Optimization Model

Sets

$$\mathcal{P} : \text{Projects}, \tag{1}$$
$$\mathcal{T} : \text{Teams}, \tag{2}$$
$$\mathcal{E} : \text{Employees}, \tag{3}$$
$$\mathcal{F} : \text{Features}, \tag{4}$$
$$\mathcal{I} : \text{Epics}, \tag{5}$$
$$\mathcal{R} : \text{Release Plans}, \tag{6}$$
$$\mathcal{S} : \text{Sprints}, \tag{7}$$
$$\mathcal{D} : \text{Feature Documentation}. \tag{8}$$

Decision Variables

$$x_t^{\mathrm{TM}} \quad 3 \leq x_t^{\mathrm{TM}} \leq 15, \quad \forall t \in \mathcal{T} \tag{9}$$
$$x_p^{\mathrm{AB}} \quad 10000 \leq x_p^{\mathrm{AB}} \leq 1000000, \quad \forall p \in \mathcal{P} \tag{10}$$
$$x_s^{\mathrm{SD}} \quad 7 \leq x_s^{\mathrm{SD}} \leq 30, \quad \forall s \in \mathcal{S} \tag{11}$$
$$x_s^{\mathrm{SP}} \quad 20 \leq x_s^{\mathrm{SP}} \leq 100, \quad \forall s \in \mathcal{S} \tag{12}$$
$$x_{e,s}^{\mathrm{TPE}} \quad 1 \leq x_{e,s}^{\mathrm{TPE}} \leq 10, \quad \forall e \in \mathcal{E},\ s \in \mathcal{S} \tag{13}$$
$$x_r^{\mathrm{FPR}} \quad 1 \leq x_r^{\mathrm{FPR}} \leq 20, \quad \forall r \in \mathcal{R} \tag{14}$$
$$x_i^{\mathrm{ESC}} \quad 2 \leq x_i^{\mathrm{ESC}} \leq 50, \quad \forall i \in \mathcal{I} \tag{15}$$
$$x_d^{\mathrm{DSD}} \quad 10 \leq x_d^{\mathrm{DSD}} \leq 30, \quad \forall d \in \mathcal{D} \tag{16}$$
$$x_p^{\mathrm{CS}} \quad 1 \leq x_p^{\mathrm{CS}} \leq 5, \quad \forall p \in \mathcal{P} \tag{17}$$
$$x_d^{\mathrm{DP}} \quad 1 \leq x_d^{\mathrm{DP}} \leq 200, \quad \forall d \in \mathcal{D} \tag{18}$$

Objectives

$$\min\ Z_1(x) = \text{Total Development Time} \tag{19a}$$
$$\max\ Z_2(x) = \text{Sprint Velocity} \tag{19b}$$
$$\min\ Z_3(x) = \text{Budget Overrun} \tag{19c}$$
$$\max\ Z_4(x) = \text{Feature Throughput} \tag{19d}$$
$$\max\ Z_5(x) = \text{Team Utilization} \tag{19e}$$
$$\min\ Z_6(x) = \text{Defect Rate} \tag{19f}$$
$$\max\ Z_7(x) = \text{Stakeholder Satisfaction} \tag{19g}$$
$$\min\ Z_8(x) = \text{Unplanned Work} \tag{19h}$$
$$\max\ Z_9(x) = \text{Backlog Health} \tag{19i}$$
$$\min\ Z_{10}(x) = \text{Rework Effort} \tag{19j}$$

Constraints

$$\text{C1: } End_p \leq EndPlan_p, \qquad \forall p \in \mathcal{P} \tag{20}$$
$$\text{C2: } Spend_p \leq x_p^{\text{AB}}, \qquad \forall p \in \mathcal{P} \tag{21}$$
$$\text{C3: } 3 \leq x_t^{\text{TM}} \leq 15, \qquad \forall t \in \mathcal{T} \tag{22}$$
$$\text{C4: } x_{e,s}^{\text{TPE}} \leq Availability_e, \qquad \forall e, s \tag{23}$$
$$\text{C5: } EndDate_s - StartDate_s = x_s^{\text{SD}}, \qquad \forall s \tag{24}$$
$$\text{C6: } a_f \leq EffortEstimate_f \leq b_f, \qquad \forall f \tag{25}$$
$$\text{C7: } Status_i = \text{Approved} \Rightarrow InSprintBacklog_i = 1, \qquad \forall i \tag{26}$$
$$\text{C8: } Attendance_e \geq 0.9, \qquad \forall e \tag{27}$$
$$\text{C9: } \text{Skill}(\tau) \subseteq \text{Skills}(AssignedEmp(\tau)), \qquad \forall \tau \tag{28}$$
$$\text{C10: } \sum_r InRelease_{r,f} = 1, \qquad \forall f \in \mathcal{F}_{critical} \tag{29}$$