Optimization Model for Scrum Software Development

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Contents

1 Sets (Entities)

- Project
- Team
- Feature
- Task
- Blocker
- Sprint
- ProductOwner
- ScrumMaster
- DevelopmentSnapshot
- ReleasePlan
- Roadmap
- ScrumBoard

- Stakeholder
- Velocity

2 Indices

- $p \in P$ (Projects)
- $t \in T$ (Teams)
- $f \in F$ (Features)
- $k \in K$ (Tasks)
- $b \in B$ (Blockers)
- $s \in S$ (Sprints)
- $po \in PO$ (ProductOwners)
- $sm \in SM$ (ScrumMasters)
- $ds \in DS$ (DevelopmentSnapshots)
- $rp \in RP$ (ReleasePlans)
- $rm \in RM$ (Roadmaps)
- $sb \in SB$ (ScrumBoards)
- $sh \in SH$ (Stakeholders)
- $v \in V$ (Velocities)

3 Goals

- G0: Maximize project budget: $\max \sum_{p \in P} budget_p$
- G1: Minimize project duration: $\min \sum_{p \in P} project\_end_p$
- G2: Maximize team size: $\max \sum_{t \in T} team\_size_t$
- G3: Maximize sprint velocity: $\max \sum_{v \in V} avg\_story\_points_v$
- G4: Minimize blocker severity: $\min \sum_{b \in B} severity_b$
- G5: Maximize feature priority: $\max \sum_{f \in F} priority_f$
- G6: Minimize task effort: $\min \sum_{k \in K} effort_k$
- G7: Maximize stakeholder influence: $\max \sum_{sh \in SH} influence\_level_{sh}$

- G8: Minimize sprint retrospective improvement actions: $\min \sum_{s \in S} improvement\_actions_s$
- G9: Maximize product owner availability: $\max \sum_{po \in PO} availability_{po}$
- G10: Minimize scrum master experience: $\min \sum_{sm \in SM} experience_{sm}$
- G11: Maximize development snapshot test status: $\max \sum_{ds \in DS} test\_status_{ds}$
- G12: Maximize release plan status: $\max \sum_{rp \in RP} status_{rp}$
- G13: Minimize roadmap milestones: $\min \sum_{rm \in RM} milestones_{rm}$
- G14: Maximize scrum board columns: $\max \sum_{sb \in SB} columns_{sb}$

4 Conditions

- C0: Ensure project status is active: $\sum_{p \in P} status_p = 1$
- C1: Ensure team status is active: $\sum_{t \in T} team\_status_t = 1$
- C2: Ensure product owner availability is high: $\sum_{po \in PO} availability_{po} \geq 2$
- C3: Ensure scrum master experience is high: $\sum_{sm \in SM} experience_{sm} \geq 2$
- C4: Ensure feature priority is high: $\sum_{f \in F} priority_f \geq 2$
- C5: Ensure task status is in progress: $\sum_{k \in K} status_k = 1$
- C6: Ensure stakeholder influence is high: $\sum_{sh \in SH} influence\_level_{sh} \geq 2$
- C7: Ensure sprint retrospective improvement actions are low: $\sum_{s \in S} improvement\_actions_s \leq 2$
- C8: Ensure development snapshot test status is high: $\sum_{ds \in DS} test\_status_{ds} \geq 2$
- C9: Ensure release plan status is high: $\sum_{rp \in RP} status_{rp} \geq 2$
- C10: Ensure roadmap milestones are low: $\sum_{rm \in RM} milestones_{rm} \leq 2$
- C11: Ensure scrum board columns are high: $\sum_{sb \in SB} columns_{sb} \geq 2$
- C12: Ensure blocker severity is low: $\sum_{b \in B} severity_b \leq 2$
- C13: Ensure sprint velocity is high: $\sum_{v \in V} avg\_story\_points_v \geq 2$
- C14: Ensure project duration is low: $\sum_{p \in P} project\_end_p \leq 2$

5 Decision Variables

- D0: Project start date: $project\_start\_date_p \in \{2023-01-01, 2024-01-01\}$
- D1: Team size: $team\_size_t \in \{1, 2, 3, 4, 5\}$
- D2: Feature priority: $priority_f \in \{1, 2, 3\}$
- D3: Task effort: $effort_k \in \{1, 2, 3, 4, 5\}$
- D4: Blocker severity: $severity_b \in \{1, 2, 3\}$
- D5: Sprint velocity: $avg\_story\_points_v \in \{1, 2, 3, 4, 5\}$
- D6: Product owner availability: $availability_{po} \in \{1, 2, 3\}$
- D7: Scrum master experience: $experience_{sm} \in \{1, 2, 3\}$
- D8: Development snapshot test status: $test\_status_{ds} \in \{1, 2, 3\}$
- D9: Release plan status: $status_{rp} \in \{1, 2, 3\}$
- D10: Roadmap milestones: $milestones_{rm} \in \{1, 2, 3\}$
- D11: Scrum board columns: $columns_{sb} \in \{1, 2, 3\}$
- D12: Project duration: $project\_end_p \in \{1, 2, 3, 4, 5\}$
- D13: Stakeholder influence: $influence\_level_{sh} \in \{1, 2, 3\}$
- D14: Sprint retrospective improvement actions: $improvement\_actions_s \in \{1, 2, 3\}$