SCRUM-Based Software Development Optimization Model

Domain Modeling System

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Contents

1. Sets (Entities)

$\mathcal{P}$: Set of Projects ($E0$)

$\mathcal{T}$: Set of Teams ($E1$)

$\mathcal{W}$: Set of Workers ($E2$)

$\mathcal{F}$: Set of Features ($E3$)

$\mathcal{S}$: Set of Skills ($E4$)

$\mathcal{R}$: Set of Roles ($E5$)

$\mathcal{PO}$: Set of Product Owners ($E6$)

$\mathcal{SM}$: Set of Scrum Masters ($E7$)

$\mathcal{PB}$: Set of Product Backlogs ($E8$)

$\mathcal{SP}$: Set of Sprints ($E9$)

$\mathcal{US}$: Set of User Stories ($E17$)

$\mathcal{TSK}$: Set of Tasks ($E18$)

$\mathcal{BL}$: Set of Blockers ($E20$)

$\mathcal{SH}$: Set of Stakeholders ($E21$)

$\mathcal{VEL}$: Set of Velocity records ($E22$)

$\mathcal{REP}$: Set of Release Plans ($E23$)

$\mathcal{RM}$: Set of Roadmaps ($E24$)

$\mathcal{DEV}$: Set of Development Snapshots ($E19$)

$\mathcal{FED}$: Set of Feature Documentations ($E26$)

2. Indices

$p \in \mathcal{P}$: Index for projects

$t \in \mathcal{T}$: Index for teams

$w \in \mathcal{W}$: Index for workers

$f \in \mathcal{F}$: Index for features

$s \in \mathcal{S}$: Index for skills

$r \in \mathcal{R}$: Index for roles

$sp \in \mathcal{SP}$: Index for sprints

$u \in \mathcal{US}$: Index for user stories

$k \in \mathcal{TSK}$: Index for tasks

$b \in \mathcal{BL}$: Index for blockers

$sh \in \mathcal{SH}$: Index for stakeholders

$v \in \mathcal{VEL}$: Index for velocity entries

$rp \in \mathcal{REP}$: Index for release plans

3. Goals

`maximize_project_budget`: $\max \sum_{p \in \mathcal{P}} \text{budget}_p \times 1.5$

`minimize_project_duration`: $\min \sum_{p \in \mathcal{P}} (\text{project\_end}_p - \text{project\_start}_p) \times 1.2$

`maximize_team_size`: $\max \sum_{t \in \mathcal{T}} \text{team\_size}_t \times 1.0$

`minimize_worker_unavailability`: $\min \sum_{w \in \mathcal{W}} I(\text{status}_w = \text{"unavailable"}) \times 1.3$

`maximize_feature_priority`: $\max \sum_{f \in \mathcal{F}} \text{priority}_f \times 1.4$

`minimize_effort_estimation`: $\min \sum_{f \in \mathcal{F}} \text{estimated\_effort}_f \times 1.1$

`maximize_story_points`: $\max \sum_{u \in \mathcal{US}} \text{story\_points}_u \times 1.6$

`minimize_sprint_duration`: $\min \sum_{sp \in \mathcal{SP}} (\text{end\_date}_{sp} - \text{start\_date}_{sp}) \times 1.0$

`maximize_velocity_trend`: $\max \sum_{v \in \mathcal{VEL}} \text{trend}_v \times 1.7$

`minimize_blocker_severity`: $\min \sum_{b \in \mathcal{BL}} \text{severity}_b \times 1.3$

`maximize_stakeholder_influence`: $\max \sum_{sh \in \mathcal{SH}} \text{influence\_level}_{sh} \times 1.2$

`minimize_task_effort`: $\min \sum_{k \in \mathcal{TSK}} \text{effort}_k \times 1.1$

`maximize_release_inclusion`: $\max \sum_{rp \in \mathcal{REP}} |\text{included\_features}_{rp}| \times 1.4$

`minimize_documentation_age`: $\min \sum_{f \in \mathcal{FED}} (\text{current\_time} - \text{creation\_date}_f) \times 1.0$

4. Conditions

`require_project_status_active`: $\forall p \in \mathcal{P} : \text{status}_p = \text{"active"}$

`require_team_status_active`: $\forall t \in \mathcal{T} : \text{team\_status}_t = \text{"active"}$

`require_worker_availability`: $\forall w \in \mathcal{W} : \text{availability}_w > 0$

`require_feature_status_not_done`: $\forall f \in \mathcal{F} : \text{status}_f \neq \text{"done"}$

`require_user_story_status_todo`: $\forall u \in \mathcal{US} : \text{status}_u = \text{"To Do"}$

`require_sprint_status_planned`: $\forall sp \in \mathcal{SP} : \text{status}_{sp} = \text{"planned"}$

`require_task_status_not_blocked`: $\forall k \in \mathcal{TSK} : \text{status}_k \neq \text{"blocked"}$

`require_blocker_resolved`: $\forall b \in \mathcal{BL} : \text{resolved\_on}_b \leq \text{current\_date}$

`require_skill_certified`: $\forall s \in \mathcal{S} : \text{certified}_s = \text{True}$

`require_role_assigned`: $\forall w \in \mathcal{W}, \exists r \in \mathcal{R} : \text{takes\_on\_role}(w, r)$

`require_velocity_positive`: $\forall v \in \mathcal{VEL} : \text{avg.\_story\_points}_v > 0$

`require_sprint_goal_defined`: $\forall sp \in \mathcal{SP}, \exists g \in \mathcal{SG} : \text{pursues\_goal}(sp, g) \wedge \text{objective\_description}_g \neq \emptyset$

`require_release_status_draft`: $\forall rp \in \mathcal{REP} : \text{status}_{rp} = \text{"draft"}$

`require_board_updated_daily`: $\forall t \in \mathcal{T} : \text{last\_updated}_{\text{scb}(t)} \geq \text{current\_date} - 1$

5. DecisionVariables

$x_{w,t} \in \{0, 1\}$: Worker w assigned to team t

$y_f \in \{0, 1\}$: Feature f selected for backlog

$z_u \in \{0, 1\}$: User story u included in sprint

$e_k \in [0, 40]$: Estimated effort for task k

$d_{sp} \in [1, 30]$: Duration of sprint sp in days

$s_u \in [1, 13]$: Story points assigned to user story u

$b_p \in [0, 10^6]$: Budget allocated to project p

$st_{sp} \in [0, 365]$: Start day of sprint sp

$m_t \in [1, 20]$: Size of team t

$m_{sm,sp} \in \{0, 1\}$: Scrum Master moderates retrospective of sprint sp

$r_b \in [0, 30]$: Days taken to resolve blocker b

$d_f \in \{0, 1\}$: Documentation for feature f updated

$v_{target} \in [0, 100]$: Target velocity for next sprint

$rd_{rp} \in [0, 730]$: Release date of plan rp in days from start

$mpo_{po} \in \{0, 1\}$: Product Owner po actively manages backlog