Optimization Model for SCRUM Software Development

Decision Variables

$v_s \in [0, 100]$ Sprint velocity (story points completed)

$t_s \in \{3, \ldots, 10\}$ Team size

$e_f \in [0.1, 40]$ Effort per task

$a_e \in [0, 40]$ Employee availability (hours per sprint)

$p_f \in \{1, \ldots, 5\}$ Feature priority

$b_c \in \{1, \ldots, 10\}$ Blocker severity

$s_p \in \{1, \ldots, 20\}$ Story points per user story

$B \in [0, 1{,}000{,}000]$ Project budget

$d_s \in \{7, \ldots, 30\}$ Sprint duration in days

$d_c \in [0, 100]$ Documentation completeness (%)

$x_{et} \in \{0, 1\}$ Assignment of employee e to task t

Objective Functions

$\max \quad v_s$ (Maximize sprint velocity)

$\min \quad b_r$ (Minimize number of unresolved blockers)

$\max \quad u_t$ (Maximize team utilization)

$\max \quad c_f$ (Maximize feature completion)

$\min \quad o_s$ (Minimize sprint overruns)

$\max \quad m_s$ (Maximize skill match in assignments)

$\min \quad r_w$ (Minimize rework due to bugs)

$\max \quad a_{po}$ (Maximize product owner availability)

$\max \quad s_c$ (Maximize customer satisfaction)

$\max \quad g_s$ (Maximize sprint goal achievement)

Constraints

$$3 \leq t_s \leq 10 \qquad \text{(Team size bounds)} \qquad (1)$$

$$\sum_t \sum_e x_{et} \cdot e_f \leq B \qquad \text{(Total effort cost within budget)}$$

$$(2)$$

$$x_{et} = 0 \quad \text{if employee } e \text{ lacks skill for task } t \qquad (3)$$

$$x_{et} = 0 \quad \text{if task } t \text{ is blocked} \qquad (4)$$

$$\sum_{t \in \text{sprint backlog}} \text{completion}(t) = |\text{sprint backlog}| \qquad \text{(Complete all sprint backlog tasks)}$$

$$(5)$$

$$\sum_e x_{et} \leq 1 \qquad \text{(Task assigned to at most one employee)}$$

$$(6)$$

$$\sum_t x_{et} \cdot e_f \leq a_e \qquad \text{(Employee workload within availability)}$$

$$(7)$$

$$d_c \geq 90 \qquad \text{(Documentation completeness at least 90\%)}$$

$$(8)$$

Other company specific constraints as required