# Optimization Model for Scrum-Based Software Development

## Decision Variables

$$x_1 := \text{Sprint Duration Days (DV1)}$$
$$x_2 := \text{Team Size (DV2)}$$
$$x_3 := \text{Budget Allocation (DV3)}$$
$$x_4 := \text{Sprint Capacity (DV4)}$$
$$x_5 := \text{Number of Developers (DV5)}$$
$$x_6 := \text{Features per Release (DV6)}$$
$$x_7 := \text{Tasks per Sprint (DV7)}$$
$$x_8 := \text{Skill Level Threshold (DV8)}$$
$$x_9 := \text{Daily Scrum Duration (DV9)}$$
$$x_{10} := \text{Sprint Review Duration (DV10)}$$
$$x_{11} := \text{Retrospective Actions Count (DV11)}$$
$$x_{12} := \text{Release Frequency per Month (DV12)}$$

## Objective Functions

$$\text{Maximize } F_1(x) = \text{Velocity}(x) \quad (G1)$$
$$\text{Minimize } F_2(x) = \text{Sprint Overrun}(x) \quad (G2)$$
$$\text{Maximize } F_3(x) = \text{Goal Achievement Rate}(x) \quad (G3)$$
$$\text{Minimize } F_4(x) = \text{Defect Rate}(x) \quad (G4)$$
$$\text{Maximize } F_5(x) = \text{Feature Completion Ratio}(x) \quad (G5)$$
$$\text{Minimize } F_6(x) = \text{Time to Market}(x) \quad (G6)$$
$$\text{Maximize } F_7(x) = \text{Team Utilization}(x) \quad (G7)$$
$$\text{Minimize } F_8(x) = \text{Budget Overrun}(x) \quad (G8)$$
$$\text{Maximize } F_9(x) = \text{Customer Satisfaction}(x) \quad (G9)$$
$$\text{Minimize } F_{10}(x) = \text{Backlog Ageing}(x) \quad (G10)$$
$$\text{Maximize } F_{11}(x) = \text{Release Frequency}(x) \quad (G11)$$
$$\text{Minimize } F_{12}(x) = \text{Technical Debt}(x) \quad (G12)$$

## Constraints

$$\text{(C1) Budget Compliance: } g_1(x) \geq 1$$
$$\text{(C2) Skill Coverage: } g_2(x) \geq 1$$
$$\text{(C3) Sprint Predictability: } g_3(x) \geq \alpha_3$$
$$\text{(C4) Team Satisfaction: } g_4(x) \geq \alpha_4$$
$$\text{(C5) Stakeholder Participation: } g_5(x) \geq 1$$
$$\text{(C6) Defect Leakage: } g_6(x) \leq \beta_6$$
$$\text{(C7) Backlog Freshness: } g_7(x) \geq \alpha_7$$
$$\text{(C8) Technical Debt Ratio: } g_8(x) \leq \beta_8$$
$$\text{(C9) Compliance Status: } g_9(x) \geq 1$$
$$\text{(C10) Risk Level: } g_{10}(x) \leq 0$$
$$\text{(C11) Timezone Overlap: } g_{11}(x) \geq \alpha_{11}$$
$$\text{(C12) Communication Delay: } g_{12}(x) \leq \beta_{12}$$

## Variable Bounds

$$7 \leq x_1 \leq 30$$
$$3 \leq x_2 \leq 10$$
$$10{,}000 \leq x_3 \leq 1{,}000{,}000$$
$$20 \leq x_4 \leq 100$$
$$1 \leq x_5 \leq 10$$
$$1 \leq x_6 \leq 20$$
$$1 \leq x_7 \leq 200$$
$$1 \leq x_8 \leq 5$$
$$5 \leq x_9 \leq 60$$
$$15 \leq x_{10} \leq 240$$
$$0 \leq x_{11} \leq 20$$
$$0.1 \leq x_{12} \leq 4$$