



Accounting and profitability

Projects and investing

Production as a part of value chain

Production processes and
production control

Production systems and
organizations

Creating value

Projects and investing

Case-examples

In this exercise:

- Project to establish a factory
 - Investment project
 - Job assignment and project network
 - Risk management
- Return on investment
 - Initial investment and cost of capital
 - Net present value (NPV)

In this exercise:

- Project to establish a factory
 - Investment project
 - Job assignment and project network
 - Risk management
- Return on investment
 - Initial investment and cost of capital
 - Net present value (NPV)

Investment in production system: BMW Mexico



Project to establish a factory

- **In 2014, BMW announced the establishment of a car factory in Mexico**
 - The factory opened in June 2019
 - The factory is expected to produce approximately 175,000 BMW 3 Series vehicles per year
- **An important factor for the investment was the low cost and the region's potential in car production**
 - Mexico is the world's fourth largest car exporter
 - Increased investment in Mexican auto production
 - Daimler and Audi established their own car factories in Mexico in 2013
- **What should be considered when setting up a factory and is it economically viable to set up a factory?**

An investment project to establish a factory

- There are three dimensions to be defined in the factory establishment project
 - Limited **scope**, i.e. what is procured
 - Limited **time**, i.e. how long it takes to set up a factory
 - Limited **costs**, i.e. how much capital is available for the project

An investment project to establish a factory

- **A company usually has many different options for implementing a project**
 - There are many builders, equipment suppliers and financiers in the market
- **Investment can be financed with equity or debt**
 - They both have a certain 'cost', meaning how much return on capital is needed
- **An investment project requires planning and negotiations between suppliers and the customer**
 - Bidding, contract negotiation and establishment of a project organization

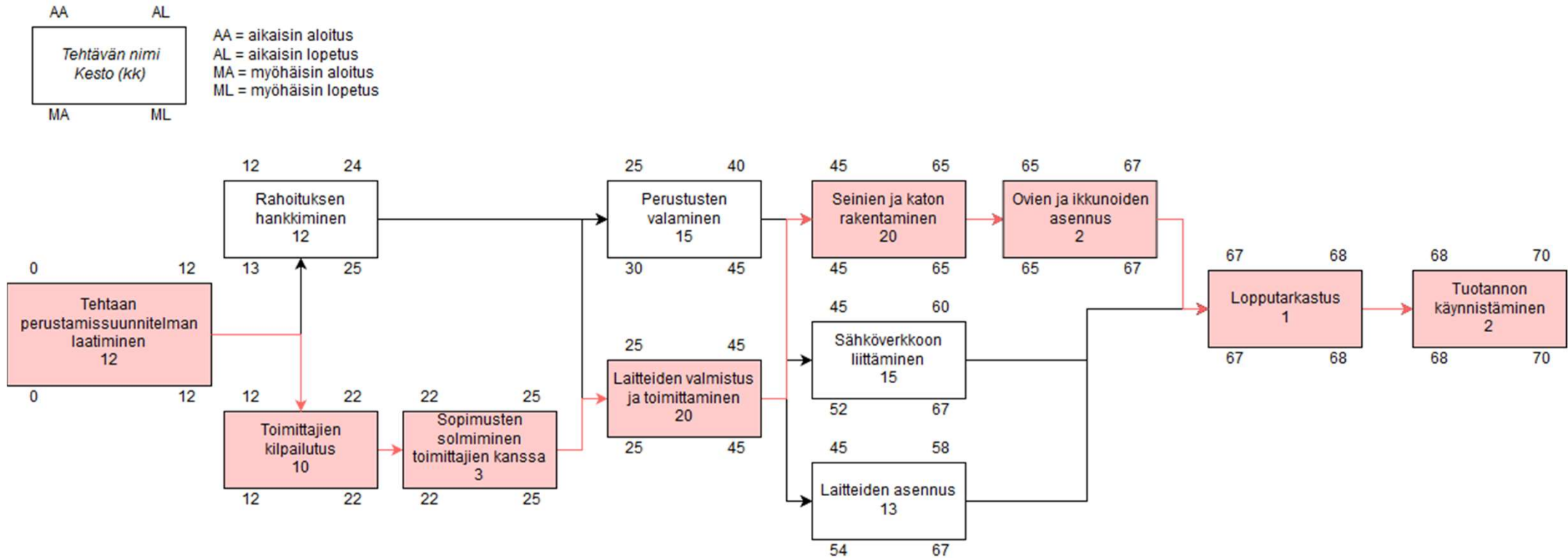
In this exercise:

- Project to establish a factory
 - Investment project
 - Job assignment and project network
 - Risk management
- Return on investment
 - Initial investment and cost of capital
 - Net present value (NPV)

Job assignment and project network

- **The tasks required to complete the project and the order in which they are carried out can be illustrated with a project network**
 - The project network indicates the tasks required to complete the project, their duration, flexibility, and the critical path
- **The tasks required to complete the task are obtained through work assignment**
 - The project is divided into smaller sections
- **Certain tasks can be performed simultaneously, which increases flexibility**

Project network of establishment of the factory



In this exercise:

- Project to establish a factory
 - Investment project
 - Job assignment and project network
 - Risk management
- Return on investment
 - Initial investment and cost of capital
 - Net present value (NPV)

Risk management

- **Projects involve risks, that is, events that affect the cost, schedule or scale of a project**
- **Risks need to be identified and assessed, and measures to avoid them must be planned**
- **Risks can be classified**
 - Operational risks
 - Business risks
 - Financial risks
 - Regional risks

Risks of setting up a factory

- **Operational risks**
 - Accidents at work, machine failures, fires
- **Business risks**
 - Production capacity, quality of equipment and other of the completed factory, competence project organization could be worse than anticipated
- **Financial risks**
 - The cash flow from the factory could be worse than anticipated, the change in the peso's value against other currencies
- **Regional risks**
 - Restrictions on trade with the United States, earthquakes

An example of the risks at the BMW factory

BMW opens its first Mexico plant as the US government threatens tariffs on Mexican goods

The Bavarian automaker is in an unenviable situation as it waits for a decision on tariffs from the US government.

BY KYLE HYATT | JUNE 6, 2019 3:24 PM PDT



In this exercise:

- Project to establish a factory
 - Investment project
 - Job assignment and project network
 - Risk management
- Return on investment
 - Initial investment and cost of capital
 - Net present value (NPV)

Evaluation of return on investment

- The profitability of an investment can be assessed by its investment costs, cash flow from the investment and cost of capital
- Common methods used to assess the profitability of an investment are:
 - Net present value (NPV)
 - Internal rate of interest (IRR)
 - Payback period

Initial investment and cash flow

- **BWM factory's Initial Investment was 1 Billion US (\$ 1,000,000,000)**
- **Most production facilities operate for an average of 10 years**
- **One 3-Series car costs around \$ 40 000**
 - Taxes are ignored for simplicity
 - Car manufacturers receive an average of 6% margin on one car sold
 - Suppose the customer pays for the car immediately upon purchase
- **Suppose the cost of the factory to be \$ 100 000 000 a year**
- **If the factory produces 150,000 cars a year, then the annual free cash flow will be**
 $150\,000 * \$40\,000 * 6\% - \$100\,000\,000 = \$260\,000\,000$

Cost of capital

- **The average capital cost of investment in the automotive industry is about 7.6%**
 - Weighted Average Cost of Capital, WACC
- **Money is more valuable today than in the future**
 - Capital has a 'cost'
 - If money is available right away, it can make a profit
 - The present value of future cash flows is obtained by discounting

In this exercise:

- Project to establish a factory
 - Investment project
 - Job assignment and project network
 - Risk management
- Return on investment
 - Initial investment and cost of capital
 - Net present value (NPV)

Net present value (NPV)

- **NPV will help you evaluate the return on investment**
 - However, NPV does not tell you the exact value of the investment!
 - NPV factors in the timing of cash flows
- **In general, the investment is profitable if the NPV is positive**
- **The net present value is calculated:**

$$\text{NPV} = \sum_{t=0}^{10} \frac{\text{FCF}_t}{(1 + r_{\text{WACC}})^t}$$

NPV

- NPV is the sum of discounted cash flows
- The table below lists free cash flows and their discounted values
 - Year 0 includes only the initial investment
 - NPV is approximately \$ 776.5 million
 - NPV gets a positive value
 - That is, along with the NPV rule, the investment is profitable

Year	0	1	2	3	4	5	6	7	8	9	10
Free cash flow	-1000000000	260000000	260000000	260000000	260000000	260000000	260000000	260000000	260000000	260000000	260000000
Discounted cash flow	-1000000000	241635687,7	224568483	208706768,6	193965398,3	180265240,1	167532751	155699582,7	144702214,4	134481611,9	124982910,7
WACC	7,60 %										
NPV	776540648,6										