list of model parameters

| Variable Type | Variable Names | Equation | Unit of Measure | Description | Exogenous/ Endogenous |
| --- | --- | --- | --- | --- | --- |
| Constant | Initial Budgeted Project Labor-hour | 7,200 | Labor-hour | Assume the initial project planned 7200 labor-hours | Exogenous |
| Constant | No. of Labor | 15 | Labor | Assume 15 labor work on this project | Exogenous |
| Constant | Labor Working-hour per Week | 40 | Labor-hour/(Week\*Labor) | Assume 40 hours per week for each labor | Exogenous |
| Constant | Seed | 1 | Dimensionless | Steam ID | Exogenous |
| Auxiliary | Performance Factor | RANDOM TRIANGULAR ("Min. Performance Factor", “Most Likely Performance Factor”, "Max. Performance Factor", Seed) | Dimensionless | Performance Factor = Earned labor-hour/Actual labor-hour, without considering scope changes, RFIs, and rework. Generate random performance factor using a triangular distribution from the minimum performance factor to the maximum performance factor with a peak at the most likely performance factor. | Exogenous |
| Auxiliary | Factored Labor Work Rate | No. of Labor × Labor Working-hour per Week x Performance Factor | Labor-hour/Week | Earned Labor-hours for each week without the impacts of rework, RFIs, and scope change. | Endogenous |
| Auxiliary | Stop Indicator | IF THEN ELSE ("Project Labor-hour to be Completed" >= Labor Working-hour per Week, 1, 0) | Dimensionless | Indicator for stopping the simulation when "Project Labor-hour to be Completed" is reaching " Labor Working-hour per Week " to ensure no negative hour will be generated. |  |
| Auxiliary | RFI Rate | RANDOM TRIANGULAR ("Min. RFI Rate", “Most Likely RFI Rate”, "Max. RFI Rate", Seed ) | Dimensionless | RFI rate = labor-hour require RFI/initially budgeted project labor-hour. Generate random RFI rate using a triangular distribution from the minimum RFI rate to the maximum RFI rate with a peak at the most likely RFI rate. | Exogenous |
| Auxiliary | Scope Change Rate on the Initial Project Scope | RANDOM TRIANGULAR ("Min. RFI Rate", “Most Likely RFI Rate”, "Max. RFI Rate", Seed) | Dimensionless | Scope Change Rate on the Initial Project Scope = scope change labor-hour/initially budgeted project labor-hour. Generate random scope change rate on the initial project scope using a triangular distribution from the minimum scope change rate on the initial project scope to the maximum scope change rate on the initial project scope with a peak at the most likely scope change rate on the initial project scope. | Exogenous |
| Auxiliary | % of RFI for Scope Change | RANDOM TRIANGULAR("Min. % of RFI for Scope Change", "Most Likely % of RFI for Scope Change", "Max. % of RFI for Scope Change" , Seed ) | Dimensionless | % of RFI for Scope Change = scope change labor-hour/initially budgeted project labor-hour. Generate random % of RFI for Scope Change using a triangular distribution from the minimum % of RFI for Scope Change to the maximum % of RFI for Scope Change with a peak at the most likely % of RFI for Scope Change. | Exogenous |
| Auxiliary | Meet Requirement Rate | RANDOM TRIANGULAR (“Min. Meet Req. Rate", "Most Like Meet Req. Rate", "Max. Meet Req. Rate", Seed) | Dimensionless | Meet Requirements rate = 1 - (rework labor-hour/initially budgeted project labor-hour). Generate random performance factor using a triangular distribution from the minimum meet requirement rate to the maximum meet requirement rate with a peak at the most likely meet requirement rate. | Exogenous |
| Auxiliary | Labor Work Rate for Initial Project Scope | IF THEN ELSE("Initial Budgeted Project Labor-hour Completed" < "Initial Budgeted Project Labor-hour" × 0.99, Factored Labor Work Rate /(1 + (1 - " Meet Requirement Rate")/" Meet Requirement Rate" + RFI Rate + RFI Rate × Scope Change Rate on the Initial Project Scope), 0 ) | Labor-hour/Week | Equal to Effective Labor Work Rate until all initial project scope is completed. | Endogenous |
| Level | Initial Budgeted Project Labor-hour Completed | INTEG (Labor Work Rate for Initial Project Scope, 0) | Labor-hour | Labor-hour and duration are required to complete the initially planned project during the construction. The initial value is set up at 0. | Endogenous |
| Auxiliary | RFI Generation Rate (Initial Scope) | Labor Work Rate for Initial Project Scope × RFI Rate | Labor-hour/Week | Labor-hour requires RFIs on the initial project scope for each week | Endogenous |
| Auxiliary | RFI Generation Rate (Scope Change on Initial Scope) | RFI Rate × Scope Change Generation Rate on Initial Scope | Labor-hour/Week | Labor-hour requires RFIs on scope changes of the initial project scope for each week | Endogenous |
| Level | Work Cannot Process Due to Missing Information | INTEG (RFI Generation Rate (Initial Scope) + RFI Generation Rate (Scope Change on Initial Scope), 0) | Labor hour | Labor-hours lost due to waiting for RFI response; the initial value is 0. | Endogenous |
| Auxiliary | Scope Change Generation Rate on Initial Scope | Labor Work Rate for Initial Project Scope × Scope Change Rate on the Initial Project Scope | Labor-hour/Week | Labor-hours generated from the initial scope for scope change | Endogenous |
| Auxiliary | Scope Change Generation Rate on RFI | RFI Generation Rate (Initial Scope) × % of RFI for Scope Change | Labor-hour/Week | Labor-hours generated from RFI responses for scope change | Endogenous |
| Auxiliary | Effective Labor Work Rate | IF THEN ELSE(Labor Work Rate for Initial Project Scope= 0, Factored Labor Work Rate/(1 + (1 - " Meet Requirement Rate")/" Meet Requirement Rate"), Factored Labor Work Rate/(1 + (1 - " Meet Requirement Rate")/" Meet Requirement Rate" + RFI Rate + RFI Rate × Scope Change Rate on the Initial Project Scope) ) × Stop Indicator | Labor-hour/Week | Labor-hour per week to complete tasks which meet requirements. | Endogenous |
| Auxiliary | Rework Generation Rate | ((1 - " Meet Requirement Rate")/" Meet Requirement Rate”) × Effective Labor Work Rate × Stop Indicator | Labor-hour/Week | Labor-hour per week to complete tasks which don’t meet requirements. | Endogenous |
| Constant | Time to Discover Rework | 3.05 | Week | The average time between the completion of a task and discovering it needs to be redone. Data is collected from the survey. | Exogenous |
| Auxiliary | Rework Discovery Rate | Generated Rework/Time to Discover Rework | Labor-hour/Week | Labor-hours per week require rework. | Endogenous |
| Level | Generated Rework | INTEG (Rework Generation Rate - Rework Discovery Rate, 0) | Labor-hour | Labor-hours are required to rework; the initial value is 0. | Endogenous |
| Level | Project Labor-hour to be Completed | INTEG (Scope Change Generation Rate on Initial Scope + Scope Change Generation Rate on RFI + Rework Discovery Rate - Effective Labor Work Rate - Rework Generation Rate,7200) | Labor-hour | Labor-hours are required to complete the RR project; the initial value is 7,200 labor-hours | Endogenous |
| Level | Work Completed - Meet Requirement | INTEG (Effective Labor Work Rate,0) | Labor-hour | Labor-hours are used for work that meets requirements. the initial value is 0. | Endogenous |
| Level | Project Duration | INTEG (Effective Labor Work Rate + Rework Generation Rate + "RFI Generation Rate (Initial Scope)" + "RFI Generation Rate (Scope Change on Initial Scope)", 0) | Labor-hour | Actual project duration is required to complete the project; the initial value is 0. Total labor-hours include effective labor hours, rework generation rate, and RFI Generation rate (on the initial scope and scope change). Total labor hour is based on Factored The labor work rate. | Endogenous |