



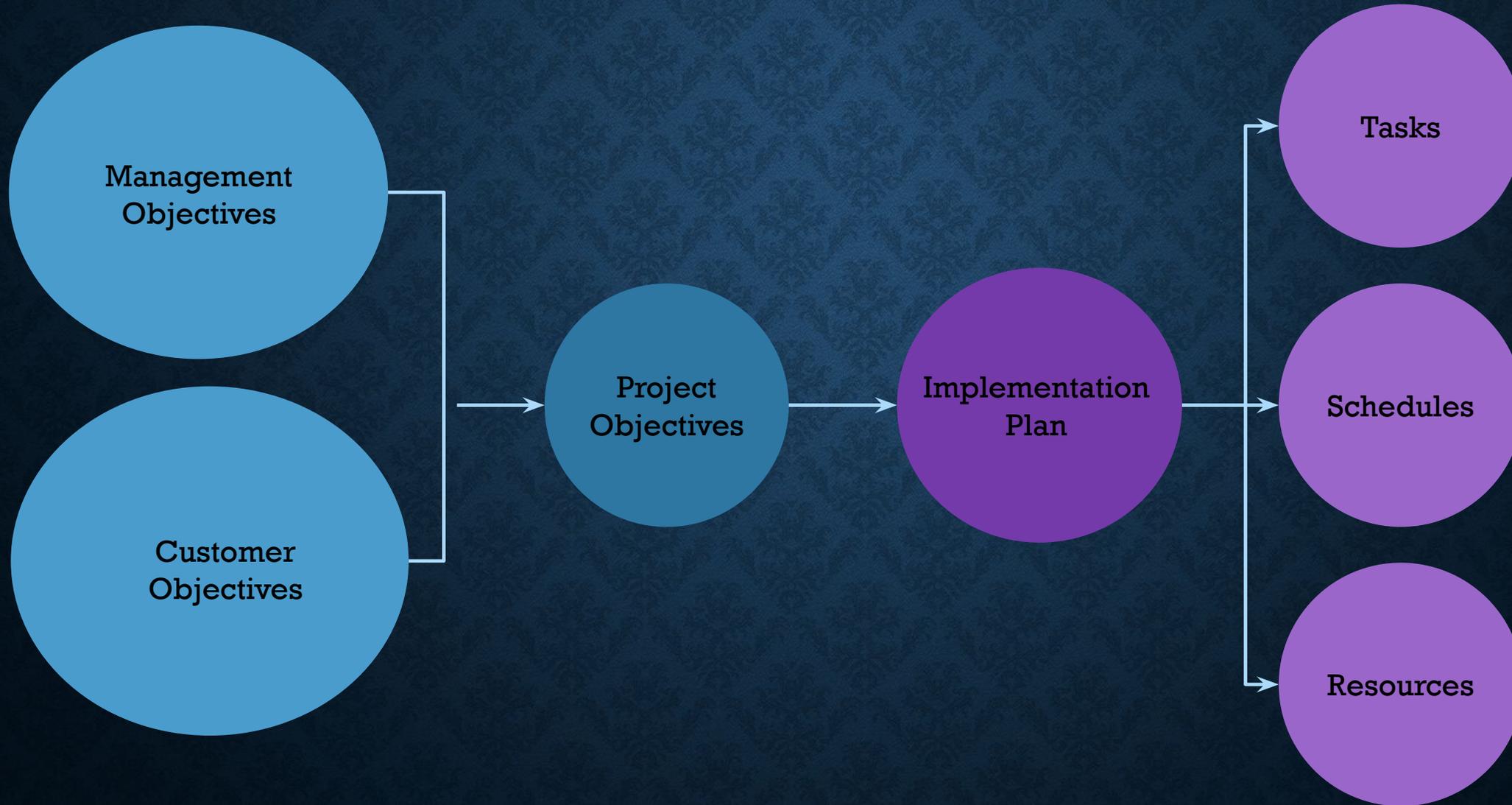
# FACTOR ANALYSIS

PRESENTATION BY-  
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FMS/MBA/21-23/039

# INTRODUCTION

- Factor analysis is a technique that is used to reduce a large number of variables into fewer numbers of factors.
- It reduces attribute space from a large no. of variables to a smaller no. of factors
- Factor analysis is a way to condense the data into few variables.

# Operation



# OBJECTIVES OF THE PRESENTATION

- To explain the Methodologies of FA and its approaches.
- To demonstrate its FA's mechanism.
- How FA enables researchers to investigate concepts that cannot easily be measured directly

# Objective of Factor Analysis



## MARKET ANALYSIS

Factor analysis has been used to develop things such as perception maps, advanced SWOT analyses, etc..



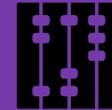
## TECHNICAL ANALYSIS

It is a multivariate statistical technique for data reduction. It has many applications in Management & Researches



## FINANCIAL ANALYSIS

FA attempts to simplify complex & diverse relationships that exist among a set of observed variables



## ECONOMIC ANALYSIS

FA is a powerful data reduction technique that enables researchers to investigate concepts that cannot easily be measured directly.



## PSYCHOLOGICAL ANALYSIS

To capture some psychological states of customers

# PROCESS OF FACTOR ANALYSIS

S 1: Selecting & Measuring a set of variables in a given domain.

S 2: Data screening in order to prepare the correlation matrix.

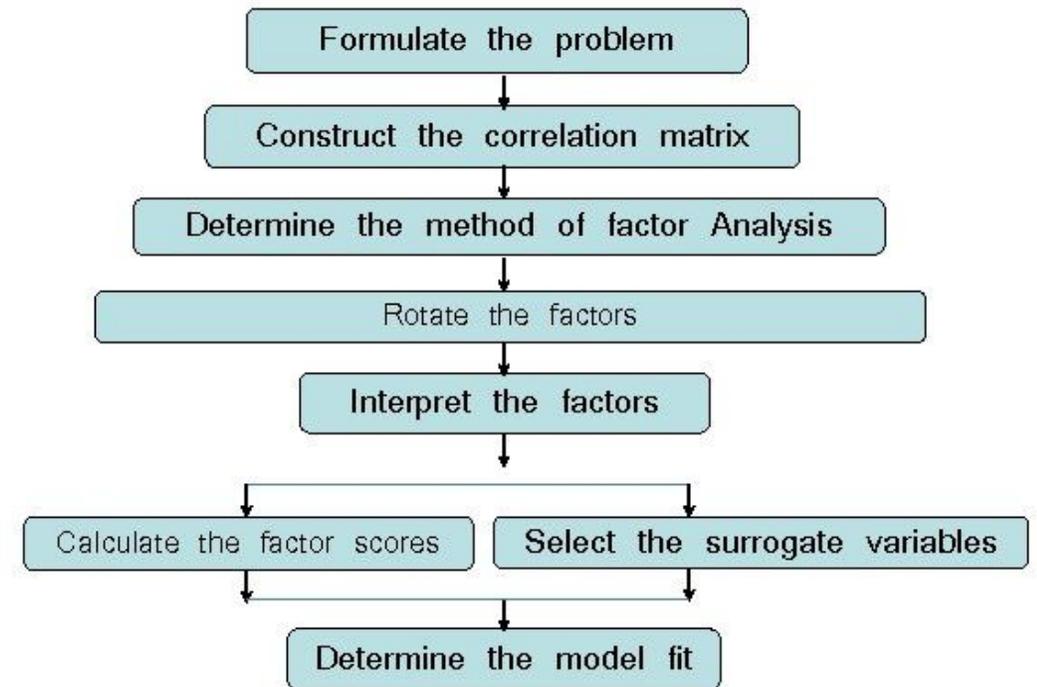
S 3: Factor Extraction.

S 4: Factor Rotation to increase interpretability.

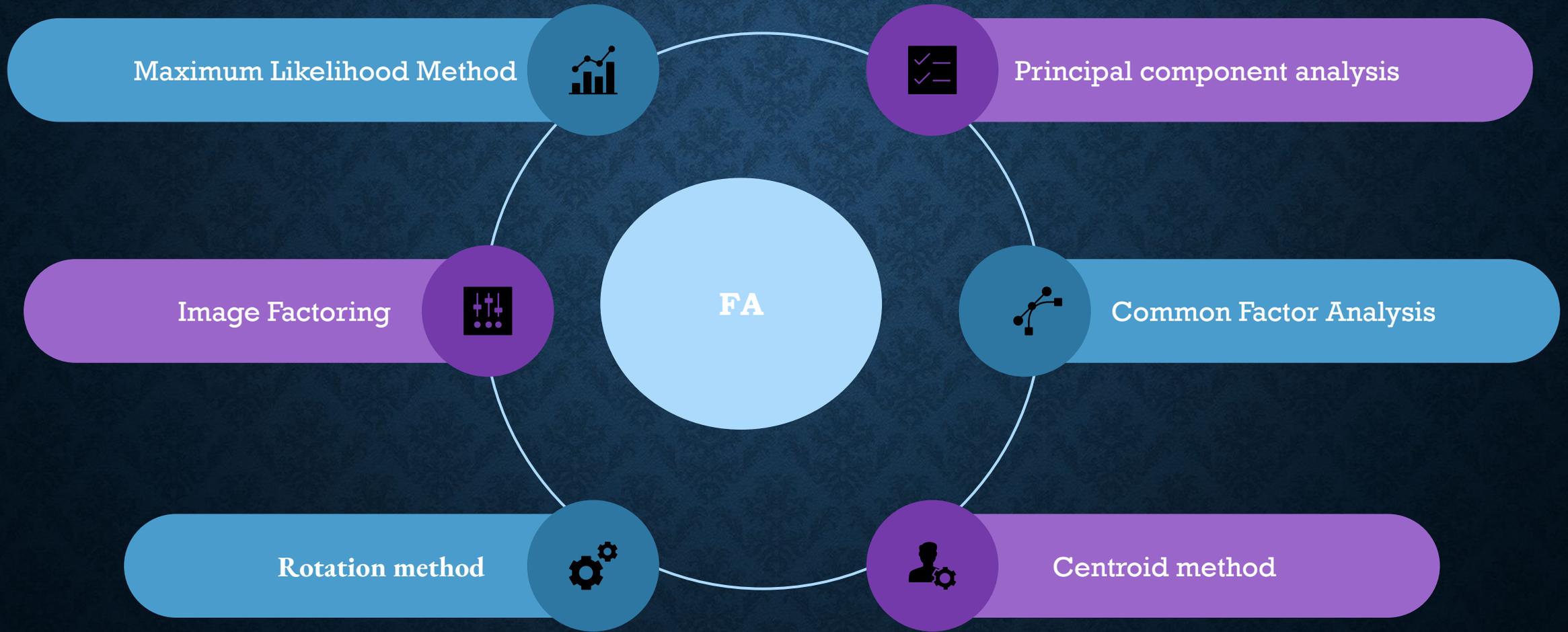
S 5: Interpretation.

S 6: Validation and Reliability of the measures.

eight-step process:



# Methods of Factor Analysis



# EXAMPLE WITH THE CASE STUDY

Suppose, a number of supervisors are asked to rate the relevance of six personality characteristics to effective job performance by subordinates. The characteristics assessed are organized, systematic, careless, creative, intellectual, and imaginative.

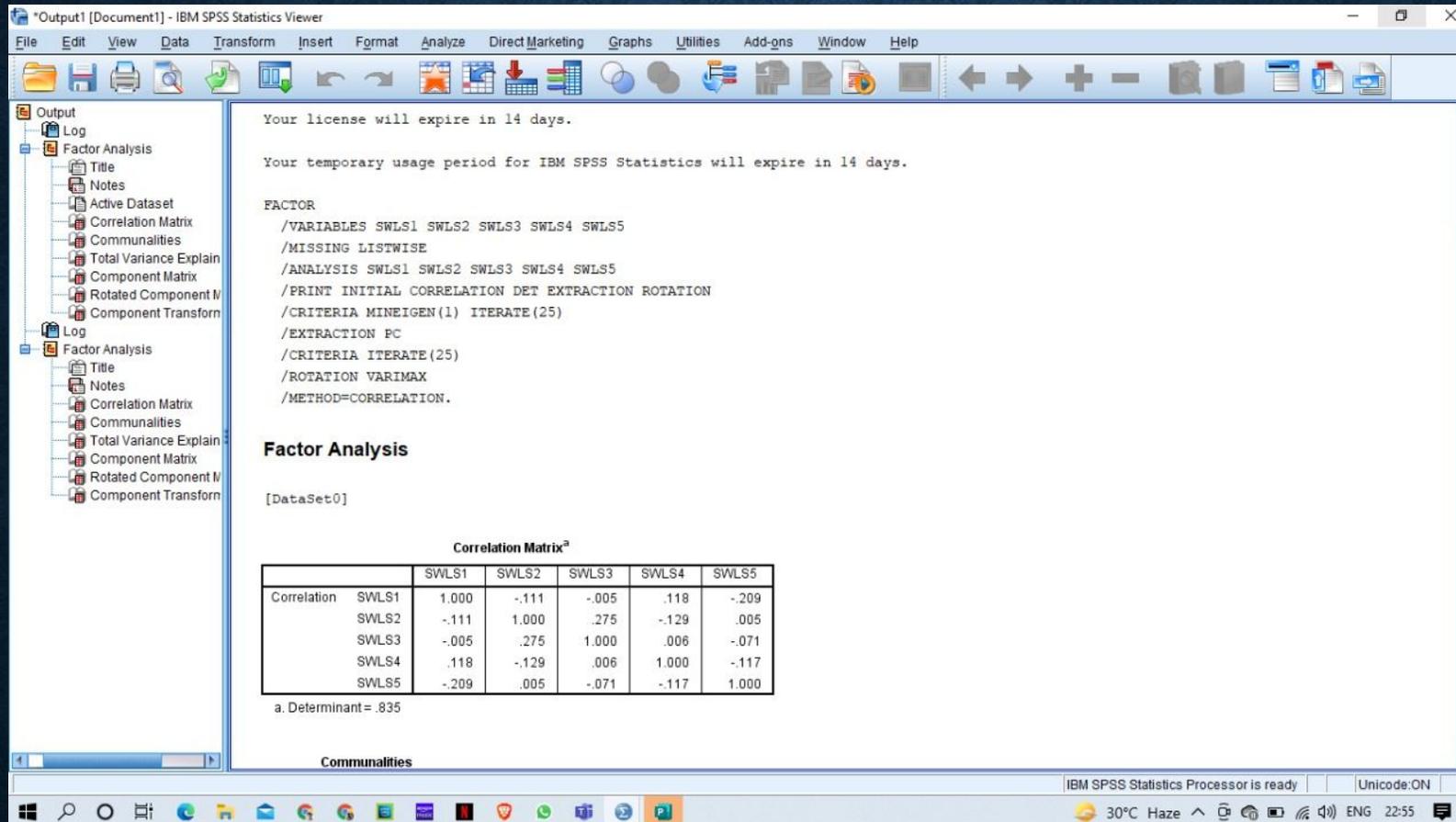
Variable	1	2	3	4	5	6
1.Organized	1.00					
2.Systematic	.72	1.00				
3.Careless	-.63	-.55	1.00			
4.Creative	.00	.00	.00	1.00		
5.Intellectual	.00	.00	.00	.56	1.00	
6.Imaginative	.00	.00	.00	.48	.42	1.00

Table: Hypothetical Correlation Matrix Observed Variables

Observed Variable	Factor 1 Conscientiousness	Factor 2 Intellect	Communality( $h^2$ )	Uniqueness ( $1-h^2$ )
1.Organized	.90	0.00	.81	.19
2.Systematic	.80	0.00	.64	.36
3.Careless	-.70	0.00	.49	.51
4.Creative	.00	.80	.64	.36
5.Intellectual	.00	.70	.49	.51
6.Imaginative	.00	.60	.36	.64
Sum of squared loadings	1.94	1.49		
Proportion of variance	$1.94/6$ =.32	$1.49/6=.25$	$.32+.25=.57$	$1-.57=.43$

Table: Factor pattern Matrix with Communalities and Uniqueness for Hypothetical Data

# Spss Link With Demonstration



Your license will expire in 14 days.  
Your temporary usage period for IBM SPSS Statistics will expire in 14 days.

```
FACTOR
/VARIABLES SWLS1 SWLS2 SWLS3 SWLS4 SWLS5
/MISSING LISTWISE
/ANALYSIS SWLS1 SWLS2 SWLS3 SWLS4 SWLS5
/PRINT INITIAL CORRELATION DET EXTRACTION ROTATION
/CRITERIA MINEIGEN(1) ITERATE(25)
/EXTRACTION PC
/CRITERIA ITERATE(25)
/ROTATION VARIMAX
/METHOD=CORRELATION.
```

**Factor Analysis**

[DataSet0]

**Correlation Matrix<sup>a</sup>**

	SWLS1	SWLS2	SWLS3	SWLS4	SWLS5
Correlation SWLS1	1.000	-.111	-.005	.118	-.209
SWLS2	-.111	1.000	.275	-.129	.005
SWLS3	-.005	.275	1.000	.006	-.071
SWLS4	.118	-.129	.006	1.000	-.117
SWLS5	-.209	.005	-.071	-.117	1.000

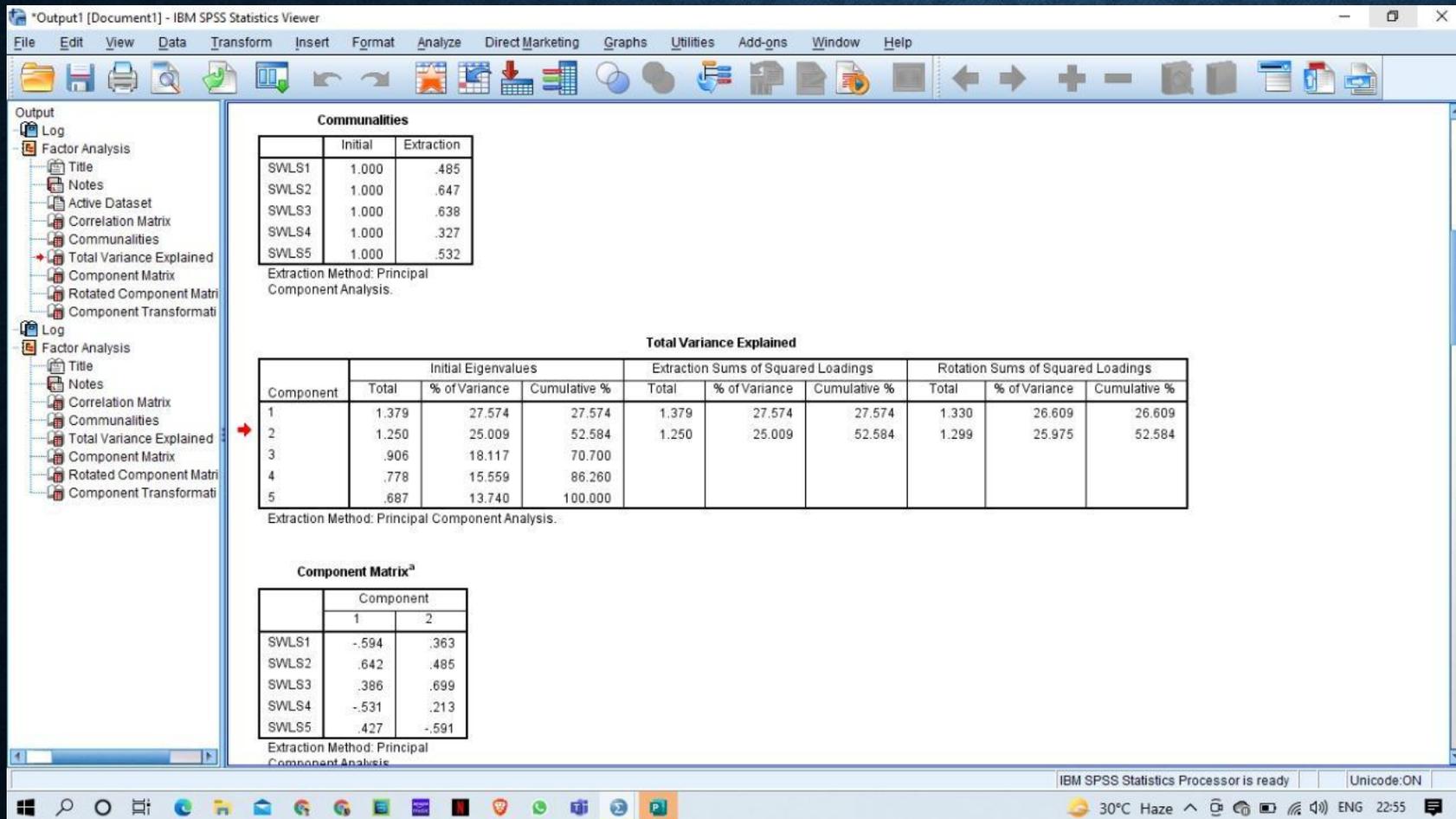
a. Determinant = .835

**Communalities**

## TWO MAIN ANALYSIS

- (i) Principal Component Analysis
- (ii) Common Factor Analysis

Five Variable listed based on the personality and relationship is analyzed among them. Correlation among similar variable shows 1 diagonally.



- Total Variance contains Initial Eigenvalues & 5 variables.
- Variable 1 & 2 shows Eigenvalue more than 1.
- Data reduced from 5 variable to 2.
- % of variance can be seen near 63% which is considered good.
- Sum of Eigenvalues= No of Components
- Two Components can be seen in Component Matrix.

- Rotated Component Matrix comes into play when there is more than one component.
- As we have two component we can see Rotated Component Matrix

The screenshot displays the IBM SPSS Statistics Viewer interface. The main window shows the results of a Factor Analysis, specifically the Rotated Component Matrix and the Component Transformation Matrix. The left sidebar lists the contents of the output document, including the Rotated Component Matrix, which is currently selected and highlighted with a red arrow.

**Rotated Component Matrix<sup>a</sup>**

	Component	
	1	2
SWLS1	.692	-.078
SWLS2	-.209	.777
SWLS3	.124	.789
SWLS4	.550	-.158
SWLS5	-.700	-.205

Extraction Method: Principal Component Analysis.  
Rotation Method: Varimax with Kaiser Normalization.  
a. Rotation converged in 3 iterations.

**Component Transformation Matrix**

Component	1	2
1	-.790	.614
2	.614	.790

Extraction Method: Principal Component Analysis.  
Rotation Method: Varimax with Kaiser Normalization.

**FACTOR**

```

/VARIABLES SWLS1 SWLS2 SWLS3 SWLS4 SWLS5
/MISSING LISTWISE
/ANALYSIS SWLS1 SWLS2 SWLS3 SWLS4 SWLS5
/PRINT INITIAL CORRELATION DET EXTRACTION ROTATION
/CRITERIA MINEIGEN(1) ITERATE(25)
/EXTRACTION PC
  
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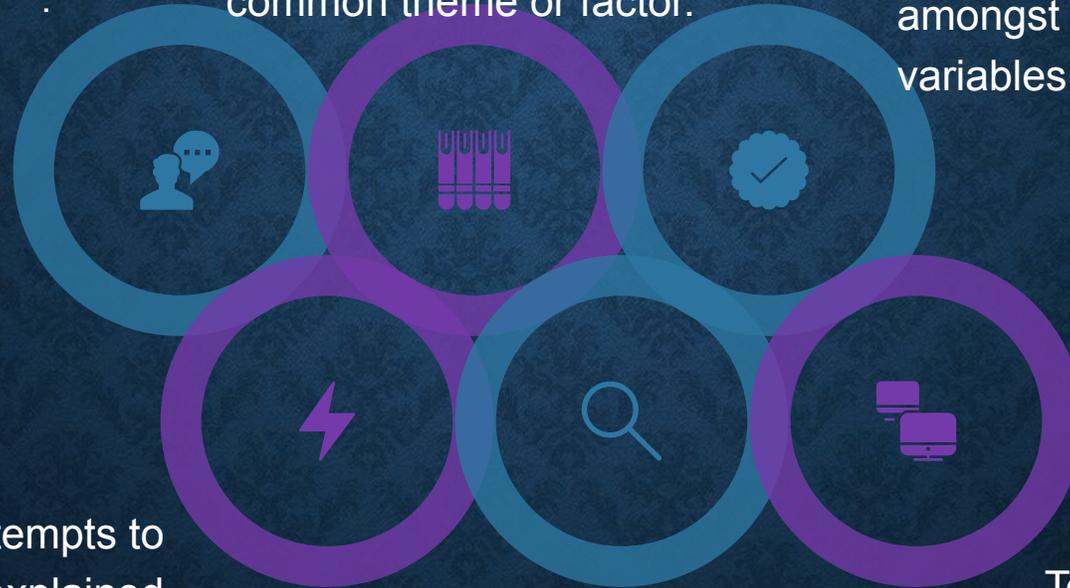
The bottom status bar of the window indicates "IBM SPSS Statistics Processor is ready" and "Unicode:ON". The system tray at the bottom right shows the date and time as "ENG 22:55" and the weather as "30°C Haze".

# Conclusion

It helps to make sense of large data with interlinked relationships

To determine the extent to which each variable in the dataset is associated with a common theme or factor.

To definitively understand how many factors are needed to explain common themes amongst a given set of variables.



Factor analysis attempts to discover the unexplained factors that influence the co-variation among multiple observations.

To provide an interpretation of the common factors in the dataset

To point out relationships that may not have been obvious



**THANK YOU**