

Optimization Model for Scrum-based Software Development

Generated by Meta AI

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Contents

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

1 Sets (Entities)

- Project (E0)
- Team (E1)
- Worker (E2)
- Feature (E3)
- Skill (E4)
- Role (E5)
- ProductOwner (E6)
- ScrumMaster (E7)
- ProductBacklog (E8)
- Sprint (E9)
- SprintPlanning (E10)
- DailyScrum (E11)

- SprintReview (E12)
- SprintRetrospective (E13)
- SprintBacklog (E14)
- SprintGoal (E15)
- Epic (E16)
- UserStory (E17)
- Task (E18)
- DevelopmentSnapshot (E19)
- Blocker (E20)
- Stakeholder (E21)
- Velocity (E22)
- ReleasePlan (E23)
- Roadmap (E24)
- ScrumBoard (E25)
- FeatureDocumentation (E26)

2 Indices

- $e \in E$: Entity index
- $t \in T$: Team index
- $s \in S$: Sprint index
- $f \in F$: Feature index
- $u \in U$: User Story index
- $k \in K$: Task index
- $b \in B$: Blocker index
- $p \in P$: Product Owner index
- $m \in M$: Scrum Master index

3 Goals

- G0: maximize_team_velocity
 - Maximize: $\sum_{t \in T} Velocity_t \cdot avg_story_points_t$
 - Mathematical Representation: $\max \sum_{t \in T} v_t$
- G1: minimize_blocker_severity
 - Minimize: $\sum_{b \in B} Blocker_b \cdot severity_b$
 - Mathematical Representation: $\min \sum_{b \in B} s_b$
- G2: maximize_sprint_goal_achievement
 - Maximize: $\sum_{s \in S} SprintGoal_s \cdot achievement_status_s$
 - Mathematical Representation: $\max \sum_{s \in S} a_s$
- G3: minimize_sprint_planning_duration
 - Minimize: $\sum_{s \in S} SprintPlanning_s \cdot duration_(\min)_s$
 - Mathematical Representation: $\min \sum_{s \in S} d_s$
- G4: maximize_feature_completion
 - Maximize: $\sum_{f \in F} Feature_f \cdot status_f$
 - Mathematical Representation: $\max \sum_{f \in F} c_f$
- G5: minimize_development_snapshot_bugs
 - Minimize: $\sum_{d \in D} DevelopmentSnapshot_d \cdot test_status_d$
 - Mathematical Representation: $\min \sum_{d \in D} b_d$
- G6: maximize_stakeholder_satisfaction
 - Maximize: $\sum_{s \in S} SprintRetrospective_s \cdot team_satisfaction_s$
 - Mathematical Representation: $\max \sum_{s \in S} t_s$
- G7: minimize_task_effort
 - Minimize: $\sum_{k \in K} Task_k \cdot effort_k$
 - Mathematical Representation: $\min \sum_{k \in K} e_k$
- G8: maximize_product_owner_availability
 - Maximize: $\sum_{p \in P} ProductOwner_p \cdot availability_p$
 - Mathematical Representation: $\max \sum_{p \in P} a_p$
- G9: minimize_scrum_master_experience
 - Minimize: $\sum_{m \in M} ScrumMaster_m \cdot experience_m$

- Mathematical Representation: $\min \sum_{m \in M} x_m$
- G10: maximize_release_plan_inclusion
 - Maximize: $\sum_{r \in R} ReleasePlan_r \cdot included_features_r$
 - Mathematical Representation: $\max \sum_{r \in R} i_r$
- G11: minimize_roadmap_objectives
 - Minimize: $\sum_{r \in R} Roadmap_r \cdot objectives_r$
 - Mathematical Representation: $\min \sum_{r \in R} o_r$
- G12: maximize_sprint_review_feedback
 - Maximize: $\sum_{s \in S} SprintReview_s \cdot feedback_documentation_s$
 - Mathematical Representation: $\max \sum_{s \in S} f_s$

4 Conditions

- C0: team_size_condition
 - Condition: $3 \leq Team_t \cdot team_size_t \leq 9$
 - Mathematical Representation: $3 \leq t_t \leq 9$
- C1: product_owner_availability_condition
 - Condition: $ProductOwner_p \cdot availability_p \geq 0.8$
 - Mathematical Representation: $a_p \geq 0.8$
- C2: scrum_master_experience_condition
 - Condition: $ScrumMaster_m \cdot experience_m \geq 2$
 - Mathematical Representation: $x_m \geq 2$
- C3: sprint_duration_condition
 - Condition: $1 \leq Sprint_s \cdot end_date_s - Sprint_s \cdot start_date_s \leq 4$
 - Mathematical Representation: $1 \leq d_s \leq 4$
- C4: feature_priority_condition
 - Condition: $Feature_f \cdot priority_f \in \{high, medium\}$
 - Mathematical Representation: $p_f \in \{1, 2\}$
- C5: task_status_condition
 - Condition: $Task_k \cdot status_k \in \{in_progress, done\}$
 - Mathematical Representation: $s_k \in \{0, 1\}$

- C6: blocker_status_condition
 - Condition: $Blocker_b \cdot status_b \in \{resolved, in_progress\}$
 - Mathematical Representation: $s_b \in \{0, 1\}$
- C7: sprint_goal_achievement_condition
 - Condition: $SprintGoal_s \cdot achievement_status_s \geq 0.8$
 - Mathematical Representation: $a_s \geq 0.8$
- C8: release_plan_status_condition
 - Condition: $ReleasePlan_r \cdot status_r \in \{in_progress, done\}$
 - Mathematical Representation: $s_r \in \{0, 1\}$
- C9: roadmap_objectives_condition
 - Condition: $Roadmap_r \cdot objectives_r \in \{aligned, not_aligned\}$
 - Mathematical Representation: $o_r \in \{0, 1\}$
- C10: sprint_review_attendees_condition
 - Condition: $SprintReview_s \cdot attendees_count_s \geq 5$
 - Mathematical Representation: $a_s \geq 5$
- C11: development_snapshot_test_status_condition
 - Condition: $DevelopmentSnapshot_d \cdot test_status_d \in \{passed, failed\}$
 - Mathematical Representation: $t_d \in \{0, 1\}$
- C12: feature_documentation_condition
 - Condition: $FeatureDocumentation_f \cdot change_log_f \in \{up - to - date, not_up - to - date\}$
 - Mathematical Representation: $c_f \in \{0, 1\}$

5 Decision Variables

- D0: team_size
 - Type: Integer
 - Domain: $\{3, 4, 5, 6, 7, 8, 9\}$
 - Min Value: 3
 - Max Value: 9
- D1: product_owner_availability
 - Type: Float

- Domain: $[0.0, 1.0]$
 - Min Value: 0.8
 - Max Value: 1.0
- D2: `scrum_master_experience`
 - Type: Integer
 - Domain: $\{2, 3, 4, 5\}$
 - Min Value: 2
 - Max Value: 5
- D3: `sprint_duration`
 - Type: Integer
 - Domain: $\{1, 2, 3, 4\}$
 - Min Value: 1
 - Max Value: 4
- D4: `feature_priority`
 - Type: Integer
 - Domain: $\{0, 1\}$
 - Min Value: 0
 - Max Value: 1
- D5: `task_status`
 - Type: Integer
 - Domain: $\{0, 1\}$
 - Min Value: 0
 - Max Value: 1
- D6: `blocker_status`
 - Type: Integer
 - Domain: $\{0, 1\}$
 - Min Value: 0
 - Max Value: 1
- D7: `sprint_goal_achievement`
 - Type: Float
 - Domain: $[0.0, 1.0]$
 - Min Value: 0.8

- Max Value: 1.0
- D8: release_plan_status
 - Type: Integer
 - Domain: $\{0, 1\}$
 - Min Value: 0
 - Max Value: 1
- D9: roadmap_objectives
 - Type: Integer
 - Domain: $\{0, 1\}$
 - Min Value: 0
 - Max Value: 1
- D10: sprint_review_attendees
 - Type: Integer
 - Domain: $\{0, 1\}$
 - Min Value: 0
 - Max Value: 1
- D11: development_snapshot_test_status
 - Type: Integer
 - Domain: $\{0, 1\}$
 - Min Value: 0
 - Max Value: 1
- D12: feature_documentation
 - Type: Integer
 - Domain: $\{0, 1\}$
 - Min Value: 0
 - Max Value: 1
- D13: task_effort
 - Type: Integer
 - Domain: $\{1, 2, 3, 4, 5\}$
 - Min Value: 1
 - Max Value: 5
- D14: blocker_severity

- Type: Integer
- Domain: $\{1, 2, 3\}$
- Min Value: 1
- Max Value: 3