

## Optimization Model

### Decision Variables:

- $x_1$  = Number of Developers ( $3 \leq x_1 \leq 9, x_1 \in \mathbb{Z}$ )
- $x_2$  = Sprint Duration (days) ( $7 \leq x_2 \leq 28, x_2 \in \mathbb{Z}$ )
- $x_3$  = Planned Story Points ( $10 \leq x_3 \leq 100, x_3 \in \mathbb{Z}$ )
- $x_4$  = Allocated Budget (USD) ( $10,000 \leq x_4 \leq 1,000,000$ )
- $x_5$  = Daily Scrum Duration (min) ( $10 \leq x_5 \leq 30, x_5 \in \mathbb{Z}$ )
- $x_6$  = Number of Testers ( $1 \leq x_6 \leq 5, x_6 \in \mathbb{Z}$ )
- $x_7$  = Backlog Refinement Hours ( $2 \leq x_7 \leq 16$ )
- $x_8$  = Documentation Effort (hrs) ( $1 \leq x_8 \leq 8$ )
- $x_9$  = Max Concurrent Sprints ( $1 \leq x_9 \leq 3, x_9 \in \mathbb{Z}$ )
- $x_{10}$  = Release Candidates ( $1 \leq x_{10} \leq 5, x_{10} \in \mathbb{Z}$ )
- $x_{11}$  = Support Staff Count ( $0 \leq x_{11} \leq 3, x_{11} \in \mathbb{Z}$ )
- $x_{12}$  = Skill Training Hours ( $0 \leq x_{12} \leq 20$ )

### Objectives (Multi-Objective)

Minimize:  $(f_{G1}(x), f_{G3}(x), f_{G6}(x), f_{G8}(x), f_{G10}(x), f_{G12}(x))$ ,

Maximize:  $(f_{G2}(x), f_{G4}(x), f_{G5}(x), f_{G7}(x), f_{G9}(x), f_{G11}(x))$ ,

where each scalar function corresponds to:

- $f_{G1}(x)$  = Project Duration (end - start)
- $f_{G2}(x) = x_3$  (Team Velocity)
- $f_{G3}(x) = |\text{ActualSpend}(x) - x_4|$  (Budget Variance)
- $f_{G4}(x)$  = Stakeholder Satisfaction Score
- $f_{G5}(x)$  = Number of Features Delivered
- $f_{G6}(x)$  = Number of Unresolved Blockers
- $f_{G7}(x) = \frac{\text{Total Effort Assigned}}{\text{Available Effort}}$
- $f_{G8}(x)$  = Sprint Planning Duration
- $f_{G9}(x)$  = Count of Required Skills Covered
- $f_{G10}(x)$  = Number of Task Switches
- $f_{G11}(x)$  = Releases per Roadmap Period
- $f_{G12}(x)$  = Defects in Production

## Constraints

$$g_{C1}(x) : 3 \leq x_1 \leq 9,$$

$$g_{C2}(x) : A_j \geq 0.8 \quad \forall j \in \text{Employees},$$

$$g_{C3}(x) : \text{PO}_t = 1, \text{SM}_t = 1 \quad \forall t \in \text{Teams},$$

$$g_{C4}(x) : \text{SkillCoverage}(t) \geq \text{RequiredSkills}(p) \quad \forall t, p,$$

$$g_{C5}(x) : x_2 \leq 28,$$

$$g_{C6}(x) : |\text{BacklogItems}| \geq 20,$$

$$g_{C7}(x) : \text{ActualSpend}(x) \leq x_4,$$

$$g_{C8}(x) : \text{ReleasesEveryWeeks} \geq \frac{1}{8},$$

$$g_{C9}(x) : |\{\text{Doc}_f\}| = |\{\text{Features}\}|,$$

$$g_{C10}(x) : \frac{|\text{ClosedActions}|}{|\text{Actions}|} \geq 0.8,$$

$$g_{C11}(x) : |\text{Feedbacks}| \geq 3,$$

$$g_{C12}(x) : \text{OverlapHours}(t) \geq 2 \quad \forall t \text{ distributed.}$$