

# Adoption of Innovation by Healthcare Organization Prerequisites Scale (AIHOPS)

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2024

## Introduction

This document presents the Adoption of Innovation by Healthcare Organization Prerequisites Scale (AIHOPS). The scale calculates a score based on various factors specified by the user to evaluate the readiness of a healthcare organization to adopt an innovation.

## AIHOPS Score Calculation

### Variables and Definitions

- $A$ : The set of all assessors, where  $|A| = m$  (the total number of assessors).
- $F$ : The set of all factors being assessed, where  $|F| = n$  (the total number of factors).
- $s_{a,f}$ : The score given by assessor  $a \in A$  to factor  $f \in F$ , where  $s_{a,f} \in \{0, 1, 2, 3, 4\}$ .
- $S_a$ : The overall score assigned by assessor  $a$ .
- $P_i$ : Probability (in decimal form) assigned by an assessor to damage severity level  $i$ , where  $P_i \geq 0$  and  $\sum_{i=1}^5 P_i = 1$ .
- $sf_i$ : Severity factor corresponding to damage severity level  $i$ .
- $d_{\text{assessor}}$ :  $d$  score assigned by an assessor, calculated using the severity factors and probabilities.
- $d$ : Overall  $d$  value, the average of all assessors'  $d_{\text{assessor}}$  scores.
- **AIHOPS Score**: The calculated score ranging from 0 to 1, indicating the likelihood of successful innovation adoption.

### Calculation Steps

#### Step 1: Calculate Each Assessor's Overall Score $S_a$

For each assessor  $a \in A$ :

##### 1. Zero Score Check:

- If any  $s_{a,f} = 0$  for any  $f \in F$ , then:

$$S_a = 0$$

##### 2. Average Score Calculation:

- If all  $s_{a,f} > 0$ , then:

$$S_a = \frac{1}{n} \sum_{f \in F} s_{a,f}$$

**Step 2: Calculate the AIHOPS Score Numerator**

$$N = \sum_{a \in A} S_a$$

**Step 3: Calculate the AIHOPS Score Denominator**

The denominator  $D$  represents the maximum possible total score across all assessors:

$$D = S_{\max} \times m$$

Where  $S_{\max}$  is the maximum possible  $S_a$  score, which is 4 (since the maximum score per factor is 4, and the average of maximum scores is 4).

**Step 4: Calculate the  $d$  Value**

**Severity Factors  $sf_i$**

Damage Severity Level		Severity Factor $sf_i$
No to Negligible Damage	(Level 1)	0.5
Minor Damage	(Level 2)	1
Manageable Damage	(Level 3)	25
Severe Damage	(Level 4)	100
Catastrophic Damage	(Level 5)	400

**Calculation Steps for Each Assessor**

For each assessor  $a \in A$ :

**1. Assign Probabilities:**

- Assign probabilities  $P_i$  (in decimal form) to each damage severity level  $i$ , ensuring:

$$P_i \geq 0 \quad \text{and} \quad \sum_{i=1}^5 P_i = 1$$

**2. Compute  $d_{\text{assessor}}$ :**

$$d_{\text{assessor}} = \sum_{i=1}^5 (P_i \times sf_i)$$

**3. Calculate the Overall  $d$  Value:**

$$d = \frac{1}{m} \sum_{a=1}^m d_{\text{assessor}}$$

**Step 5: Calculate the AIHOPS Score**

$$\text{AIHOPS Score} = \left( \frac{N}{D} \right)^d$$

**Explanation of Denominator  $D$** 

The denominator  $D$  is calculated as:

$$D = S_{\max} \times m$$

Where:

- $S_{\max} = 4$  is the maximum possible average score per assessor (since the maximum score per factor is 4, and the average of maximum scores across  $n$  factors is also 4).
- $m$  is the total number of assessors.

This ensures that  $\frac{N}{D}$  represents the proportion of the maximum possible total score achieved by all assessors.

## Example Calculation

Assuming there are  $m = 2$  assessors and  $n = 3$  factors.

### Assessors' Factor Scores and $S_a$

**Assessor A:**

$$s_{A,1} = 2, \quad s_{A,2} = 3, \quad s_{A,3} = 4$$

No zeros, so:

$$S_A = \frac{1}{3}(2 + 3 + 4) = 3$$

**Assessor B:**

$$s_{B,1} = 4, \quad s_{B,2} = 4, \quad s_{B,3} = 4$$

No zeros, so:

$$S_B = \frac{1}{3}(4 + 4 + 4) = 4$$

### Calculate Numerator $N$ and Denominator $D$

$$N = S_A + S_B = 3 + 4 = 7$$

$$D = S_{\max} \times m = 4 \times 2 = 8$$

$$\frac{N}{D} = \frac{7}{8} = 0.875$$

### Assign Probabilities and Calculate $d$

**Severity Factors ( $sf_i$ )**

Damage Severity Level		Severity Factor $sf_i$
No to Negligible Damage	(Level 1)	0.5
Minor Damage	(Level 2)	1
Manageable Damage	(Level 3)	25
Severe Damage	(Level 4)	100
Catastrophic Damage	(Level 5)	400

**Assessor A:**

Assign probabilities  $P_i$ :

$$P_1 = 0.8, \quad P_2 = 0.1, \quad P_3 = 0.1, \quad P_4 = 0, \quad P_5 = 0$$

Compute  $d_{\text{assessor}}$ :

$$\begin{aligned} d_{\text{assessor}} &= (0.8 \times 0.5) + (0.1 \times 1) + (0.1 \times 25) + (0 \times 100) + (0 \times 400) \\ &= 0.4 + 0.1 + 2.5 + 0 + 0 \\ &= 3 \end{aligned}$$

**Assessor B:**

Assign probabilities  $P_i$ :

$$P_1 = 0.6, \quad P_2 = 0.3, \quad P_3 = 0.1, \quad P_4 = 0, \quad P_5 = 0$$

Compute  $d_{\text{assessor}}$ :

$$\begin{aligned}
d_{\text{assessor}} &= (0.6 \times 0.5) + (0.3 \times 1) + (0.1 \times 25) + (0 \times 100) + (0 \times 400) \\
&= 0.3 + 0.3 + 2.5 + 0 + 0 \\
&= 3.1
\end{aligned}$$

**Calculate Overall  $d$  Value**

$$d = \frac{d_{\text{Assessor A}} + d_{\text{Assessor B}}}{2} = \frac{3 + 3.1}{2} = 3.05$$

**Calculate AIHOPS Score**

$$\text{AIHOPS Score} = \left(\frac{7}{8}\right)^{3.05}$$

Calculating the exponentiation:

$$\begin{aligned}
\left(\frac{7}{8}\right)^{3.05} &\approx 0.875^{3.05} \\
&= e^{3.05 \times \ln(0.875)} \\
&= e^{3.05 \times (-0.1335)} \\
&= e^{-0.4072} \\
&\approx 0.6659
\end{aligned}$$

**AIHOPS Score  $\approx 0.666$**

## Interpretation

An AIHOPS Score of approximately 0.666 indicates a moderate likelihood of successful innovation adoption, considering the scores and risk assessments provided by the assessors.