Optimization Model for SCRUM-based Software Development

Generated by ChatGPT

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1. Problem Overview

This optimization model is constructed to support planning and management in a SCRUM-based software development company. It considers various goals, constraints, and decision variables derived from the company's entity-relationship model.

2. Sets and Indices

$$
\begin{aligned}
P &: \text{Set of projects} \\
T &: \text{Set of teams} \\
E &: \text{Set of employees} \\
F &: \text{Set of features} \\
S &: \text{Set of sprints} \\
B &: \text{Set of blockers} \\
U &: \text{Set of user stories} \\
K &: \text{Set of skills} \\
R &: \text{Set of roles}
\end{aligned}
$$

3. Decision Variables

$$
\begin{aligned}
x_{tf} \in \{0,1\} && \text{1 if team } t \text{ is assigned feature } f \\
y_{es} \in \{0,1\} && \text{1 if employee } e \text{ is assigned to sprint } s \\
z_{eu} \in \{0,1\} && \text{1 if employee } e \text{ is assigned to user story } u \\
d_{sb} \in \mathbb{Z}_{+} && \text{Resolution time in days for blocker } b \text{ in sprint } s \\
v_s \in \mathbb{R} && \text{Velocity in sprint } s \\
a_p \in \mathbb{R} && \text{Budget allocation for project } p
\end{aligned}
$$

4. Objective Function

Maximize:

$$
\max \quad \sum_{s \in S} v_s - \sum_{f \in F} Effort_f - \sum_{b \in B} \sum_{s \in S} d_{sb} - \sum_{p \in P} a_p \\
+ \sum_{e \in E, u \in U} skill\_match_{eu} \cdot z_{eu}
$$

5. Constraints

$$\sum_{e \in E} y_{es} \leq team\_size_t \qquad \forall t \in T, s \in S$$

$$\sum_{f \in F} x_{tf} \leq max\_features_t \qquad \forall t \in T$$

$$\sum_{u \in U} z_{eu} \leq max\_tasks_e \qquad \forall e \in E$$

$$a_p \leq budget\_limit_p \qquad \forall p \in P$$

$$d_{sb} \leq max\_resolution\_time \qquad \forall s \in S, b \in B$$

$$\sum_{u \in U} story\_points_u \cdot z_{eu} \leq v_s \qquad \forall s \in S$$

$$x_{tf}, y_{es}, z_{eu} \in \{0, 1\}, d_{sb} \in \mathbb{Z}_+, v_s, a_p \in \mathbb{R}$$

6. Notes

- Skill match values are normalized between 0 and 1.

- Blockers and budget are to be minimized.

- Sprints aim for velocity maximization.

- Task assignment must honor team member availability and capacity.