



# Systems Engineering at Schindler

## Challenges of the Elevator Business

A Lecture for the Swiss Chapter of INCOSE



**Schindler**

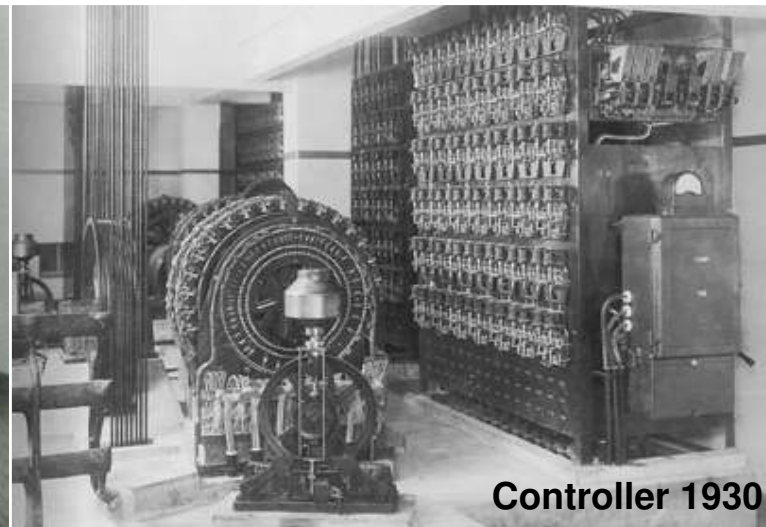
# Content

- **Schinder the Elevator Company**
- **A Brief Overview on Products**
- **A View into a Traction Elevator**
- **Challenges**
- **System Life Cycle**
- **Conclusion**

# Schindler Lucerne 1874

## Founder Robert Schindler

Plant 1900



Controller 1930

Drives 1954



Cars 1890



Lift boy

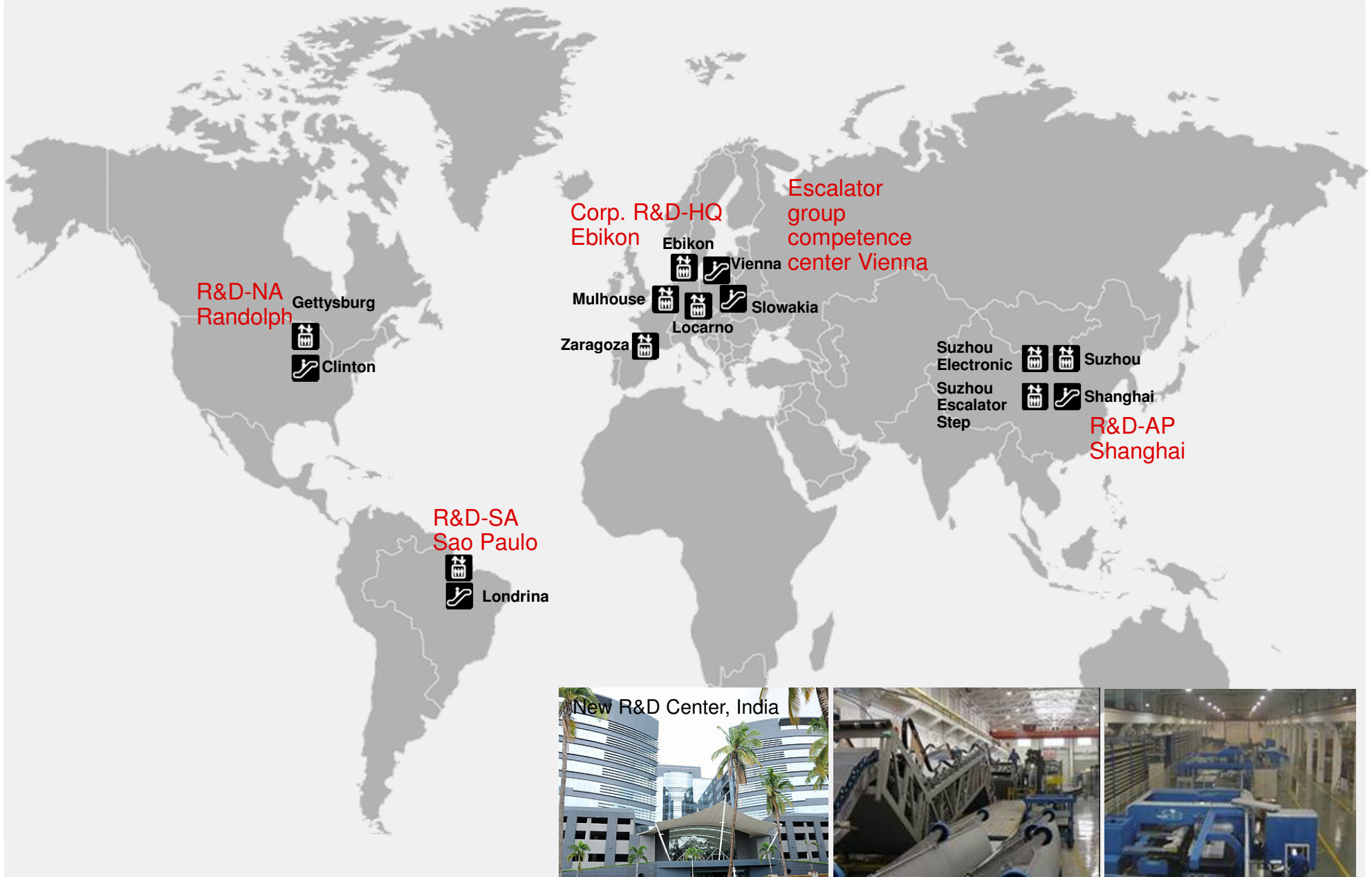
# Schindler Group

## Global presence



~ 44 500 employees – more than 100 countries – more than 1 000 branches

# Continental sourcing



# Continental platforms

## Americas (North)

### Elevators:

Schindler 330A  
Schindler 400A  
Schindler 500A  
Schindler 7000

### Escalators:

Schindler 9300  
Schindler 9500  
Schindler 9700

## Americas (South)

### Elevators:

Schindler 3300  
Schindler 5300  
Schindler 7000

### Escalators:

Schindler 9300  
Schindler 9500  
Schindler 9700

## Europe North/South

### Elevators:

Schindler 3100  
Schindler 3300  
Schindler 3400  
Schindler 5300  
Schindler 5400  
Schindler 2400  
Schindler 2500  
Schindler 2600  
Schindler 6200  
Schindler 6300  
Schindler 7000

### Escalators

Schindler 9300  
Schindler 9500  
Schindler 9700

## Asia/Pacific

### Elevators:

Schindler 3300  
Schindler 5300  
Schindler 7000

### Escalators

Schindler 9300  
Schindler 9500  
Schindler 9700

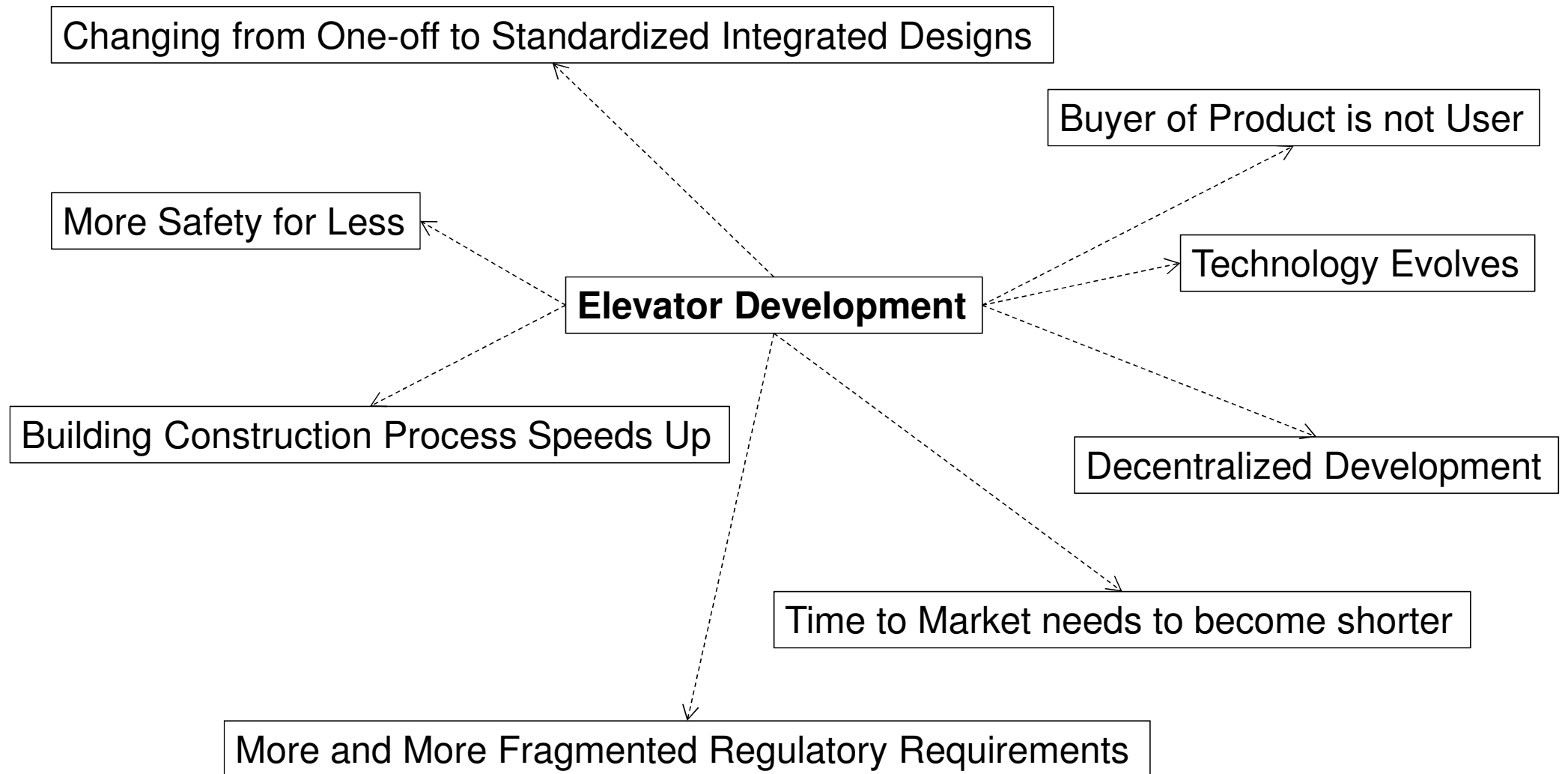
# Application Scope of Product Segments

	Commodity (E1)	Custom Modular (E2)	Custom Design (E3)
Rated Car Load [kg]	320...1200	450...4000	630...6300
Rated Travel Speed [m/s]	0.4...1.75	0.8...3.0	2.5...10
Rated Travel Height [m]	2.6...75	2.6...150	2.6...600
Number of Stops	2...20	2...32	2...128
Car Dimensions	fixed sizes	sizes in 50 mm steps	sizes in 10 mm steps

# Traction Elevator – With or Without Machine Room



# Challenges in Elevator Development



# S3300 – Our Commodity Product

## A Few Parameter Lead to a Lot of Variants

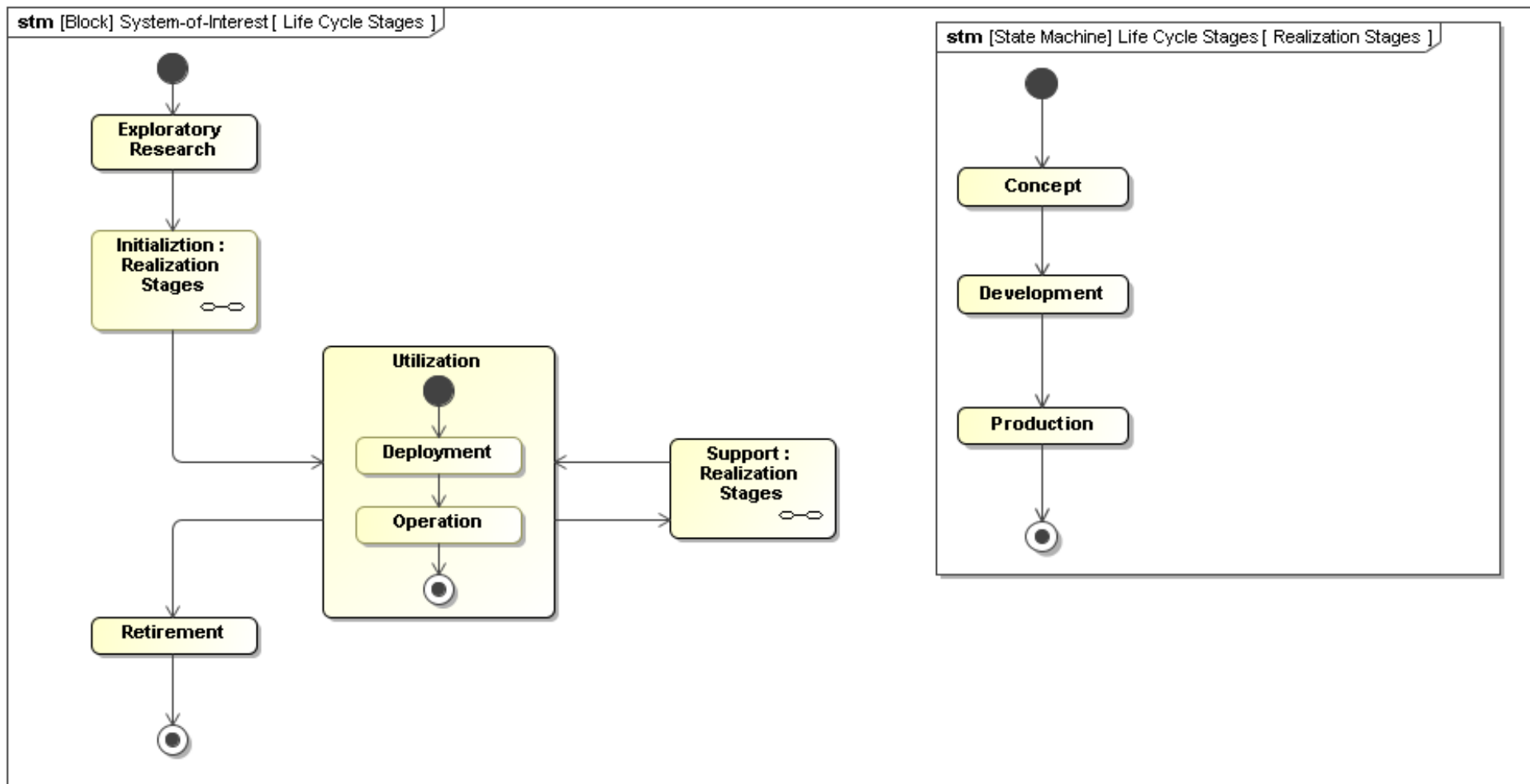
### **300'000+ Variants**

- 5 variants for rated load
- 3 variants for car width
- 5 variants for car depth
- 3 variants for door width
- 2 variants for door height
- 2 variants of rated speed
- 2 variants for entrance sides
- 19 variants for number of stops
- 4 deco variants with 2-9 wall designs and 6-7 floor designs
- 2 variants of car operating panel with 3 layout variants
- 7 car options
- 15 controller options

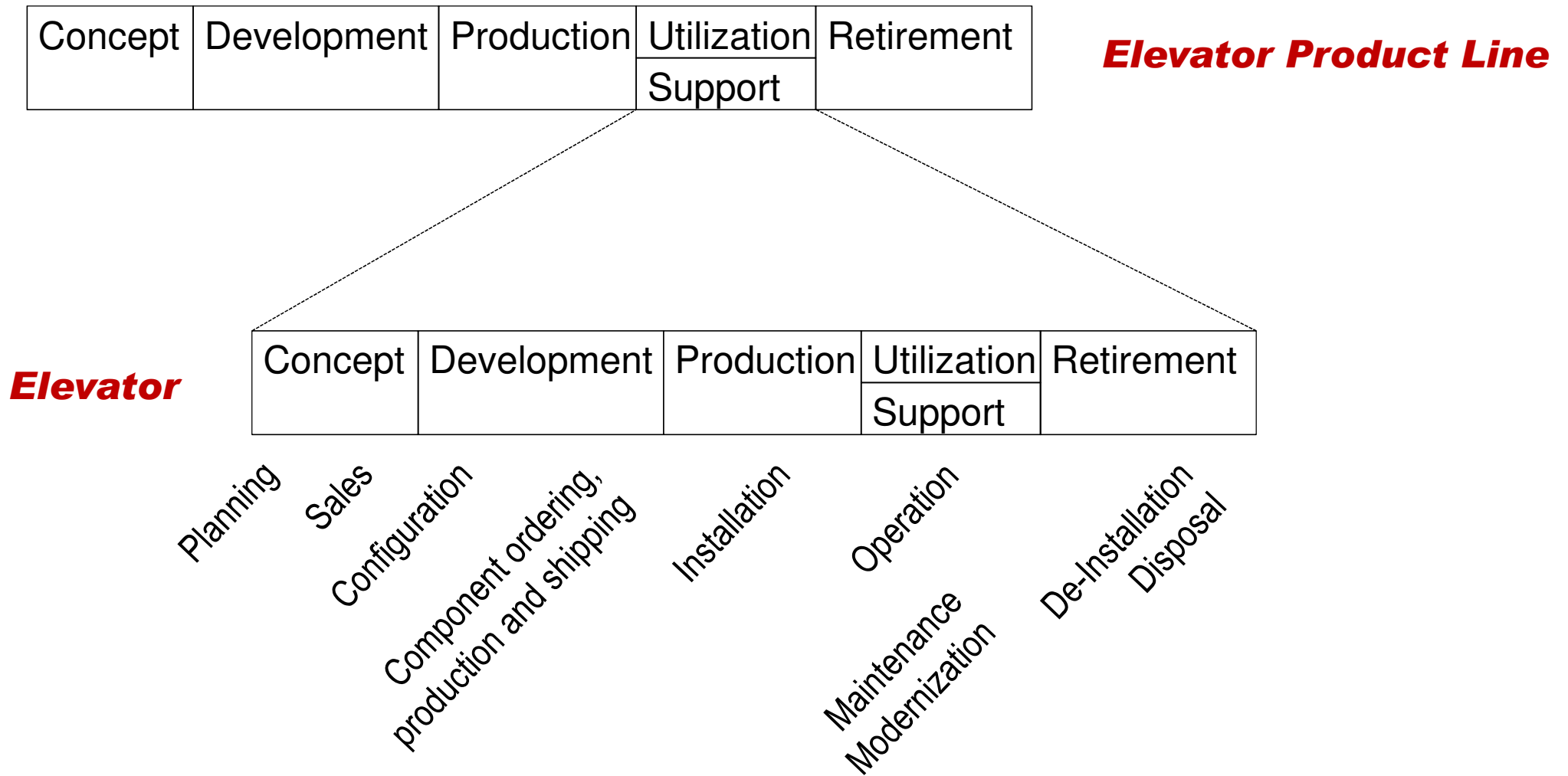
**Results in 8000+ parts (leaf elements in BOM structure)**

# Generic Life Cycle Stages of a System

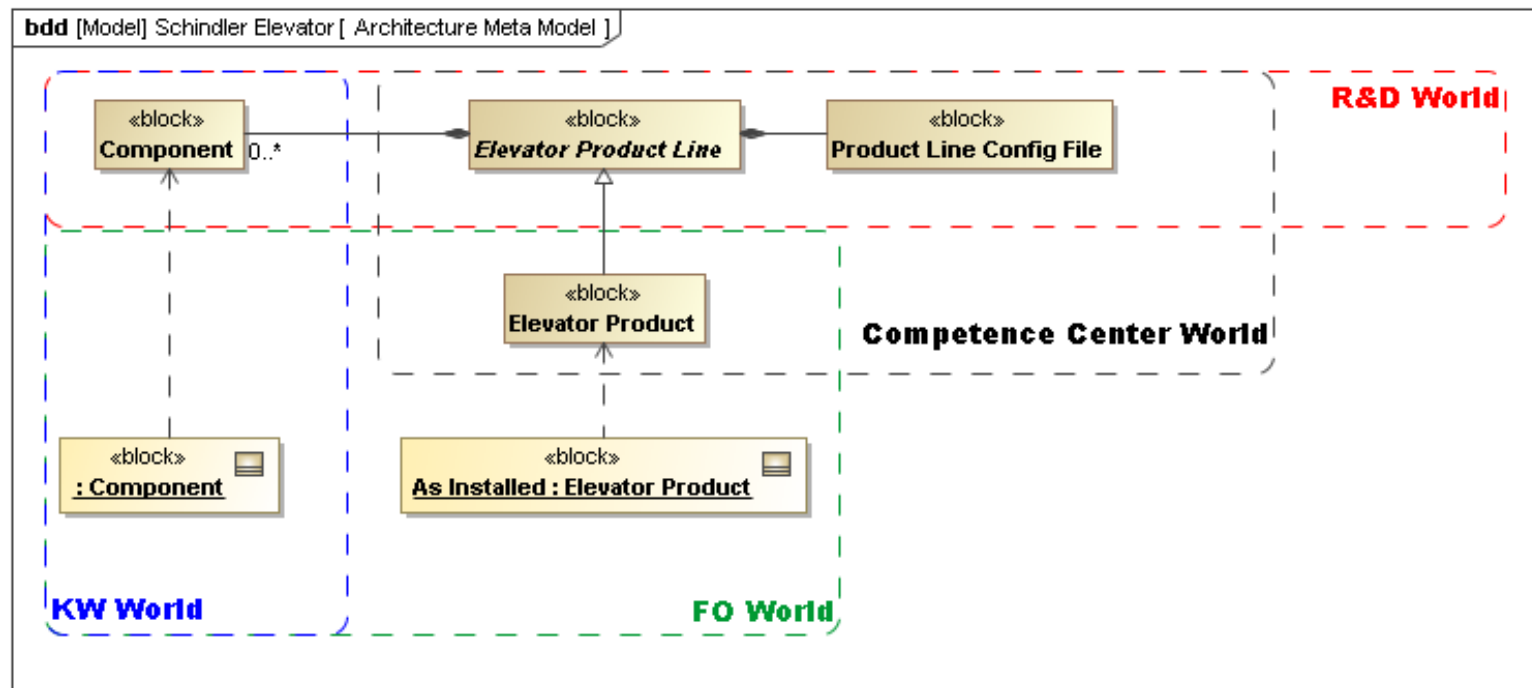
Exploratory Research	Concept	Development	Production	Utilization Support	Retirement
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# Life Cycle of an Elevator



# A Variety of Systems – Each with its Life Cycle



# What are the Solutions?

## Models and Enabling Systems

- Models will support layering and standardized interfaces and hence support reuse.
- Different models exist. Higher product integration requires tighter interlinking between these models.
- Model being used to realize enabling systems.
- Existing enabling systems serve for model validation.
- Enabling system support the operation process. That is, they calculate the appropriate solution in a multidimensional solution space.

«To the optimist, the glass is half full.

To the pessimist, the glass is half-empty.

To the systems engineer, the glass is twice as big as it needs to be.»

# Thank you for your attention.

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