	0.143	0.200	0.500	0.143	0.200	0.333	1.000	0.333	0.083	3.000	0.125	0.500	2.000	3.000	0.143	2.000	3.000	4.000	0.143	3.000	4.000	4.000
Usability - Fatal erroneous	0.200	0.333	0.500	3.000	0.250	0.333	3.000	3.000	1.000	3.000	5.000	0.167	4.000	5.000	6.000	0.250	3.000	4.000	5.000	0.250	4.000	5.000	5.000
Usability - Nonfatal	0.143	0.200	0.333	0.500	0.143	0.200	0.333	2.000	0.333	1.000	3.000	0.143	3.000	4.000	5.000	0.200	2.000	3.000	4.000	0.200	3.000	4.000	4.000
Usability - suggestions	0.125	0.200	0.250	0.333	0.125	0.200	0.250	0.333	0.200	0.333	1.000	0.125	2.000	3.000	4.000	0.167	0.250	2.000	4.000	0.167	2.000	3.000	3.000
Maintenanbility - Fatal abort	0.250	6.000	7.000	8.000	0.333	6.000	7.000	8.000	6.000	7.000	8.000	1.000	3.000	4.000	5.000	4.000	5.000	6.000	7.000	3.000	5.000	6.000	5.000
Maintenanbility- Fatal erroneous	0.200	0.250	0.333	0.500	0.250	0.333	3.000	2.000	0.250	0.333	0.500	0.333	1.000	3.000	4.000	0.250	4.000	5.000	6.000	0.333	4.000	5.000	4.000
Maintenanbility - Nonfatal	0.143	0.200	0.250	0.333	0.167	0.250	0.333	0.500	0.200	0.250	0.333	0.250	0.333	1.000	3.000	0.200	3.000	4.000	5.000	0.250	3.000	4.000	3.000
Maintenanbility - suggestions	0.125	0.167	0.200	0.250	0.143	0.200	0.250	0.333	0.167	0.200	0.250	0.200	0.250	0.333	1.000	0.167	0.500	3.000	4.000	0.200	2.000	3.000	2.000
Standards - Fatal abort	0.167	5.000	6.000	7.000	0.200	5.000	6.000	7.000	4.000	5.000	6.000	0.250	4.000	5.000	6.000	1.000	3.000	4.000	5.000	2.000	4.000	5.000	4.000
Standards - Fatal erroneous	0.143	0.200	0.250	0.333	0.167	0.250	0.333	0.500	0.333	0.500	4.000	0.200	0.250	0.333	2.000	0.333	1.000	3.000	4.000	0.500	3.000	4.000	3.000
Standards - Nonfatal	0.125	0.167	0.200	0.250	0.143	0.200	0.250	0.333	0.250	0.333	0.500	0.167	0.200	0.250	0.333	0.250	0.333	1.000	3.000	0.333	2.000	3.000	2.000
Standards - suggestions	0.111	0.143	0.167	0.167	0.125	0.167	0.200	0.250	0.200	0.250	0.250	0.143	0.167	0.200	0.250	0.056	0.250	0.333	1.000	0.250	2.000	2.000	2.000
Installability - Fatal abort	0.200	4.000	3.000	2.000	0.250	5.000	6.000	7.000	4.000	5.000	6.000	0.333	3.000	4.000	5.000	0.500	2.000	3.0[illegible]	4.000	1.000	3.000	4.000	5.000
Installability- Fatal erroneous	0.167	0.200	0.250	0.333	0.167	0.200	0.250	0.333	0.250	0.333	0.500	0.200	0.250	0.333	0.500	0.250	0.[illegible]	[illegible]500	0.500	0.333	1.000	3.000	4.000
Installability - Nonfatal	0.143	0.167	0.200	0.250	0.143	0.167	0.200	0.250	0.200	0.250	0.333	0.167	0.200	0.250	0.333	0.[illegible]	[illegible]50	0.333	0.500	0.250	0.333	1.000	3.000
Installability - suggestions	0.125	0.143	0.167	0.200	0.143	0.167	0.200	0.250	0.200	0.250	0.333	0.200	0.250	0.333	0.5[illegible]	[illegible]333	0.333	0.500	0.500	0.200	0.250	0.333	1.000
SUM	**4.849**	**28.495**	**36.217**	**49.783**	**7.858**	**37.200**	**54.933**	**70.083**	**35.583**	**56.117**	**76.000**	**11.746**	**43.733**	**65.03[illegible]**		**[illegible]091**	**59.250**	**81.667**	**104.500**	**19.860**	**74.583**	**96.333**	**98.000**

Add the values in each column

End user provides inputs to determine weightage of defect based on its type and severity

Verbal Judgment of Preference	Numerical Rating
Extremely Preferred	9
Very strong to extremely	8
Very strongly preferred	7
Strongly to very strongly	6
Strongly preferred	5
Moderately to strongly	4
Moderately preferred	3
Equally to moderately	2
Equally preferred	1

Determining weightage of defects using AHP Step2

weightage is computed as mean value after normalization

	AHP																							
	Functional - Fatal abort	Functional - Fatal erroneous	Functional - Nonfatal	Functional - suggestions	Requirements - Fatal abort	Requirements - Fatal erroneous	Requirements - Nonfatal	Requirements - suggestions	Usability - Fatal erroneous	Usability - Nonfatal	Usability - suggestions	Maintenanbility - Fatal abort	Maintenanbility- Fatal erroneous	Maintenanbility - Nonfatal	Maintenanbility - suggestions	Standards - Fatal abort	Standards - Fatal erroneous	Standards - Nonfatal	Standards - suggestions	Installability - Fatal abort	Installability- Fatal erroneous	Installability - Nonfatal	Installability - suggestions	Weighatges
Functional - Fatal abort	0.206	0.105	0.138	0.161	0.382	0.134	0.109	0.114	0.141	0.125	0.105	0.341	0.114	0.108	0.094	0.299	0.118	0.098	0.086	0.252	0.080	0.073	0.082	0.151
Functional - Fatal erroneous	0.069	0.035	0.083	0.100	0.021	0.108	0.091	0.100	0.084	0.089	0.066	0.014	0.091	0.077	0.071	0.010	0.084	0.073	0.067	0.013	0.067	0.062	0.071	0.067
Functional - Nonfatal	0.041	0.012	0.028	0.060	0.018	0.081	0.073	0.071	0.056	0.053	0.053	0.012	0.069	0.062	0.059	0.008	0.068	0.061	0.057	0.017	0.054	0.052	0.061	0.049
Functional - suggestions	0.026	0.007	0.009	0.020	0.016	0.054	0.055	0.029	0.009	0.036	0.039	0.011	0.046	0.046	0.047	0.007	0.051	0.049	0.057	0.025	0.040	0.042	0.051	0.034
Requirements - Fatal abort	0.069	0.211	0.193	0.161	0.127	0.081	0.091	0.100	0.112	0.125	0.105	0.255	0.091	0.092	0.082	0.249	0.101	0.086	0.077	0.201	0.080	0.073	0.071	0.123
Requirements - Fatal erroneous	0.041	0.009	0.009	0.010	0.042	0.027	0.055	0.071	0.084	0.089	0.066	0.014	0.069	0.062	0.059	0.010	0.068	0.061	0.057	0.010	0.067	0.062	0.061	0.048
Requirements - Nonfatal	0.034	0.007	0.007	0.007	0.025	0.009	0.018	0.043	0.009	0.053	0.053	0.012	0.008	0.046	0.047	0.008	0.051	0.049	0.048	0.008	0.054	0.052	0.051	0.030
Requirements - suggestions	0.026	0.005	0.006	0.010	0.018	0.005	0.006	0.014	0.009	0.001	0.039	0.011	0.011	0.031	0.035	0.007	0.034	0.037	0.038	0.007	0.040	0.042	0.041	0.021
Usability - Fatal erroneous	0.041	0.012	0.014	0.060	0.032	0.009	0.055	0.043	0.028	0.053	0.066	0.014	0.091	0.077	0.071	0.012	0.051	0.049	0.048	0.013	0.054	0.052	0.051	0.043
Usability - Nonfatal	0.029	0.007	0.009	0.010	0.018	0.005	0.006	0.029	0.009	0.018	0.039	0.012	0.069	0.062	0.059	0.010	0.034	0.037	0.038	0.010	0.040	0.042	0.041	0.028
Usability - suggestions	0.026	0.007	0.007	0.007	0.016	0.005	0.005	0.005	0.006	0.006	0.013	0.011	0.046	0.046	0.047	0.008	0.004	0.024	0.038	0.008	0.027	0.031	0.031	0.018
Maintenanbility - Fatal abort	0.052	0.211	0.193	0.161	0.042	0.161	0.127	0.114	0.169	0.125	0.105	0.085	0.069	0.062	0.059	0.199	0.084	0.073	0.067	0.151	0.067	0.062	0.051	0.108
Maintenanbility- Fatal erroneous	0.041	0.009	0.009	0.010	0.032	0.009	0.055	0.029	0.007	0.006	0.007	0.028	0.023	0.046	0.047	0.012	0.068	0.061	0.057	0.017	0.054	0.052	0.041	0.031
Maintenanbility - Nonfatal	0.029	0.007	0.007	0.007	0.021	0.007	0.006	0.007	0.006	0.004	0.004	0.021	0.008	0.015	0.035	0.010	0.051	0.049	0.048	0.013	0.040	0.042	0.031	0.020
Maintenanbility - suggestions	0.026	0.006	0.006	0.005	0.018	0.005	0.005	0.005	0.005	0.004	0.003	0.017	0.006	0.005	0.012	0.008	0.008	0.037	0.038	0.010	0.027	0.031	0.020	0.013
Standards - Fatal abort	0.034	0.175	0.166	0.141	0.025	0.134	0.109	0.100	0.112	0.089	0.079	0.021	0.091	0.077	0.071	0.050	0.051	0.049	0.048	0.101	0.054	0.052	0.041	0.081
Standards - Fatal erroneous	0.029	0.007	0.007	0.007	0.021	0.007	0.006	0.007	0.009	0.009	0.053	0.017	0.006	0.005	0.024	0.017	0.017	0.037	0.038	0.025	0.040	0.042	0.031	0.020
Standards - Nonfatal	0.026	0.006	0.006	0.005	0.018	0.005	0.005	0.005	0.007	0.006	0.007	0.014	0.005	0.004	0.004	0.012	0.006	0.012	0.029	0.017	0.027	0.031	0.020	0.012
Standards - suggestions	0.023	0.005	0.005	0.003	0.016	0.004	0.004	0.004	0.006	0.004	0.003	0.012	0.004	0.003	0.003	0.003	0.004	0.004	0.010	0.013	0.027	0.021	0.020	0.009
Installability - Fatal abort	0.041	0.140	0.083	0.040	0.032	0.134	0.109	0.100	0.112	0.089	0.079	0.028	0.069	0.062	0.059	0.025	0.034	0.037	0.038	0.050	0.040	0.042	0.051	0.065
Installability- Fatal erroneous	0.034	0.007	0.007	0.007	0.021	0.005	0.005	0.005	0.007	0.006	0.007	0.017	0.006	0.005	0.006	0.012	0.006	0.006	0.005	0.017	0.013	0.031	0.041	0.012
Installability - Nonfatal	0.029	0.006	0.006	0.005	0.018	0.004	0.004	0.004	0.006	0.004	0.004	0.014	0.005	0.004	0.004	0.010	0.004	0.004	0.005	0.013	0.004	0.010	0.031	0.009
Installability - suggestions	0.026	0.005	0.005	0.004	0.018	0.004	0.004	0.004	0.006	0.004	0.004	0.017	0.006	0.005	0.006	0.012	0.006	0.006	0.005	0.010	0.003	0.003	0.010	0.008

Q Defect removal effectiveness of Review

Review Effectiveness Metric								
			With Review				Without Review	
			Review		Testing and Production		Production	
Defect Type	Defect Severity	Weightage	No. of Defects	Defect Value D	No. of Defects	Defect Value O	No. of Defects	Defect Value O
Functional	Fatal abort	0.151		0	36	5.436	36	5.436
	Fatal erroneous	0.067	20	1.34	120	8.04	140	9.38
	Nonfatal	0.049	22	1.078	93	4.557	115	5.635
	suggestions	0.034	1	0.034	27	0.918	28	0.952
Requirements	Fatal abort	0.123		0	6	0.738	6	0.738
	Fatal erroneous	0.048	2	0.096	8	0.384	10	0.48
	Nonfatal	0.03	14	0.42	7	0.21	21	0.63
	suggestions	0.021	3	0.063	1	0.021	4	0.084
Usability	Fatal erroneous	0.043		0		0	0	0
	Nonfatal	0.028	2	0.056	40	1.12	42	1.176
	suggestions	0.018		0	35	0.63	35	0.63
Maintainability	Fatal abort	0.108		0		0	0	0
	Fatal erroneous	0.031	1	0.031		0	1	0.031
	Nonfatal	0.02		0		0	0	0
	suggestions	0.013	1	0.013	3	0.039	4	0.052
Standards	Fatal abort	0.081		0		0	0	0
	Fatal erroneous	0.02	4	0.08		0	4	0.08
	Nonfatal	0.012	24	0.288	17	0.204	41	0.492
	suggestions	0.009	2	0.018	7	0.063	9	0.081
Installability	Fatal abort	0.065		0	8	0.52	8	0.52
	Fatal erroneous	0.012		0	6	0.072	6	0.072
	Nonfatal	0.009	1	0.009	9	0.081	10	0.09
	suggestions	0.008		0	1	0.008	1	0.008
						Review Effectiveness		13.27210449

	Conventional	Using AHP
Review effectiveness	18.61804223	13.27210449

Comparison of Review effectiveness

Q Defect removal effectiveness of Testing

Test Effectiveness Metric								
			With Testing				Without Testing	
			Testing		Production		Production	
Defect Type	Defect Severity	Weightage	No. of Defects	Defect Value D	No. of Defects	Defect Value O	No. of Defects	Defect Value O
Functional	Fatal abort	0.151	24	3.624	12	1.812	36	5.436
	Fatal erroneous	0.067	105	7.035	15	1.005	120	8.04
	Nonfatal	0.049	73	3.577	20	0.98	93	4.557
	suggestions	0.034	4	0.136	24	0.816	28	0.952
Requirements	Fatal abort	0.123		0	6	0.738	6	0.738
	Fatal erroneous	0.048		0	8	0.384	8	0.384
	Nonfatal	0.03	4	0.12	3	0.09	7	0.21
	suggestions	0.021	1	0.021		0	1	0.021
Usability	Fatal erroneous	0.043		0		0	0	0
	Nonfatal	0.028	39	1.092	1	0.028	40	1.12
	suggestions	0.018	35	0.63		0	35	0.63
Maintainability	Fatal abort	0.108	0	0		0	0	0
	Fatal erroneous	0.031	0	0		0	0	0
	Nonfatal	0.02	0	0		0	0	0
	suggestions	0.013	1	0.013	2	0.026	3	0.039
Standards	Fatal abort	0.081		0		0	0	0
	Fatal erroneous	0.02		0		0	0	0
	Nonfatal	0.012	17	0.204		0	17	0.204
	suggestions	0.009	7	0.063		0	7	0.063
Installability	Fatal abort	0.065	8	0.52		0	8	0.52
	Fatal erroneous	0.012	4	0.048	2	0.024	6	0.072
	Nonfatal	0.009	9	0.081		0	9	0.081
	suggestions	0.008	1	0.008		0	1	0.008
						Test Effectiveness		74.41820152

	Conventional	Using AHP
Test effectiveness	78.11764706	74.41820152

Comparison of Test effectiveness

Q Defect removal effectiveness of the Release

Defect removal effectiveness Metric								
			With Review and Testing				Without Review and Testing	
			Review and Testing		Production		Production	
Defect Type	Defect Severity	Weightage	No. of Defects	Defect Value D	No. of Defe	Defect Va	No. of Defects	Defect Value O
Functional	Fatal abort	0.151	24	3.624	12	1.812	36	5.436
	Fatal erroneous	0.067	125	8.375	15	1.005	140	9.38
	Nonfatal	0.049	95	4.655	20	0.98	115	5.635
	suggestions	0.034	5	0.17	24	0.816	29	0.986
Requirements	Fatal abort	0.123		0	6	0.738	6	0.738
	Fatal erroneous	0.048	2	0.096	8	0.384	10	0.48
	Nonfatal	0.03	18	0.54	3	0.09	21	0.63
	suggestions	0.021	4	0.084		0	4	0.084
Usability	Fatal erroneous	0.043		0		0	0	0
	Nonfatal	0.028	41	1.148	1	0.028	42	1.176
	suggestions	0.018	35	0.63		0	35	0.63
Maintainability	Fatal abort	0.108	0	0		0	0	0
	Fatal erroneous	0.031	1	0.031		0	1	0.031
	Nonfatal	0.02	0	0		0	0	0
	suggestions	0.013	1	0.013	2	0.026	3	0.039
Standards	Fatal abort	0.081		0		0	0	0
	Fatal erroneous	0.02	4	0.08		0	4	0.08
	Nonfatal	0.012	41	0.492		0	41	0.492
	suggestions	0.009	9	0.081		0	9	0.081
Installability	Fatal abort	0.065	8	0.52		0	8	0.52
	Fatal erroneous	0.012	4	0.048	2	0.024	6	0.072
	Nonfatal	0.009	10	0.09		0	10	0.09
	suggestions	0.008	1	0.008		0	1	0.008
							Defect removal effectiveness	77.79825485

	Conventional	Using AHP
Defect removal effectiveness	82.14971209	77.7982549

Comparison of Defect removal effectiveness

Defect removal effectiveness and Customer satisfaction

	Defect removal effectiveness		Customer satisfaction (1-5)
Defect type	Conventional	AHP approach	
Functional	77.81	78.48	3.83
Requirements	58.54	37.27	3.16
Usability	98.7	98.45	3.35
Maintainability	50	62.86	3.42
Installability	92	96.52	3.23

'Requirements' defect type has the lowest customer satisfaction.

DRE of AHP approach is relatively lower than conventional approach.

DRE using AHP approach provides better insight about the defect removal process

Q

Defect removal efficiency

Attributes	Notation	Release
Size (in RP)	S	250
Effort in person-months	E	10
Defect removal effectiveness	DRE	77.8
Production rate (RP/pm) = (S/E)	p_i	25
Max. production rate (RP/pm)	p_{Max}	25
Productivity = (p_i/p_{Max})	P	1
Defect removal efficiency	η_D	77.8

Refined approach

Advantages

- Teams can focus on the defects significant to the customer
- Improved insight in to the review or testing process
- Helps in choosing alternative review or testing techniques

Disadvantages

- Difficulty in providing inputs to compute weightages
- Categorizing defects affects inspection/test effectiveness and inspection/test efficiency values

References

1. Lionel Briand, Khaled El Emam, Oliver Laitenberger, “Using simulation to build inspection efficiency benchmarks for development projects”, Proceedings of the 20th International Conference on Software engineering, Apr 1998, pp: 340-349.
2. Caper Jones, “Software defect-removal efficiency”, Computer , Vol 29, No 4, Apr 1996, pp:94 – 95
3. Jack Barnard, Art Price, “Managing code inspection information“, IEEE Software, Vol 11, No 2, Mar 1994, pp:59-69
4. Ravichandran, S, Shareef. P. M., “Software Process Assessment through Metrics Models”, Proc. of the ESCOM 2001, Apr 2001, London, pp: 367-376.
5. Seimens automation metrics, http://www.hi.is/pub/cs/2001-02ms/gsh/siemens2.doc
6. Claes Wohlin, Aybuke Aurum, Haken Peterson, Forrest Shull, Markus Ciolkowski, “Software inspection benchmarking- A Qualitative and Quantitative Comparative opportunity”, Proceedings of 8th IEEE Symposium on Software Metrics, Jun 2002, pp:118-127.

Q

Questions

Q

Thank you

Mahesh Kuruba

mahesh_kuruba@ieee.org