

# NEW TREND IN PLS APPROACH

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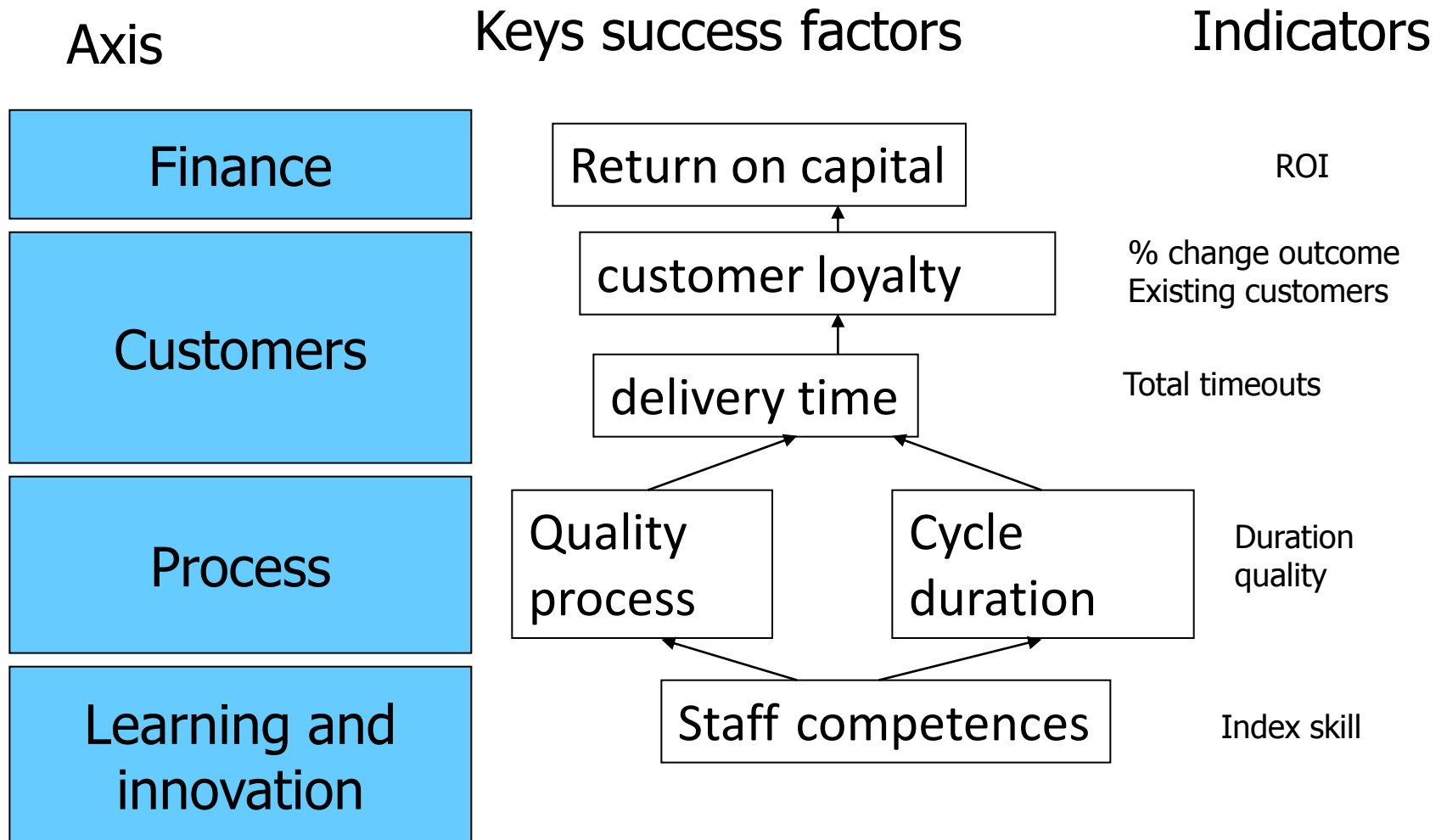
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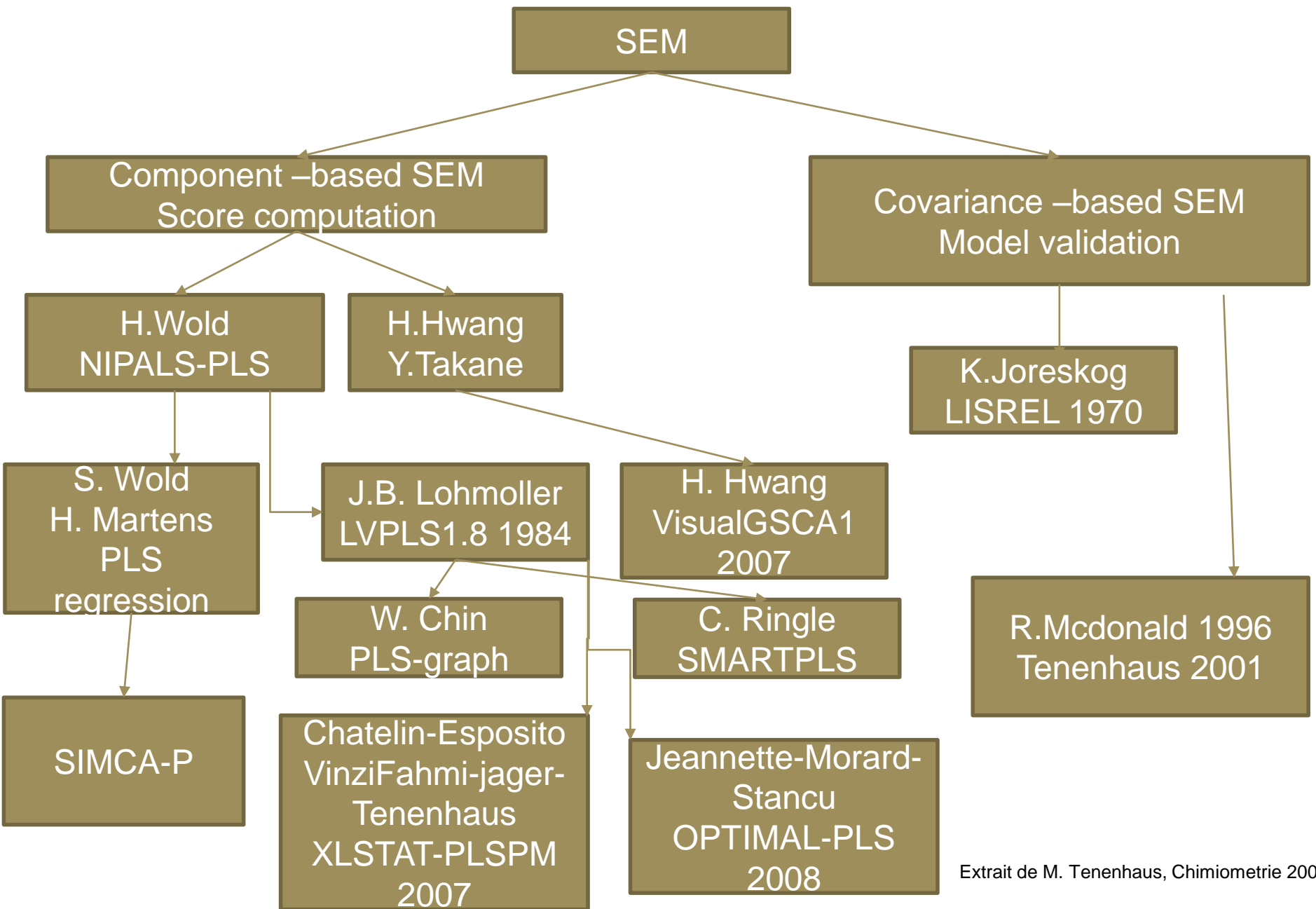
# Overview

1. The beginning...
2. General overview of structural modeling
3. PLS characteristics and algorithm
4. Model construction of optimal PLS
5. Several practical examples
6. Conclusion

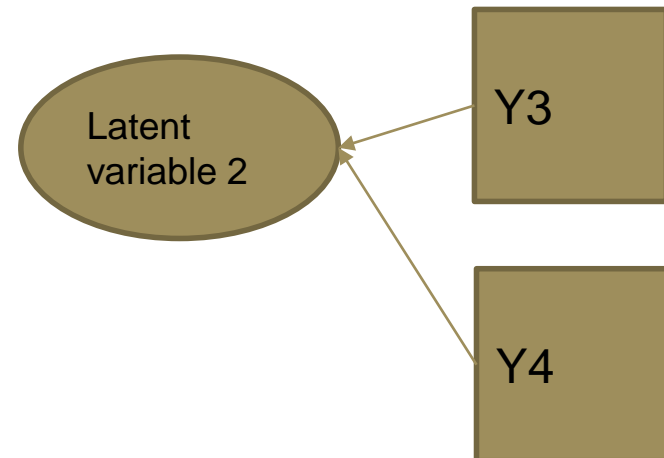
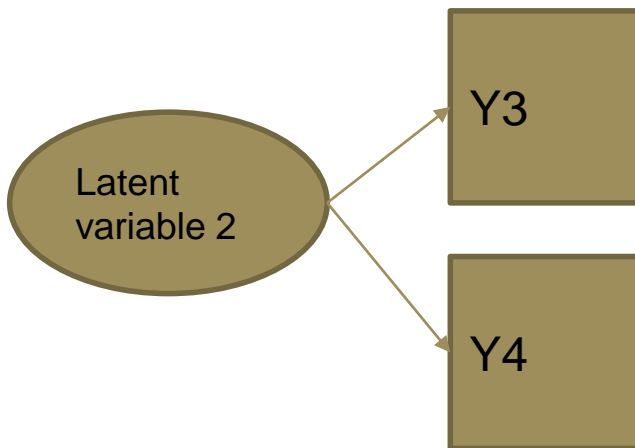
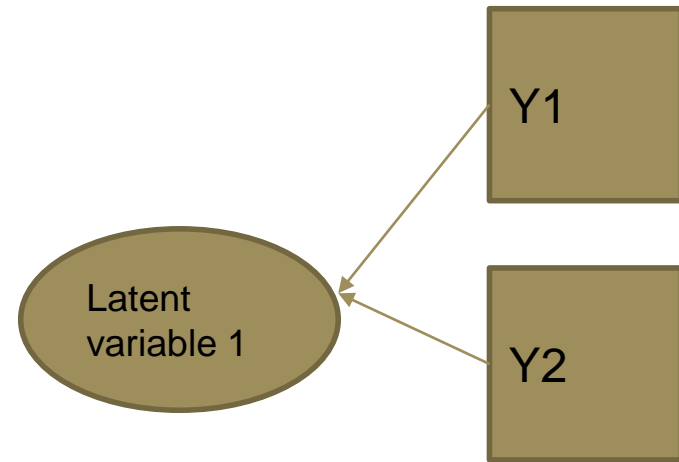
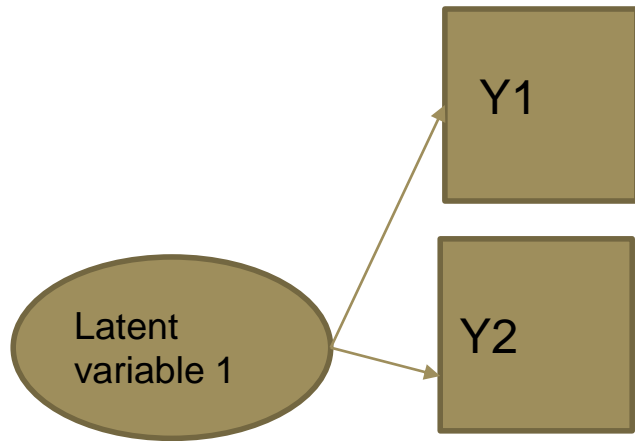
A classic example in the management sector BSC/Kaplan-Cooper



Following Kaplan "The strategy is reflected in the Balanced Scorecard"



# Rationalize the approach : SEM and PLS modeling....



Reflexive model

Formative model

# Short Overview ...Comparative Analysis

## • PLS/SEM

- 1-Few statistical requirements for model variables (method adapted to nominal, interval or continuous variables),
- 2-Well adapted to exploratory type analyzes, or to the testing of partial models,
- 3-Compatible with small samples and complex relational models (up to several hundred variables),
- 4-A flexible method for testing models with formative and reflective variables,
- 5-Measure model and structural model are estimated simultaneously (the links between indicators and latent variables depend on the relationships between latent variables)
- 6-Reserved for the test of recursive models (the causality between the latent variables must be univocal)

## • LISREL/SEM

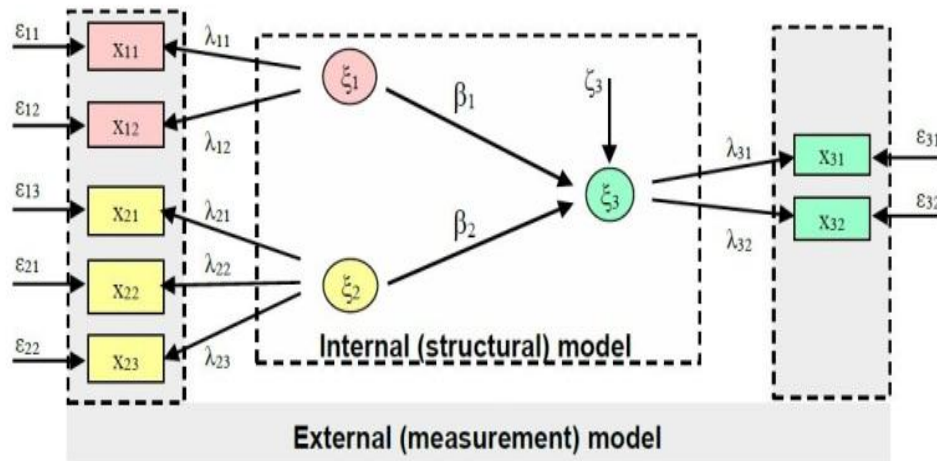
- 2-All variables must be continuous or interval, and normally distributed (multinormality condition), to use algorithms based on maximum likelihood.
- 2-Well adapted to the test of complete models, based on a firmly established theory
- 3-Requires medium size samples (minimum 200 observations), and moderately complex models,
- 4-Formative / reflexive models are identifiable (and testable) only if they have certain characteristics,
- 5-The estimation and validation of the measurement model are independent of that of the structural model,
- 6-Allows to test recursive and non-recursive models

## 2. Purpose & value for PLS...

- Purpose:
  - Showing the many possibilities of Big Data/PLS analysis offers and its ease of use
- Originality:
  - The use of a new approach to PLS: The optimal PLS (O-PLS)
  - Simplifying PLS use in 5 steps
  - Testing O-PLS several different field of research
- Practical application:
  - Use PLS analysis more easily (5 steps)
  - No theoretical knowledge of statistics needed

# 3. PLS characteristics and algorithm

## PLS : general model



$$\zeta_j = \beta_{j0} + \sum_i \beta_{ji} \zeta_i + v_j$$

$$x_{jh} = \pi_{jh0} + \pi_{jh} \zeta_i + v_j$$

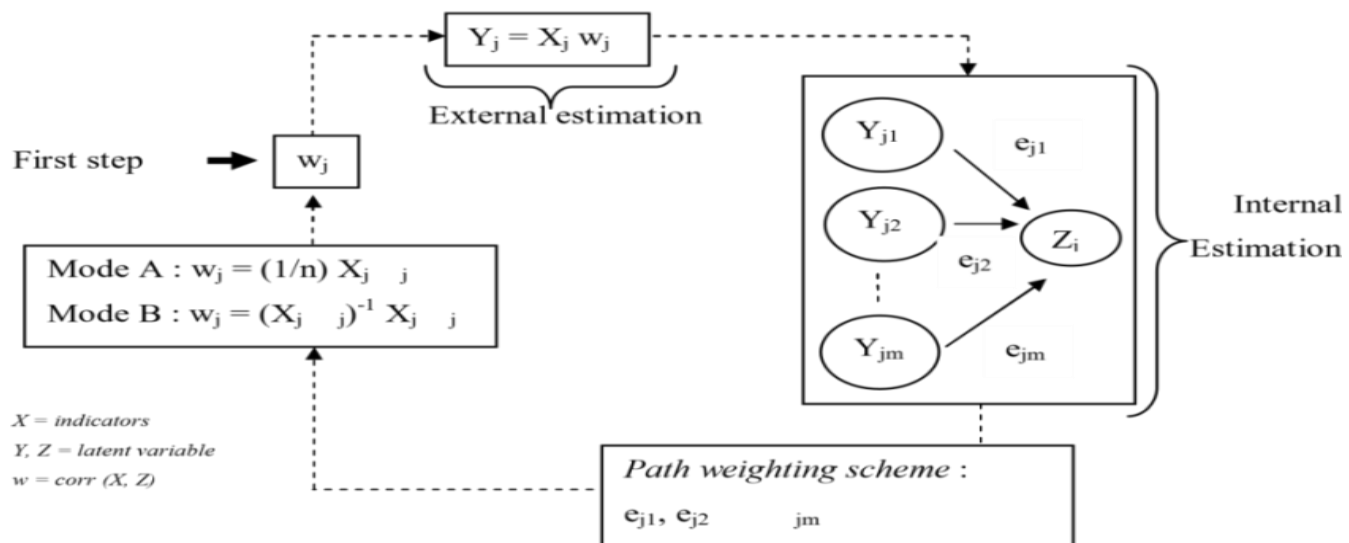
- Causality between latent variables
- $\beta$  coefficient represents the regression value between latent variable)



# 3. PLS characteristics and algorithm

## PLS illustration: External model

Algorithm (Iterate until convergence) :



$X$  = indicators  
 $Y, Z$  = latent variable  
 $w$  = corr ( $X, Z$ )

- Connection of simple regressions between the observed variables and their respective latent variables
- these stages have to iterate until they reach convergence, when:

$$\sum_{h,j} |W_{jh}^{(k)} - W_{jh}^{(k-1)}| < 10^{-5}$$

# 4. Model construction of Optimal PLS

## 5 chronological steps of PLS-Graph

- Two way methodological approach ; we choose an validate a model or search the Best model ..
- We choose the second approach with no specific model and we reduce the dimension by ACP
- With the cause-and-effect links between the variables, directions, and the different indicators of each axis
- Simplify the use of PLS

- **Step 1** – *Collecting data*
- **Step 2** – *Cleaning data*
- **Step 3** – *Filtering and congregating variables*
- **Step 4** – *Generating an optimal cause-and-effect schema*
- **Step 5** – *Applying PLS equation*



# 4. Model construction of Optimal PLS

## The 5 chronological steps

### Step 1 – Collecting data

→ Identifies and collects all the historical data and numerical elements that comprise the chosen quantitative indicators (No initial selection of variables, collect the maximum of information)



# 4. Model construction of Optimal PLS

## The 5 chronological steps

### Step 2 – Cleaning data

→ Cleaning the collected data to avoid data errors that can distort the findings and lead to wrong conclusions

- ❖ Reliability and consistency
- ❖ Same occurrence in time ( periodicity)
- ❖ Ability to capture the actual situation
- ❖ Information singularity
- ❖ Clarity and straightforwardness

# 4. Model construction of Optimal PLS

## The 5 chronological steps

### Step 3 – Filtering and congregating variables

- Generating a number of axes by Principal component Analysis
- Selecting certain axes (Equivalent to a minimum of 70% of the variance explained)
- Keeping the axes with useful information and high correlation for the variable...

# 4. Model construction of Optimal PLS

## The 5 chronological steps

### **Step 4 – Generating an optimal cause-and-effect schema**

- Determining the structure of the most viable and optimal model for the present situation
- Testing model for statistical reliability to determine the most statistically stable
- Naming the axes
- Connections between axes are studied to understand and optimize the “cause-and-effect” chain

# 4. Model construction of Optimal PLS

## The 5 chronological steps

### Step 5 – Applying PLS equation

→ Allow to:

- ❖ Measure the variance impact on the entire model
- ❖ Forecast the future changes of the present situation
- ❖ Determine the composition of the necessary elements for optimal changes
- ❖ Determine how these changes will impact the future situation

*Nb. Quality tests are the same as for SEM analysis (Composite reliability, Average Variance Extracted, R-squared, Cronbach alpha)*

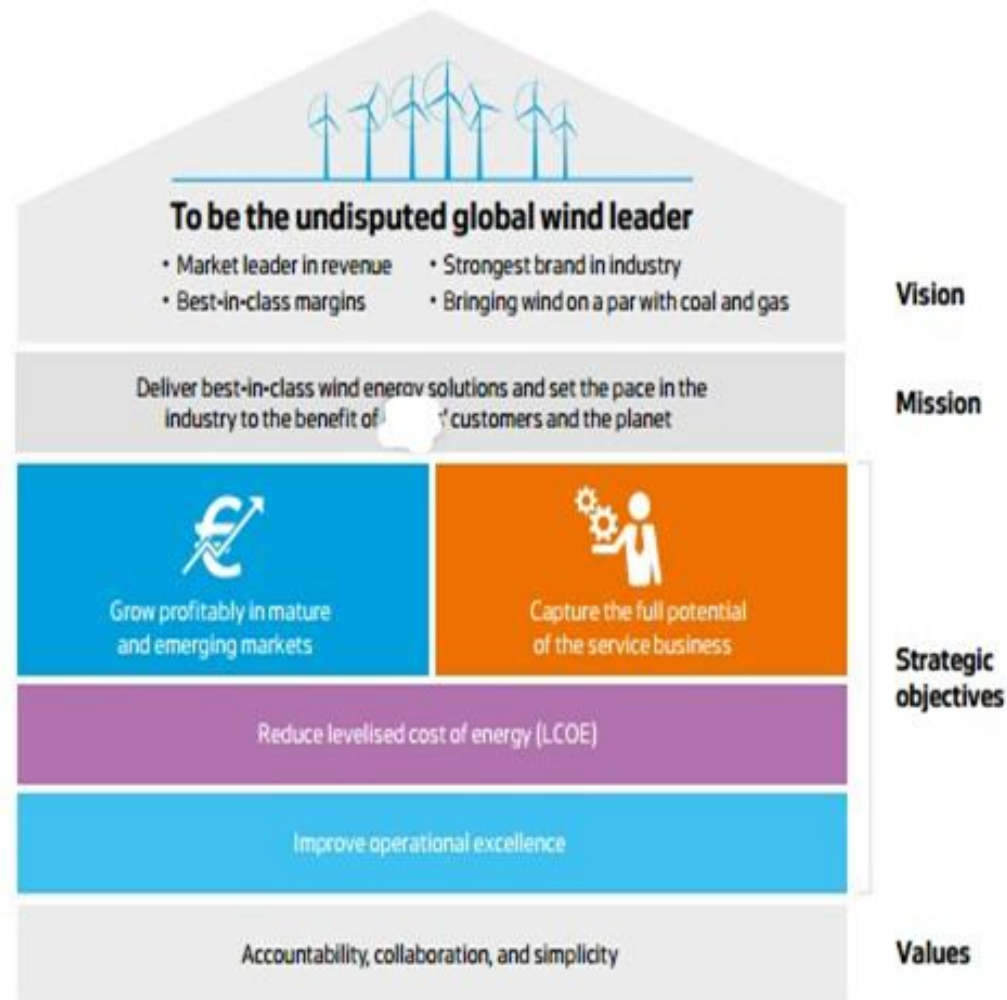
## 5.3 the firm.....products

- The 2MW platforms offer a competitive selection of turbines for all wind segments. In fact, this platform resists to low, medium, high and extreme weather conditions. With more than 17'200 2MW turbines installed, the 2 MW platforms have become one of the most popular platforms in their portfolio.
- The 3MW platform has been created for a broad range of wind and site conditions and for exceptional energy capture. This product is made for costumers looking to combine reliability with performance





# Practical 5.3...V...vision and strategy

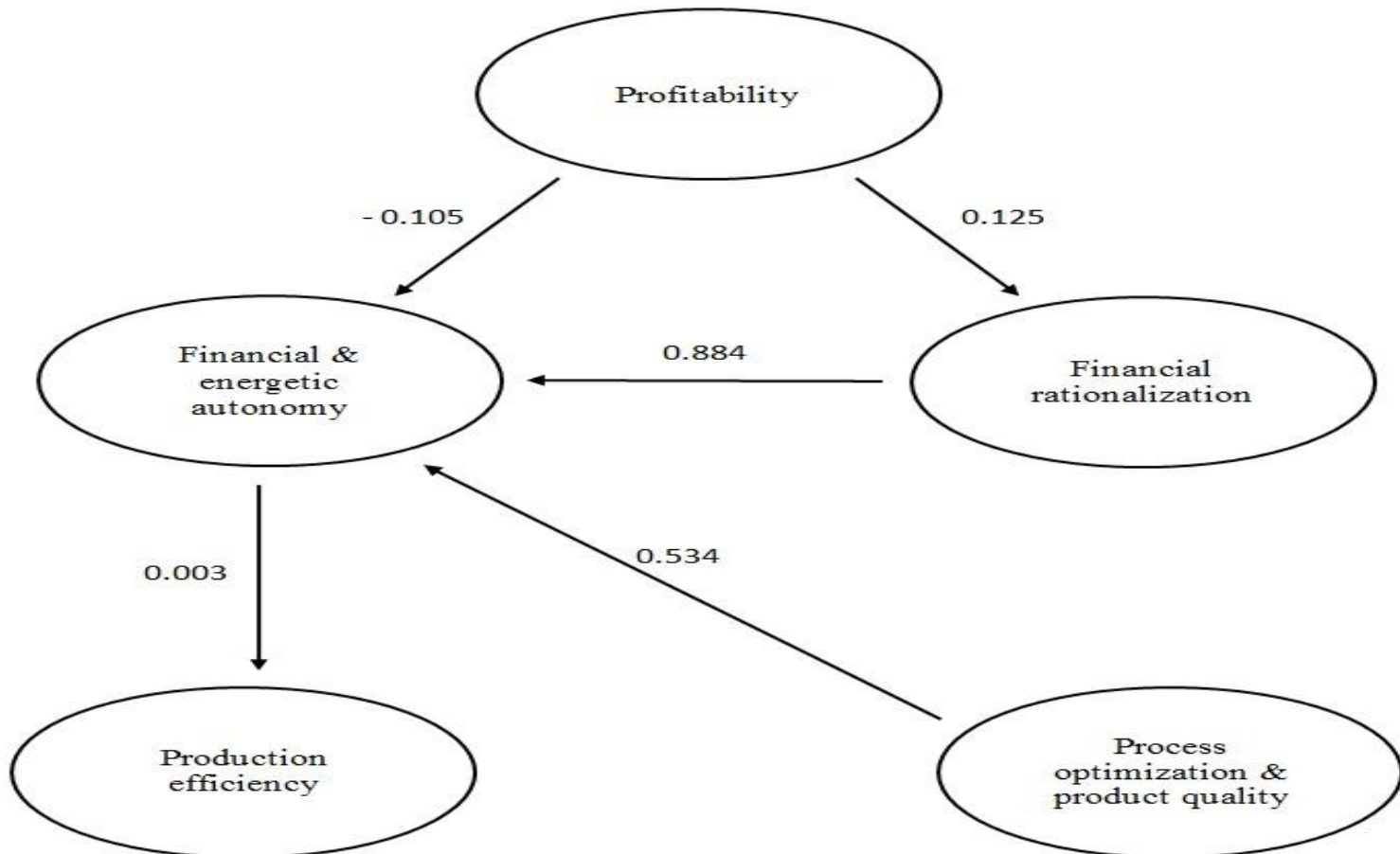


## 5.3 The strategy.....

- Grow profitability in mature and emerging market
- Capture the full potential of the service business
- Reduce levelised cost of energy
- Improve operational excellence



## 5.3 the inner model.....



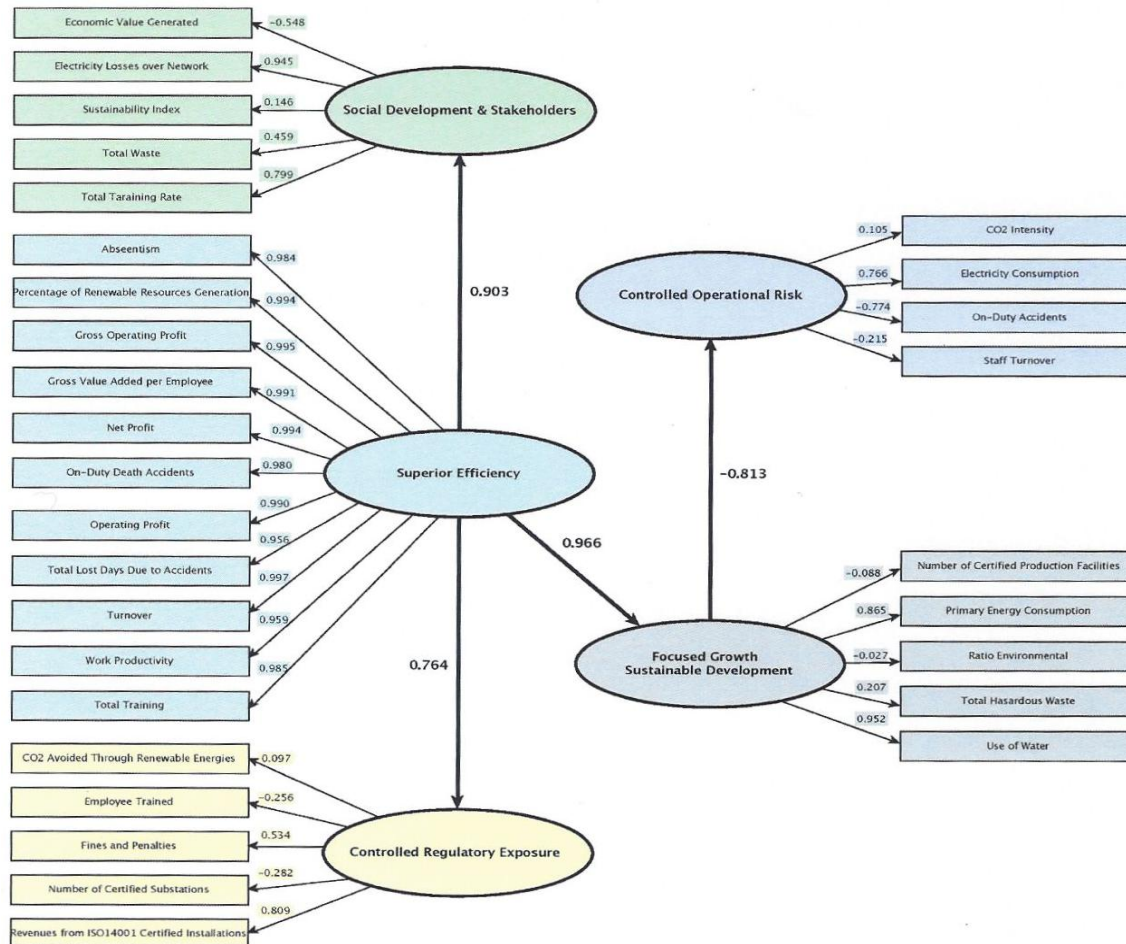
## 5.4 Firm strategy in the energy sector

- Risk control (compliance with regulatory rules, setting up lucrative offers with coverages, reducing CO2 emissions),
- increasing the efficiency of the organization (implementation of an efficient cost system, strict investment discipline, abandoning activities that are not in the core business),
- creating profitable growth (developing the wind energy sector, developing two production units, etc.), and the creation of a new wind farm.

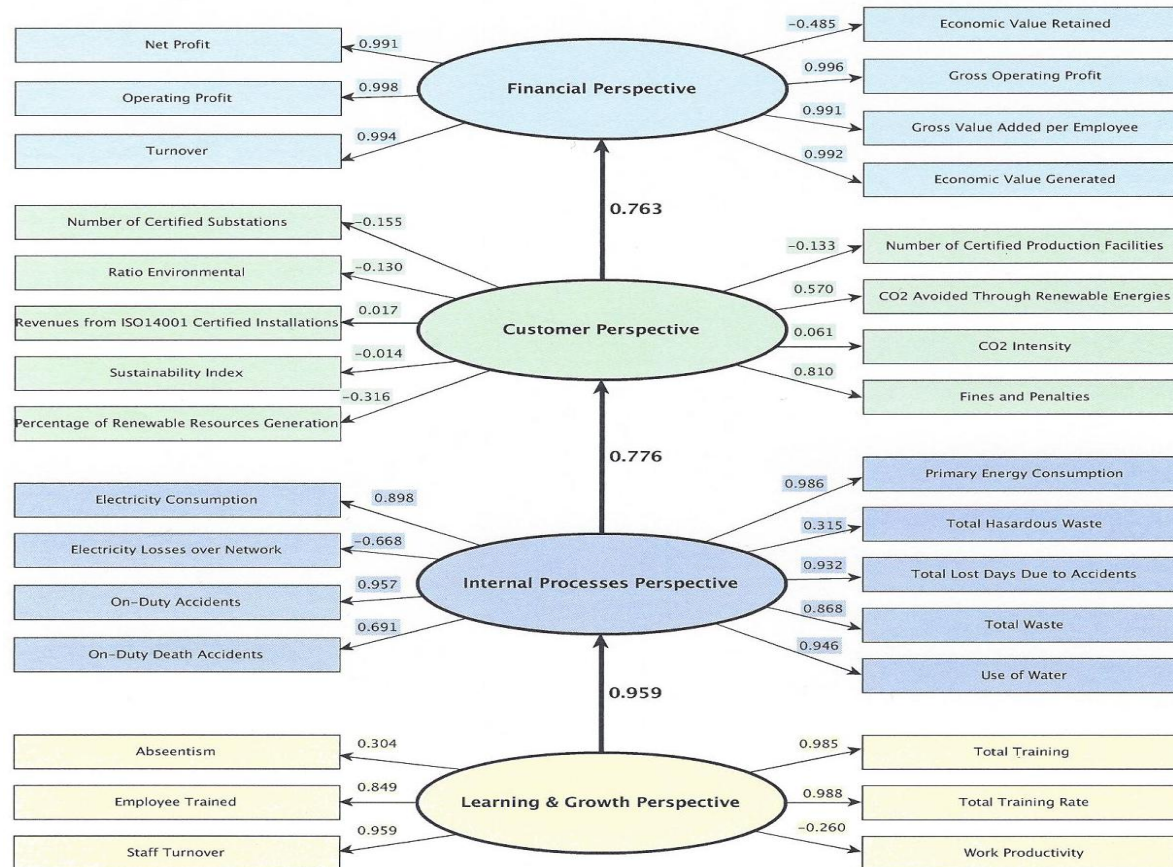
## 5.4 Data....results

- . The principal component analysis reduced the initial sample size by 175 key variables 30 variables with an explanatory power rate of 75% and
- five main axes correlated to these variables. The nature of the axes is provided by the variables with which they are correlated. The following axes can be mentioned here without difficulty:
  - Axis 1: search for efficiency,
  - Axes 2 control and exposure rules,
  - Axis 3: social development and partnership,
  - Axis 4: operational risk controls,
  - Axis 5 - Growth and sustainable development.

# 5.4 Optimal results....(explanatory power 75%)



# 5.4 classic Kaplan BSC (explanatory power of 65%)





# In summary

## Analogies in research process

### In management controlling

→ The optimal model (OBSC) is the one with the best predictability capabilities for the actual company strategy in a specific market

### In consumer research

→ The optimal model (OCBD) is the one with the best predictability capabilities for the actual consumer behavior strategy in a specific market and for a specific product

### In big data approach

→ General research of connection between data table

If each strategy has its own optimal model, traditional models cannot be applied, because they are generic and not optimal!



# 7. Conclusion

## Practical use

High potential for companies of PLS-Graph analysis in specific markets :

- Finding opportunities to adapt their future strategic plans
- Having a better understanding of the target market
- Being closer to the real needs of the market
- Having the ability to synthesize the available information quickly

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# O-PLS analysis online tool

[Optimal-PLS.com](http://Optimal-PLS.com)