

Data Mining with IBM SPSS AMOS 20.0 (IBM: Statistical Package for Social Sciences AMOS 20)

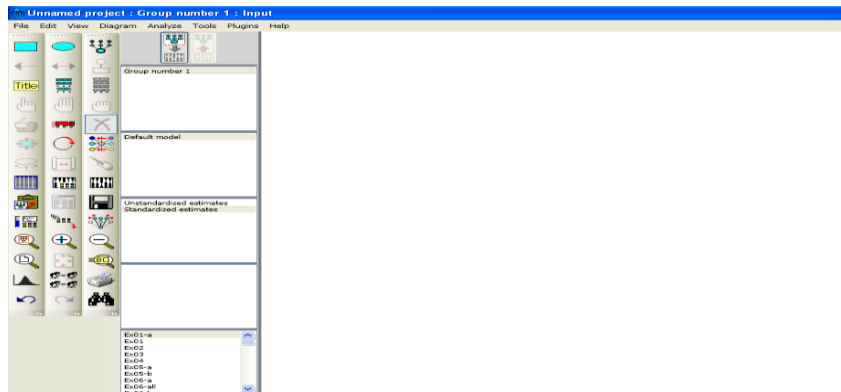
Case Study

This is a simple regression model where a SEM has been used to predict performance determined by Knowledge, Value and Satisfaction. A total of 98 responses were collected from the survey. The data set used in this analysis is downloaded from the website in the format as a working file *Warren9v.wk1* (containing the sample variances and co-variances of these subtests).

Variable name Description

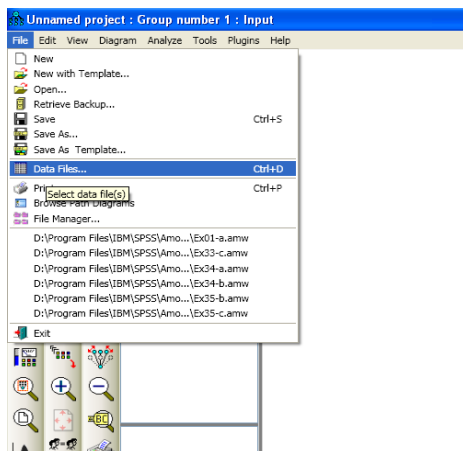
<i>1performance</i> 12-item subtest of Role Performance	<i>2performance</i> 12-item subtest of Role Performance
<i>1knowledge</i> 13-item subtest of Knowledge	<i>2knowledge</i> 13-item subtest of Knowledge
<i>1value</i> 15-item subtest of Value Orientation	<i>2value</i> 15-item subtest of Value Orientation
<i>1satisfaction</i> 5-item subtest of Role Satisfaction	<i>2satisfaction</i> 6-item subtest of Role Satisfaction

Click on IBM SPSS AMOS 20.0
Select Amos Graphics
OK



Specifying the Data File

- From the menus, choose File → Working Files.
- In the Data Files dialog box, click File Name.
- Browse to the required file, click OK.



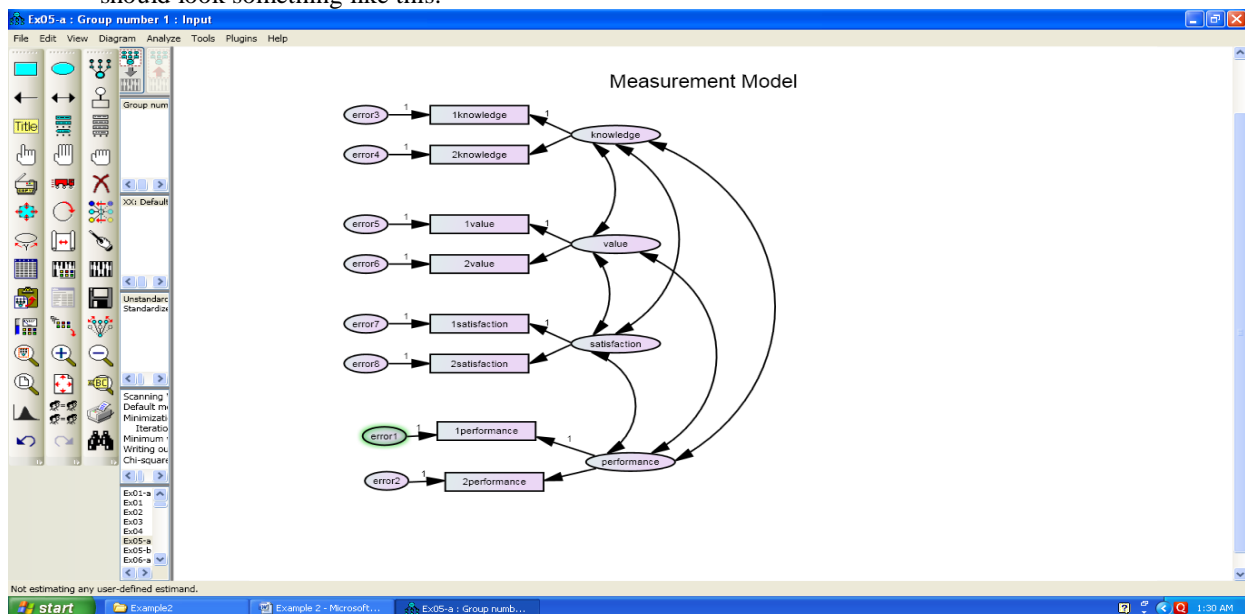
rowtype	varname	1performance	2performance	1knowledge	2knowledge	1value	2value	1satisfaction	2satisfaction	past_training
n		98	98	98	98	98	98	98	98	98
cov	1performance	0.0271								
cov	2performance	0.0172	0.0222							
cov	1knowledge	0.0219	0.0193	0.0676						
cov	2knowledge	0.0164	0.013	0.0217	0.0568					
cov	1value	0.0264	0.0294	0.0303	0.0151	0.1026				
cov	2value	0.0217	0.0185	0.0266	0.023	0.074	0.1473			
cov	1satisfaction	0.0083	0.0011	-0.001	0.0055	-0.0087	0.0089	0.1137		
cov	2satisfaction	0.0074	0.0015	0.0035	0.0089	-0.0007	-0.0088	0.0722	0.1024	
cov	past_training	0.018	0.0194	0.0203	0.0192	0.0563	0.0142	-0.0056	-0.0077	0.0946
mean		0.0646	0.0542	1.4333	1.3259	2.9404	2.9143	2.4514	2.4711	2.1174

Specifying the Model and Variables (Measurement Model)

- The next step is to draw the variables in your model. First, you'll draw three rectangles to represent the observed variables, and then you'll draw an ellipse to represent the unobserved variable.
- From the menus, choose Diagram → Draw Observed.
- In the drawing area, move your mouse pointer to where you want the Education rectangle to appear. Click and drag to draw the rectangle. Don't worry about the exact size or placement of the rectangle because you can change it later.
- Use the same method to draw two more rectangles for Income and SAT.
- In the drawing area, move your mouse pointer to the right of the three rectangles and click and drag to draw the ellipse.
- The model in your drawing area should now look similar to the following:

Naming the Variables and drawing arrows

- From the menu, select view-variables in the data set
- From the variable list drag the corresponding variables to the rectangles
- Draw an eclipse for the residual term and to name the variable double click the eclipse an object properties dialog box will be opened. Name the variable.
- Click the Parameters tab.
- In the Regression weight text box, type 1.
- Close the Object Properties dialog box.
- Now you will add arrows to the path diagram, using the following model as your guide:
- From the menus, choose Diagram → Draw Path.
- Click and drag to draw an arrow between Education and SAT.
- Use this method to add each of the remaining single-headed arrows.
- From the menus, choose Diagram → Draw Co-variances.
- Click and drag to draw a double-headed arrow between Income and Education. Don't worry about the curve of the arrow because you can adjust it later.
- Your path diagram is now complete, other than any changes you may wish to make to its appearance. It should look something like this:



Setting up Optional Output

- Some of the output in Amos is optional. In this step, you will choose which portions of the optional output you want Amos to display after the analysis.
- From the menus, choose View → Analysis Properties. (For measurement model do not click estimate mean and intercept)
- Click the Output tab.
- Select the correlation, covariance and factor loading matrix.

Performing the Analysis

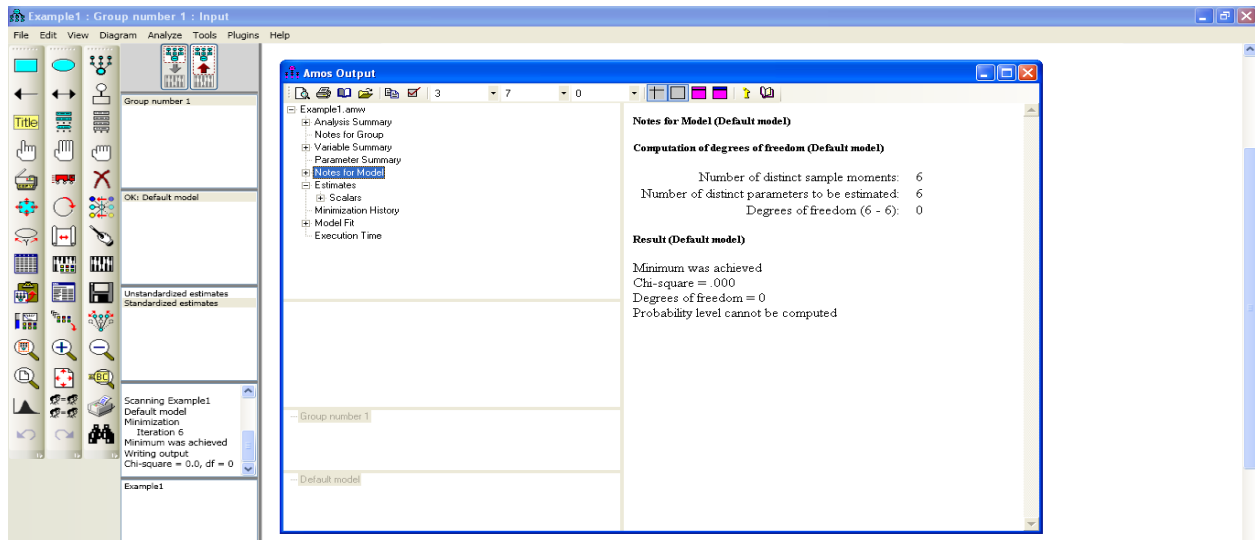
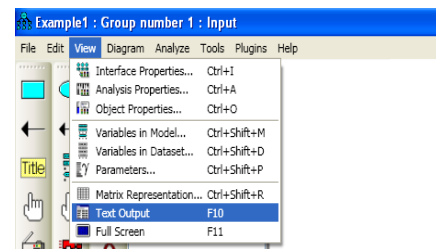
- The only thing left to do is perform the calculations for fitting the model. Note that in order to keep the parameter estimates up to date, you must do this every time you change the model, the data, or the options in the Analysis Properties dialog box.
- From the menus, click Analyze → Calculate Estimates.

Viewing Output

- When Amos has completed the calculations, you have two options for viewing the output: text and graphics.

To View Text Output

- From the menus, choose View → Text Output.
- The tree diagram in the upper left pane of the Amos Output window allows you to choose a portion of the text output for viewing.
- Click Estimates to view the parameter estimates.



Scalar Estimates (Group number 1 - Default model)

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P	Label
2satisfaction <--- satisfaction	.792	.438	1.806	.071	par_1
1satisfaction <--- satisfaction	1.000				
2value <--- value	.763	.185	4.128	***	par_2
1value <--- value	1.000				
2knowledge <--- knowledge	.683	.161	4.252	***	par_3
1knowledge <--- knowledge	1.000				
1performance <--- performance	1.000				
2performance <--- performance	.867	.116	7.450	***	par_9

Covariances: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P	Label
value <--> knowledge	.037	.012	3.036	.002	par_4
satisfaction <--> value	-.008	.013	-.610	.542	par_5
satisfaction <--> knowledge	.004	.009	.462	.644	par_6
knowledge <--> performance	.022	.005	4.210	***	par_7
value <--> performance	.030	.007	3.969	***	par_8
satisfaction <--> performance	.005	.005	1.050	.294	par_10

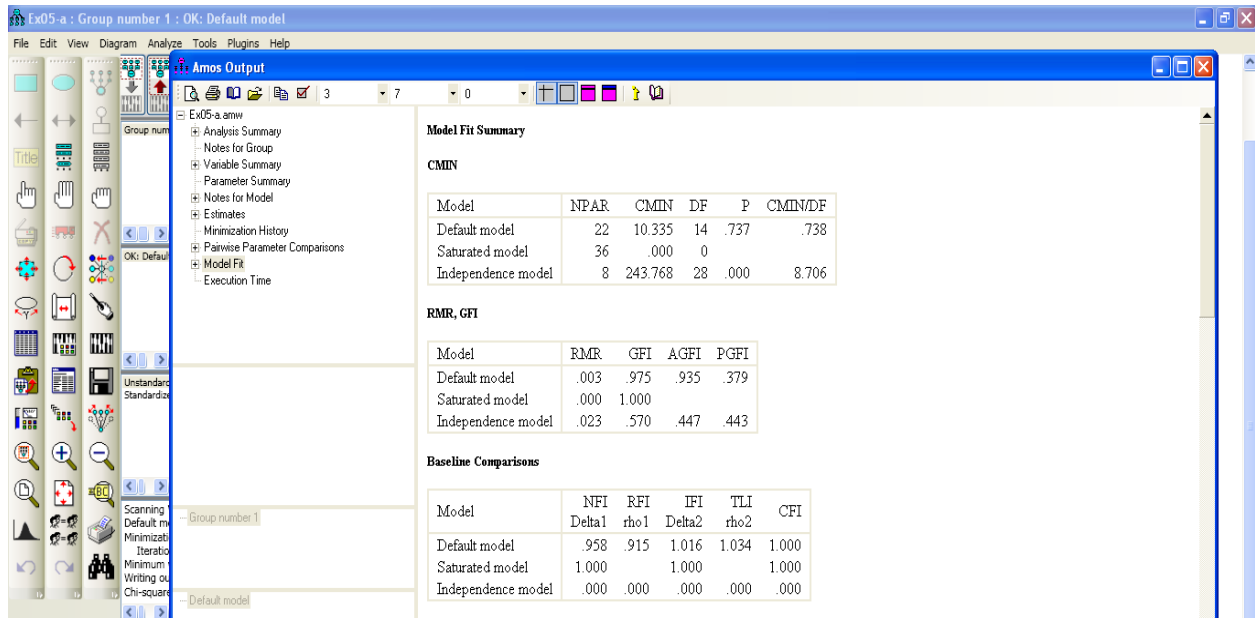
Variances: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P	Label
satisfaction	.090	.052	1.745	.081	par_11
value	.100	.032	3.147	.002	par_12
knowledge	.046	.015	3.138	.002	par_13
performance	.020	.004	4.626	***	par_14
error3	.041	.011	3.611	***	par_15
error4	.035	.007	5.167	***	par_16
error5	.080	.025	3.249	.001	par_17
error6	.087	.018	4.891	***	par_18
error7	.022	.049	.451	.652	par_19
error8	.045	.032	1.420	.156	par_20
error1	.007	.002	3.110	.002	par_21
error2	.007	.002	3.871	***	par_22

Factor Score Weights (Group number 1 - Default model)

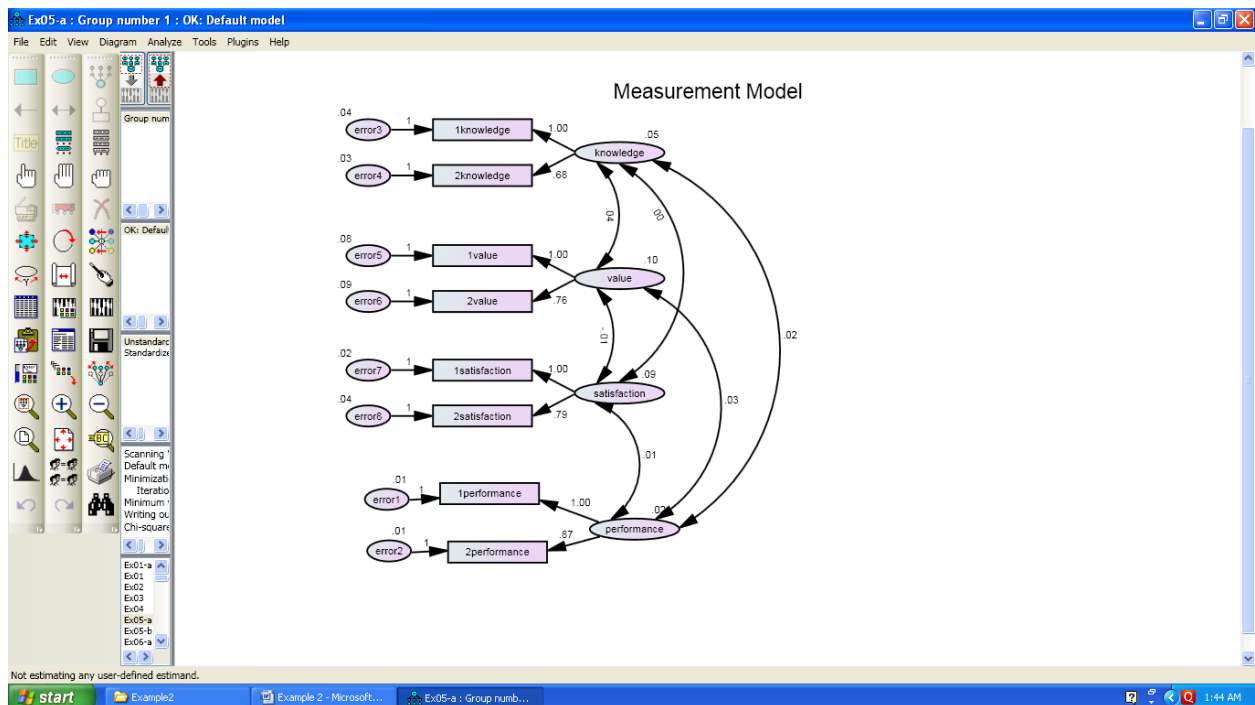
	2performance	1performance	2satisfaction	1satisfaction	2value	1value	2knowledge	1knowledge
performance	.350	.406	.005	.012	.019	.027	.035	.044
knowledge	.214	.248	.000	.001	.019	.027	.249	.311
value	.256	.297	-.019	-.049	.244	.348	.042	.053
satisfaction	.031	.036	.251	.638	-.010	-.014	.000	.000

LOADINGS	2Perf	1Perf	2Sat	1sat	2val	1val	2know	1know	Add & Sq	CR	AVE
Performance	0.35	0.406							0.5715	0.9997	0.9993
Knowledge							0.249	0.311	0.3136	0.9819	0.9649
Value					0.244	0.348			0.3505	0.9263	0.8663
Satisfaction			0.251	0.638					0.7903	0.9944	0.9905
ERRORS											
Performance	0.007	0.007							0.0002		
Knowledge							0.041	0.035	0.0058		
Value					0.08	0.087			0.0279		
Satisfaction			0.022	0.045					0.0045		

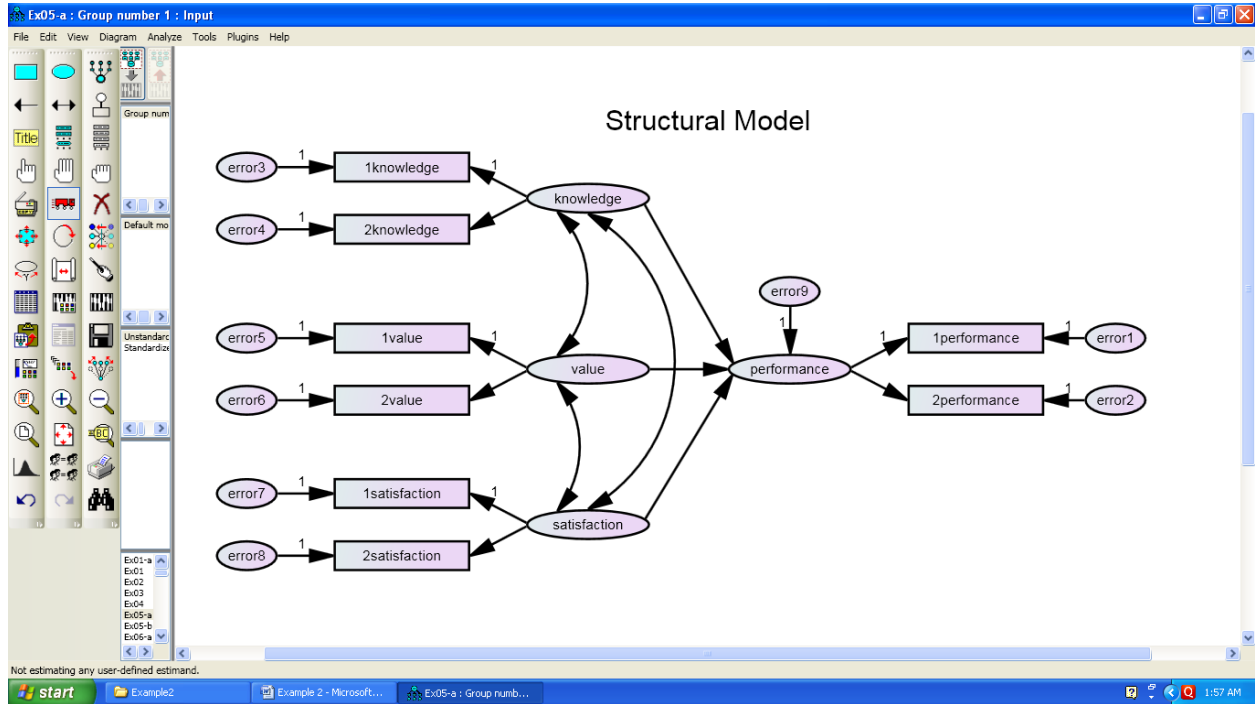


To View Graphics Output

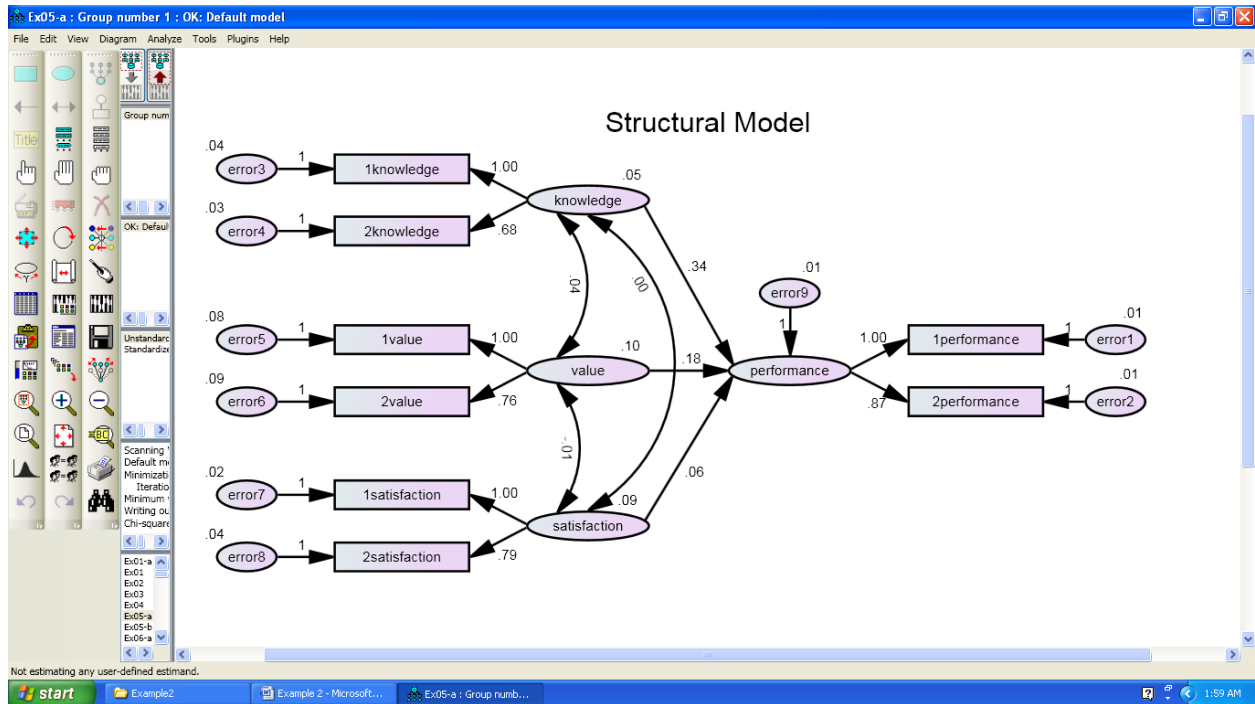
- Click the Show the output path diagram button.
- In the Parameter Formats pane to the left of the drawing area, click *Standardized estimates*.
- Your path diagram now looks like this:



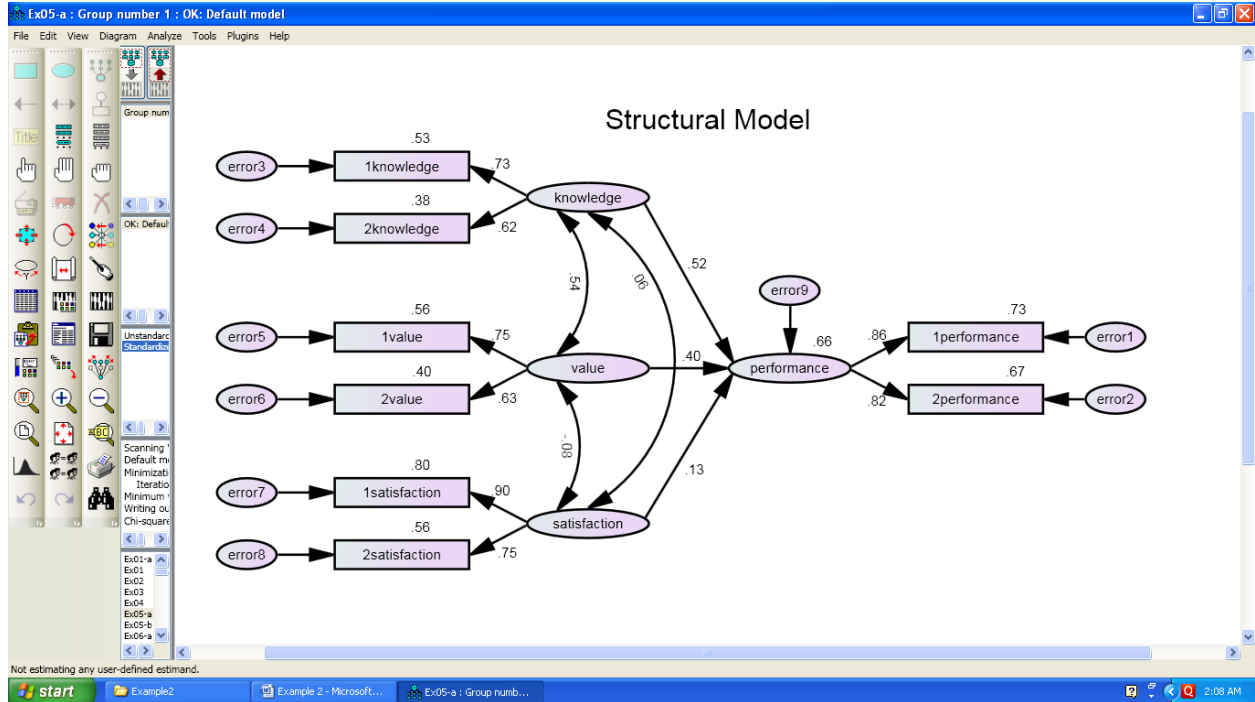
Specifying the Model and Drawing Variables (Structural Model)



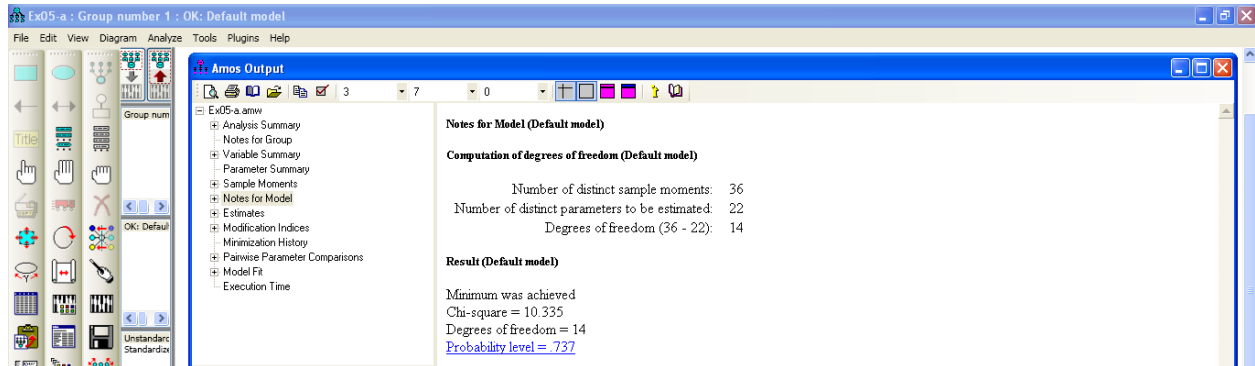
Graphics Output (Unstandardized estimates)



Standardized estimates

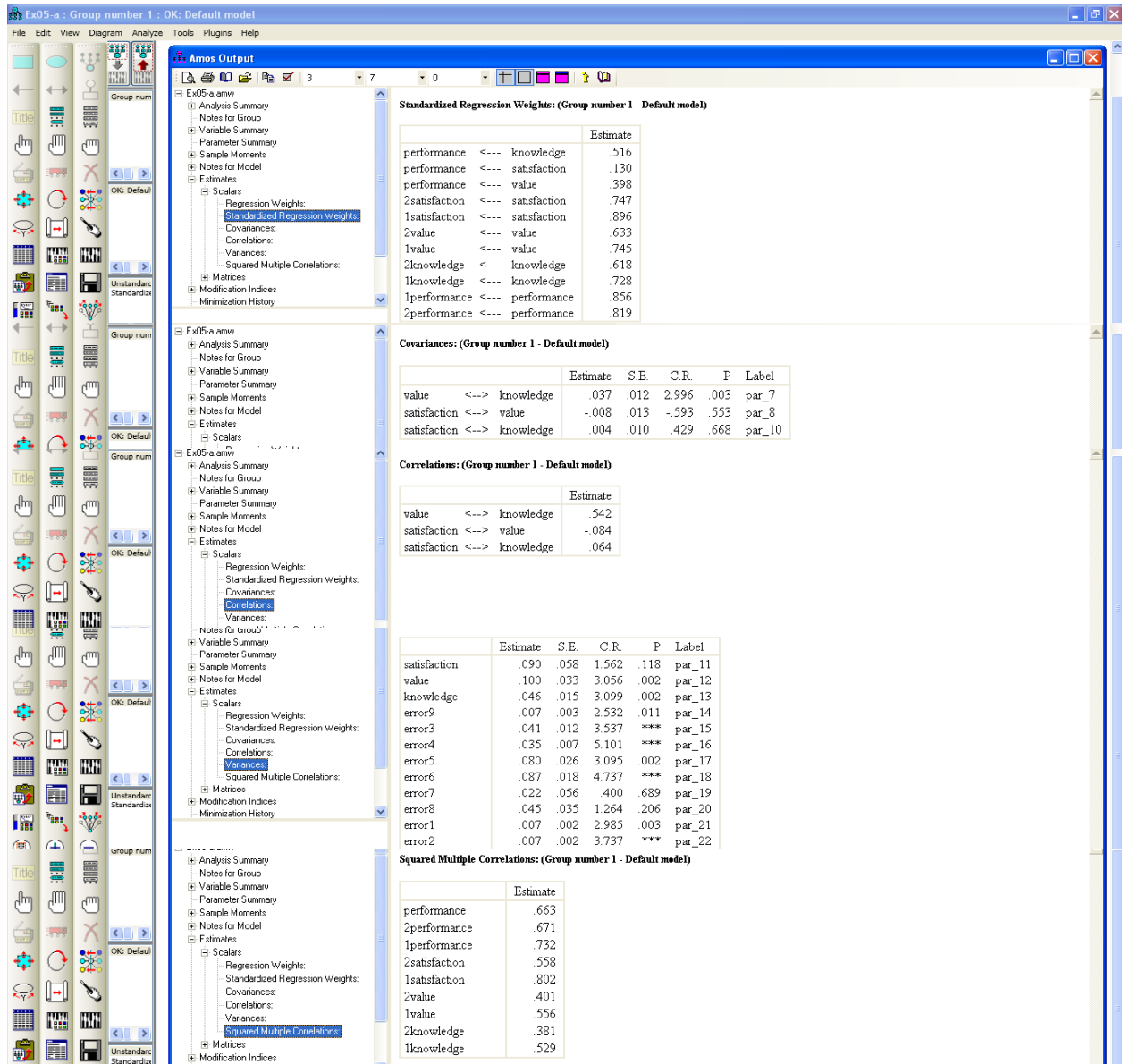


Text Output



Regression Weights: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P	Label
performance <--- knowledge	.337	.129	2.608	.009	par_4
performance <--- satisfaction	.061	.053	1.156	.248	par_5
performance <--- value	.176	.076	2.316	.021	par_6
2satisfaction <--- satisfaction	.792	.493	1.606	.108	par_1
1satisfaction <--- satisfaction	1.000				
2value <--- value	.763	.194	3.927	***	par_2
1value <--- value	1.000				
2knowledge <--- knowledge	.683	.164	4.157	***	par_3
1knowledge <--- knowledge	1.000				
1performance <--- performance	1.000				
2performance <--- performance	.867	.120	7.219	***	par_9



Implied (for all variables) Co-variances

	knowledge	value	satisfaction	Perf.	2Perf.	1Perf.	2Satis	1Satis	2value	1value	2Know	1Know
knowledge	.046											
value	.037	.100										
satisfaction	.004	-.008	.090									
performance	.022	.030	.005	.020								
2performance	.019	.026	.005	.017	.022							
1performance	.022	.030	.005	.020	.017	.027						
2satisfaction	.003	-.006	.071	.004	.004	.004	.101					
1satisfaction	.004	-.008	.090	.005	.005	.005	.071	.113				
2value	.028	.077	-.006	.023	.020	.023	-.005	-.006	.146			
1value	.037	.100	-.008	.030	.026	.030	-.006	-.008	.077	.181		
2knowledge	.031	.025	.003	.015	.013	.015	.002	.003	.019	.025	.056	
1knowledge	.046	.037	.004	.022	.019	.022	.003	.004	.028	.037	.031	.087

Implied (for all variables) Correlations (Group number 1 - Default model)

	knowledge	value	satisfaction	Perf.	2Perf.	1Perf.	2Satis	1Satis	2value	1value	2Know	1Kn
knowledge	1.000											
value	.542	1.00										
satisfaction	.064	-.084	1.00									
performance	.739	.666	.130	1.00								
2performance	.606	.546	.107	.819	1.00							
1performance	.633	.570	.111	.856	.701	1.00						
2satisfaction	.048	-.063	.747	.097	.080	.083	1.00					
1satisfaction	.058	-.075	.896	.116	.095	.100	.669	1.00				
2value	.343	.633	-.053	.422	.345	.361	-.040	-.048	1.00			
1value	.404	.745	-.063	.496	.407	.425	-.047	-.056	.472	1.00		
2knowledge	.618	.335	.040	.457	.374	.391	.030	.036	.212	.249	1.00	
1knowledge	.728	.394	.047	.538	.441	.460	.035	.042	.250	.294	.449	1.00

Implied Co-variances (Group number 1 - Default model)

	2performance	1performance	2satisfaction	1satisfaction	2value	1value	2knowledge	1knowledge
2performance	.022							
1performance	.017	.027						
2satisfaction	.004	.004	.101					
1satisfaction	.005	.005	.071	.113				
2value	.020	.023	-.005	-.006	.146			
1value	.026	.030	-.006	-.008	.077	.181		
2knowledge	.013	.015	.002	.003	.019	.025	.056	
1knowledge	.019	.022	.003	.004	.028	.037	.031	.087

Implied Correlations (Group number 1 - Default model)

	2performance	1performance	2satisfaction	1satisfaction	2value	1value	2knowledge	1knowledge
2performance	1.000							
1performance	.701	1.000						
2satisfaction	.080	.083	1.000					
1satisfaction	.095	.100	.669	1.000				
2value	.345	.361	-.040	-.048	1.000			
1value	.407	.425	-.047	-.056	.472	1.000		
2knowledge	.374	.391	.030	.036	.212	.249	1.000	
1knowledge	.441	.460	.035	.042	.250	.294	.449	1.000

Residual Co-variances (Group number 1 - Default model)

	2performance	1performance	2satisfaction	1satisfaction	2value	1value	2knowledge	1knowledge
2performance	.000							
1performance	.000	.000						
2satisfaction	-.002	.003	.000					
1satisfaction	-.004	.003	.000	.000				
2value	-.001	-.001	-.004	-.001	.000			
1value	.003	-.001	.006	-.001	.000	.000		
2knowledge	.000	.001	.007	.003	.004	-.010	.000	
1knowledge	.000	-.001	.000	-.004	.007	.001	.000	.000

Standardized Residual Co-variances (Group number 1 - Default model)

	2performance	1performance	2satisfaction	1satisfaction	2value	1value	2knowledge	1knowledge
2performance	.000							
1performance	.000	.000						
2satisfaction	-.472	.563	.000					
1satisfaction	-.721	.489	.000	.000				
2value	-.204	-.161	-.315	-.057	.000			
1value	.502	-.192	.409	-.043	.000	.000		
2knowledge	-.075	.249	.857	.323	.382	-.967	.000	
1knowledge	-.029	-.098	.019	-.422	.610	.085	.000	.000

Factor Score Weights (Group number 1 - Default model)

	2performance	1performance	2satisfaction	1satisfaction	2value	1value	2knowledge	1knowledge
knowledge	.214	.248	.000	.001	.019	.027	.249	.311
value	.256	.297	-.019	-.049	.244	.348	.042	.053
satisfaction	.031	.036	.251	.638	-.010	-.014	.000	.000
performance	.350	.406	.005	.012	.019	.027	.035	.044

Total Effects (Group number 1 - Default model)

	knowledge	value	satisfaction	performance
performance	.337	.176	.061	.000
2performance	.292	.152	.053	.867
1performance	.337	.176	.061	1.000
2satisfaction	.000	.000	.792	.000
1satisfaction	.000	.000	1.000	.000
2value	.000	.763	.000	.000
1value	.000	1.000	.000	.000
2knowledge	.683	.000	.000	.000
1knowledge	1.000	.000	.000	.000

Standardized Total Effects (Group number 1 - Default model)

	knowledge	value	satisfaction	performance
performance	.516	.398	.130	.000
2performance	.423	.326	.107	.819
1performance	.441	.340	.111	.856
2satisfaction	.000	.000	.747	.000
1satisfaction	.000	.000	.896	.000
2value	.000	.633	.000	.000
1value	.000	.745	.000	.000
2knowledge	.618	.000	.000	.000
1knowledge	.728	.000	.000	.000

Direct Effects (Group number 1 - Default model)

	knowledge	value	satisfaction	performance
performance	.337	.176	.061	.000
2performance	.000	.000	.000	.867
1performance	.000	.000	.000	1.000
2satisfaction	.000	.000	.792	.000
1satisfaction	.000	.000	1.000	.000
2value	.000	.763	.000	.000
1value	.000	1.000	.000	.000
2knowledge	.683	.000	.000	.000
1knowledge	1.000	.000	.000	.000

Standardized Direct Effects (Group number 1 - Default model)

	knowledge	value	satisfaction	performance
performance	.516	.398	.130	.000
2performance	.000	.000	.000	.819
1performance	.000	.000	.000	.856
2satisfaction	.000	.000	.747	.000
1satisfaction	.000	.000	.896	.000
2value	.000	.633	.000	.000
1value	.000	.745	.000	.000
2knowledge	.618	.000	.000	.000
1knowledge	.728	.000	.000	.000

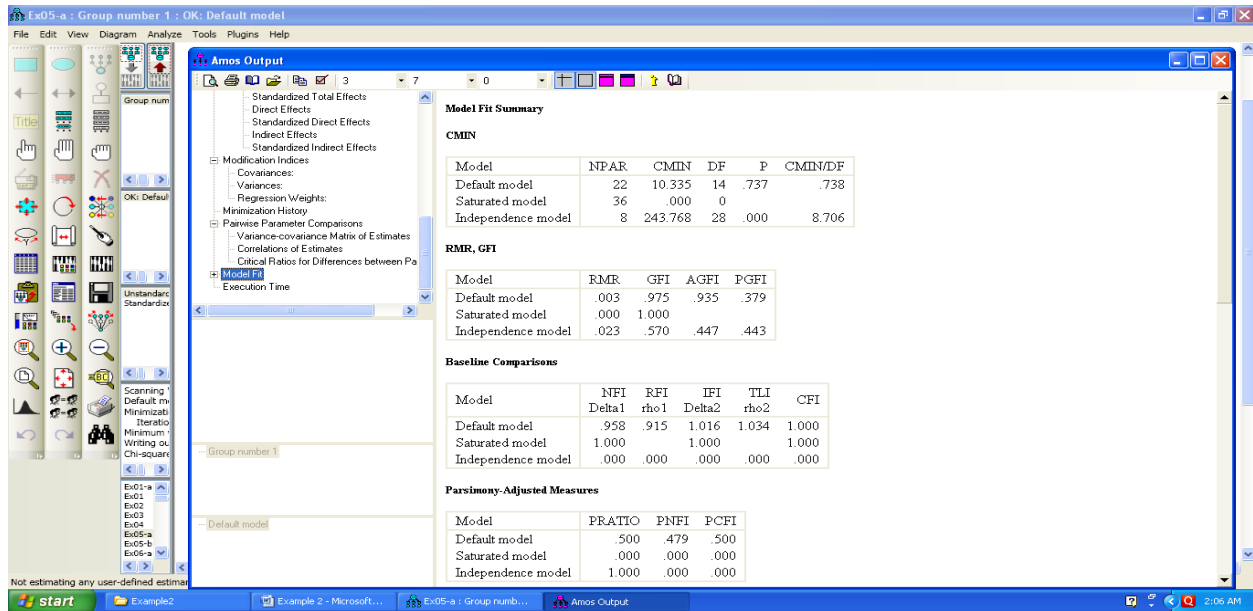
Indirect Effects (Group number 1 - Default model)

	knowledge	value	satisfaction	performance
performance	.000	.000	.000	.000
2performance	.292	.152	.053	.000
1performance	.337	.176	.061	.000
2satisfaction	.000	.000	.000	.000
1satisfaction	.000	.000	.000	.000
2value	.000	.000	.000	.000
1value	.000	.000	.000	.000
2knowledge	.000	.000	.000	.000
1knowledge	.000	.000	.000	.000

Standardized Indirect Effects (Group number 1 - Default model)

	knowledge	value	satisfaction	performance
performance	.000	.000	.000	.000
2performance	.423	.326	.107	.000
1performance	.441	.340	.111	.000
2satisfaction	.000	.000	.000	.000
1satisfaction	.000	.000	.000	.000
2value	.000	.000	.000	.000
1value	.000	.000	.000	.000
2knowledge	.000	.000	.000	.000
1knowledge	.000	.000	.000	.000

Model Fit



NPAR	CMIN	DF	P	CMIN/DF
8	243.768	28	.000	8.706
RMR	GFI	AGFI	PGFI	
.023	.570	.447	.443	
NFI	RFI	IFI	TLI	
Delta1	rho1	Delta2	rho2	CFI
.000	.000	.000	.000	.000

PRATIO	PNFI	PCFI	
1.000	.000	.000	
NCP	LO 90	HI 90	
215.768	169.584	269.424	
FMIN	F0	LO 90	HI 90
2.513	2.224	1.748	2.778
RMSEA	LO 90	HI 90	PCLOSE
.282	.250	.315	.000
AIC	BCC	BIC	CAIC
259.768	261.404	280.447	288.447
ECVI	LO 90	HI 90	MECVI
2.678	2.202	3.231	2.695
HOELTER	HOELTER		
.05	.01		
17	20		

Printing the Path Diagram

From the menus, choose File → Print.

- The Print dialog box appears.
- Click Print.

Copying the Path Diagram

- Amos Graphics lets you easily export your path diagram to other applications such as Microsoft Word.
- From the menus, choose Edit → Copy (to Clipboard).
- Switch to the other application and use the Paste function to insert the path diagram.