Optimization Model for Scrum-based Software Development

Generated by Meta AI

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Contents

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)
- $po \in PO$ (ProductOwner index)
- $sm \in SM$ (ScrumMaster index)
- $pb \in PB$ (ProductBacklog index)
- $sp \in SP$ (Sprint index)
- $sg \in SG$ (SprintGoal index)

- $e \in E$ (Epic index)
- $us \in US$ (UserStory index)
- $tsk \in TSK$ (Task index)
- $dev \in DEV$ (DevelopmentSnapshot index)
- $bl \in BL$ (Blocker index)
- $sh \in SH$ (Stakeholder index)

3 Goals

- G0: maximize_project_budget
  Maximize project budget: $\max \sum_{p \in P} budget_p$
- G1: minimize_project_duration
  Minimize project duration: $\min \sum_{p \in P} (project\_end_p - project\_start_p)$
- G2: maximize_team_velocity
  Maximize team velocity: $\max \sum_{t \in T} avg\_story\_points_t$
- G3: maximize_sprint_goal_achievement
  Maximize sprint goal achievement: $\max \sum_{sg \in SG} achievement\_status_s g$
- G4: minimize_blocker_severity
  Minimize blocker severity: $\min \sum_{bl \in BL} severity_b l$
- G5: maximize_feature_priority
  Maximize feature priority: $\max \sum_{f \in F} priority_f$
- G6: minimize_task_effort
  Minimize task effort: $\min \sum_{tsk \in TSK} effort_t sk$
- G7: maximize_stakeholder_satisfaction
  Maximize stakeholder satisfaction: $\max \sum_{sh \in SH} satisfaction_s h$
- G8: maximize_product_owner_availability
  Maximize product owner availability: $\max \sum_{po \in PO} availability_p o$
- G9: minimize_sprint_planning_duration
  Minimize sprint planning duration: $\min \sum_{spp \in SPP} duration\_(min)_s pp$
- G10: maximize_development_snapshot_quality
  Maximize development snapshot quality: $\max \sum_{dev \in DEV} test\_status_d ev$
- G11: maximize_scrum_board_productivity
  Maximize scrum board productivity: $\max \sum_{scb \in SCB} number\_of\_cards_s cb$
- G12: minimize_release_plan_delay
  Minimize release plan delay: $\min \sum_{rep \in REP} (planned\_date_r ep - current\_date)$

4 Conditions

- C0: project_status_must_be_active
  Project status must be active: $\forall p \in P, status_p = active$
- C1: team_status_must_be_active
  Team status must be active: $\forall t \in T, team\_status_t = active$
- C2: product_owner_must_be_available
  Product owner must be available: $\forall po \in PO, availability_p o = 1$
- C3: sprint_goal_must_be_defined
  Sprint goal must be defined: $\forall sg \in SG, objective\_description_s g \neq \emptyset$
- C4: blocker_must_be_resolved
  Blocker must be resolved: $\forall bl \in BL, status_b l = resolved$
- C5: feature_must_be_prioritized
  Feature must be prioritized: $\forall f \in F, priority_f > 0$
- C6: task_must_be_assigned
  Task must be assigned: $\forall tsk \in TSK, status_t sk = assigned$
- C7: stakeholder_must_be_satisfied
  Stakeholder must be satisfied: $\forall sh \in SH, satisfaction_s h \geq threshold$
- C8: development_snapshot_must_be_tested
  Development snapshot must be tested: $\forall dev \in DEV, test\_status_d ev = passed$
- C9: scrum_board_must_be_updated
  Scrum board must be updated: $\forall scb \in SCB, last\_updated_s cb \geq current\_date - \Delta t$
- C10: release_plan_must_be_defined
  Release plan must be defined: $\forall rep \in REP, planned\_date_r ep \neq \emptyset$
- C11: product_backlog_must_be_ordered
  Product backlog must be ordered: $\forall pb \in PB, status_p b = ordered$
- C12: sprint_backlog_must_be_defined
  Sprint backlog must be defined: $\forall sbl \in SBL, status_s bl = defined$

5 Decision Variables

- D0: project_start_date
  Project start date: $project\_start\_date \in \{2023-01-01, 2024-12-31\}$
- D1: team_size
  Team size: $team\_size \in \{1, 2, 3, ..., 10\}$

- D2: product_owner_availability
  Product owner availability: $product\_owner\_availability \in \{0, 1\}$
- D3: sprint_goal_achievement
  Sprint goal achievement: $sprint\_goal\_achievement \in [0, 1]$
- D4: blocker_severity
  Blocker severity: $blocker\_severity \in \{1, 2, 3, 4, 5\}$
- D5: feature_priority
  Feature priority: $feature\_priority \in \{1, 2, 3, 4, 5\}$
- D6: task_effort
  Task effort: $task\_effort \in \{1, 2, 3, ..., 100\}$
- D7: stakeholder_satisfaction
  Stakeholder satisfaction: $stakeholder\_satisfaction \in [0, 1]$
- D8: development_snapshot_quality
  Development snapshot quality: $development\_snapshot\_quality \in [0, 1]$
- D9: scrum_board_productivity
  Scrum board productivity: $scrum\_board\_productivity \in \{1, 2, 3, ..., 100\}$
- D10: release_plan_delay
  Release plan delay: $release\_plan\_delay \in \{0, 1, 2, ..., 30\}$
- D11: sprint_planning_duration
  Sprint planning duration: $sprint\_planning\_duration \in \{30, 60, 90, ..., 240\}$
- D12: product_backlog_size
  Product backlog size: $product\_backlog\_size \in \{1, 2, 3, ..., 100\}$