Optimization Model for Scrum-based Software Development

Generated by Meta AI

September 5, 2025

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)
- $t \in T$ (Team)
- $w \in W$ (Worker)
- $f \in F$ (Feature)
- $s \in S$ (Skill)
- $r \in R$ (Role)
- $po \in PO$ (ProductOwner)
- $sm \in SM$ (ScrumMaster)
- $pb \in PB$ (ProductBacklog)
- $sp \in SP$ (Sprint)
- $sg \in SG$ (SprintGoal)

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

3 Goals

- $G0$: Maximize team velocity ($\max \sum_{t \in T} VEL_{t,avg.story.points}$)
- $G1$: Minimize blocker severity ($\min \sum_{bl \in BL} BL_{bl,severity}$)
- $G2$: Maximize sprint goal achievement ($\max \sum_{sg \in SG} SG_{sg,achievement.status}$)
- $G3$: Minimize task effort ($\min \sum_{tsk \in TSK} TSK_{tsk,effort}$)
- $G4$: Maximize feature priority ($\max \sum_{f \in F} F_{f,priority}$)
- $G5$: Minimize sprint duration ($\min \sum_{sp \in SP} SP_{sp,end.date}$)
- $G6$: Maximize stakeholder satisfaction ($\max \sum_{sh \in SH} SH_{sh,influence.level}$)
- $G7$: Minimize task dependencies ($\min \sum_{tsk \in TSK} TSK_{tsk,type}$)
- $G8$: Maximize product backlog quality ($\max \sum_{pb \in PB} PB_{pb,status}$)
- $G9$: Minimize release plan deviation ($\min \sum_{rep \in REP} REP_{rep,planned.date}$)
- $G10$: Maximize team collaboration ($\max \sum_{t \in T} T_{t,team.size}$)
- $G11$: Minimize development snapshot bugs ($\min \sum_{dev \in DEV} DEV_{dev,test.status}$)
- $G12$: Maximize feature documentation quality ($\max \sum_{fed \in FED} FED_{fed,title}$)
- $G13$: Minimize scrum board complexity ($\min \sum_{scb \in SCB} SCB_{scb,number.of.cards}$)
- $G14$: Maximize sprint review feedback ($\max \sum_{sr \in SR} SR_{sr,feedback.documentation}$)

4 Conditions

- $C0$: Team size must be greater than 5 ($T_{t,team.size} \geq 5$)
- $C1$: Sprint duration must be less than 30 days ($SP_{sp,end.date} - SP_{sp,start.date} \leq 30$)
- $C2$: Feature priority must be high ($F_{f,priority} = 3$)
- $C3$: Task effort must be less than 10 hours ($TSK_{tsk,effort} \leq 10$)
- $C4$: Stakeholder influence must be high ($SH_{sh,influence.level} = 3$)
- $C5$: Product backlog status must be up-to-date ($PB_{pb,status} = 1$)
- $C6$: Release plan deviation must be less than 10
- $C7$: Team collaboration must be high ($T_{t,team.size} \geq 5$)
- $C8$: Development snapshot quality must be high ($DEV_{dev,test.status} = 1$)
- $C9$: Feature documentation quality must be high ($FED_{fed,title} = 1$)
- $C10$: Scrum board complexity must be low ($SCB_{scb,number.of.cards} \leq 10$)
- $C11$: Sprint review feedback must be positive ($SR_{sr,feedback.documentation} = 1$)
- $C12$: Blocker severity must be low ($BL_{bl,severity} = 1$)
- $C13$: Sprint goal achievement must be high ($SG_{sg,achievement.status} = 1$)
- $C14$: Task dependencies must be low ($TSK_{tsk,type} = 1$)

5 Decision Variables

- $D0$: Team size ($T_{t,team.size} \in \{5, 10, 15\}$)
- $D1$: Sprint duration ($SP_{sp,end.date} - SP_{sp,start.date} \in \{14, 21, 28\}$)
- $D2$: Feature priority ($F_{f,priority} \in \{1, 2, 3\}$)
- $D3$: Task effort ($TSK_{tsk,effort} \in \{1, 5, 10\}$)
- $D4$: Stakeholder influence ($SH_{sh,influence.level} \in \{1, 2, 3\}$)
- $D5$: Product backlog status ($PB_{pb,status} \in \{0, 1\}$)
- $D6$: Release plan deviation ($REP_{rep,planned.date} - REP_{rep,actual.date} \in [0, 10]$)
- $D7$: Team collaboration ($T_{t,team.size} \in \{1, 2, 3\}$)

- $D8$: Development snapshot quality ($DEV_{dev,test.status} \in \{1, 2, 3\}$)
- $D9$: Feature documentation quality ($FED_{fed,title} \in \{1, 2, 3\}$)
- $D10$: Scrum board complexity ($SCB_{scb,number.of.cards} \in \{1, 2, 3\}$)
- $D11$: Sprint review feedback ($SR_{sr,feedback.documentation} \in \{1, 2, 3\}$)
- $D12$: Blocker severity ($BL_{bl,severity} \in \{1, 2, 3\}$)
- $D13$: Sprint goal achievement ($SG_{sg,achievement.status} \in \{1, 2, 3\}$)
- $D14$: Task dependencies ($TSK_{tsk,type} \in \{1, 2, 3\}$)