15 Mediation Model

A research team sought to estimate the model $E(Y) = \beta_0 + \beta_1 x + \beta_2 w$. The variable Y was the measure of the task proficiency of an employee observed 4 years after training; the variable w was the measure of the employee's productivity observed 2 years after training; and the variable x was the measure of the task proficiency of an employee observed immediately after training. They observed values of y, x, w on $n = 283$ employees. They found that the standard deviation of Y, where the variance estimator used division by $n - 1$, was 33.2; the standard deviation of x was 35.2; and the standard deviation of w was 29.4. The correlation between Y and w was 0.59; the correlation between Y and x was 0.40; and the correlation between x and w was 0.71.

1. Compute the partial correlation coefficient $r_{Yx \cdot w}$.
2. Compute the partial correlation coefficient $r_{Yw \cdot x}$.
3. Which of the following is the best causal model for this data?
   a. Explanation model.
   b. Mediation model.
   c. Neither a nor b.

1. $r_{yx \cdot w} = \dfrac{r_{yx} - r_{yw} r_{xw}}{\sqrt{(1 - r_{yw}^2)(1 - r_{xw}^2)}}$

$= \dfrac{0.40 - (0.59)(0.71)}{\sqrt{(1-.59^2)(1-.71^2)}} = \dfrac{-0.0189}{\sqrt{(0.6591)(0.4959)}}$

$= \dfrac{-.0189}{\sqrt{0.32685}} = \dfrac{-0.0189}{0.57171} = -0.0331$

THE APPROXIMATE STANDARD ERROR OF $r_{yx \cdot w}$ IS $\sqrt{\frac{1}{n-3}} = \sqrt{\frac{1}{280}} = 0.0598$;

$r_{yx \cdot w}$ IS WITHIN 1 SE OF 0 AND

HENCE W IS THE KEY VARIABLE IN

THIS PROBLEM.

2. $r_{yw.x} = \dfrac{r_{yw} - r_{yx} r_{wx}}{\sqrt{(1 - r_{yx}^2)(1 - r_{wx}^2)}}$

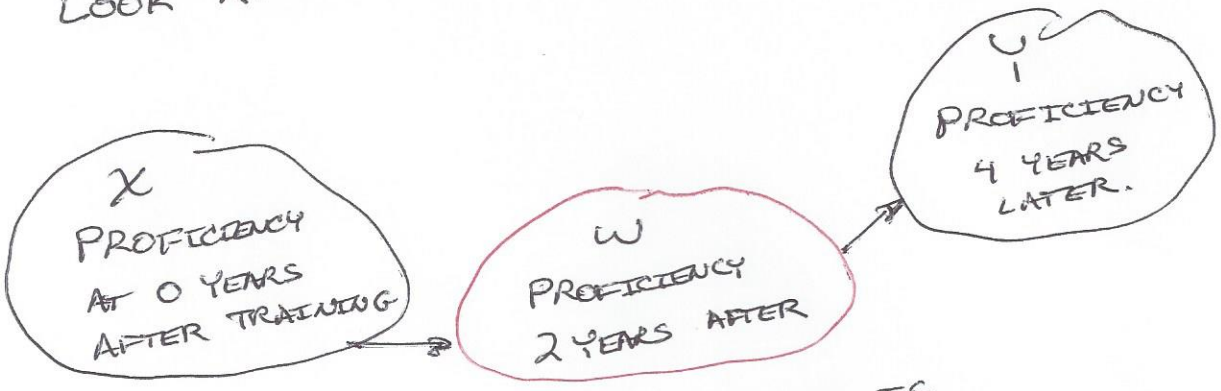
$= \dfrac{0.59 - (0.40)(0.71)}{\sqrt{(1-(0.40)^2)(1-(0.71)^2)}} = \dfrac{0.306}{\sqrt{(0.84)(0.4959)}}$

$= \dfrac{0.306}{\sqrt{0.41650}} = \dfrac{0.306}{0.64541} = 0.4741$

$r_{yw.x}$ IS CLEARLY NOT 0.

X IS NOT THE KEY VARIABLE

3. LOOK AT TIME ORDER OF VARIABLES.



KEY VARIABLE IS W, WHICH IS INTERMEDIATE BETWEEN X AND Y.

HENCE MEDIATION MODEL.