Activity-Based Software Estimation using Work Break down Structure

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ABSTRACT

Software Cost estimation at activity level is very much accurate than macro estimation with respect to phases of software development life cycle, but the same is very difficult to achieve[1]. Activity based estimation focus on key activities should not be left out and if any effort variance occurs it will be possible to track at particular activity level rather than affecting the entire activities[1]. Activity-based Software estimation based on work break down structure has been explained by collecting and analyzing the data for 12 Enhancements from Application service Maintenance project which were already delivered. This paper explains how to arrive accurate estimation at different micro level activities of Software Development Life Cycle(SDLC).

1. Introduction

Work break down structure(WBS) results in breaking of major component or activity into sub-components or smaller activities. This breaking down process will continue until it is not possible to breakdown each lower lever of sub-components either logically or physically. Each sub-component or smallest activity need to be analyzed and mapped to set of Requirements. WBS suits for most of the Application service maintenance projects since they involve in executing small Enhancements, where we cannot apply the full pledged Estimation Methodology either Function Point Analysis or lines of code(LOC). In this case, most of the company's goes for Activity based software estimation using Work Break down Structure(WBS).

2. Work Break Down Structure

WBS focuses on breaking down project into different activities and assigns efforts to each sub activity. Breaking up of activities into to different activities is not uniform across all the applications or different projects and also varies from one organization to another organization depending on their process defined. There is a need to predict various potential parameters to make WBS more accurate, by analyzing the estimated efforts data of similar projects executed at micro level Activities of SDLC.

3. Work Done

We have taken 12 Enhancements data for simulation which, were delivered for analysis purpose as shown in Fig1. Here Author is not explicitly mentioning the Enhancement names and application names in view of maintaining the company/client confidentiality.

Data collected contains Initial Estimation, Revised Estimation, Approved efforts and Effort variance details.

Effort Variance Details->Six months data							
Sr. No	Enancement (Enh) Name	Initial Estimation	Revised Estimation	Approved efforts	Approved Vs Initial Estimated - Variance in %	Actual Efforts spent	Actual Vs Initial Estimated - Variance in %
1	Enh1	440	N/A	500	13.64	607	37.95
2	Enh2	160	N/A	300	87.50	276.5	72.81
3	Enh3	168	N/A	211	25.60	119.3	-33.15
4	Enh4	194	N/A	194	0.00	153.6	-14.64
5	Enh5	317	N/A	456	43.85	426.8	31.86
6	Enh6	130	N/A	180	38.46	221.7	16.69
7	Enh7	120	N/A	180	50.00	151.7	68.92
8	Enh8	200	N/A	310	55.00	319.7	59.85
9	Enh9	166	N/A	172	3.61	163.4	5.36
10	Enh10	172	N/A	180	27.91	206.8	15.29
11	Enh11	130	N/A	145	11.54	162.3	24.85
12	Enh12	198	N/A	250	26.26	224.9	19.39

Fig 1. Effort variance details

Again data has been collected for estimated efforts and actual efforts at different micro level Activities of SDLC for each Enhancement as listed in below tables

Enhancements-Activities Wise Efforts Details

Enhancement(Enh)1

Activities	Estimated Efforts	Actual Efforts	Estimated Efforts In %	Actual Efforts in %
Analysis & Query Resolution	90	101	18.00	16.64
Design	90	97	18.00	15.98
Coding	200	207	40.00	34.10
Testing	40	39.8	8.00	6.56
PM	5	0	1.00	0.00
Quality Assurance(QA)	15	0	3.00	0.00
Reviews	30	82.2	6.00	13.54
UAT(User Acceptance Testing)	15	28	3.00	4.61
Documentation	1	0	0.20	0.00
Config Management	2	0	0.40	0.00
Onsite Coordination	7	13.5	1.40	2.22
Test Case Preparation	5	5	1.00	0.82
Defect Fixing	0	2	0.00	0.33
Environment setup	0	7	0.00	1.15
Implementation/build	0	11	0.00	1.81
Release	0	11	0.00	1.81
Status Meetings	0	1.5	0.00	0.25
Knowledge Transfer	0	1	0.00	0.16
	500	607		

Enhancement 2

Activities	Estimated Efforts	Actual Efforts	Estimated Efforts in %	Actual Efforts in %
Analysis & Query Resolution	90	90	30.00	32.55
Design	35	30	11.67	10.85
Coding	125	124	41.67	44.85
Testing	20	7	6.67	2.53
PM	4	0	1.33	0.00
QA	4	0	1.33	0.00
Reviews	12	9.5	4.00	3.44
UAT	10	0	3.33	0.00
Onsite Coordination	0	6	0.00	2.17
Estimate and Statement of Work(SOW)	0	10	0.00	3.62
	300	276.5		

Enhancement 3

Activities	Estimated Efforts	Actual Efforts	Estimated Efforts in %	Actual Efforts in %
Analysis & Query Resolution	42	54	19.91	45.26
Design	24	16	11.37	13.41
Coding	50	8	23.70	6.71
Testing	24	16	11.37	13.41
PM	4	0	1.90	0.00
QA	9	0	4.27	0.00
Reviews	16	11.3	7.58	9.47
Documentation	22	5	10.43	4.19
Onsite Coordination	8	2	3.79	1.68
Test Case Preparation	12	5	5.69	4.19
Implementation/build	0	2	0.00	1.68
	211	119.3		

Enhancement 4

Activities	Estimated Efforts	Actual Efforts	Estimated Efforts in %	Actual Efforts in %
Analysis & Query Resolution	64	22	32.99	14.32
Design	32	52.3	16.49	34.05
Coding	48	38	24.74	24.74
Testing	24	14	12.37	9.11
PM	8	0	4.12	0.00
QA	8	0	4.12	0.00
Reviews	10	9.8	5.15	6.38
UAT	0	0.5	0.00	0.33
Documentation	0	5	0.00	3.26
Onsite Coordination	0	2	0.00	1.30
Defect Fixing	0	32	0.00	20.83
	194	153.6		