

## EDMS 722

### Assignment 1: Measured Variable Path Analysis (Standardized)

**Grading:** This assignment is worth a total of 34 points.

**Format:** Neatly handwritten work is acceptable. Show all work and explain answers where required. This assignment does not require the use of a computer.

**Due date:** This is due at the start of our next class. Work should be submitted on time for full earned credit. Late work will be accepted for full earned credit if and only if special arrangements are made with me prior to the due date; otherwise 5% of the total points possible will be deducted for each day the assignment is late.

In the article by Howard & Maxwell (1982), some path analysis is performed. Using their very first figure at the top of page 180 (Satisfaction #37 at Time 1), and the correlation matrix below, answer the following questions.

	P	M	G	S
P	1			
M	.108	1		
G	.078	.167	1	
S	.327	.403	.319	1

1. Draw out a complete path diagram with boxes and arrows, labeling the paths as shown below. **(3 points)**

path M → P labeled as:	p <sub>PM</sub>
path M → S labeled as:	p <sub>SM</sub>
path M → G labeled as:	p <sub>GM</sub>
path P → G labeled as:	p <sub>GP</sub>
path P → S labeled as:	p <sub>SP</sub>
path G → S labeled as:	p <sub>SG</sub>
  
2. As defined in class, which are independent variable(s) and which are dependent variable(s)? **(2 points)**
  
3. Attach errors to the dependent variable(s) in your diagram. **(1 point)**
  
4. Following Wright's rules, generate all algebraic quantities (using the symbols p<sub>PM</sub>, p<sub>SM</sub>, p<sub>GM</sub>, p<sub>GP</sub>, p<sub>SP</sub>, p<sub>SG</sub>; not numbers) for the direct effects, indirect effects, total effects, nonstructural relations, and total correlations of all paths, and put in the observed numerical values of the correlations to the right. Be sure to get all the paths. (Some paths are tricky. Note that proceeding along two or more backward arrows in sequence, as long as not preceded by a forward arrow, is "legal.") Complete a diagram in a format like that on the next page (only bigger; you'll need room): **(12 points)**

pair	direct effect	indirect effect	total effect	nonstructural relations	total correlation	observed correlation
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M, P

M, S

M, G

P, G

P, S

G, S

5. Write out the equations that need to be solved in order to determine the path coefficients. (Only if you're feeling a fit of masochism should you try to solve them.) **(2 points)**
6. Does this path model appear globally under-identified, just-identified, or over-identified. Explain. **(2 points)**
7. The path coefficients have obviously been solved for by the authors and appear on their original diagram. Show that these values satisfy all of your equations from question 5. (If they don't, you made an error and you should re-do question 5.) **(3 points)**
8. Re-do the diagram from Question 4 by computing the appropriate numerical values of the direct, indirect, and total effects. You may check some of your answers in the top half of the authors' Table 2 on page 182. **(6 points)**
9. Compute the  $R^2$  values and the path coefficient(s) for the error term(s) from question 3. (Note: One of them is not nearly as much fun as the others.) **(3 points)**