

# Mathematical Summary of Structural Equation Modeling

## I. Eight Matrices

### A. Error terms

1. Theta  $\Theta$   
-Delta & Epsilon

2. Psi  $\Psi$

### B. Factor Loadings

3. Lamda  $\Lambda$   
- x and y

### C. Latent Variables

4. Kxi  $\xi$

5. Eta  $\eta$

### D. Structural Coefficients

6. Phi  $\Phi$

7. Beta  $B$

8. Gamma  $\Gamma$

## II. Three Sub-models

### A. Measurement models

1. Sub-model 1 (x variables)

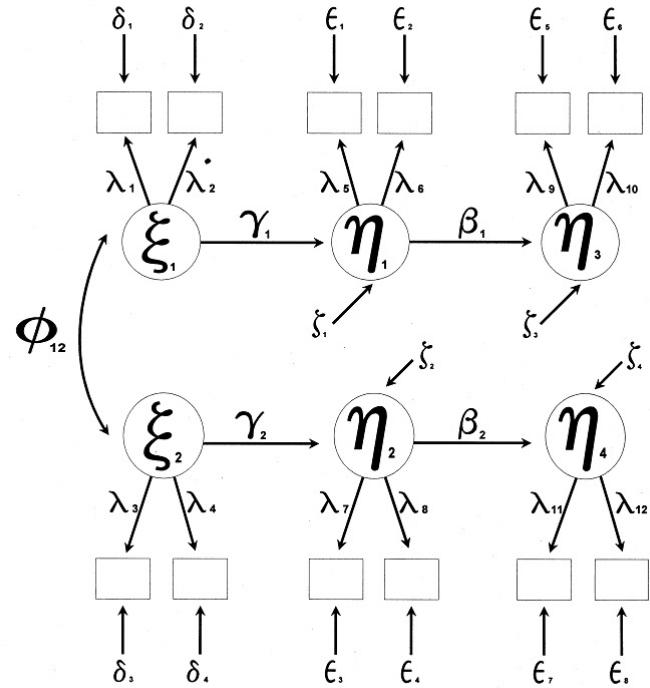


Diagram illustrating the measurement model:

$$\underline{x} = \underline{\Lambda}_x \underline{\xi} + \underline{\delta}$$

where:

- $\underline{x}$  is a vector of observed exogenous indicators.
- $\underline{\Lambda}_x$  is a matrix of structural coefficients.
- $\underline{\xi}$  is the vector of exogenous concepts.
- $\underline{\delta}$  is a vector of errors.

Matrix representation:

$$\begin{bmatrix} x_1 \\ \vdots \\ x_q \end{bmatrix} = \begin{bmatrix} \cdots & \cdots & \cdots \\ - & - & - \\ \cdots & \cdots & - \end{bmatrix} \begin{bmatrix} \xi_1 \\ \vdots \\ \xi_n \end{bmatrix} + \begin{bmatrix} \delta_1 \\ \vdots \\ \delta_p \end{bmatrix}$$

Notes:

- a vector of observed exogenous indicators
- a matrix of structural coefficients
- the vector of exogenous concepts
- a vector of "errors" in the measurement model. The covariances among these errors constitute  $\Phi_\delta$