Software Estimation

Each team member individually placed the complexity estimates for each external input, external output, external query, internal file and external interface our top priority use case requires. The top priority use case according to Kano prioritization was “Plan a Family Activity”. These estimates were then repeated for each alternative scenario and exception scenario. After individual team members noted their own expert judgement for these function points, we derived consolidated function point estimates for each scenario. The team consensus for best-case, average-case and worst-case function point estimates for each scenario were based off of an average of all the team member estimates. Our final best-case, most-likely-case and worst-case estimates for code sizes were then determined by multiplying each average function point estimate by its respective complexity multiplier on the ‘References’ sheet and the Javascript programming language multiplier.

Aggregate Size Estimates

First, using the pessimistic Program Evaluation and Review Technique (PERT) equation, we came up with an expected-case code size of each scenario as displayed in the following table. Note that the equation used was:

$$Expected\ Case\ = [Best\ Case\ +\ (3\ *\ Likely\ Case)\ +\ (2\ *\ Worst\ Case)]\ /\ 6$$

The final result is rounded to the closest whole number for consistency.

Scenario	**Expected-Case Code Size (LOC)**
Happy Path	[3434.8 + (3 * 6540.2) + (2 * 9198)] / 6 = 6908.57 ***≈ 6909***

Alternative 1	[403 + (3 * 826.8) + (2 * 1171.8)] / 6 = 871.17 ***≈ 871***
Alternative 2	[403 + (3 * 773.8) +(2 * 1108.8)] / 6 = 823.67 ***≈ 824***
Alternative 3	[403 + (3 * 848) + (2 * 1323)] / 6 = 932.17 ***≈ 932***
Alternative 4	[551.8+ (3 * 1166) + (2 * 1890)] / 6 = 1304.97 ***≈ 1305***
Exception 1	[310 + (3 * 657.2) + (2 * 995.4)] / 6 = 712.07 ***≈ 712***
Exception 2	[589 + (3 * 1208.4) +(2 * 1751.4)] / 6 = 1286.17 ***≈ 1286***

We then deduced an aggregate expected-case code size for the use case using our worst-case, expected-case (PERT) and best-case estimations for the seven scenarios.

$$Aggregate\ Expected\ Case\ =\ Sum\ of\ all\ Expected\ Cases\ =\ 12838.79\ LOC \approx 12839\ LOC$$

We also computed the aggregate standard deviation. The computation of the aggregate expected-case code size and aggregate standard deviation is as follows:

Scenario	**Standard Deviation (LOC)**	**Variance (LOC)**
Happy Path	(9198 - 3434.8) / 2 = 2881.6	(2881.6)^2
Alternative 1	(1171.8 - 403) / 2 = 384.4	(384.4)^2
Alternative 2	(1108.8 - 403) / 2 = 352.9	(352.9)^2
Alternative 3	(1323 - 403) / 2 = 460	(460)^2
Alternative 4	(1890 - 551.8) / 2 = 669.1	(669.1)^2
Exception 1	(995.4 - 310) / 2 = 342.7	(342.7)^2
Exception 2	(1751.4 - 589) / 2 = 581.2	(581.2)^2

$$Aggregate\ Standard\ Deviation\ =\ \sqrt{Sum\ of\ all\ Variances}\ =\ \sqrt{9695117.47}\ =\ 3113.7\ LOC$$

Using the aggregate standard deviation, we determined an aggregate best-case, worst-case and likely-case from the seven scenarios as follows:

$$Aggregate\ Best\ Case\ =\ Sum\ of\ all\ \ LCs - 3SD = 12{,}839 - 9341.1\ LOC = 3{,}498.9\ LOC$$

$$Aggregate\ Worst\ Case\ =\ Sum\ of\ all\ \ LCs + 3SD = 12{,}839 + 9341.1\ LOC = 22{,}180.1\ LOC$$

$$Aggregate\ Likely\ Case\ =\ Sum\ of\ all\ LCs\ \ = 12{,}839\ LOC$$

Finally, we deduced use case size estimates with 25%, 50%, 75% and 100% confidence. The computations are as follows:

Confidence (%)	Size Estimate Calculation (LOC)
25	Expected Case - (0.67 * SD) = 12838.79 - (0.67 * 3113.7) = 10752.61 ***≈ 10753***
50	Expected Case = 12838.79 ***≈ 12839***
75	Expected Case + (0.67 * SD) = 12838.79 + (0.67 * 3113.7) = 14924.97 ***≈ 14925***
100	Expected Case + (3 * SD) = 12838.79 + (3 * 3113.7) = 22179.89 ***≈ 22180***

Effort Estimates

Since our project is a standard mobile application, we used industry average data in 2006 in slide 4 of lecture 11c to determine best, worst and expected case effort estimates. The equation we use to convert LOC to estimated effort is:

$$Effort = Past\ Effort * (Size / Past\ Size)$$

The estimated size and effort are rounded to the closest whole number for consistency.

Use Case: Plan a Family Activity	Estimated Size (LOC)	Effort (staff months)
Best Estimate	6094	85 * (6094/ 65,000) = 7.97 ***≈ 8***
Expected Estimate	12839	120 * (12839 / 80,000) = 19.26 ***≈ 19***
Worst Estimate	17438	170 * (17438 / 100,000) = 29.64 ***≈ 30***

$$Standard\ Deviation = (Worst\ Estimate - Best\ Estimate) / 2 = (30 - 8) / 2 = 11\ staff\ months$$

We deduced use case effort estimates with 25%, 50%, 75% confidence. The computations are as follows:

Confidence (%)	Effort Estimate Calculation
25	Expected Case - (0.67 * SD) = 19.26 - (0.67 * 11) = 11.89 ***≈ 12***
50	Expected Case = 19.26 **≈ 19**
75	Expected Case + (0.67 * SD) = 19.26 + (0.67 * 11) = 26.63 ***≈ 27***