

Optimization Model for Software Development Company using Scrum

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September 5, 2025

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1 1. Sets (Entities)

- Project (P)
- Team (T)
- Worker (W)
- Feature (F)
- Epic (E)
- User Story (US)
- Task (TSK)
- Sprint (SP)
- Product Backlog (PB)
- Release Plan (REP)
- Roadmap (RM)
- Scrum Board (SCB)

- Stakeholder (SH)
- Blocker (BL)
- Development Snapshot (DEV)
- Feature Documentation (FED)
- Velocity (VEL)

2 2. Indices

- $p \in P$ (Project index)
- $t \in T$ (Team index)
- $w \in W$ (Worker index)
- $f \in F$ (Feature index)
- $e \in E$ (Epic index)
- $us \in US$ (User Story index)
- $tsk \in TSK$ (Task index)
- $sp \in SP$ (Sprint index)
- $pb \in PB$ (Product Backlog index)
- $rep \in REP$ (Release Plan index)
- $rm \in RM$ (Roadmap index)
- $scb \in SCB$ (Scrum Board index)
- $sh \in SH$ (Stakeholder index)
- $bl \in BL$ (Blocker index)
- $dev \in DEV$ (Development Snapshot index)
- $fed \in FED$ (Feature Documentation index)
- $vel \in VEL$ (Velocity index)

3 3. Goals

- *G0*: Maximize project budget ($\max \sum_{p \in P} budget_p$)
 - ID: G0
 - Name: maximize_project_budget
- *G1*: Minimize project duration ($\min \sum_{p \in P} project_end_p$)
 - ID: G1
 - Name: minimize_project_duration
- *G2*: Maximize team velocity ($\max \sum_{vel \in VEL} avg_story_points_{vel}$)
 - ID: G2
 - Name: maximize_team_velocity
- *G3*: Minimize task effort ($\min \sum_{tsk \in TSK} effort_{tsk}$)
 - ID: G3
 - Name: minimize_task_effort
- *G4*: Maximize sprint goal achievement ($\max \sum_{sp \in SP} achievement_of_goal_{sp}$)
 - ID: G4
 - Name: maximize_sprint_goal_achievement
- *G5*: Minimize blocker severity ($\min \sum_{bl \in BL} severity_{bl}$)
 - ID: G5
 - Name: minimize_blocker_severity
- *G6*: Maximize feature priority ($\max \sum_{f \in F} priority_f$)
 - ID: G6
 - Name: maximize_feature_priority
- *G7*: Minimize user story complexity ($\min \sum_{us \in US} story_points_{us}$)
 - ID: G7
 - Name: minimize_user_story_complexity
- *G8*: Maximize sprint review feedback ($\max \sum_{sr \in SR} feedback_documentation_{sr}$)
 - ID: G8
 - Name: maximize_sprint_review_feedback
- *G9*: Minimize development snapshot bugs ($\min \sum_{dev \in DEV} test_status_{dev}$)
 - ID: G9

- Name: minimize_development_snapshot_bugs
- *G10*: Maximize stakeholder satisfaction ($\max \sum_{sh \in SH} influence_level_{sh}$)
 - ID: G10
 - Name: maximize_stakeholder_satisfaction
- *G11*: Minimize sprint retrospective improvement actions ($\min \sum_{sre \in SRE} improvement_actions_{sre}$)
 - ID: G11
 - Name: minimize_sprint_retrospective_improvement_actions
- *G12*: Maximize product backlog quality ($\max \sum_{pb \in PB} status_{pb}$)
 - ID: G12
 - Name: maximize_product_backlog_quality
- *G13*: Minimize release plan risk ($\min \sum_{rep \in REP} status_{rep}$)
 - ID: G13
 - Name: minimize_release_plan_risk
- *G14*: Maximize roadmap objectives ($\max \sum_{rm \in RM} objectives_{rm}$)
 - ID: G14
 - Name: maximize_roadmap_objectives

4 4. Conditions

- *C0*: Project status condition ($status_p = 2$)
 - ID: C0
 - Name: project_status_condition
- *C1*: Team size condition ($team_size_t \geq 5$)
 - ID: C1
 - Name: team_size_condition
- *C2*: Worker availability condition ($availability_w \geq 0.8$)
 - ID: C2
 - Name: worker_availability_condition
- *C3*: Feature priority condition ($priority_f \geq 3$)
 - ID: C3
 - Name: feature_priority_condition

- C4: Sprint goal condition ($achievement_of_goal_{sp} \geq 0.8$)
 - ID: C4
 - Name: sprint_goal_condition
- C5: Blocker status condition ($status_{bl} = 2$)
 - ID: C5
 - Name: blocker_status_condition
- C6: User story status condition ($status_{us} = 2$)
 - ID: C6
 - Name: user_story_status_condition
- C7: Sprint review attendees condition ($attendees_count_{sr} \geq 5$)
 - ID: C7
 - Name: sprint_review_attendees_condition
- C8: Development snapshot deployment condition ($deployment_target_{dev} = 2$)
 - ID: C8
 - Name: development_snapshot_deployment_condition
- C9: Stakeholder influence condition ($influence_level_{sh} \geq 3$)
 - ID: C9
 - Name: stakeholder_influence_condition
- C10: Sprint retrospective satisfaction condition ($team_satisfaction_{sre} \geq 0.8$)
 - ID: C10
 - Name: sprint_retrospective_satisfaction_condition
- C11: Product backlog entries condition ($number_of_entries_{pb} \geq 10$)
 - ID: C11
 - Name: product_backlog_entries_condition
- C12: Release plan features condition ($included_features_{rep} \geq 5$)
 - ID: C12
 - Name: release_plan_features_condition
- C13: Roadmap milestones condition ($milestones_{rm} \geq 3$)
 - ID: C13

- Name: roadmap_milestones_condition
- C14: Scrum board tasks condition ($number_of_cards_{scb} \geq 10$)
 - ID: C14
 - Name: scrum_board_tasks_condition

5 5. Decision Variables

- D0: Project budget allocation ($0 \leq budget_allocation_p \leq 1000000$)
 - ID: D0
 - Name: project_budget_allocation
- D1: Team velocity target ($0 \leq team_velocity_target_{vel} \leq 100$)
 - ID: D1
 - Name: team_velocity_target
- D2: Task effort allocation ($0 \leq task_effort_allocation_{tsk} \leq 100$)
 - ID: D2
 - Name: task_effort_allocation
- D3: Sprint goal achievement target ($0 \leq sprint_goal_achievement_target_{sp} \leq 1$)
 - ID: D3
 - Name: sprint_goal_achievement_target
- D4: Blocker resolution time ($0 \leq blocker_resolution_time_{bl} \leq 30$)
 - ID: D4
 - Name: blocker_resolution_time
- D5: Feature priority level ($1 \leq feature_priority_level_f \leq 5$)
 - ID: D5
 - Name: feature_priority_level
- D6: User story complexity level ($1 \leq user_story_complexity_level_{us} \leq 10$)
 - ID: D6
 - Name: user_story_complexity_level
- D7: Sprint review feedback score ($0 \leq sprint_review_feedback_score_{sr} \leq 5$)
 - ID: D7

- Name: `sprint_review_feedback_score`
- *D8*: Development snapshot quality score ($0 \leq \textit{development_snapshot_quality_score}_{dev} \leq 5$)
 - ID: D8
 - Name: `development_snapshot_quality_score`
- *D9*: Stakeholder satisfaction level ($0 \leq \textit{stakeholder_satisfaction_level}_{sh} \leq 5$)
 - ID: D9
 - Name: `stakeholder_satisfaction_level`
- *D10*: Sprint retrospective improvement actions count ($0 \leq \textit{sprint_retrospective_improvement_actions} \leq 10$)
 - ID: D10
 - Name: `sprint_retrospective_improvement_actions_count`
- *D11*: Product backlog entries count ($0 \leq \textit{product_backlog_entries_count}_{pb} \leq 100$)
 - ID: D11
 - Name: `product_backlog_entries_count`
- *D12*: Release plan features count ($0 \leq \textit{release_plan_features_count}_{rep} \leq 20$)
 - ID: D12
 - Name: `release_plan_features_count`
- *D13*: Roadmap milestones count ($0 \leq \textit{roadmap_milestones_count}_{rm} \leq 10$)
 - ID: D13
 - Name: `roadmap_milestones_count`
- *D14*: Scrum board tasks count ($0 \leq \textit{scrum_board_tasks_count}_{scb} \leq 50$)
 - ID: D14
 - Name: `scrum_board_tasks_count`