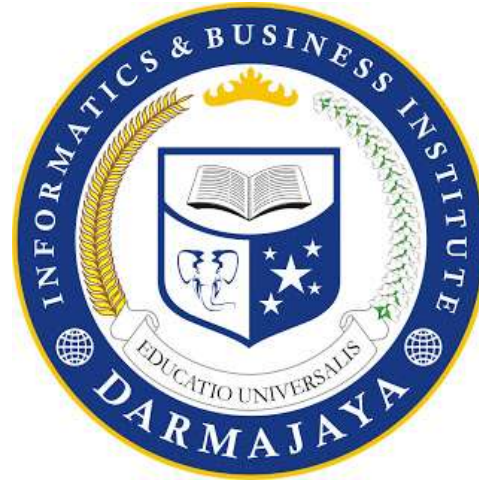


# Seri Pelatihan Metode Penelitian Introductory to SmartPLS



**FAKULTAS EKONOMI DAN BISNIS  
INSTITUT INFORMATIKA DAN BISNIS DARMAJAYA**

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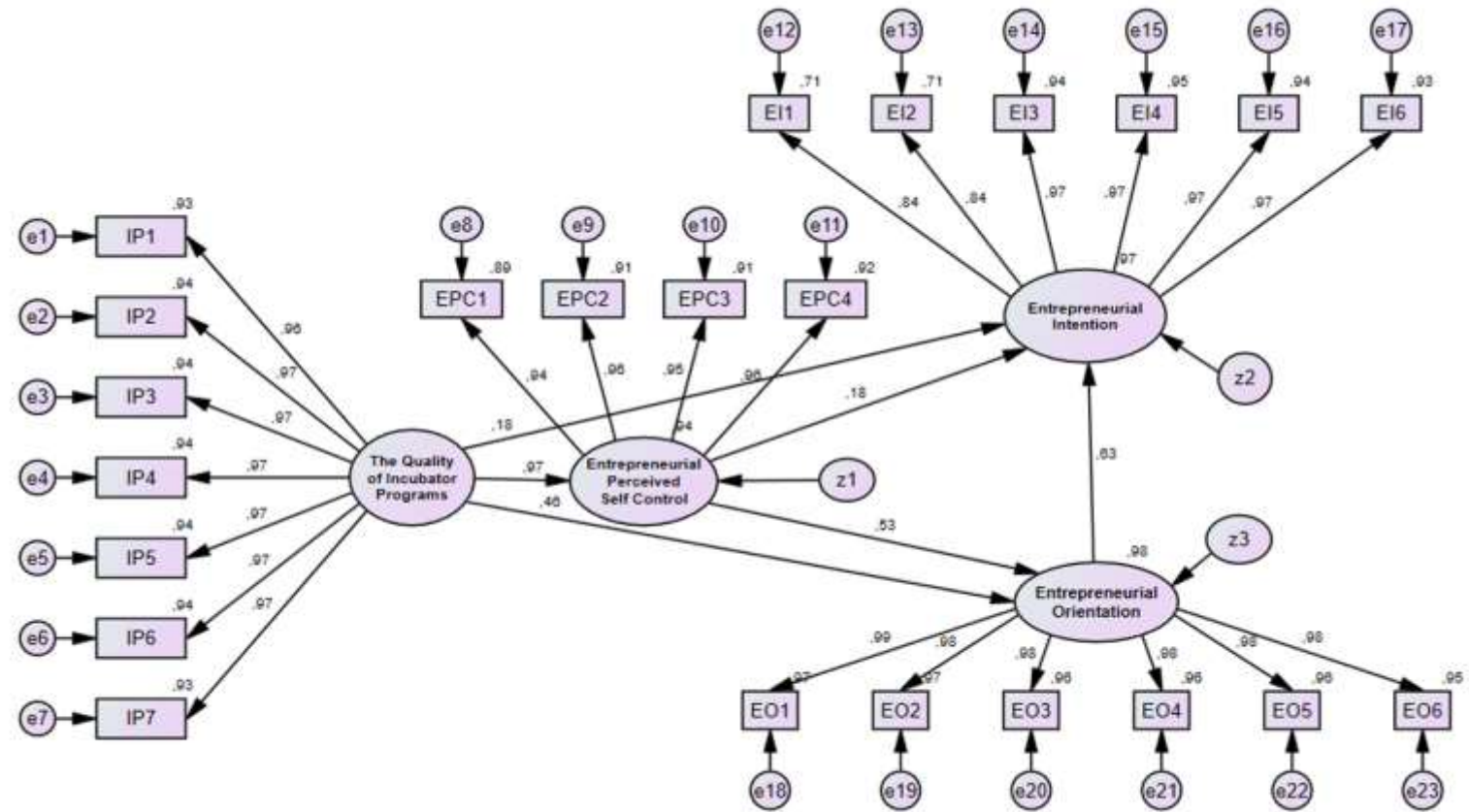
**INSTRUKTUR PELATIHAN:**

TRUFI MURDIANI, S.T., M.A.

Email : [trufimurdiani@darmajaya.ac.id](mailto:trufimurdiani@darmajaya.ac.id) IG : @murdiani06  
Website : <https://linktr.ee/murdianit> WA : 082184890458

# Analisis CB-SEM (Covariance Based - Structured Equation Modelling)

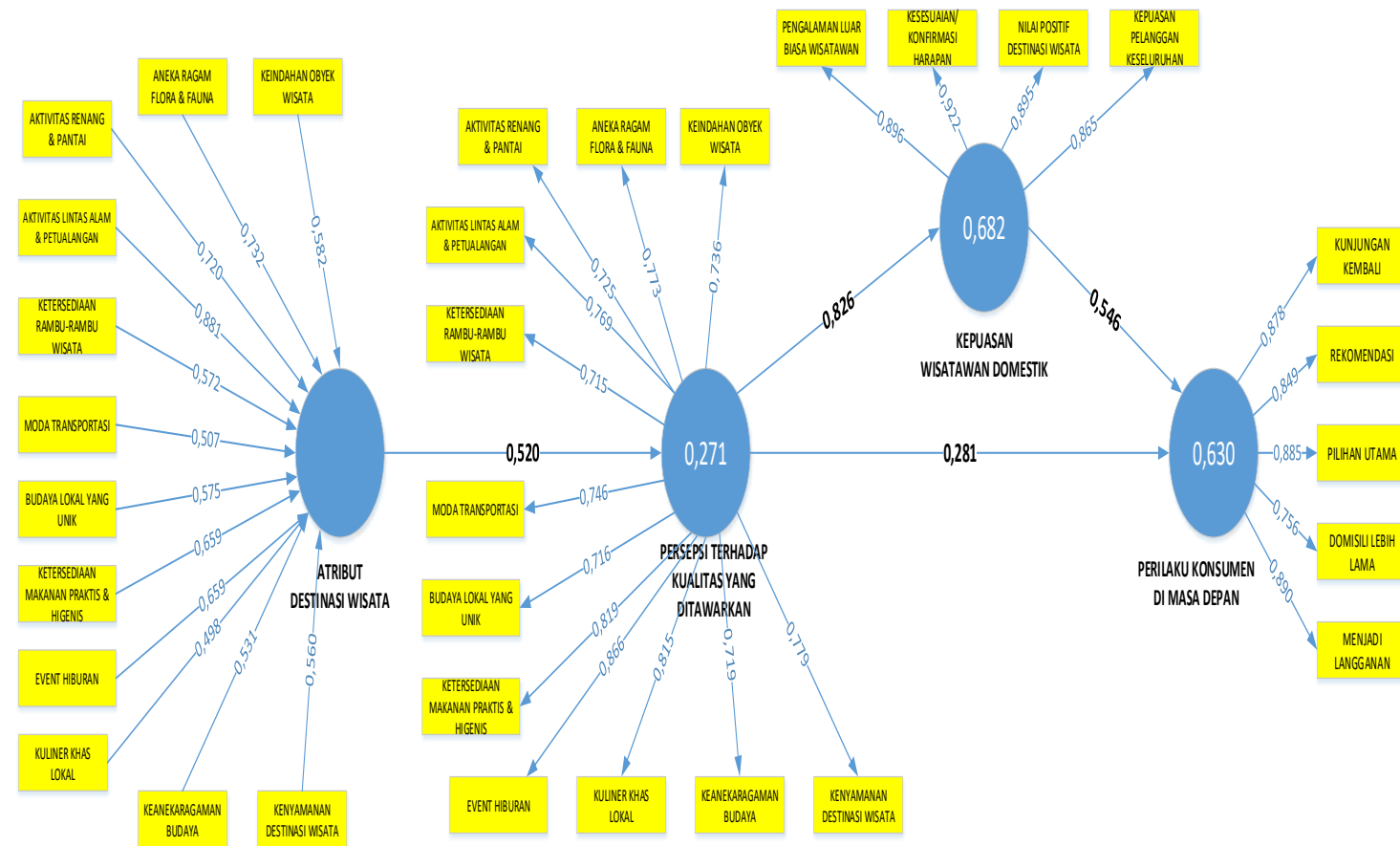
▣ **STRUCTURED EQUATION MODELLING (SEM)** merupakan teknik analisis yang merupakan gabungan dari dua metodologi disiplin ilmu yaitu perspektif ekonometrika yang menfokuskan pada prediksi dan psychometrika yang mampu menggambarkan konsep model dengan variabel laten (variabel yang tidak dapat diukur secara langsung) akan tetapi diukur melalui indikator-indikatornya (*manifest variables*).



Model Testing: Chi-Square = 56,678 ; Significance = 0,089 ; Derajat Kebebasan = 224 ; GFI = 0,943 ; TLI = 0,988 ; CFI = 0,990 ; RMSEA = 0,050

# Analisis PLS-SEM (Partial Least Square - Structured Equation Modelling)

- Merupakan salah satu bagian metode Structured Equation Modeling (SEM), akan tetapi alih-alih menggunakan covariance based, akan tetapi menggunakan Partial Least Squares
- Partial Least Squares disebut juga sebagai soft modelling karena meniadakan asumsi-asumsi OLS (Ordinary Least Squares) Regresi seperti data harus terdistribusi normal secara multivariate dan tidak adanya problem multikolinearitas antar variabel eksogen.
- Pada dasarnya PLS digunakan untuk menguji teori yang lemah dan data yang lemah seperti jumlah sampel yang kecil atau adanya normalitas data





# Introduction of PLS

---

- Jika antar variabel independen terjadi korelasi (ada multikolinieritas), maka analisis regresi tidak layak dipakai, sehingga PLS diciptakan untuk solusi ini.
- PLS mengakomodasi data besar (banyak) dan data kecil (sedikit)
- PLS Tidak banyak asumsi
- PLS bisa untuk konfirmasi dan prediksi
- PLS bisa menggunakan indikator reflesif dan formatif
- PLS menguji estimasi dan signifikansi dengan model Resampling (Bootstrap)
- Tujuan Estimasi PLS adalah membuat komponen skor / bobot terbaik dari variabel laten endogen, untuk memprediksi hubungan variabel laten dengan indikatornya.
- Inner Model: Hubungan antar sesama variabel Laten.
- Outer Model: Hubungan antara indikator dengan variabel latennya.



# Langkah-Langkah Menggunakan SmartPLS

---

1. Memperoleh data data penelitian berdasarkan indikator pengukuran variabel. Data diinput di Ms. Excel dan kemudian di Save – As dalam format CSV (Comma Delimited).
2. Aktifikan Program Smart PLS dengan menggunakan data penelitian yang telah di Save – As dalam format CSV (Comma Delimited).
3. Menggambar model penelitian sesuai dengan tujuan penelitian yang didukung oleh grand theory, riset pendahuluan dan hipotesis yang ingin diuji.
4. Mengolah data estimate, untuk mengetahui Hasil Outer Model
5. Mengolah data Resampling Bootstrapping, untuk mendapatkan model terbaik.
6. Membaca goodness of fit dari model
7. Hasil pengujian hipotesis.



# Download Software Smart-PLS

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https://www.smartpls.com/downloads

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Next Generation Path Modeling

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## Download latest version - SmartPLS 3.2.8 (see [release notes](#))

### Mac OS X

SmartPLS 3 is compatible with all recent Mac OS X versions:

- High Sierra 10.13 (with minor problems)
- Sierra 10.12
- El Capitan 10.11
- Yosemite 10.10
- Mavericks 10.9
- Mountain Lion 10.8
- Lion 10.7

For installation, please download and run the DMG installer.

Download DMG Installer

### Windows

SmartPLS 3 is compatible with all recent Windows versions:

- 10
- 8, 8.1
- 7
- Vista
- XP
- Windows 2000

For installation, please download the right installer and run the file.

32 Bit Installer 64 Bit Installer

Search Windows

19:52 31/07/2019



# Pilih Skema Layanan SmartPLS

SmartPLS License Options English

Student	Professional	Professional	Professional
Limited Features Free Forever	All Features 30 days for free	All Features Enter License Key	All Features Enter License Server

Change License Exit Continue

# Susun Data di Excel

The screenshot displays the Microsoft Excel interface with a data table. The ribbon at the top includes 'File', 'Home', 'Insert', 'Page Layout', 'Formulas', 'Data', 'Review', 'View', and 'Nitro Pro 10'. The 'Home' ribbon is active, showing options for Clipboard, Font, Alignment, Number, Styles, Cells, and Editing. The data table is organized as follows:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
1	TL1	TL2	TL3	TL4	PSP1	PSP2	PSP3	EOU1	EOU2	EOU3	EOU4	PU1	PU2	PU3	PU4	ENJ1	ENJ2	ENJ3	ENJ4	TRS1	TRS2	TRS3	TRS4	ATT1
2	4	2	2	2	1	1	1	2	2	2	3	2	2	2	3	4	1	1	1	2	2	2	2	2
3	2	2	2	2	1	1	1	2	2	5	2	4	4	5	5	6	3	3	1	2	2	2	2	3
4	7	7	6	6	6	6	5	4	4	5	4	4	4	4	4	5	5	4	3	4	4	4	4	4
5	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	2	3	2	2	2
6	3	2	2	2	1	4	2	5	4	2	3	4	4	4	5	5	5	4	4	4	4	4	4	4
7	6	5	5	6	5	5	4	6	2	3	3	3	4	5	5	7	7	7	7	6	6	5	5	5
8	4	3	2	2	4	5	4	4	3	5	5	4	5	4	4	5	5	4	4	4	3	2	4	4
9	5	4	3	6	5	6	6	3	6	7	7	4	7	6	7	6	7	7	7	6	6	4	4	4
10	6	6	5	7	4	3	2	4	3	4	4	4	5	4	5	7	7	7	6	4	4	4	4	4
11	5	6	6	5	5	5	5	5	6	6	6	6	6	6	6	6	6	6	6	6	5	6	6	6
12	1	2	2	4	4	3	3	7	7	7	5	5	4	4	5	5	5	5	4	4	4	4	5	5
13	7	7	7	6	3	3	3	5	4	5	5	4	2	2	3	5	6	6	5	4	4	4	4	4
14	5	4	2	1	1	2	1	1	1	7	3	6	1	1	3	5	5	5	6	5	6	1	2	2
15	4	4	3	3	5	5	4	3	2	5	5	3	3	3	3	3	6	6	6	4	4	3	4	4
16	2	3	5	5	1	1	1	3	4	6	5	3	5	5	5	3	5	3	4	6	5	6	5	5
17	1	1	6	4	5	4	3	7	6	5	5	6	6	6	6	7	5	5	5	5	5	6	6	6
18	6	5	5	4	5	3	5	5	5	5	5	4	3	4	4	6	6	5	5	5	4	4	5	5
19	4	6	3	5	6	2	4	5	2	4	5	4	5	6	3	2	6	5	6	1	4	5	5	5
20	6	6	5	7	1	1	1	7	7	7	7	6	4	4	4	5	4	5	5	7	6	4	7	7
21	4	5	4	3	5	5	5	5	7	7	7	7	5	5	6	6	7	6	6	7	7	7	7	7
22	6	5	4	5	5	5	4	5	3	4	6	5	4	4	6	7	5	6	6	7	7	7	7	7
23	5	5	2	2	5	5	5	6	4	5	5	5	5	5	6	6	5	5	6	7	7	6	6	6

# Rubah Menjadi CSV (Comma Delimited)

The image shows a screenshot of the Microsoft Excel 'Save As' dialog box. The dialog is open, and the 'Save as type' dropdown menu is expanded, showing various file formats. The 'CSV (Comma delimited)' option is highlighted in blue. The background shows the Excel ribbon with the 'File' tab selected, and the 'Save As' option is highlighted in the ribbon. The 'Save as type' dropdown is currently set to 'Excel Workbook'. The 'File name' field is empty, and the 'Save as type' field is set to 'Excel Workbook'. The 'Save' button is visible at the bottom right of the dialog.

Save As

Organize

This PC

Desktop

Documents

Downloads

Music

Pictures

Videos

WINDOWS10

DATA\_1 (D:)

File name:

Save as type:

Authors: USER

Tags: Add a tag

Save Thumbnail

Hide Folders

Tools

Save

Cancel

Excel Workbook

Excel Macro-Enabled Workbook

Excel Binary Workbook

Excel 97-2003 Workbook

XML Data

Single File Web Page

Web Page

Excel Template

Excel Macro-Enabled Template

Excel 97-2003 Template

Text (Tab delimited)

Unicode Text

XML Spreadsheet 2003

Microsoft Excel 5.0/95 Workbook

**CSV (Comma delimited)**

Formatted Text (Space delimited)

Text (Macintosh)

Text (MS-DOS)

CSV (Macintosh)

CSV (MS-DOS)

DIF (Data Interchange Format)

SYLK (Symbolic Link)

Excel Add-In

Excel 97-2003 Add-In

PDF

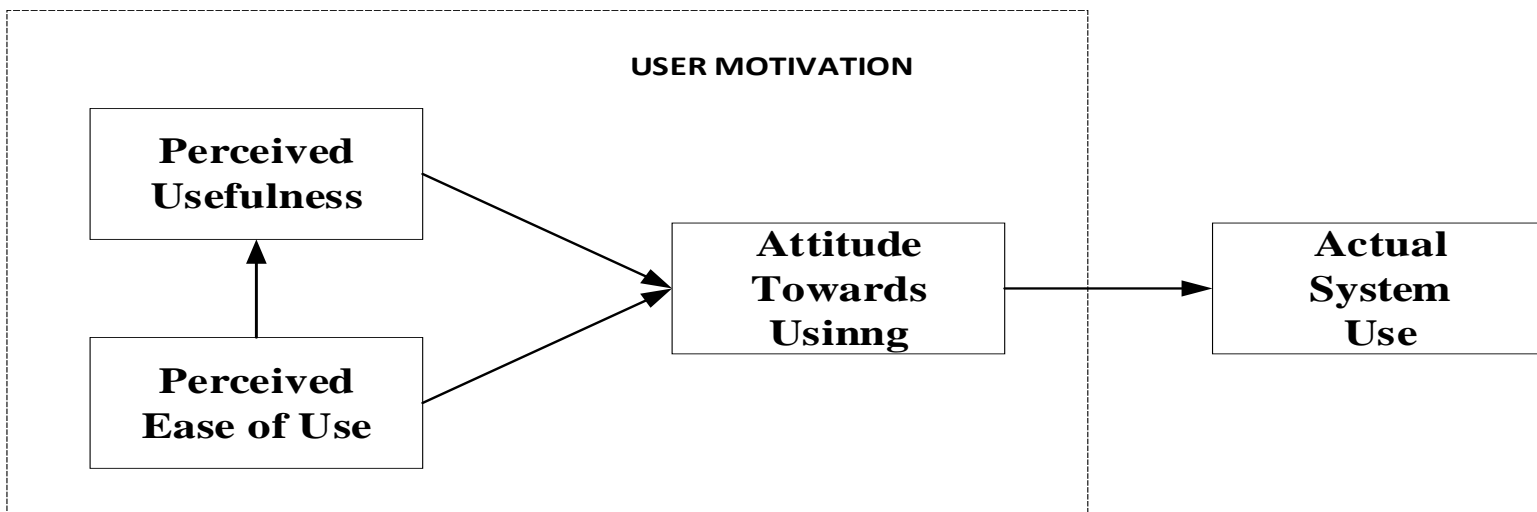
XPS Document

Strict Open XML Spreadsheet

OpenDocument Spreadsheet

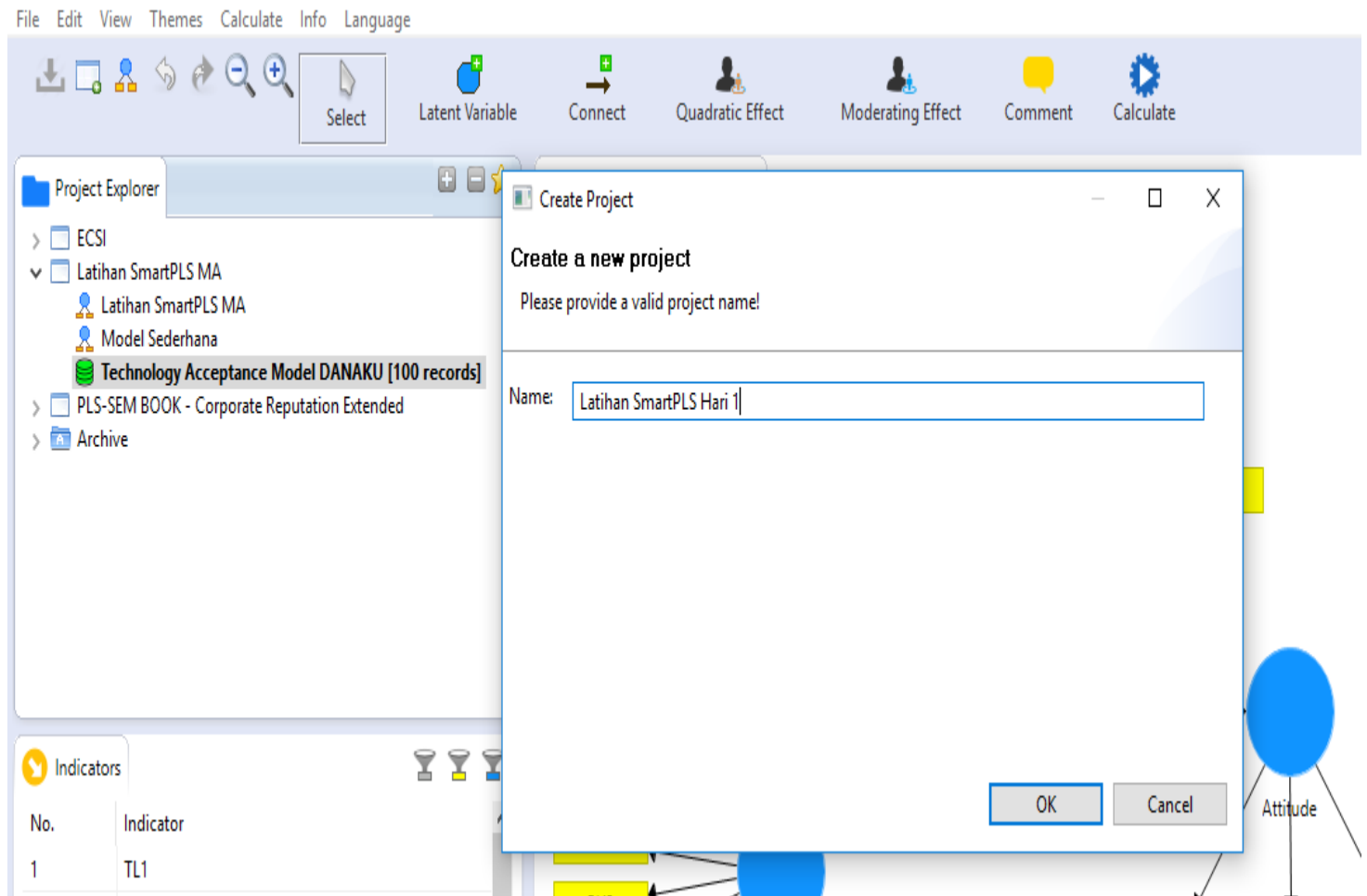
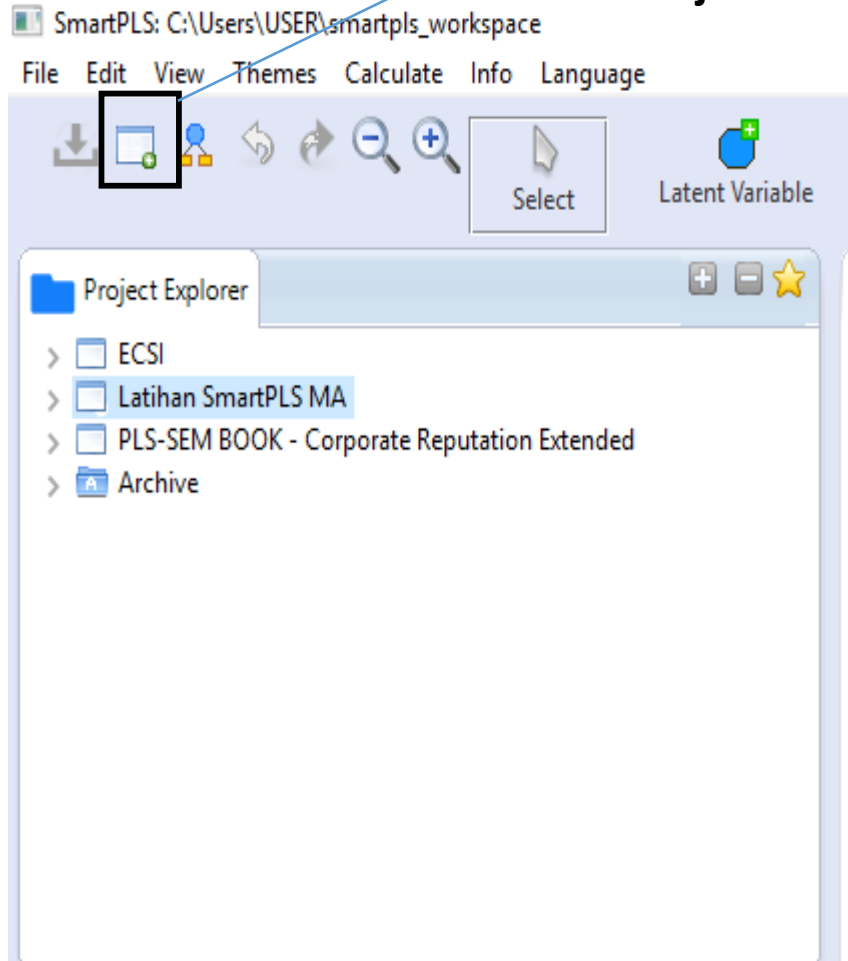
Excel Workbook

<b>Nama Theory</b>	:	<b>Technology Acceptance Model</b>
<b>Ilmuwan Pengembang Theory</b>	:	Davis pada tahun 1986
<b>Penjabaran Teori</b>	:	<p>Technology Acceptance Model (TAM) digunakan untuk menerangkan mengapa sikap (attitude) dan kepercayaan (belief) konsumen dapat berpengaruh terhadap perilaku konsumen dalam menerima atau menolak suatu produk sistem informasi/teknologi. Dalam TAM, terdapat dua determinan utama sebagai dasar hubungan terkait penggunaan sistem, yaitu: Perceived Usefulness (Sejauh mana seseorang yakin bahwa penggunaan sistem/teknologi akan meningkatkan performansinya atau bermanfaat).”.</p> <p>Variabel Perceived Ease of Use diartikan sejauh mana seseorang yakin bahwa menggunakan sistem tertentu tidak memerlukan usaha yang keras atau dengan kata lain mudah penggunaannya.”.</p> <p>TAM menghipotesiskan bahwa Perceived Ease Of Use dan Percieved Usefulness merupakan determinan dari Attitude To Use The System. Attitude Toward Using merupakan varaibel mediasi dari pengaruh Perceived Ease Of Use dan Perceived Usefulness terhadap Actual System Use. Perceived Usefulness dipengaruhi secara langsung oleh Perceived Ease Of Use.</p> <p>TAM adalah salah satu teori adopsi teknologi yang paling banyak dipakai dan dirujuk untuk menjelaskan penerimaan induvidu terhadap sistem informasi atau teknologi</p>



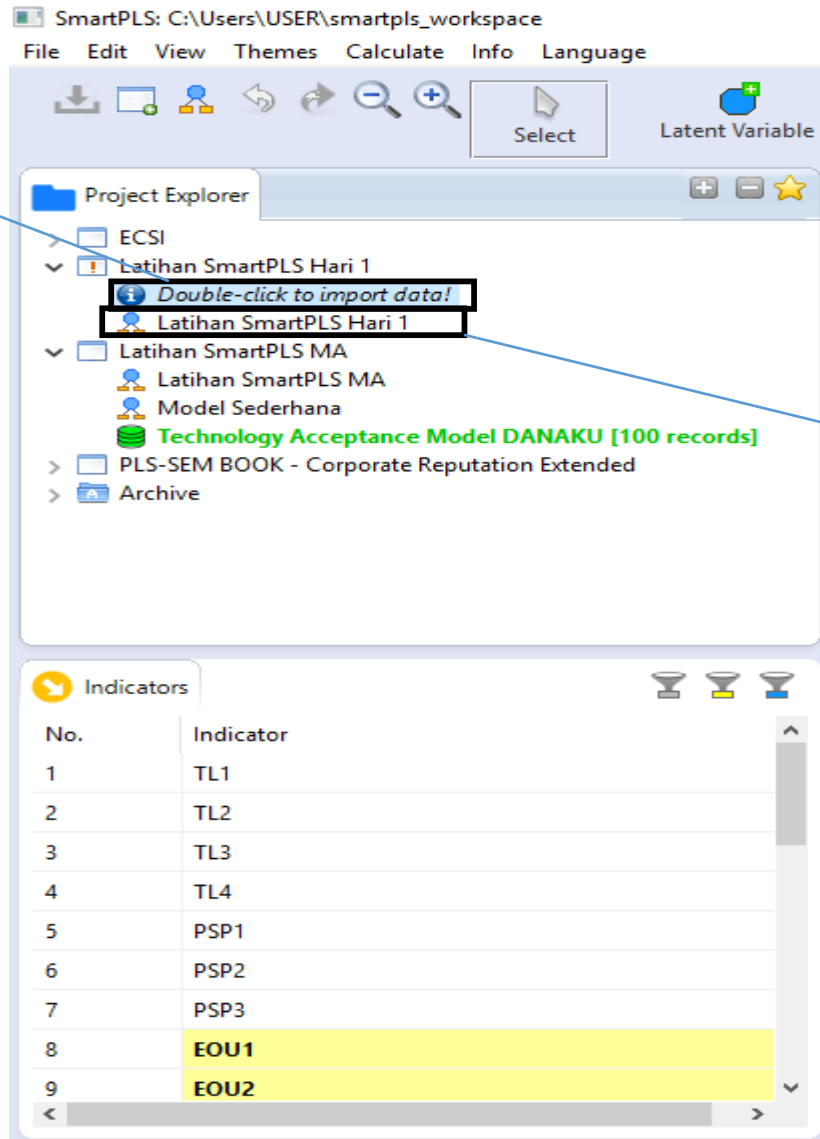
# Create New Project

Create  
New Project



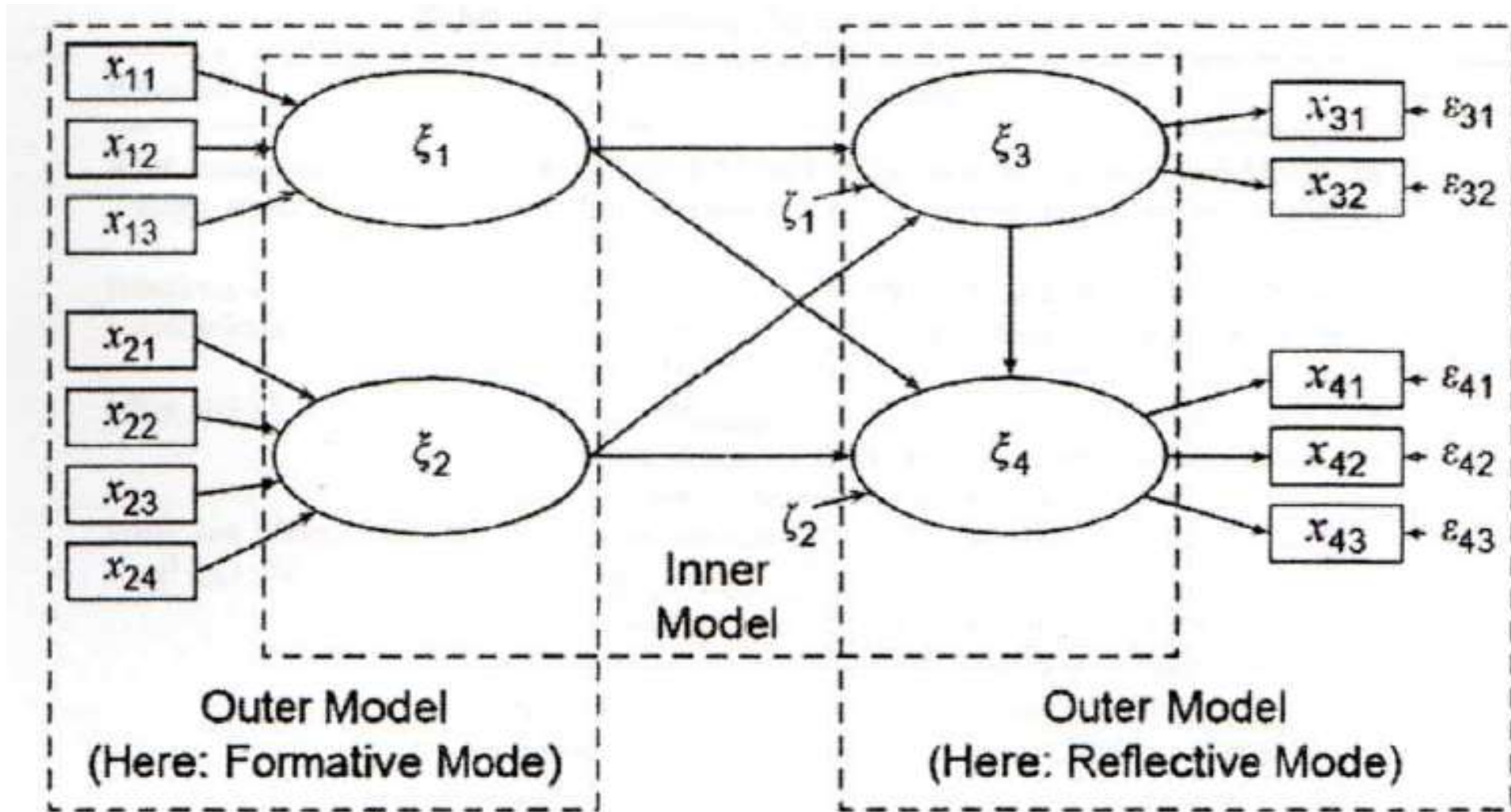
# Masukkan Data ke SmartPLS

Memasukkan Data



Menggambar Model

# Masukkan Data ke SmartPLS



# Menggambar Model

Kalkulasi Data

The screenshot displays the SmartPLS software interface. The main window shows a path model diagram with the following structure:

- Latent Variables (blue circles):** Perceived ease of Use, Perceived Usefulness, Trust, and Attitude.
- Indicators (yellow rectangles):**
  - Perceived ease of Use: EOU1, EOU2, EOU3, EOU4
  - Perceived Usefulness: PU1, PU2, PU3, PU4
  - Trust: TRS1, TRS2, TRS3, TRS4
  - Attitude: ATT1, ATT2, ATT3
- Path Diagram:** Arrows indicate relationships: Perceived ease of Use → Perceived Usefulness; Perceived ease of Use → Trust; Perceived Usefulness → Trust; Trust → Attitude.

The interface includes a menu bar (File, Edit, View, Themes, Calculate, Info, Language), a toolbar with icons for Select, Latent Variable, Connect, Quadratic Effect, Moderating Effect, Comment, and Calculate (highlighted with a red box and an arrow from the text 'Kalkulasi Data'). A Project Explorer on the left shows a tree view of project files, with 'Technology Acceptance Model DANAKU [100 records]' selected. An Indicators table is visible in the bottom-left corner.

No.	Indicator
1	TL1
2	TL2
3	TL3
4	TL4
5	PSP1
6	PSP2
7	PSP3
8	EOU1
9	EOU2

Windows taskbar at the bottom shows the time as 23:22 on 31/07/2019.

# UJI Measurement (Outer) Model

## UJI VALIDITAS CONVERGENT

1. Click **Calculate**
2. Pilih **PLS Algorihtm**

Evaluasi dari measurement model dapat dilihat dari korelasi antara score item/indicator dengan score konstraknya . Indikator individu dianggap reliable jika memiliki nilai korelasi diatas 0,70. Namun demikian pada riset pengembangan skala, outer loading 0.50 sampai 0.60 masih dapat **diterima (Imam Ghozali, 2015)**



Outer Loadings

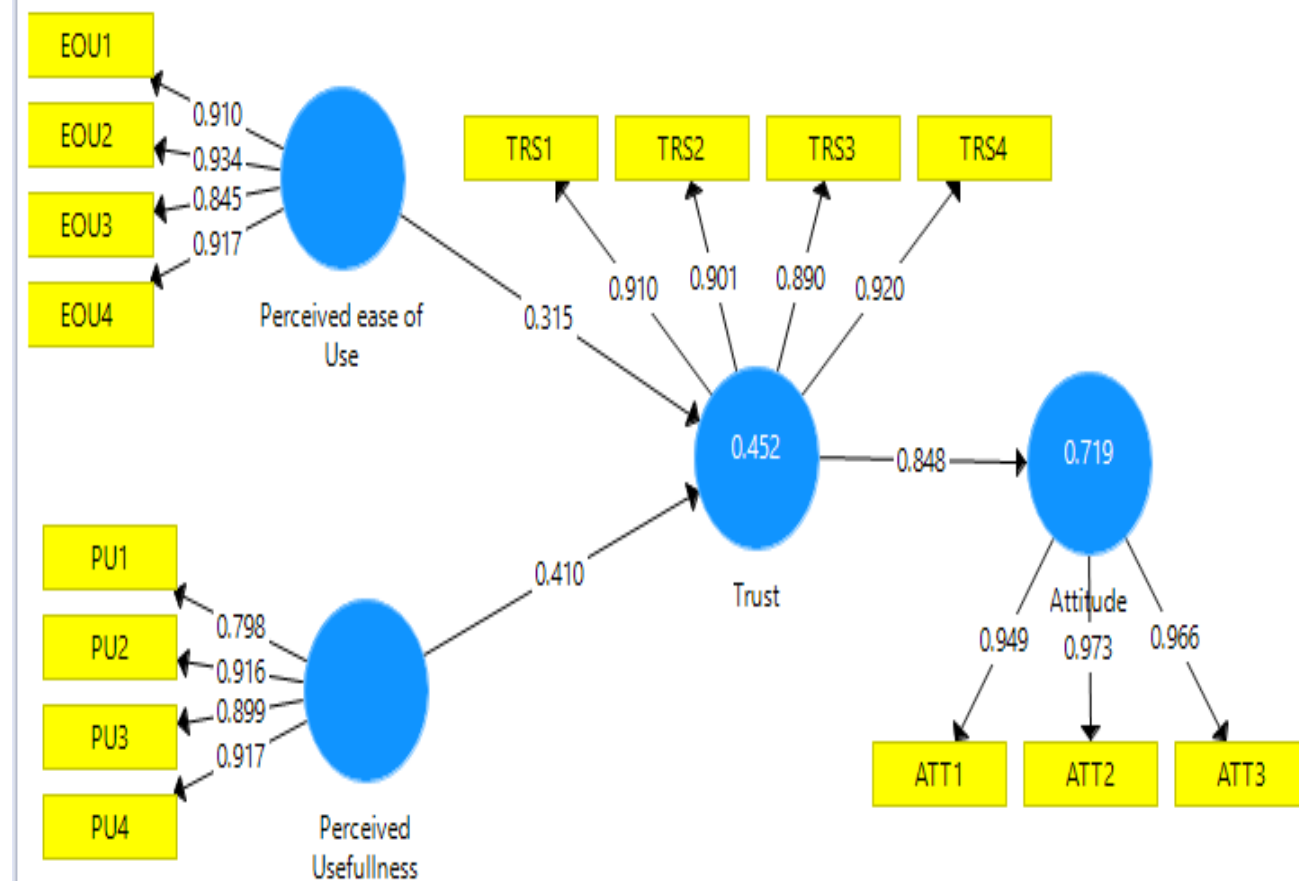
	Attitude	Perceived Usef...	Perceived ease...	Trust
ATT1	0.949			
ATT2	0.973			
ATT3	0.966			
EOU1			0.910	
EOU2			0.934	
EOU3			0.845	
EOU4			0.917	
PU1		0.798		
PU2		0.916		
PU3		0.899		
PU4		0.917		

Final Results: Path Coefficients, Indirect Effects, Total Effects, Outer Weights, Latent Variable Residuals

Quality Criteria: R Square, f Squares, Construct Reliability and Validity, Discriminant Validity, Collinearity Statistics (VIF), Model Fit

Interim Results: Stop Criterion Changes

Base Data: Setting, Inner Model, Outer Model, Indicator Data (Original), Indicator Data (Standardized), Indicator Data (Correlations)



# UJI Measurement (Outer) Model

Uji Measurement juga bisa dievaluasi dari Discriminant Validity dengan melihat **Fornell-Larckell Criteria** dan **Cross Loading**. Yang dilihat dari evaluasi ini adalah korelasi antara Variabel-Variabelnya (Untuk **Fornell-Larckell**) dan Korelasi antara indicator suatu variable apabila dibandingkan dengan korelasi variable lainnya (Cross Loading).

Model Sederhana.splsm PLS Algorithm (Run No. 1)

### Discriminant Validity

Fornell-Larcker Criteri... Cross Loadings Heterotrait-Monotrait R... Heterotrait-Monotr...

	Attitude	Perceived Usef...	Perceived ease...	Trust
Attitude	0.963			
Perceived Usef...	0.671	0.884		
Perceived ease ...	0.739	0.717	0.902	
Trust	0.848	0.636	0.609	0.905

Final Results	Quality Criteria	Interim Results	Base Data
<a href="#">Path Coefficients</a>	<a href="#">R Square</a>	<a href="#">Stop Criterion Changes</a>	<a href="#">Setting</a>
<a href="#">Indirect Effects</a>	<a href="#">f Square</a>		<a href="#">Inner Model</a>
<a href="#">Total Effects</a>	<a href="#">Construct Reliability and Validity</a>		<a href="#">Outer Model</a>
<a href="#">Outer Loadings</a>	<a href="#">Discriminant Validity</a>		<a href="#">Indicator Data (Original)</a>
<a href="#">Outer Weights</a>	<a href="#">Collinearity Statistics (VIF)</a>		<a href="#">Indicator Data (Standardized)</a>
<a href="#">Latent Variable</a>	<a href="#">Model Fit</a>		<a href="#">Indicator Data (Correlations)</a>
<a href="#">Residuals</a>			

Model Sederhana.splsm PLS Algorithm (Run No. 1)

### Discriminant Validity

Fornell-Larcker Criteri... Cross Loadings Heterotrait-Monotrait R... Heterotrait-Monotrait R... Copy to Cli...

	Attitude	Perceived Usefulness	Perceived ease of Use	Trust
ATT1	0.949	0.652	0.759	0.818
ATT2	0.973	0.643	0.681	0.822
ATT3	0.966	0.644	0.695	0.809
EOU1	0.681	0.635	0.910	0.523
EOU2	0.667	0.673	0.934	0.561
EOU3	0.538	0.641	0.845	0.444
EOU4	0.753	0.645	0.917	0.639
PU1	0.723	0.798	0.792	0.652
PU2	0.526	0.916	0.558	0.500
PU3	0.513	0.899	0.549	0.480
PU4	0.556	0.917	0.573	0.567

Final Results	Quality Criteria	Interim Results	Base Data
<a href="#">Path Coefficients</a>	<a href="#">R Square</a>	<a href="#">Stop Criterion Changes</a>	<a href="#">Setting</a>
<a href="#">Indirect Effects</a>	<a href="#">f Square</a>		<a href="#">Inner Model</a>
<a href="#">Total Effects</a>	<a href="#">Construct Reliability and Validity</a>		<a href="#">Outer Model</a>
<a href="#">Outer Loadings</a>	<a href="#">Discriminant Validity</a>		<a href="#">Indicator Data (Original)</a>
<a href="#">Outer Weights</a>	<a href="#">Collinearity Statistics (VIF)</a>		<a href="#">Indicator Data (Standardized)</a>
<a href="#">Latent Variable</a>	<a href="#">Model Fit</a>		<a href="#">Indicator Data (Correlations)</a>
<a href="#">Residuals</a>			

# UJI Measurement (Outer) Model

## UJI REABILITAS

Reabilitas Outer Model dapat dilihat dari nilai AVE, Cronbach Alpha dan Composite Reability:

Nilai AVE  $\geq 0,50$

Nilai Composite Reability  $\geq 0,70$

Nilai Cronbach Alpha  $\geq 0,70$

Note:

Biasanya nilai **Cronbach Alpha** yang dihasilkan PLS sedikit Underestimate sehingga lebih disarankan untuk menggunakan **composite reability**

Model Sederhana.splsm

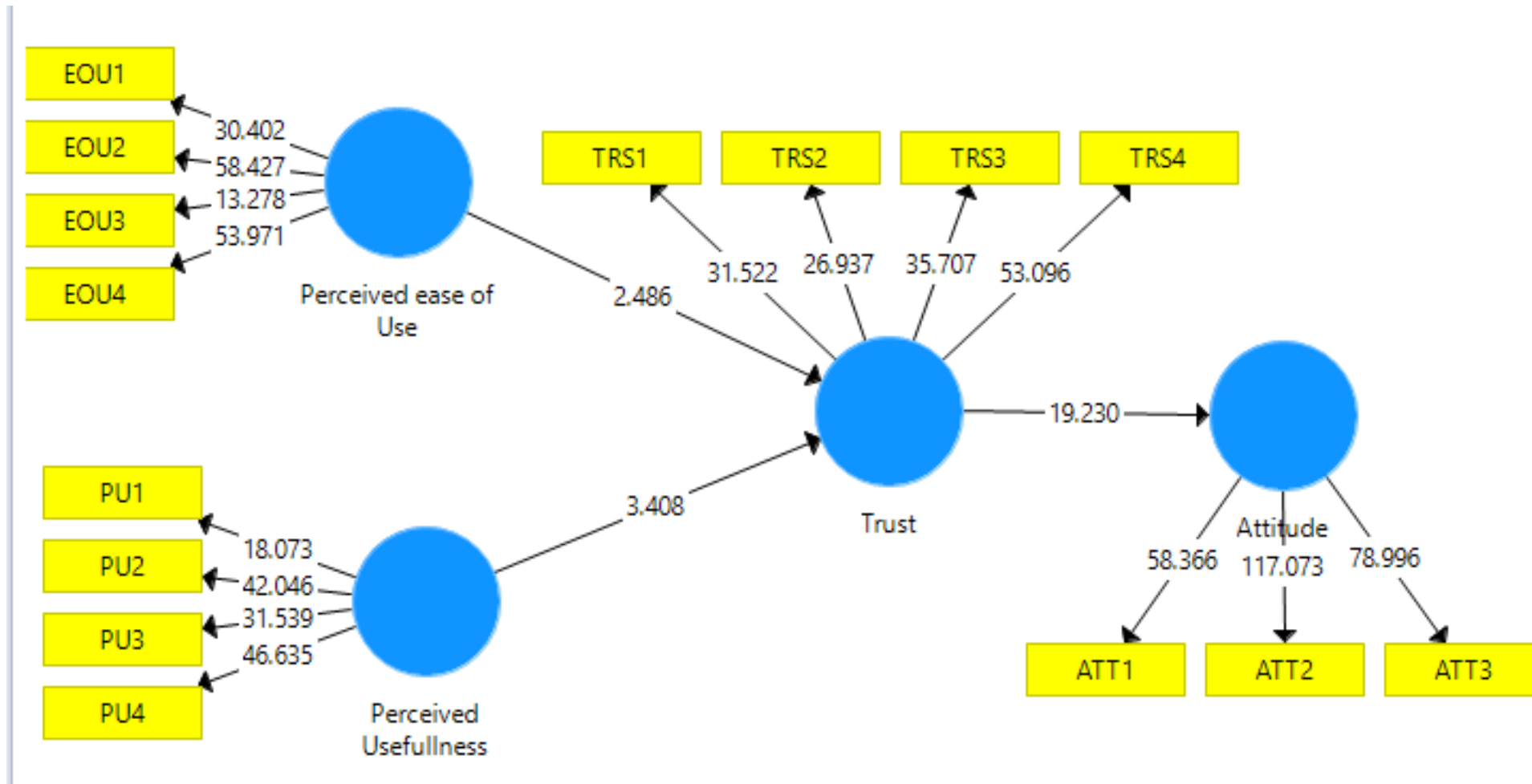
PLS Algorithm (Run No. 1)

### Construct Reliability and Validity

Matrix	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (...)	Copy to Clipboard:	Excel Format	R Format
	Cronbach's Al...	rho_A	Composite Reliability	Average Variance Extracted (AVE)			
Attitude	0.960	0.961	0.974	0.927			
Perceived Usefulness	0.906	0.913	0.934	0.781			
Perceived ease of Use	0.924	0.940	0.946	0.814			
Trust	0.927	0.936	0.948	0.819			

# UJI Struktural (Inner) Model

1. Click **Calculate**
2. Pilih **Bootstrapping**



# UJI Struktural (Inner) Model

Model Sederhana.splsm Bootstrapping (Run No. 2)

### Outer Weights

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O /STDEV)	P Values
ATT1 <- Attitude	0.347	0.349	0.011	32.728	0.000
ATT2 <- Attitude	0.349	0.350	0.010	34.557	0.000
ATT3 <- Attitude	0.343	0.342	0.011	31.798	0.000
EOU1 <- Perceived ease of Use	0.267	0.265	0.022	12.253	0.000
EOU2 <- Perceived ease of Use	0.286	0.287	0.020	14.028	0.000
EOU3 <- Perceived ease of Use	0.226	0.225	0.033	6.941	0.000
EOU4 <- Perceived ease of Use	0.326	0.329	0.028	11.507	0.000
PU1 <- Perceived Usefulness	0.338	0.344	0.046	7.423	0.000
PU2 <- Perceived Usefulness	0.259	0.258	0.019	13.798	0.000
PU3 <- Perceived Usefulness	0.249	0.247	0.021	12.025	0.000
PU4 <- Perceived Usefulness	0.294	0.293	0.023	12.735	0.000
TRS1 <- Trust	0.260	0.261	0.010	24.996	0.000
TRS2 <- Trust	0.249	0.249	0.013	19.644	0.000
TRS3 <- Trust	0.275	0.275	0.016	17.070	0.000
TRS4 <- Trust	0.320	0.321	0.021	15.397	0.000

### R Square

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O /STDEV)	P Values
Attitude	0.719	0.720	0.074	9.779	0.000
Trust	0.452	0.472	0.098	4.620	0.000

### R Square Adjusted

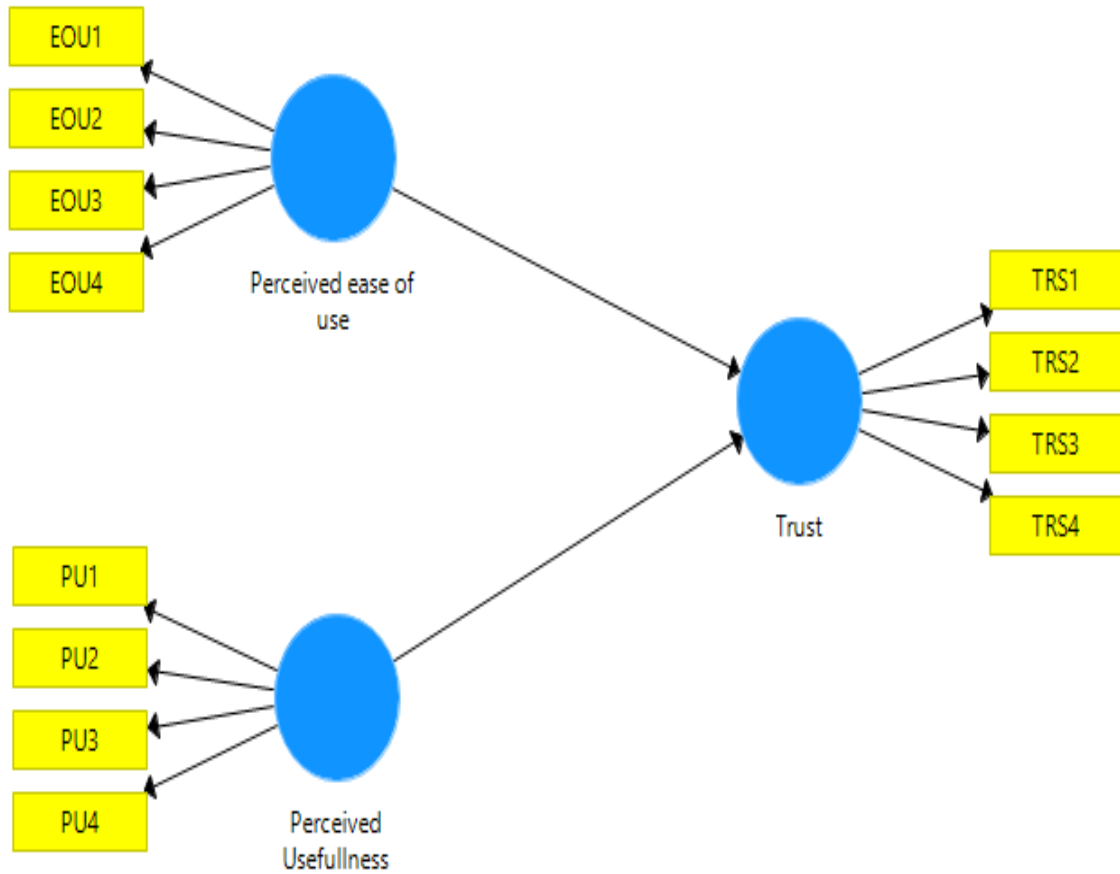
	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O /STDEV)	P Values
Trust	0.441	0.461	0.100	4.414	0.000
Attitude	0.717	0.717	0.074	9.642	0.000

### Path Coefficients

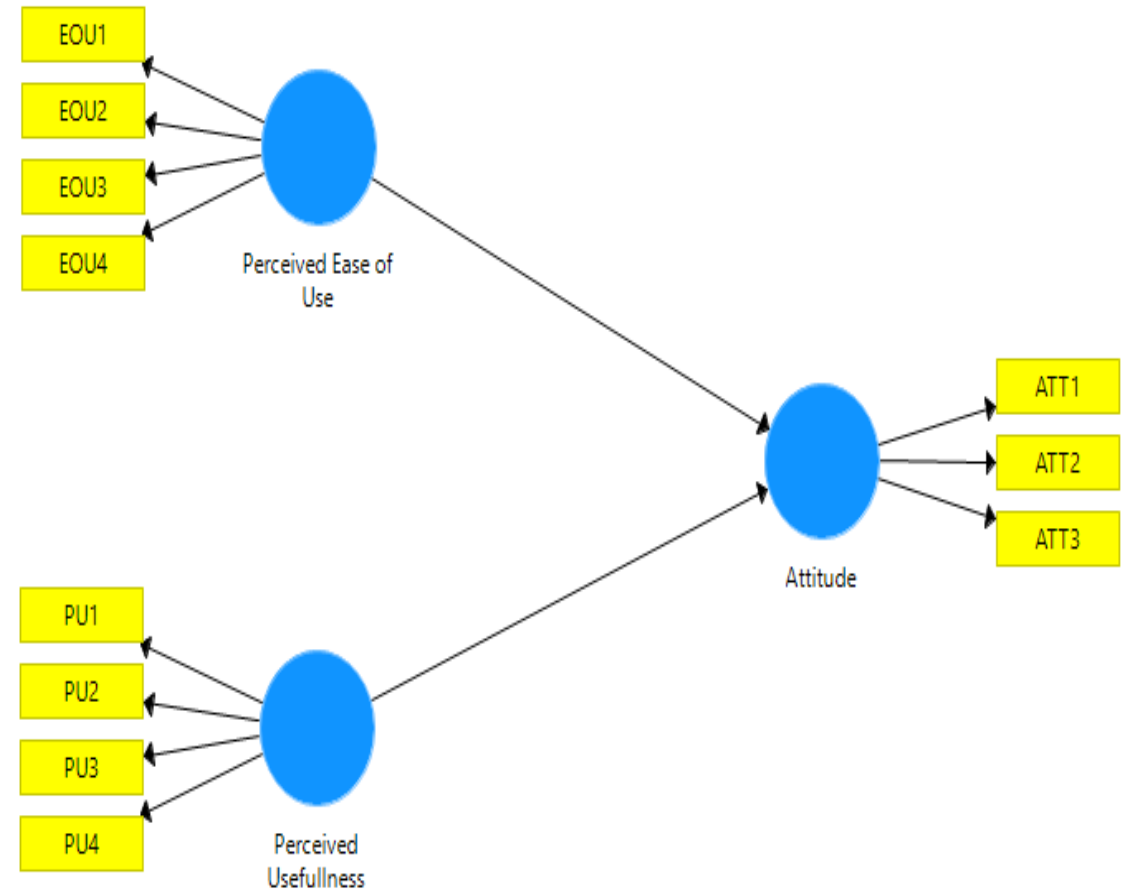
	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O /STDEV)	P Values
Perceived Usefulness -> Trust	0.410	0.416	0.120	3.408	0.001
Perceived ease of Use -> Trust	0.315	0.314	0.127	2.486	0.013
Trust -> Attitude	0.848	0.848	0.044	19.230	0.000

- Outer Weight memperlihatkan bahwa tiap indikator signifikan terhadap variabel latennya, karena t statistiknya > 1,96..
- Path Coefficient menunjukkan bahwa semua pengujian variabel antar variabel adalah signifikan. Dengan demikian dapat disimpulkan bahwa semua hipotesis dapat diterima.
- R Square dan Adj. R Square menunjukkan kemampuan variabel variabel eksogen dalam menjelaskan variabel endogen. Jadi kemampuan Variabel Perceived ease of use, Perceived Usefulness dan Trust kepada attitude adalah 71,9%

# Latihan 1. Menggambar Model & Analisis



(a) Regresi 01



(b) Regresi 02

# Latihan 2. Menggambar Model & Analisis

SmartPLS: C:\Users\USER\smartpls\_workspace  
File Edit View Themes Calculate Info Language

Project Explorer

- ECSI
- Latihan SmartPLS Hari 1
  - Double-click to import data!
  - Latihan SmartPLS Hari 1
- Latihan SmartPLS MA
  - Latihan SmartPLS MA
  - Model Sederhana
  - Technology Acceptance Model DANAKU [100 records]
- PLS-SEM BOOK - Corporate Reputation Extended
- Archive

Indicators

No.	Indicator
1	TL1
2	TL2
3	TL3
4	TL4
5	PSP1
6	PSP2
7	PSP3
8	EOU1
9	EOU2

Model Sederhana.splsm | Latihan SmartPLS MA.splsm

The diagram illustrates a PLS-SEM model with the following structure:

- Latent Variables (Blue Circles):** Perceived ease of Use, Perceived Usefulness, Perceived of Social Presence, Trust, Attitude, Telepresence, and Enjoyment.
- Indicators (Yellow Rectangles):**
  - Perceived ease of Use: EOU1, EOU2, EOU3, EOU4
  - Perceived of Social Presence: PSP1, PSP2, PSP3
  - Telepresence: TL1, TL2, TL3, TL4
  - Trust: TRS1, TRS2, TRS3, TRS4
  - Enjoyment: ENU1, ENU2, ENU3, ENU4
  - Attitude: ATT1, ATT2, ATT3
  - Perceived Usefulness: PU1, PU2, PU3, PU4
- Path Diagram:** Arrows indicate the following relationships:
  - Perceived ease of Use → Perceived Usefulness
  - Perceived of Social Presence → Perceived Usefulness
  - Perceived of Social Presence → Trust
  - Trust → Perceived Usefulness
  - Trust → Attitude
  - Trust → Enjoyment
  - Attitude → Perceived Usefulness
  - Attitude → Enjoyment
  - Telepresence → Perceived Usefulness
  - Telepresence → Enjoyment
  - Perceived Usefulness → PU1, PU2, PU3, PU4
  - Enjoyment → ENU1, ENU2, ENU3, ENU4

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Bold, Italic  
Border Size: -1, -, +1  
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