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INDUSTRIAL ENGINEERING

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Chapter 03

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PRODUCT DEVELOPMENT

OUTLINE

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1. Product
2. Product Innovation
3. Product Portfolio
4. Product Life Cycle
5. Product Requirements
6. Consecutive Exercise

PRODUCT DEVELOPMENT – PORSCHE

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PRODUCT

PRODUCT

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A product is a good, service, or idea consisting of a bundle of tangible and intangible attributes that satisfies consumers/costumers

Industrial Products

Materials & Parts

- Raw Materials
- Manufactured Materials

Capital Goods

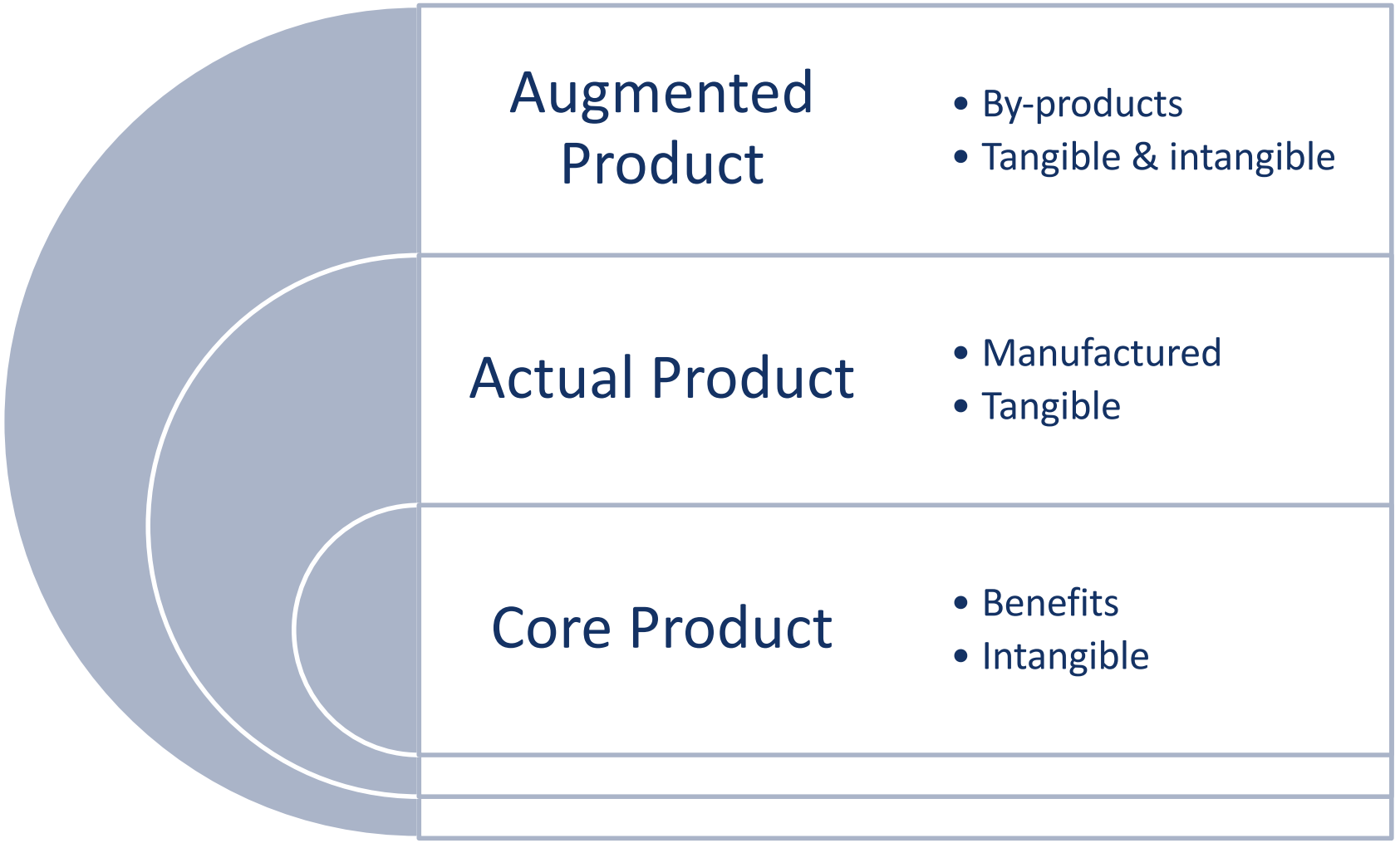
- Installations
- Equipments

Supply Material

- Operating supplies
- Maintenance & spare parts

A product that will fix a problem, address a need, make a task easier, and/or improve someone's life.

PRODUCT LAYERS



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PRODUCT INNOVATION

PRODUCT INNOVATION

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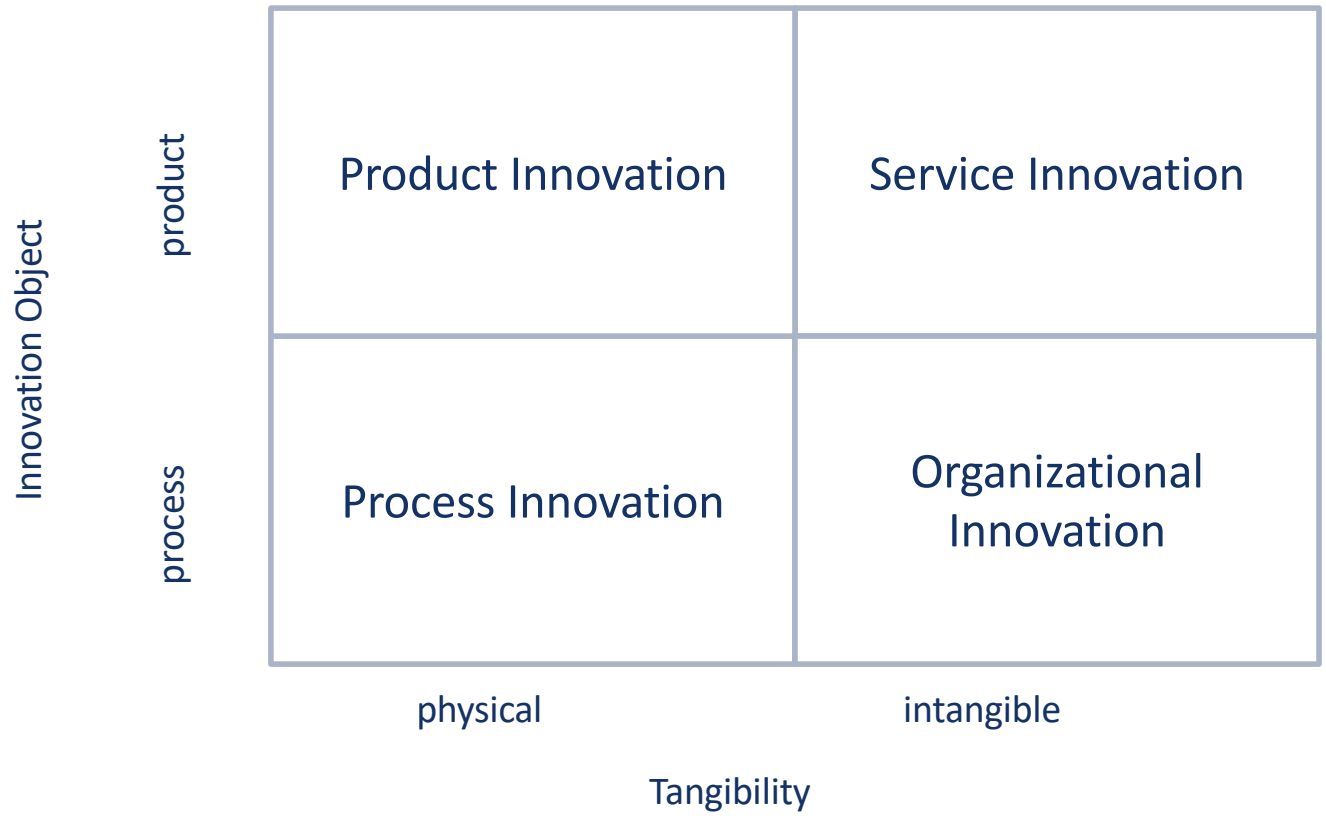
Innovation has different types



The innovation fields may be interconnected

FUNDAMENTAL INNOVATION APPROACHES

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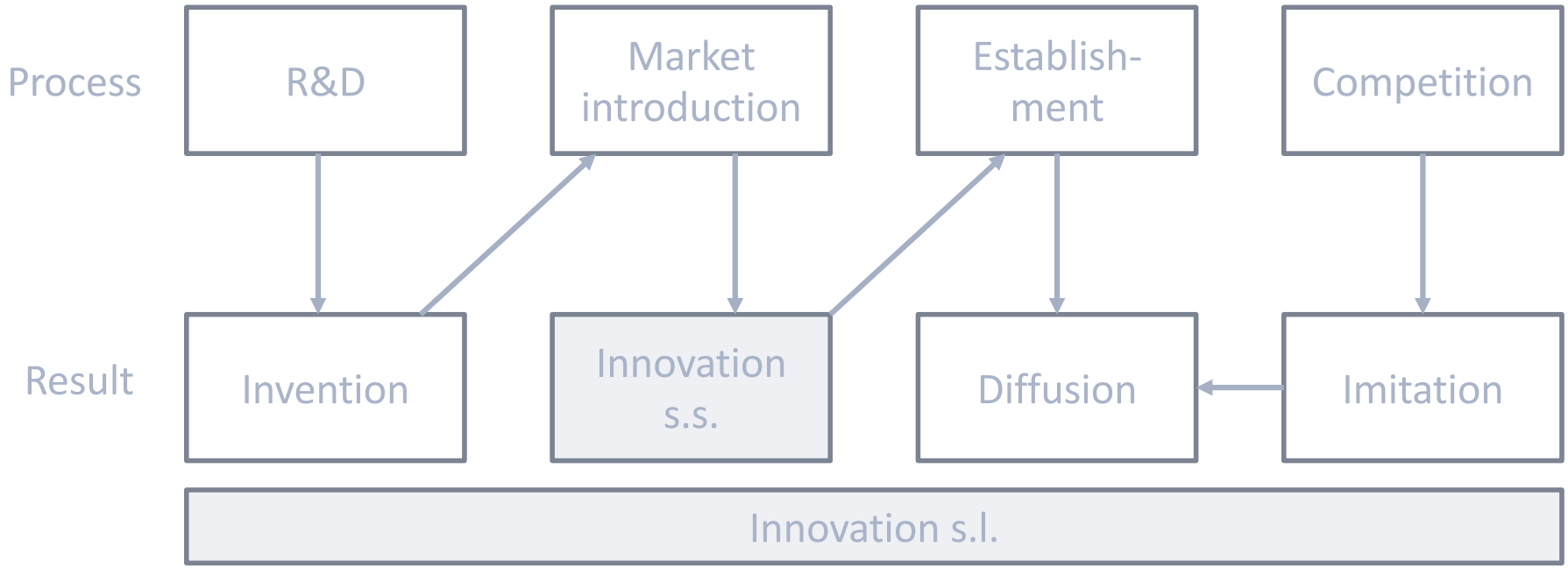
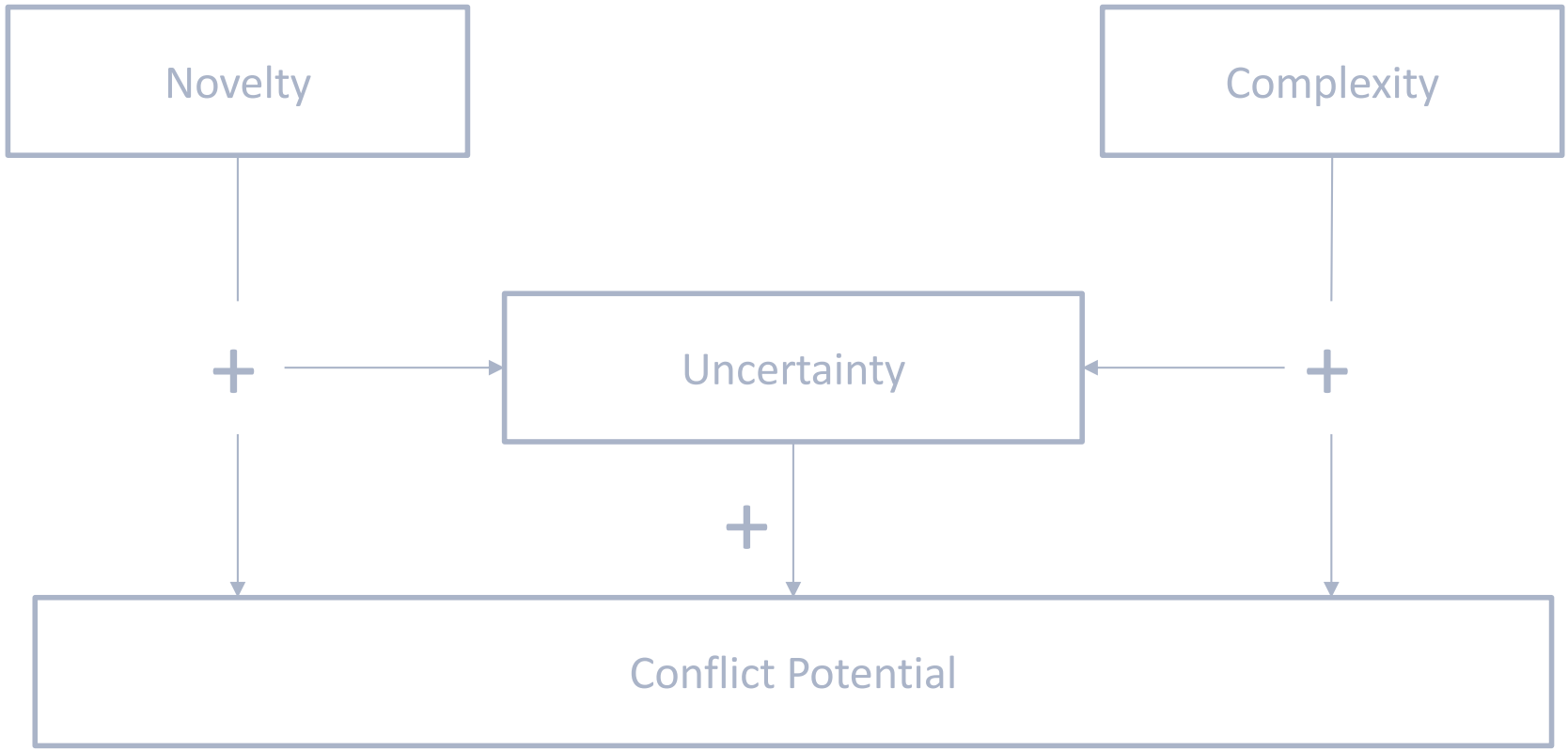
Analysis	Interpretation
• Rational decision-making and problem-solving • series of discrete problems and an associated series of decisions • Manager is lead problem-solver & mediator • Requires clear understanding of the whole product/project • Customer needs may be misleading since complex products might not be well understood by the customer	• Creative approach embracing ambiguity • Manager is initiating and guiding conversations • More appropriate when the possible outcomes are unknown

Firms must continually participate in exploratory, interpretive conversations with a variety of interlocutor

SCOPE OF INNOVATION



DETERMINANTS OF INNOVATION



FACTORS HAMPERING INNOVATION

Economic Factors

- Excessive perceived risk
- High costs
- Lack of appropriate sources of finance
- Too long pay-off period of innovation

Enterprise Factors

- Lack of skilled personnel
- Lack of information on technology
- Lack of information on markets
- Innovation expenditure hard to control
- Resistance to change in the firm
- Deficiencies in the availability of external services
- Lack of opportunities for cooperation

Other Reasons

- Lack of technological opportunity
- Lack of infrastructure
- No urge due to prior innovations
- Weakness of intellectual property rights
- Legislation, norms, regulations, taxation
- Unresponsive customers

INNOVATION & PRODUCT DEVELOPMENT PROCESS

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The development of original products, product improvements, product modifications, and new brands through the firm's own R & D efforts.

- Step 1 • Idea Generation
- Step 2 • Idea Screening
- Step 3 • Concept Development & Testing
- Step 4 • Marketing Strategy Development
- Step 5 • Business Analysis
- Step 6 • Prototyping
- Step 7 • Market Testing
- Step 8 • Commercialization

PRODUCT PORTFOLIO

BILL OF MATERIAL (BOM)

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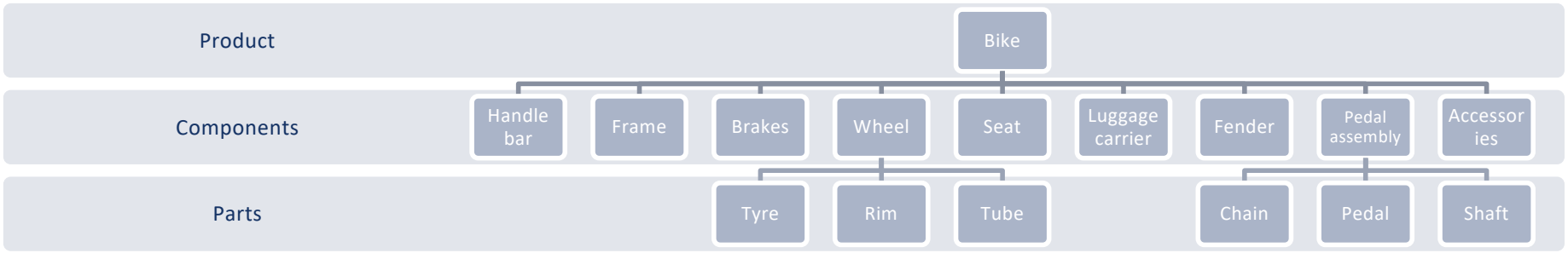
A BOM is a list of raw materials, parts, components, and the quantity needed to finish a product.



The BOM is usually used for production orders

PRODUCT PORTFOLIO

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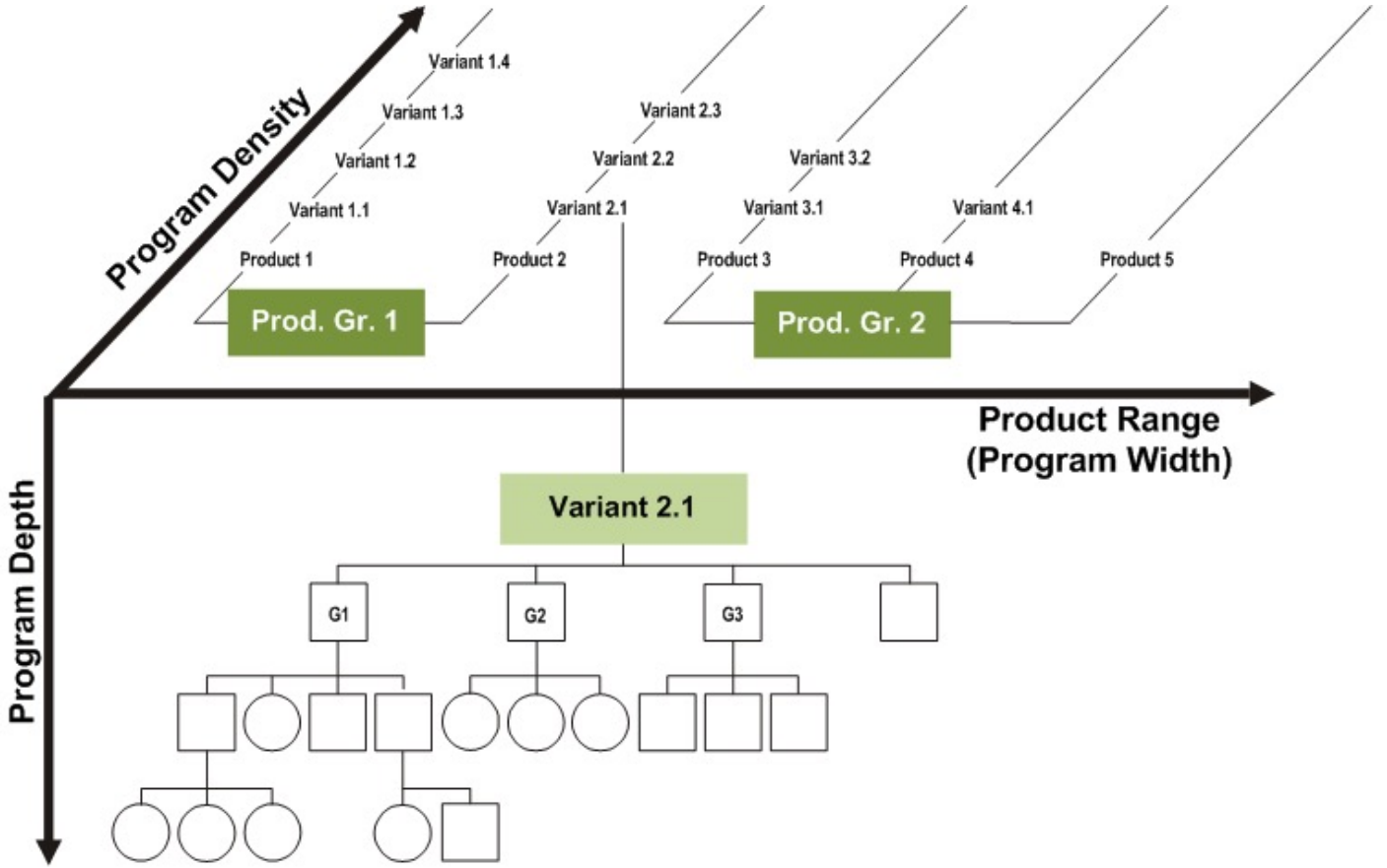
The product portfolio defines the program width, depth, and density



PRODUCT PORTFOLIO - EXAMPLE

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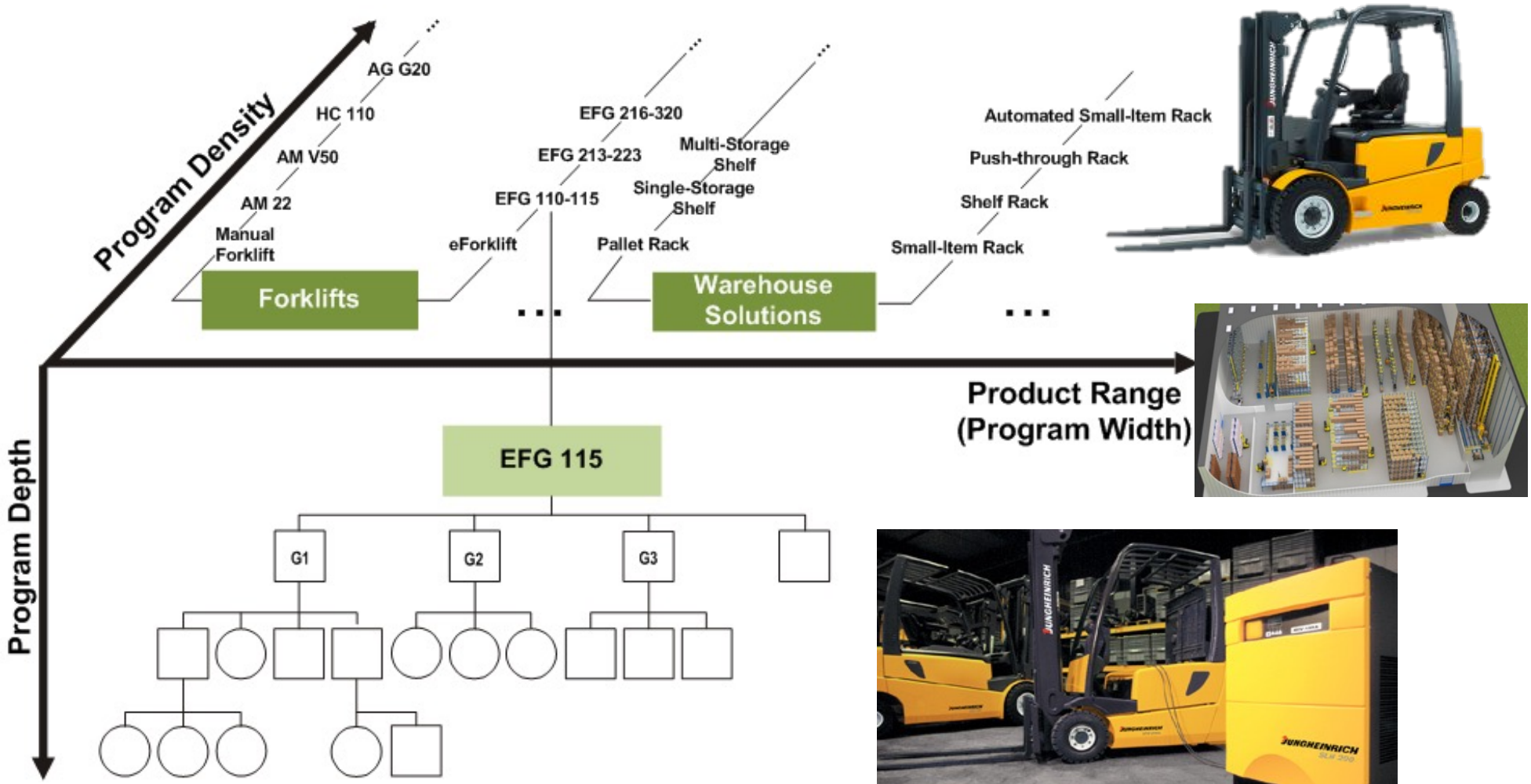
- Consider a forklift manufacturer, such as Jungheinrich, that produces two different groups of products, i.e. forklifts and warehouse systems. Forklifts cover a range of manual forklifts (AM22, AM V50, HC 110 and AG G20, etc.) and electric forklifts (EFG 110/115, EFG 213/223, EFG 216/320, etc.). Its warehouse systems include pallet racks (single-storage shelf SS1 and multi-storage-shelf MS1) and small item racks (shelf racks, push-thru racks, and automated small item racks). The company makes the engine, chassis (car body/frame), forks by itself and buys all other components from suppliers.

- Define its
  - Program width
  - Program density
  - Program depth

EXERCISE 3.2 - SOLUTION



Source: Jungheinrich AG

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PRODUCT LIFE CYCLE

PRODUCT LIFE CYCLE (PLC)

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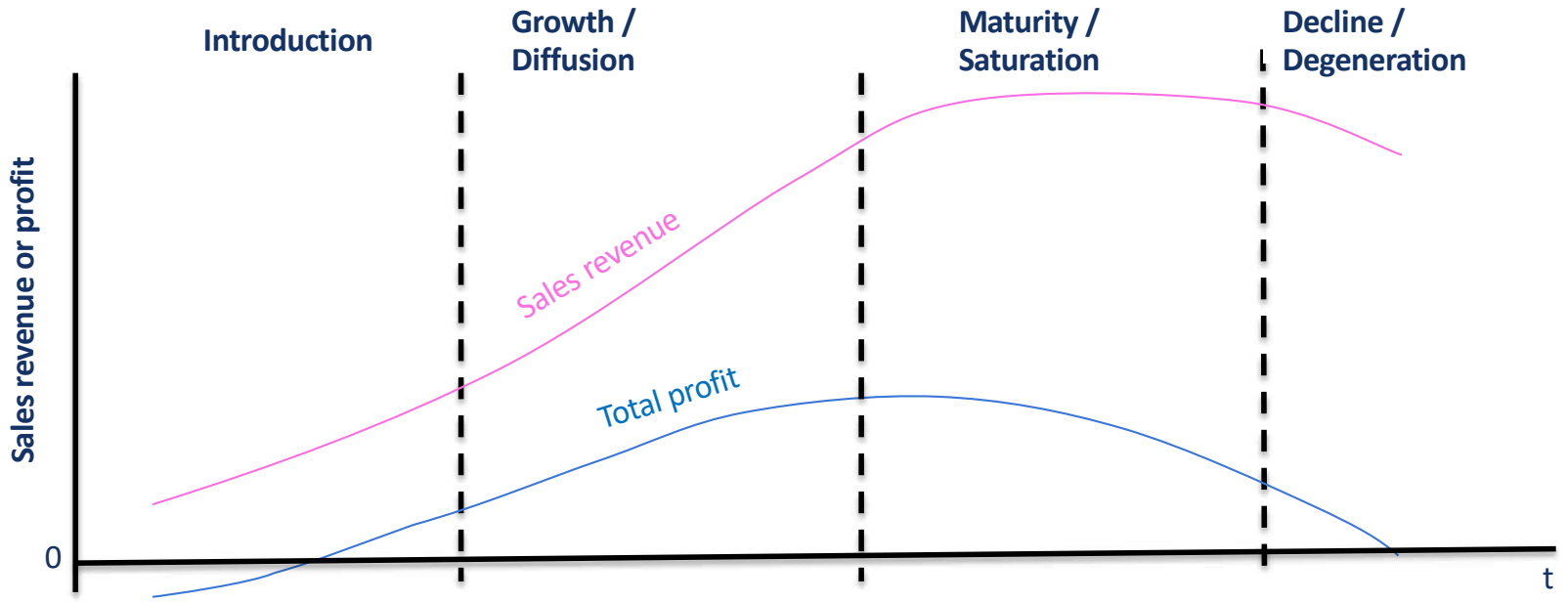
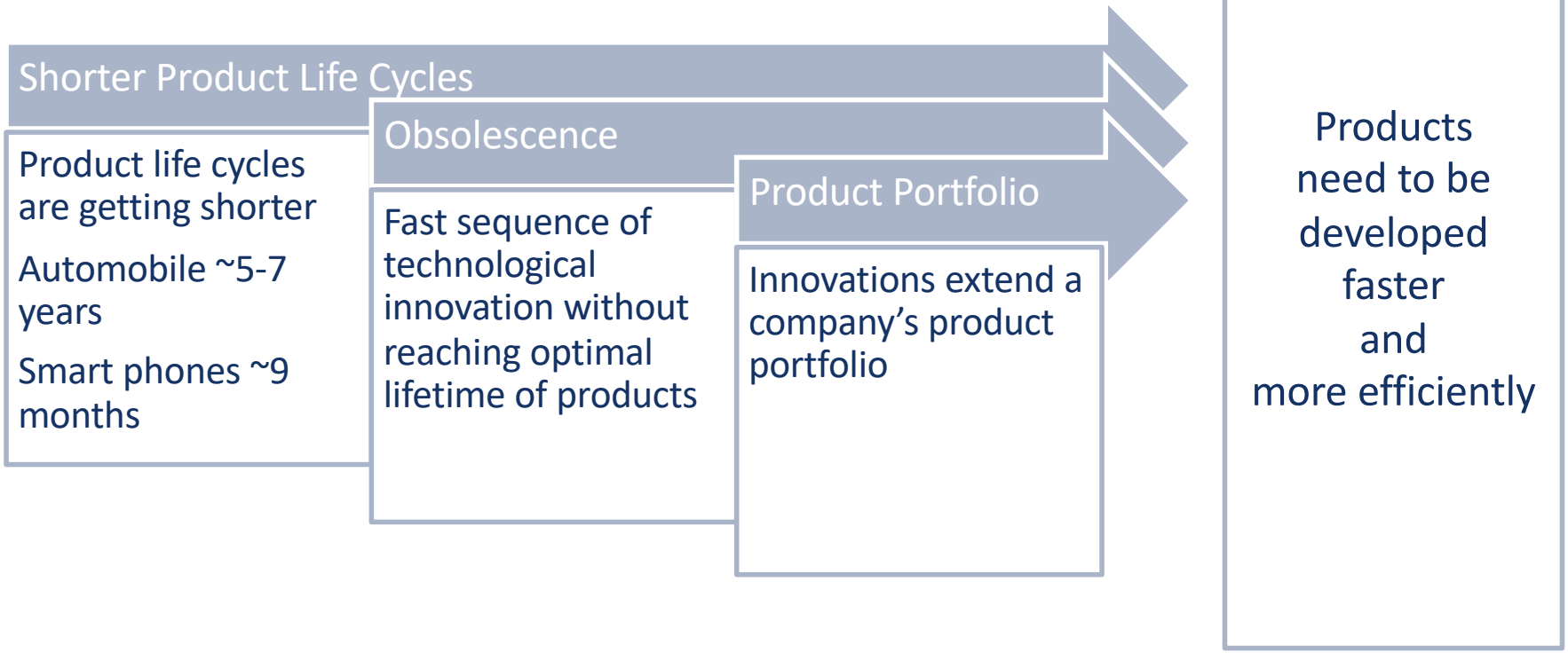
PLC is the cycle through which every product goes through from introduction to withdrawal or eventual demise



• High production costs • Slow sales growth • Minimal or negative profit	• Economies of scale • Increased sales • High competition • Healthy profit	• Saturation of the market place • Decreasing sales growth rate • Decreasing profit	• Decreasing demand • Decreasing sales • Decreasing competition
Create awareness	Differentiation	Brand Loyalty	Harvesting

PLC´S IMPACT ON MANUFACTURING



EXERCISE 3.1 – PRODUCT LIFE CYCLE

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- Create the Product Life Cycle charts for the three product in spreadsheet S04
- Discuss the curves

PRODUCT REQUIREMENTS

DEFINING REQUIREMENTS - HOUSE OF QUALITY

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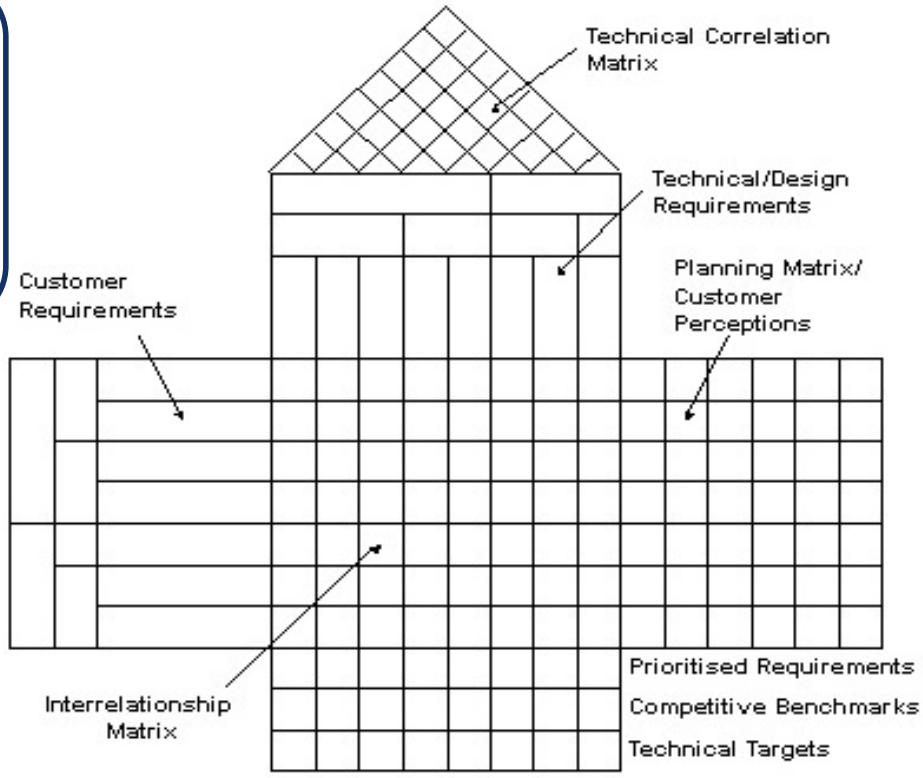
A diagram, resembling a house, used for defining the relationship between customer desires and the firm/product capabilities

- Safe
- Corrosion resistance
- Fast
- Fuel efficiency
- Reliability

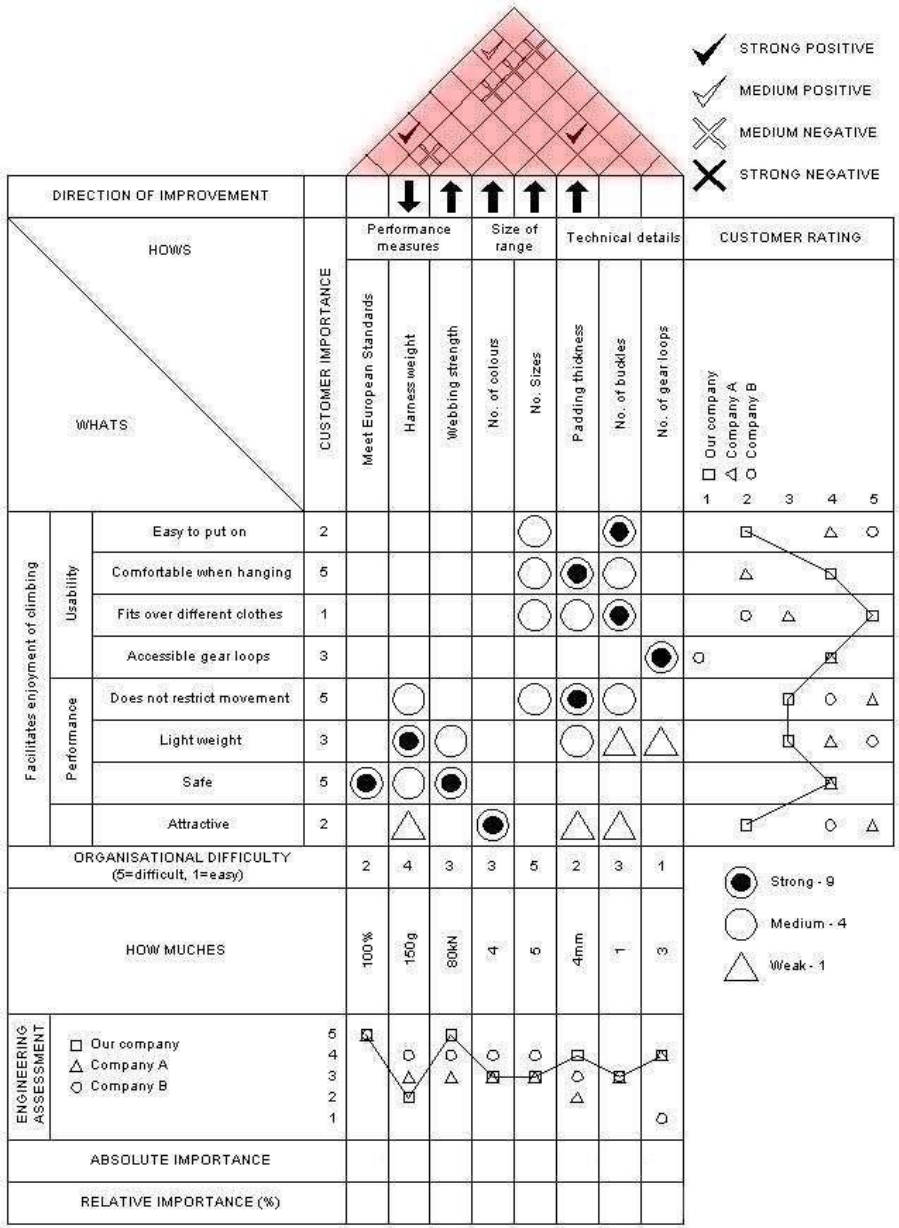


- Weight
- Engine power
- Cost of production
- Life expectancy

Symbols	Meaning	
⊙	Strong	(9)
○	Good	(3)
▲	Weak	(-3)
☒	No	

- A planning matrix to relate what the customer wants to how a firm is going to meet those wants

HOUSE OF QUALITY – CLIMBING ROPE EXAMPLE



EXERCISE 3.2

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- Consider the e-Bike manufacturer Pedego
- Pedego is planning to introduce new generation of city e-bikes
- After extensive market research, they have drafted their customer requirements and also identified their main competitors
- Their goal is to outplay competitors and engineer the e-bike which meets the customer requirements, has higher quality and lower price than the ones that are on the market.
- Perform a House of Quality analysis in order to transform the voice of the customer into engineering characteristics for a product.

Customer requirements:
- Style
- Cheap
- Lightweight
- Durable
- Quiet
- Fast
- Simple locking system
- High-quality breaks
- Long battery life
- Short charging time
- Easy-to-replace parts
- Connectivity to the smartphone

Competitors:
- GTECH EBIKE CITY
- RALEIGH CENTROS CROSSBAR
- HAIBIKE SDURO TREKKING
- EMU CROSSBAR

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THANK YOU!