

Optimization Model for Scrum-based Software Development

Generated by Meta AI

September 5, 2025

Contents

1	Sets (Entities)	1
2	Indices	2
3	Goals	3
4	Conditions	3
5	Decision Variables	4

1 Sets (Entities)

- Project (P)
- Team (T)
- Worker (W)
- Feature (F)
- Skill (S)
- Role (R)
- ProductOwner (PO)
- ScrumMaster (SM)
- ProductBacklog (PB)
- Sprint (SP)
- SprintPlanning (SPP)
- DailyScrum (DS)

- SprintReview (SR)
- SprintRetrospective (SRE)
- SprintBacklog (SBL)
- SprintGoal (SG)
- Epic (E)
- UserStory (US)
- Task (TSK)
- DevelopmentSnapshot (DEV)
- Blocker (BL)
- Stakeholder (SH)
- Velocity (VEL)
- ReleasePlan (REP)
- Roadmap (RM)
- ScrumBoard (SCB)
- FeatureDocumentation (FED)

2 Indices

- $p \in P$ (Project index)
- $t \in T$ (Team index)
- $w \in W$ (Worker index)
- $f \in F$ (Feature index)
- $s \in S$ (Skill index)
- $r \in R$ (Role index)
- $sp \in SP$ (Sprint index)
- $tsk \in TSK$ (Task index)
- $sg \in SG$ (Sprint Goal index)
- $bl \in BL$ (Blocker index)
- $sh \in SH$ (Stakeholder index)

3 Goals

- G0: maximize_team_velocity $\max \sum_{t \in T} VEL_t \cdot avg_story_points_t$
- G1: minimize_blocker_severity $\min \sum_{bl \in BL} severity_{bl}$
- G2: maximize_sprint_goal_achievement $\max \sum_{sg \in SG} achievement_status_{sg}$
- G3: minimize_task_effort $\min \sum_{tsk \in TSK} effort_{tsk}$
- G4: maximize_feature_priority $\max \sum_{f \in F} priority_f$
- G5: minimize_project_duration $\min \sum_{p \in P} project_end_p - project_start_p$
- G6: maximize_team_satisfaction $\max \sum_{sre \in SRE} team_satisfaction_{sre}$
- G7: minimize_number_of_blockers $\min \sum_{bl \in BL} 1$
- G8: maximize_product_owner_availability $\max \sum_{po \in PO} availability_{po}$
- G9: minimize_sprint_planning_duration $\min \sum_{spp \in SPP} duration_(\min)_{spp}$
- G10: maximize_development_snapshot_quality $\max \sum_{dev \in DEV} test_status_{dev}$
- G11: maximize_stakeholder_influence $\max \sum_{sh \in SH} influence_level_{sh}$
- G12: minimize_task_status $\min \sum_{tsk \in TSK} status_{tsk}$
- G13: maximize_release_plan_status $\max \sum_{rep \in REP} status_{rep}$
- G14: minimize_scrum_board_columns $\min \sum_{scb \in SCB} columns_(\text{todo/done...})_{scb}$

4 Conditions

- C0: team_size_condition $3 \leq team_size_t \leq 10 \quad \forall t \in T$
- C1: project_status_condition $project_status_p = active \quad \forall p \in P$
- C2: task_priority_condition $task_priority_{tsk} = high \quad \forall tsk \in TSK$
- C3: sprint_goal_alignment $sprint_goal_alignment_{sg} = 1 \quad \forall sg \in SG$
- C4: product_owner_availability $product_owner_availability_{po} = 1 \quad \forall po \in PO$
- C5: scrum_master_experience $scrum_master_experience_{sm} \geq 1 \quad \forall sm \in SM$
- C6: team_location_condition $team_location_t = same_office \quad \forall t \in T$
- C7: feature_priority_condition $feature_priority_f = high \quad \forall f \in F$
- C8: blocker_resolution $blocker_resolution_{bl} \leq 5 \quad \forall bl \in BL$

- C9: sprint_review_attendance sprint_review_attendance_{sr} ≥ 1 ∀sr ∈ SR
- C10: development_snapshot_deployment development_snapshot_deployment_{dev} = 1 ∀dev ∈ DEV
- C11: stakeholder_involvement stakeholder_involvement_{sh} ≥ 0 ∀sh ∈ SH
- C12: release_plan_alignment release_plan_alignment_{rep} = 1 ∀rep ∈ REP
- C13: scrum_board_organization scrum_board_columns_{scb} ≤ 5 ∀scb ∈ SCB
- C14: feature_documentation feature_documentation_status_{fed} = 1 ∀fed ∈ FED

5 Decision Variables

- DV0: team_size (team_size_t) team_size_t ∈ {3, 4, 5, 6, 7, 8, 9, 10} ∀t ∈ T
- DV1: project_status (project_status_p) project_status_p ∈ {0, 1} ∀p ∈ P
- DV2: task_priority (task_priority_{tsk}) task_priority_{tsk} ∈ {1, 2, 3} ∀tsk ∈ TSK
- DV3: sprint_goal_alignment (sprint_goal_alignment_{sg}) sprint_goal_alignment_{sg} ∈ {0, 1} ∀sg ∈ SG
- DV4: product_owner_availability (product_owner_availability_{po}) product_owner_availability_{po} ∈ [0, 1] ∀po ∈ PO
- DV5: scrum_master_experience (scrum_master_experience_{sm}) scrum_master_experience_{sm} ∈ {1, 2, 3, 4, 5} ∀sm ∈ SM
- DV6: team_location (team_location_t) team_location_t ∈ {same_office, remote} ∀t ∈ T
- DV7: feature_priority (feature_priority_f) feature_priority_f ∈ {1, 2, 3} ∀f ∈ F
- DV8: blocker_resolution (blocker_resolution_{bl}) blocker_resolution_{bl} ∈ {1, 2, 3, 4, 5} ∀bl ∈ BL
- DV9: sprint_review_attendance (sprint_review_attendance_{sr}) sprint_review_attendance_{sr} ∈ {1, 2, 3, 4, 5} ∀sr ∈ SR
- DV10: development_snapshot_deployment (development_snapshot_deployment_{dev}) development_snapshot_deployment_{dev} ∈ {0, 1} ∀dev ∈ DEV
- DV11: stakeholder_involvement (stakeholder_involvement_{sh}) stakeholder_involvement_{sh} ∈ [0, 1] ∀sh ∈ SH

- DV12: `release_plan_alignment` (*release_plan_alignment_{rep}*) `release_plan_alignmentrep` $\in \{0, 1\} \quad \forall rep \in REP$
- DV13: `scrum_board_columns` (*scrum_board_columns_{scb}*) `scrum_board_columnsscb` $\in \{3, 4, 5\} \quad \forall scb \in SCB$
- DV14: `feature_documentation_status` (*feature_documentation_status_{fed}*) `feature_documentation_statusfed` $\in \{0, 1\} \quad \forall fed \in FED$