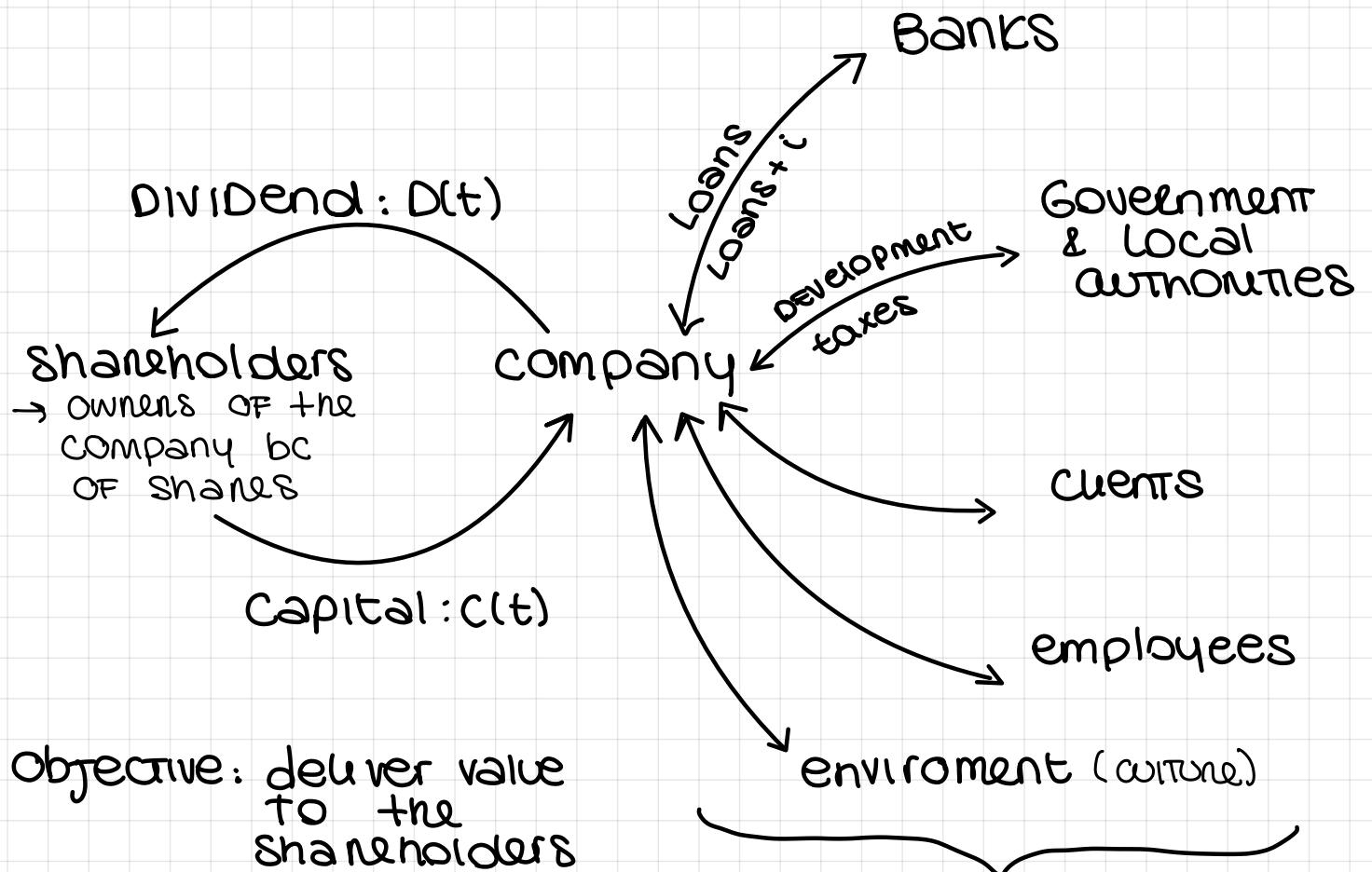
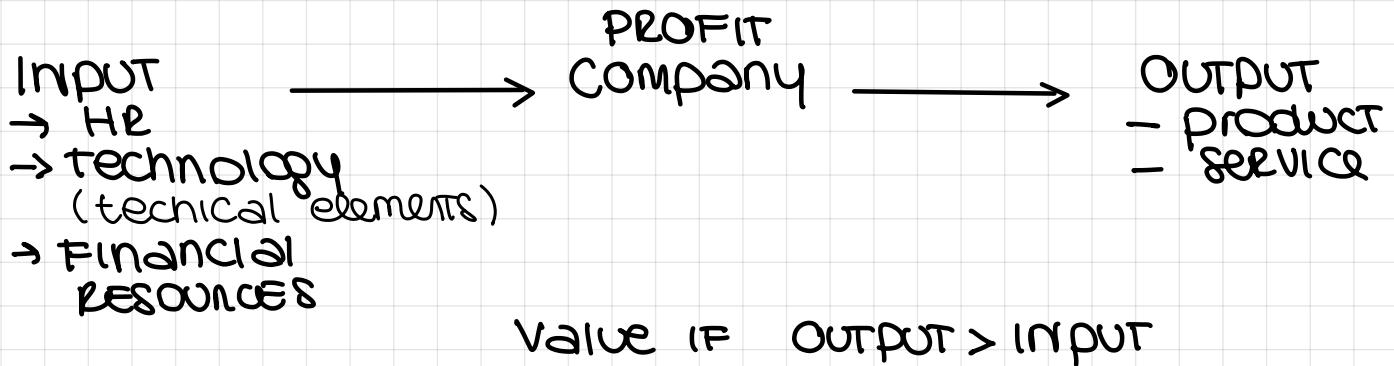


# MOOC: fundamentals of Financial and management Accounting

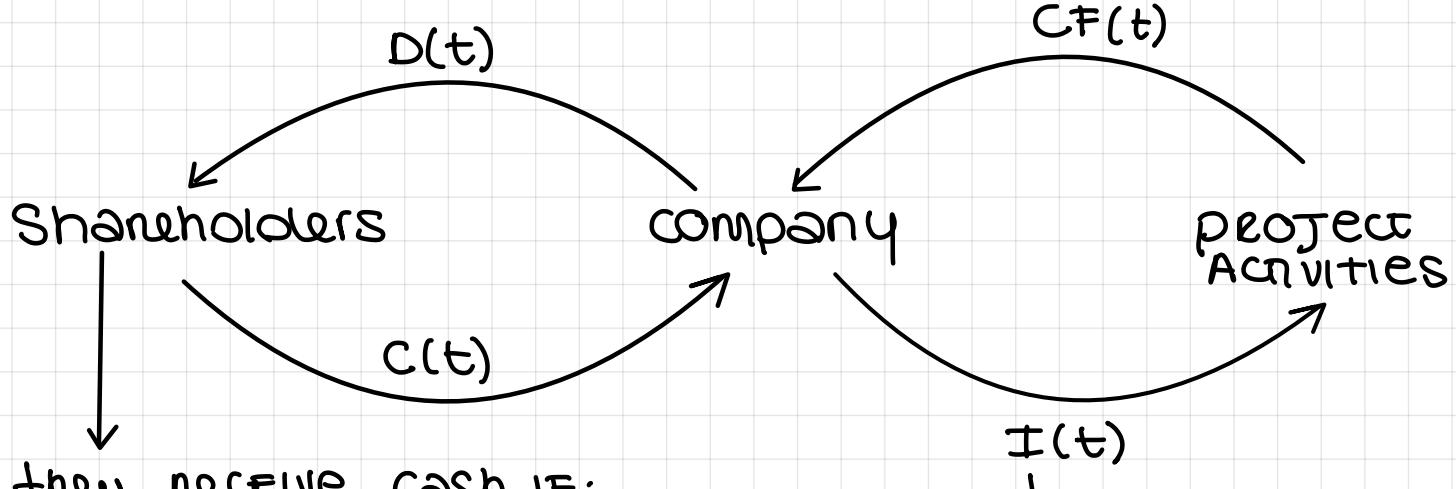
## ① Introduction to the Enterprise

### WHAT IS A COMPANY



**STAKEHOLDERS**  
→ don't own the company  
→ they have interest in the company performance

## NPV CALCULATION



they RECEIVE cash IF:

$$NCG = D(t) - C(t) > 0$$

↓  
net cash generation

the cash from the shareholders is used to invest. Investments are assets that provide value for the company in more than a year

the cash generated by the project is given by:

However, this formula is considering only 1 year, therefore we need to adjust for the long run:

$$NCF = CF(t) - I(t) > 0$$

↓  
net cash flow

NET present value  
= the value today  
that the company is  
able to deliver in  
the long run

$$NPV(0) = \sum_{t=0}^{\infty} \frac{Cf(t) - I(t)}{(1+k)^t}$$

↓

in order to DISCOUNT  
the cash flows

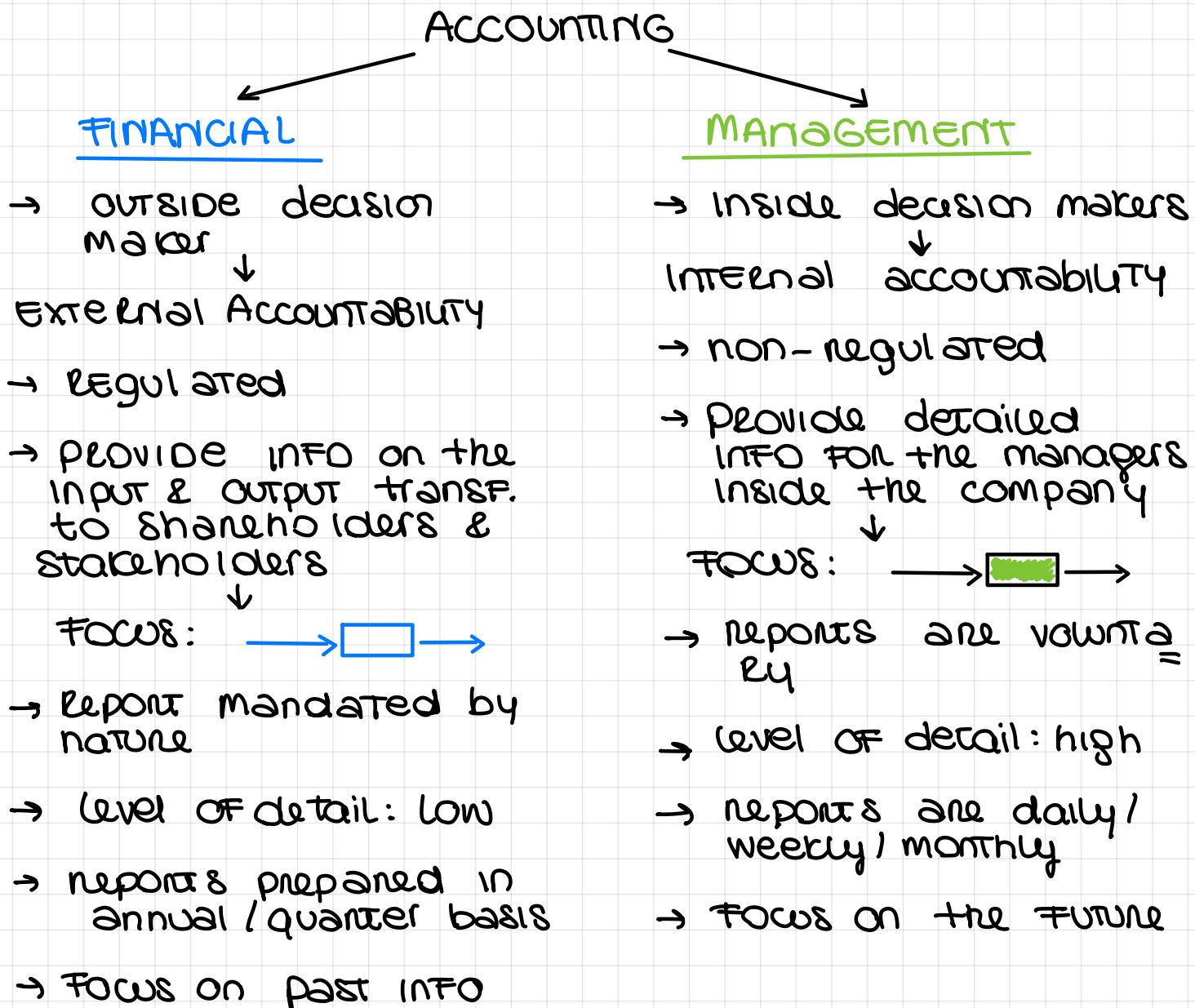
COST OF  
the CAPITAL  
composed by:

- the RISK FREE rate ( $i$ ) = rate of gov. securities
- INFLATION ( $\pi$ )
- RISK PREMIUM ( $R$ ) = level of risk of a company activity

# WHAT IS ACCOUNTING

PROCESS OF IDENTIFYING, CLASSIFYING, RECORDING INFORMATION & THAT ARE RELATED TO EVENTS THAT OCCUR INSIDE THE ORGANISATION & REPORTING THESE EVENTS TO DECISION MAKERS

BASED ON WHO IS THE DECISION MAKER WE CAN DISTINGUISH FROM:



# Stock Exchanges & going public

## → What is an Exchange?

An **Exchange** is a market place in which securities, commodities, derivatives & other financial instruments are traded



Function is to ensure fair & orderly trading

- Exchanges give companies, governments & other groups a **platform** to sell securities to the investing public
- An exchange functions properly thanks to 3 things:

### 1) RULES

- TO regulate trading activities
- TO define who is authorized to trade
- TO set what are the securities to buy & to sell

### 2) SUPERVISION AUTHORITIES

- TO define the rules
- TO supervise a proper functioning of the markets

### 3) MICROSTRUCTURE

- Timetables, techniques to fix prices & how to liquidate contracts

## → What are the main actors involved?

### 1) ISSUERS

- governments (gov. bond)
- Companies (stocks & bonds)

### 2) INVESTORS

- they buy & sell securities
- TWO main categories:
  - RETAIL INVESTORS (individuals)
  - INSTITUTIONAL INVESTORS (banks, funds, insurance c.)
- they are attracted by markets where:
  - liquidity & info are better
  - cost of transaction are lower
- mostly, they buy & sell without direct access

### 3) INTERMEDIARIES

- brokers & dealers that let investors trade securities
- brokers puts who buys & who sells in contact
- dealers take a position

### 4) AUTHORITIES & TECHNOLOGY PROVIDERS

→ Why do companies go public?

- CAPITAL FOR GROWTH
- PROVIDE A MARKET FOR COMPANY'S SHARE
- EMPLOYEE'S COMMITMENT
- RELIABILITY & VISIBILITY
- TAKING ADVANTAGES FROM ACQUISITION
- RAISE MONEY FOR FINANCIAL RESTRUCTURING

→ How do companies go public?

- 1) APPROVAL OF THE BOD & FINANCIAL ADVISOR SELECTION
- 2) APPROVAL OF THE GENERAL MEETING & APPOINTMENT OF THE SPONSOR & LEGAL ADVISOR TO SUPPORT THE PROCESS
- 3) DUE DILIGENCE : TO GIVE INFO ON POTENTIAL RISKS & RETURNS
- 4) PREPARATION OF THE PROSPECTUS AND AUTHORITIES APPR.
- 5) APPLICATION FOR LISTING IN THE SELECTED STOCK EXCHANGE
- 6) ROADSHOW & BOOK BUILDING TO PRESENT ITSELF TO POTENTIAL INVESTORS
- 7) FINAL PUBLISHING & START TRADING

2

## Introduction to Financial Accounting

With financial accounting events are classified & translated into financial statements following rules & management choices (accounting principles)

→ financial statements are mandated, therefore they have to respect 4 requirements:

- 1) RELEVANT INFO
- 2) RELIABLE & TRUSTFUL INFO
- 3) COMPARABILITY = with F.S. of other companies
- 4) CONSISTENT INFO = same accounting principles over the year

→ the rules are called:

I nternational  
A ccounting  
S tandards

I nternational  
F inancial  
R eporting  
S tandards

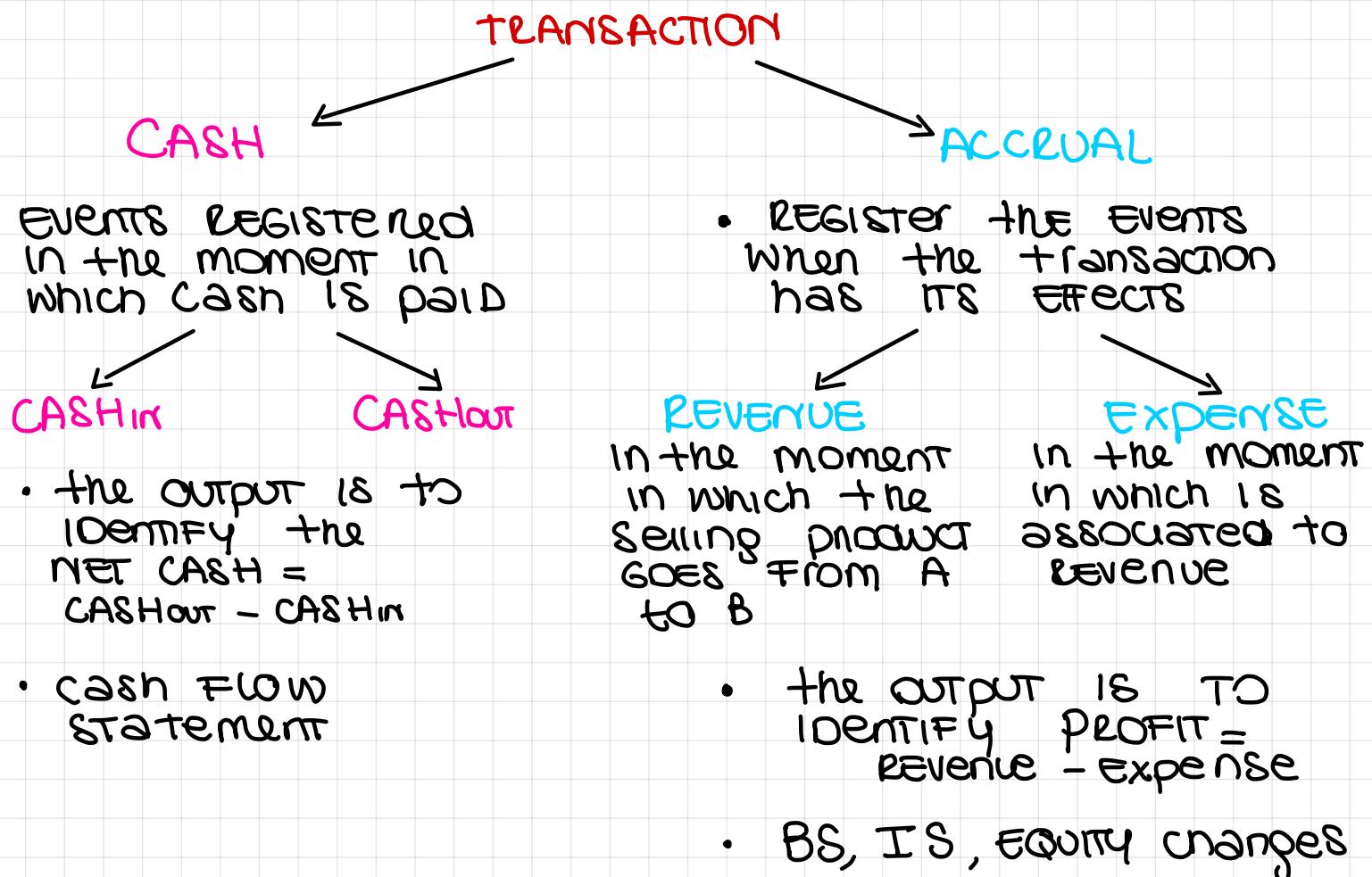
} define how to register info on financial st. to compare companies of diff. countries

≠ In America they use: G eneral  
A ccepted  
A ccounting  
P rinciples

→ A company is required by law to provide 5 financial documents:

- 1) balance sheet = info about assets & liabilities
- 2) income statement = info about profit & loss
- 3) cash flow stat. = info about the cash
- 4) statement of changes = info about equity changes
- 5) note to the financial statement = info on how the docs have been prepared & with which principles

# ACCUAL & CASH PRINCIPLE



## EXAMPLE:

Selling (2013) : 40 mil € products

30 mil received by cash in 2013  
10 mil received by cash in 2014

Purchase (2013) : 25 mil € paid immediately raw material

2013

**CASH**

- $\text{CASHin} = 30 \text{ mil €}$
- $\text{CASHout} = 25 \text{ mil €}$
- NET CASH = 5 mil €

**ACCRUAL**

- REVENUE = 40 mil €
  - Expense = 25 mil €
  - PROFIT = 15 mil €
- Recorded only if we have a revenue registered in the same year

3

## Balance Sheet

represents the snapshot of the company in a precise moment of time (at the end of the year)

### ASSETS

resources available for the company useful in order to produce value

→ **NON-CURRENT ASSET:**  
resources available for the company for more than 1 year

- 1) Tangible (PPE)
- 2) Intangible (softwares,)
- 3) Financial (equity inv.)

→ **CURRENT ASSETS:**  
resources available within the year

- 1) CASH & EQUIVALENT
- 2) TRADE RECEIVABLES
- 3) INVENTORIES
- 4) ORDERED WORK IN PROGRESS

### EQUITY & LIABILITIES

rights of the people that owns the resources (assets)

→ Shareholders EQUITY

→ third party liabilities

1) non-current liabilities  
= long-term debt

2) current liabilities  
= short-term debt  
(trade payables)

## NON - CURRENT ASSETS & DEPRECIATION

IFRS provide details on how to recognize non current assets also in the years subsequent to the initial recognition.

→ PROPERTY, PLANT & EQUIPMENT (PPE)

- Initial value recognition = at the cost of purchase
- Subsequent recognition = 2 alternatives:

**COST MODEL**

PPE value = COST - Cumulated depreciation

Loss of value of an asset because of its usage overtime



the more the company uses the asset the lower the value.

To calculate depreciation:

→ straight line approach:

$$D = \frac{\text{Initial Cost}}{\text{Useful Life}}$$

↓  
# years used

fixed

**REVALUATION MODEL**

PPE value = Fair value

= market value = value at which a certain resource can be exch. in the market

$$\Delta = \text{Fair value} - \text{book value}$$

→ IF  $\Delta > 0 \rightarrow \text{Fair value} > \text{book value}$

↓  
is registered in the BS as **REVALUATION RESERVE**  
= shareholders have additional use

→ IF  $\Delta < 0 \rightarrow \text{Fair value} < \text{book value}$

is recognized as an expense

→ IF  $\Delta = 0 \rightarrow \text{Fair value} = \text{book value}$

we go back to the cost approach

$$D = \frac{\text{Fair value}}{\text{Useful life}}$$

## EXAMPLE OF RECOGNITION OF NON-CURRENT ASSETS

Company purchases equipment for 5000€ on the 1st Jan 2014 & is expected to be used for the next 5 years

What happens to this recognition in the BS?

either the company uses cost or revaluation model the initial measurement is the same:

- Initial value = 5000€
- Subsequent recognition:

→ COST MODEL

	2014	2015	2016	2017	2018
Initial cost	5000	5000	5000	5000	5000
D = 5000/5	1000	1000	1000	1000	1000
$\sum D$	1000	2000	3000	4000	5000
$E(Q)$ value = cost - $\sum D$	4000	3000	2000	1000	0

→ REVALUATION MODEL

• Fair value at end 2016 = 3900€

• E(Q) market value = 3900

• Fair value end 2017 = 1100 → E(Q) = 1100

• 600€ (IS)

unrecoverable  
↓  
IMPAIRMENT

BS(2016)

$$\begin{aligned} E(Q) \text{ book value} &= 3000 \\ &\quad + 900 \\ - D &= \underline{\underline{3900}} = -1300 \\ 5 & \underline{\underline{2600}} \end{aligned}$$

$$\begin{aligned} 1100 - 2600 &= -1500 = \\ - D &= \underline{\underline{1100}} = \underline{\underline{-550}} = \\ 2 & \underline{\underline{550}} \end{aligned}$$

$$\begin{aligned} \text{REVALUATION RESERVE} &= \\ 3900 - 3000 &= 900 \text{€} \\ FV - BV &= -900 \text{€} \end{aligned}$$

Impairment test applied:

- revaluation model
- cost model when the loss of value is unrecoverable

## INVENTORIES

talking about current assets cash & cash receivables value can be immediately recognized, but this doesn't happen for inventories.

We can have 3 type of inventories at the end of the per.

- 1) Raw materials = that are in the warehouse, not yet considered for the production process
- 2) Inventories = in the warehouse we have some finished or finished products that have not been sold yet goods
- 3) Inventories of working progress = something which is no more raw material, not yet finished products

### RECOGNITION OF INVENTORIES

COST MODEL

NET REALIZABLE VALUE

Recognize inventories by looking at the amount of resources that have been absorbed by these inventories during the year

→ FIFO (FIRST IN FIRST OUT)

→ weighted average

Ex: 5 bags:

20€	25€	15€	30€	20€
110€				

FIFO  
Inv = 50€

- 5) 20€  
4) 30€  
3) 15€ }  
2) 25€ }  
1) 20€ }

Weighted average

$$\text{Inv.} = \left( \frac{110\text{€}}{5} \right) \times 2 = 44\text{€}$$

It's possible to calculate the value of the inventories as:

$$\text{NRV} = E(p) - E(\text{cost completion})$$

↓  
Estimated selling price

In order to recognize the value of inventories we do the lower between the cost & the NRV in the BS

## EQUITY & LIABILITIES

→ third part liabilities = owners of the resources that are listed in the assets section are external/outside the company

→ non-current liabilities = liabilities due by the company over one year



- bank-debt
- bonds
- provisions (pensions & taxes)

→ current liabilities = due by the company within 12 months (1 year)



- bank-debt
- bonds
- account payables (delayed payment)

→ shareholders EQUITY

→ capital = • sum of money provided by the sh. inside the company  
• always issued at the nominal value of the shares ITSELF  
• the nominal value is reduced by:

- treasury shares
- shareholders receivables = amount of money that sh. will provide to the company but haven't yet

→ RESERVES = additional shareholders use that emerge during the year

- ↓
- LEGAL RESERVES = required by law
  - STATUTORY RESERVES = required by shareholders
  - REVALUATION RESERVES = used to classify & recognize the revaluation of an asset
  - PROFIT & LOSS brought forward = profit retained by the company & NOT distributed

→ PROFIT/LOSS = also find in the IS by using an accrual logic

# ④ Income & Cash Flow Statement

## INCOME STATEMENT

also defined as "PROFIT & LOSS STATEMENT" & has the purpose to show the PROFIT OR LOSS OF THE YEAR AS THE DIFFERENCE BETWEEN THE REVENUES & ALL OF THE COSTS THAT WOULD OCCUR WITHIN THE COMPANY DURING THE YEAR

both revenue & income are registered by accrual logic

IS can be reported:

- by NATURE = all the operating costs classified according to their nature (raw material, labour cost, depreciation cost,...)
- by FUNCTION = all operating cost classified according to the organizational unit that is in charge of using these resources

IS STRUCTURE:

REVENUES = related to products sold & rendering services

- COST OF SALES = value of all the resources that are used in order to realize this amount of production

= GROSS PROFIT (EBITDA)

+ OTHER OPERATING INCOME = Revenue related to rent, royalties which are not related to production but are operating revenues

- Selling & general administrative expenses = costs not related to production (advertising cost, administration cost, selling cost)

= OPERATING PROFIT = Earnings before Interest & Taxes (EBIT) OR NET OPERATING INCOME (NOI)

Operating activity of the company of selling product & purchasing resources to realize the products

## OPERATING PROFIT

- Financial Expenses = interest on the bank debt

+ Financial Income = incomes in investments in other companies or the one from shares in associates

= PROFIT BEFORE TAXES (EBT)

- Accrual taxes of the year

= PROFIT FROM THE YEAR FROM CONTINUING OPERATIONS

+/- RESULTS FROM DISCONTINUED = diff extraordinary respect to the normal cycle of the company (M&A, selling a branch...)

= NET PROFIT OF THE YEAR

## RECAP OF 18:

### REVENUES

- COST OF SALES

GROSS PROFIT (EBITDA)

+ OTHER OPERATING INCOME

- SGA EXPENSES

OPERATING PROFIT (EBIT)

+ FINANCIAL INCOME

- FINANCIAL EXPENSES

PROFIT BEFORE TAXES

- TAXES

PROFIT FROM THE YEAR FROM  
CONTINUING OPERATIONS

+/- RESULTS FROM  
DISCONTINUED OPERATIONS

NET PROFIT OF THE YEAR



→ IF A COMPANY IS LISTED AFTER THE NET PROFIT WE HAVE THE EARNINGS PER SHARE (the value of 1 share that is delivering to the shareholders)

EPS

BASE EPS

DILUTED EPS

PROFIT/LOSS - PREFERRED dividends

$\sum \text{# ordinary shares}$

PROFIT/LOSS - PREFERRED dividends

$\sum \text{# ordinary + convertible instruments}$

IF Sh. exercise these rights the # shares increases & EPS decreases

additional shareholder rights:  
- Warrants  
- STOCK option  
- convertible preferred shares

## THE IMPACT OF INVENTORIES ON PROFIT

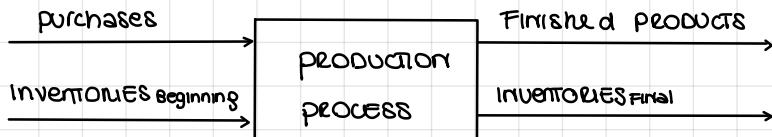
BS = gives snapshot of the value of the inventories at the end of the year

IS = gives the variation of the inventories between the beginning & the end of the year



### IN THE COST OF SALES

→ IT IS THE AMOUNT OF RESOURCES THAT HAVE BEEN ABSORBED FOR PRODUCTION WITHIN A YEAR, BUT WHAT DOES THIS INCLUDE?



$$\left. \begin{array}{l} \text{PW (Purchase for FP)} = 1000 \text{ €} \\ \text{INV B} = 800 \text{ €} \end{array} \right\} \text{available resources}$$

$$- \text{INV F} = -500 \text{ €}$$

$$\text{COST OF SALES} = 800 \text{ €} \rightarrow \text{COST OF SALES} = \text{PURCHASES} + \text{INV B} - \text{INV F}$$

IS BY FUNCTION = ALL INV. INCLUDED

IS BY NATURE = Δ INV IN REVENUES, INV. RAW MATER. IN THE COST OF SALES

## EX. On INVENTORIES:

- period 1: the company purchases 2000€ of raw mat. that enters in stock
- period 2: company uses raw mat. previously purchased, employs 1000€ of direct labour & incurs in 500€ of other production costs, to produce semi finished products, which are entered in stock
- period 3: the company uses the semi-finished products previously entered in stock & employs an additional 500€ of direct labour, to produce finished products, which are entered in stock
- period 4: the company sells the FP previously entered in stock, obtaining a total revenue of 5000€

Q: COST OF SALES & GROSS PROFIT at the end of each period

PERIOD 1	PERIOD 2	PERIOD 3	PERIOD 4
$RM : 2000\text{€}$ $RM \rightarrow STOCK$ $P = 2000\text{€}$ $+ I_B = 0\text{ €}$ $- I_F = 2000\text{€}$ <u>Since the RM are used</u>	$DL : 1000\text{€}$ $add RES. : 500\text{€}$ $DL + RM + RES = WIP \rightarrow STOCK$ $P = 1500\text{€}$ $+ INV_B = 2000\text{€}$ $- INV_F = 3500\text{€}$	$DL : 500\text{€}$ $DL + WIP = FP$ $FP \rightarrow STOCK$ $P = 500\text{€}$ $INV_B = 3500\text{€}$ $- INV_F = 4000\text{€}$	SELLING $REV = 5000\text{€}$ $P = 0\text{€}$ $INV_B = 4000\text{€}$ $- INV_F = 0\text{€}$ <u>because the company sold everything</u>
$COS = 0\text{€}$ $REV = 0\text{€}$ <u>the company is not selling</u> $GP = 0\text{€}$	$COS = 0\text{€}$ $REV = 0\text{€}$ $GP = 0\text{€}$	$COS = 0\text{€}$ $REV = 0\text{€}$ $GP = 0\text{€}$	$COS = 4000\text{€}$ $REV = 5000\text{€}$ $GP = 1000\text{€}$

Inventories impact the GP only when we have the selling

## CASH FLOW STATEMENT

this statement records cash in & cash out that have occurred during the financial year with the purpose to show the net cash at the end of the year.

→ 3 categories in which we recognize cash in & cash out:

- 1) OPERATING ACTIVITIES → CASH IN = selling of the product  
↓ CASH OUT = purchasing of components
- 2) INVESTING ACTIVITIES = DISPOSAL OF ASSETS = ACQUISITION OF a new equipment or disposal of equipment, building etc...
- 3) FINANCIAL ACTIVITIES = cash that changes the equity structure of the company = requirements of a new bank debt or distribution of dividend

DIRECT METHOD CASH LOGIC	INDIRECT METHOD ACCUAL LOGIC
+ CASH RECEIPTS FROM CUSTOMERS - CASH PAID TO SUPPLIERS - CASH PAID TO EMPLOYEES - CASH PAID FOR OTHER OPERATING EXPENSES - INTEREST PAID - INCOME TAX PAID	PROFIT BEFORE INTEREST & INCOME TAXES (recognized in IS, it is an accrual value that has to be adjusted to arrive a cash value) + DEPRECIATION & AMORTISATION (we add them since we prev. deducted them to calculate profit) + OPERATING WORKING CAPITAL: + Δ RECEIVABLES IF F>I → - + Δ INVENTORIES IF F>I → - + Δ TRADE PAYABLES IF F>I → + - INTEREST PAID - INCOME TAX PAID
NET CASH FROM OPERATING ACTIVITIES - ACQUISITION OF ASSET + DISPOSAL OF ASSET	NET CASH FROM OPERATING ACTIVITIES - ACQUISITION OF ASSET + DISPOSAL OF ASSET
NET CASH USED IN INVESTING ACTIVITIES - DIVIDENDS PAID +/- Repayment of borrowings	NET CASH USED IN INVESTING ACTIVITIES - DIVIDENDS PAID +/- Repayment of borrowings
NET CASH FROM FINANCIAL ACTIVITIES	NET CASH FROM FINANCIAL ACTIVITIES
NET INCREASE/DECREASE IN CASH	NET INCREASE/DECREASE IN CASH

## 5 Introduction to costs

### WHAT ARE COSTS

- CO-COMPONENT OF management accounting is represented by the COSTS
- COST IS THE VALUE OF THE RESOURCES EXPRESSED IN MONETARY TERMS WHICH IS USED IN ORDER TO REALIZE A CERTAIN OBJECTIVE (THE COST OBJECT: A SERVICE OR A PRODUCT)
- IN MANAGEMENT ACCOUNTING WE NEED COST IN ORDER TO DEFINE 3 MAIN OBJECTIVES:
  - 1) INVENTORIES: IF WE HAVE SOME UN SOLD PRODUCTS WE NEED TO DEFINE THE VALUE OF INVENTORIES IN THE BALANCE SHEET BY DEALING WITH THE COST MANAGEMENT
  - 2) SHORT-TERM : WE NEED DATA ABOUT COST OF PRODUCTS & SERVICES IN ORDER TO MAKE DECISIONS RELATED TO OPERATING ACTIVITIES
  - 3) EVALUATION OF : ORGANIZATIONAL UNITS THAT WE HAVE INSIDE THE ENTERPRISE & WE CAN USE DATA ABOUT THE COST IN ORDER TO DEFINE THE PERFORMANCES OF THESE ORGANIZATIONAL UNITS
- MANAGEMENT ACCOUNTING DEALS WITH DATA ABOUT COST IN ORDER TO SUPPORT THESE THREE DIFFERENT KIND OF ACTIVITIES

# COST CLASSIFICATION

## DIRECT COST



IF this resource can be univocally & exclusively assigned to one unit of our cost object

- EX. FOR A TABLE, DIRECT COST IS THE WOOD OR THE EMPL. DIRECTLY INVOLVED IN THE REALIZATION OF THE TABLE



In manufacturing company the types of DIRECT COSTS:

- COST OF DIRECT MATERIAL (the wood)
- COST OF DIRECT LABOUR (employee)

VS

## INDIRECT COST



resources that are used JOINTLY in order to realize more than one unit

- EX. THE EQUIPMENT USED TO BUILD THE TABLE IS ALSO USED TO DO SEVERAL.
- THE MAN IN CHARGE OF SELLING THE TABLE IS ALSO IN CHARGE TO SELL MORE THAN ONE UNIT

these resources are ind. because they are absorbed by more than one unit of our output



INDIRECT COSTS ARE ALSO DEFINED AS OVERHEAD (OVH)

WITH RESPECT TO MANUFACTURING COMPANY WE HAVE:

- **MANUFACTURING OVERHEAD** = INDIRECT RESOURCES RELATED TO THE PRODUCTION PROCESS (SUPERVISION, DEPRECIATION, SETUP)
- **NON-MANUFACTURING OVERHEAD** = INDIRECT RESOURCES NOT RELATED TO THE PP (MARKETING, SGA, COMMERCIAL)

## PRODUCT COST

VS

## PERIOD COST



Value of all the resources that are involved in the production process which means in the transformation from the input into output

3 TYPES OF PRODUCT COSTS:

- 1) **Direct Material** = initial resources that are transferred into the final product, so they are production cost
- 2) **Direct Labour** = are production cost bc we are talking about employees that are physically involved in the transformation of raw mat. into final product
- 3) **Manufacturing overhead** = Resources used within the production process. Employees involved in the supervision of the production activity, depreciation of machines, equipments, lighting... Everything related to production but not for the realization of a single unit

→ **non-manufacturing OH**  
= they are period costs because they are general expenses related to the overall activity of the organization, but not specifically related to the production process

- selling expenses
- general expenses
- administrative exp.

↓  
SGA

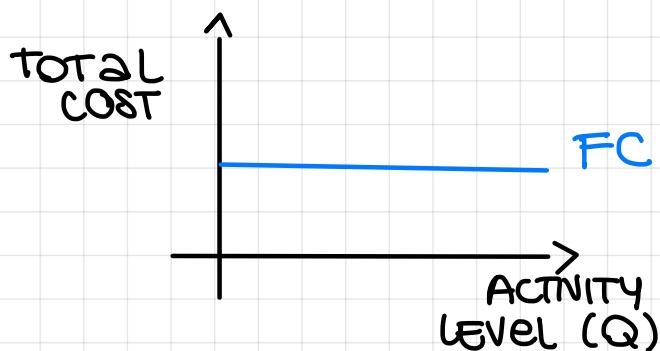
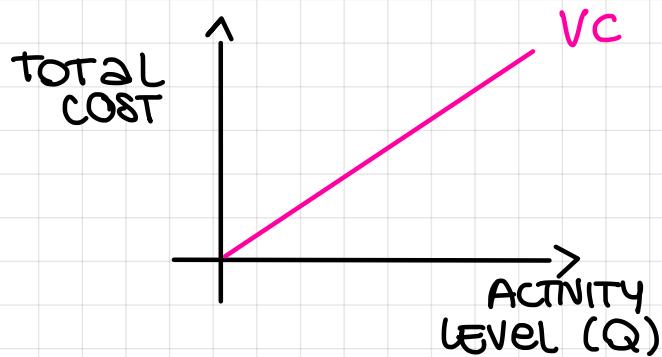
## VARIABLE COSTS

VS

## FIXED COSTS



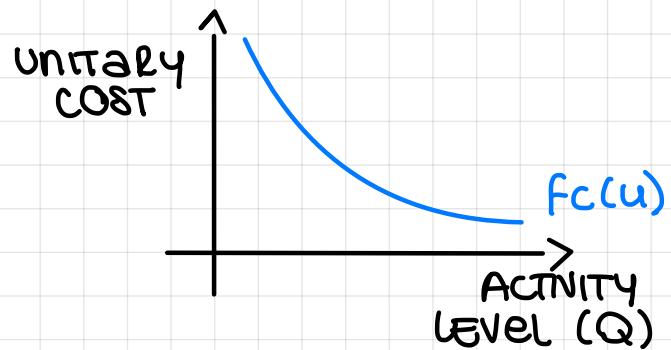
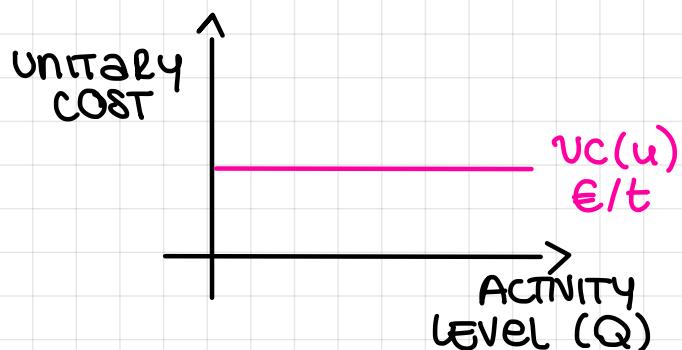
IF the overall cost increases in a proportional way if the quality that is realized increases as well



TYPES OF VARIABLE COSTS:

- **Direct material** = the higher the n° of tables to realize the more the wood we need to purchase the higher the overall cost
- **Direct labour**

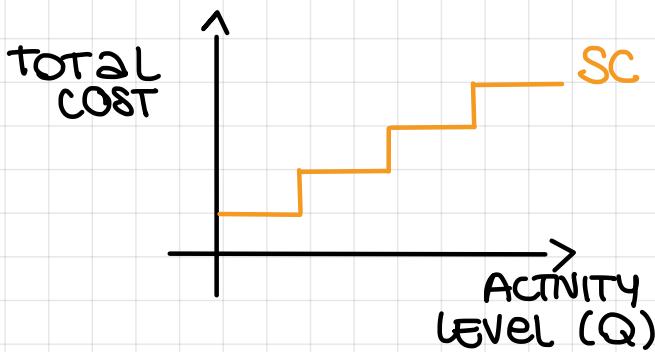
IF we have depreciation of our equipment or if we have the rent of a warehouse the overall value of the resources is not affected by the quantity we are producing. Also the cost of supervisor will always be the same  
→ Manufacturing overhead



The €/ton of the wood will always be the same whatever the quantity we are measuring. So it is not dependent on the quant.

IF we want to define the unitary value of the fixed cost we need to devide it by the quantity. So the higher the quantity the lower the fixed cost.  
the higher the units measured the lower the unit. = value of depreciation assigned to the final product

## SEMI VARIABLE COST



We have a component which is fixed & then a variable one

EX UTILITIES:

- fixed rate = which is paid for the lighting & heating
- variable rate = the overall paid amount which depends on consumption

Ex: SERVICE

You want to organize a party & want to define the overall cost:

- activity level = # people that are going to come to the party
- variable cost = drink, food → everything that will increase if # people increases
- fixed cost = boy band → amount paid is the same no matter how many ppl come
- semi variable = someone who is in charge to sell the tickets → you are going to pay him a fixed amount + surplus based on amount of ticket sold

# COST CONFIGURATION: DIRECT VS FULL COSTS

- COST CONFIGURATION ALLOWS TO DECIDE & TO CHOOSE WHICH RESOURCES WE WANT TO ASSIGN TO OUR FINAL COST OBJECT

- 3 CONFIGURATION COSTS

## 1) PRIME COST:

→ ASSIGNS DIRECT COSTS TO THE FINAL COST OBJECT:

DIRECT MATERIAL + DIRECT LABOUR

## 2) FULL MANUFACTURING COSTS:

→ ASSIGNS BOTH DIRECT COSTS & MANUFACTURING OVH  
→ WE ARE CALCULATING THE PRODUCTION COST

PRIME COST + MANUFACTURING OVH

## 3) FULL COST CONFIGURATION:

→ VERY COMPLETE BUT NOT PRACTICAL

FULL MANUFACTURING + NON-MANUFACTURING OVH

- IMPACT ON THE FINANCIAL STATEMENT:

DATA: REVENUE = 100€

PRODUCTION COST = 80€

PERIOD COST = 10€  
(MARKETING)

↳ 50% → STOCK

$$\begin{array}{r} \text{REVENUE} \\ - \text{COGS} \\ \hline \end{array}$$

$$\begin{array}{r} 100\text{€} \\ - 40\text{€} \quad (\text{because accrual logic, so} \\ \text{only) the goods sold} \\ \hline \end{array}$$

$$\begin{array}{r} \text{GP} \\ - \text{SGA} \\ \hline \end{array}$$

$$\begin{array}{r} 60\text{€} \\ - 10\text{€} \\ \hline \end{array}$$

NOI

$$\begin{array}{r} \text{NOI} = 50\text{€} \\ \hline \end{array}$$

WHATEVER THE VALUE, PERIOD COST ARE IMMEDIATELY ASSIGNED, AS AN EXPENSE, WITHIN THE INCOME ST.

PRODUCTION = INVENTORABLE COSTS

VS PERIOD = NON INVENTORABLE COSTS

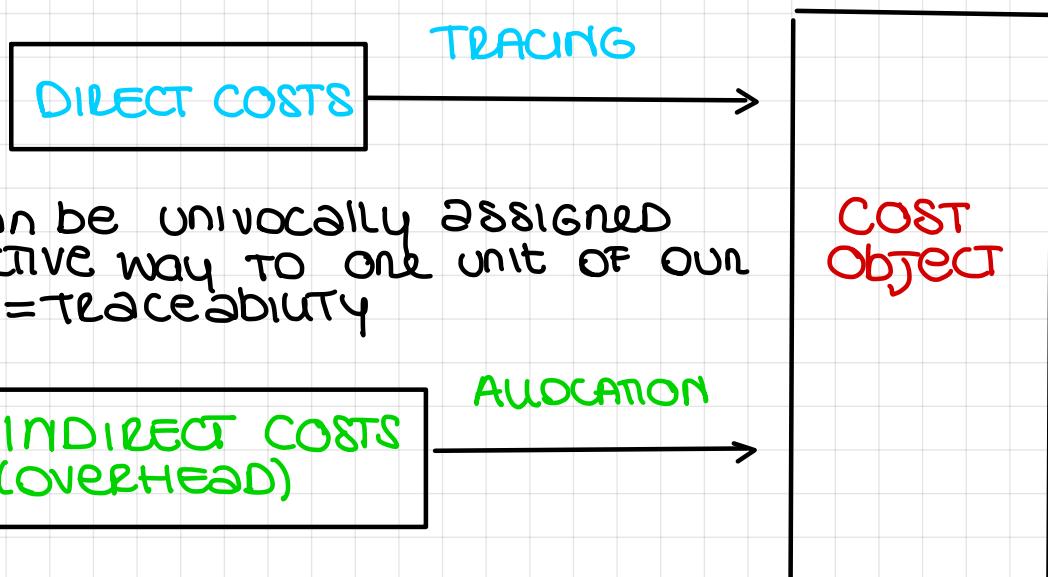
→ INVENTORING COSTS

→ IMMEDIATE REPORTING

## 6

# Cost Assignment

- Given a certain cost object which can be a product, a service, a project or an organizational unit, the objective is to assign the value of the resources which are absorbed by this cost object.

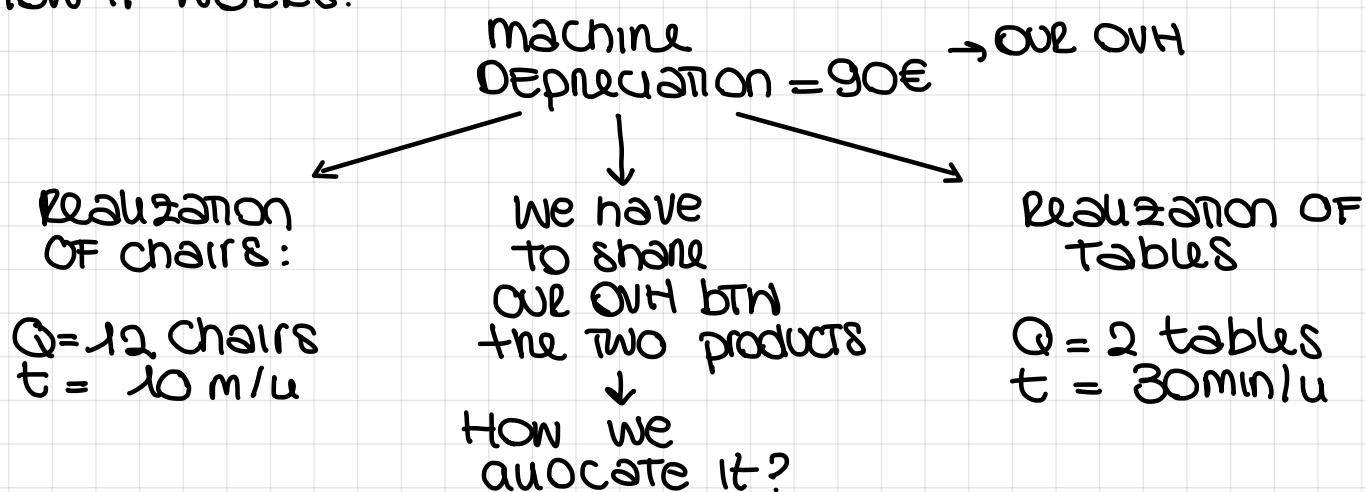


DM & DL can be univocally assigned in an objective way to one unit of our cost object = traceability

by definition they are absorbed jointly by more than one cost object. This means we cannot assign their value in a univocal way, but we need to allocate the value of the OH to the final output

**ALLOCATION** = we are using a proxy in order to assign this value to the final CO. We use subjectivity in order to translate & share the value of this OH on the final

How it works:



$$\text{Allocation coefficient (AC)} = K = \frac{\text{OVH}_{\text{TOT}}}{\text{allocation basis (AB}_{\text{TOT}}\text{)}} = \frac{90\text{€}}{(12 \times 10/\text{u}) + (2 \times 30/\text{u})} = 0,5\text{€/min}$$

↓  
quantity which  
explains the  
relationship between  
resource & final product

the proxy that explains the  
relationship between the usage  
of the machine & the realized  
output

$AC = 0,5\text{€/min} \rightarrow$  every minute in which the machine is used it absorbs 0,5€ of resources

ASSIGNMENT:

$$\text{OVH}_C = K \times AB_C = 0,5\text{€/min} \times 120\text{min} = 60\text{€}$$

$$\text{OVH}_T = K \times AB_T = 0,5\text{€/min} \times 60\text{min} = 30\text{€}$$

TO BE MORE SPECIFIC:

## ALLOCATION

TRADITIONAL COSTING SYSTEM

- Only single allocation
- Job Order Costing (JOC)

ACTIVITY BASED COSTING (ABC)

- we calculate AC twice to improve precision

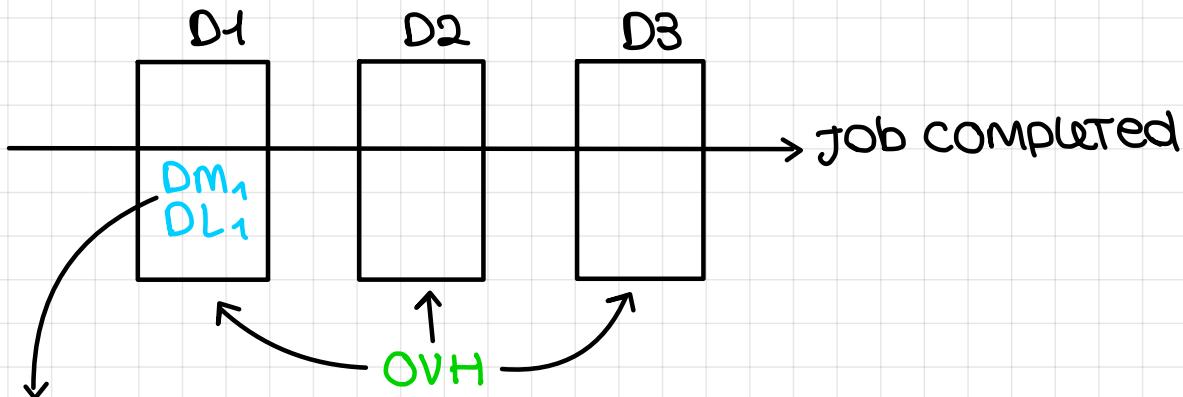
# JOB ORDER COSTING

- Given a certain cost object direct material & direct labour are directly traced to the cost object while OHs are allocated
- The co-component of a JOC is the job, where it can be a single unit of our output
  - For a large project it can be an infrastructure, a ship a building → something unique which is requested by the customer as a single unit
- We have a job also if we have batch production

Graphically we can have:

- Different departments if it's batch production
- Different phases if it's unique output request by the customer

Assuming these are departments:



the moment in which the raw material is picked up from the warehouse within the departments you can exactly assign the value of our direct material & DL to our job

# If we have OH (es: electricity) you cannot know in advance the amount of elect. absorbed by each department

↳ you assign them using some rules  
some OH are common to several departm., to several activities & at the same time several jobs

↓  
We have to understand their division

To assign the OVH if we have a JOC we use the:  
JOB ORDER SHEET

job n° \_\_\_\_\_

CUSTOMER \_\_\_\_\_

DATE \_\_\_\_\_

CODE \_\_\_\_\_

PRIORITY \_\_\_\_\_

	DEP <sub>1</sub>	DEP <sub>2</sub>	DEP <sub>3</sub>	TOT
Dm	TRACED			
DL		IMMEDIATELY		
OVH	*			

$$K = \frac{OVH_{TOTD1}}{AB_{TOTD1}} \rightarrow OVH_{J01} = K \times AB_{JD1}$$

Example:

→ We have a batch of 10 bags which is realized  
So our job is composed by 10 units of bags

→ In order to realize the bags we have a production process composed by 3 different phases:

	PREPARATION DEP	MACHINING DEP	FINISHING DEP	Q=10 bags TOT
Machine h	200h	250h	100h	
Machine h TO realize 10 bags	6h	5h	4h	
OVH (energy)	1000€	2500€	800€	

DM	25€	40€	10€	75€
DL	10€	15€	5€	30€
K	$\frac{1000}{200} = 5€/h$	$\frac{2500}{250} = 10€/h$	$\frac{800}{100} = 8€/h$	
OVH	$5 \times 6h = 30€$	$10 \times 5 = 50€$	$8 \times 4h = 32€$	112€

270€

↓  
TOTAL COST  
OF OUR bag

## Ex JOc

woody spa produces high quality wooden toys

the company has 3 production departments:

- 1) Preparation
- 2) machining → all the machines operating 1000h
- 3) Finishing

budgeted OH costs for the next month are expected as:

- Rent = 1000€
- Electricity to power machines = 100€
- Cleaning = 60€
- Machine depreciation = 200€

Salaries of each of the indirect workers:

- Prep. dep = 2000€
- mach. dep = 2400€
- Finish. dep = 1800€

# OF direct workers:	W H	\$
----------------------	-----	----

- prep. dep = 6 160 h 12€/h
- mach. dep = 9 160 h 12€/h
- finish. dep = 5 160 h 12€/h

Floor space occupied by departments:

- prep dep = 15.000 m<sup>2</sup>
  - mach. dep = 20.000 m<sup>2</sup>
  - finish. dep = 5.000 m<sup>2</sup>
- } TOT = 40.000 m<sup>2</sup>

1) TOTAL OH?

	Prep	Mach.	Finish
DM	85€	13€	6€
DL h	10h	7h	5h
Machine h	-	8h	-

→ 2) Full job cost?

1)

	PREP.	MACH.	FINISH
ELECTRICITY		100€	
DEPRECIATION		200€	
INDIRECT W.	2000€	2400€	1800€
RENT & CL.	397,5€	530€	132,5€
TOT OVH	2397,5€	3230€	1932,5€

INDIRECT COST  
HAS TO BE  
ALLOCATED

↳ how? → using the  $M^2 \rightarrow k = \frac{1000 + 60}{40'000} = 0,0265\text{€}/\text{m}^2$

$$OVH_{\text{prep}} = 0,0265 \times 15'000 = 397,5\text{€}$$

$$OVH_{\text{mach}} = 0,0265 \times 20'000 = 530\text{€}$$

$$OVH_{\text{finish}} = 0,0265 \times 5'000 = 132,5\text{€}$$

2)

	PREP	MACH	FINISH	TOT
DM	85€	13€	6€	104€
DL	120€	84€	60€	264€ +
$k$	2,49	3,20	2,41	
OVH	24,97€	25,84	12,07€	<u>62,88€ =</u>

TOT amount of resources absorbed  $\leftarrow 430,88\text{€}$

We only have the DL h we have to multiply it by the cost of 1h:

$$DL_{\text{prep}} = 10h \times 12\text{€}/h = 120\text{€}$$

$$DL_{\text{mach}} = 7h \times 12\text{€}/h = 84\text{€}$$

$$DL_{\text{finish}} = 5h \times 12\text{€}/h = 60\text{€}$$

$$k_{\text{prep}} = \frac{2397,5}{160 \times 6} = 2,49\text{€}/h \rightarrow OVH = 2,49 \times 10h = 24,97\text{€}$$

$\downarrow$   
DLh

$$k_{\text{mach}} = \frac{3230}{1000} = 3,23\text{€}/h \rightarrow OVH_m = 3,23 \times 8h = 25,84\text{€}$$

↳ data given of machine h TOT

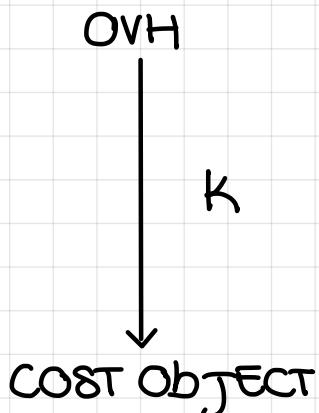
$\downarrow$   
machine h working

$$k_{\text{finish}} = \frac{1932,5}{160 \times 5} = 2,41\text{€}/h \rightarrow OVH_f = 2,41 \times 5 = 12,07\text{€}$$

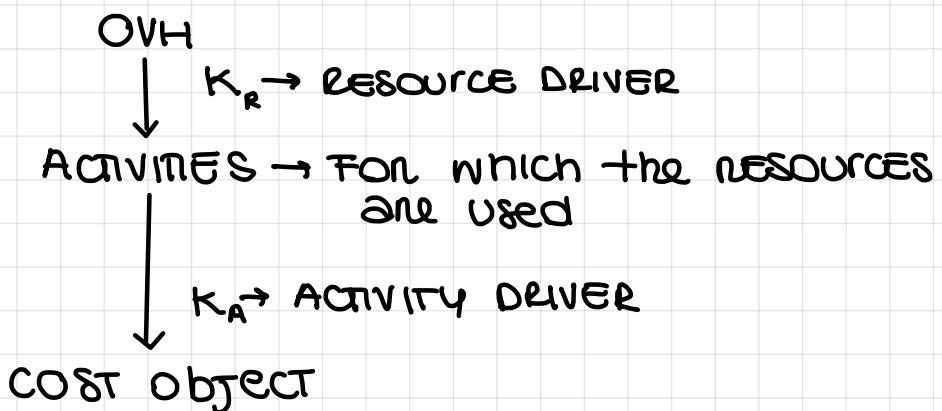
# ACTIVITY BASED COSTING

- OVH are assigned to activities first & then they are allocated to the final cost object

## TRADITIONAL COSTING SYSTEM



## ACTIVITY BASED COSTING



- We are allocating the cost (k) twice
- Increased complexity & precision because of activity identification
- Usually used if the incidents of OVH's in the org. is high

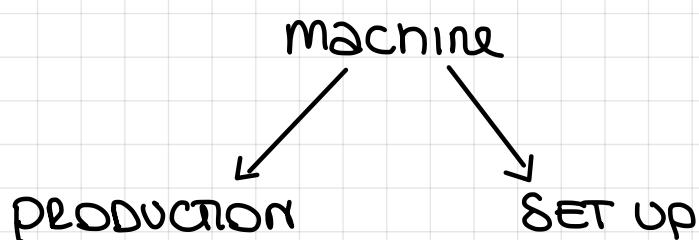
## HOW IT WORKS :

$$\text{INDIRECT} = \text{Machine Resource Depreciation} = 90\text{€}$$

We have to assign this value to the 2 diff. products by using ABC

	Chairs	Tables	TOT
Quantity	120	20	
Prod. Time	10 min/u	30 min/u	
Tot Prod. Time	120 min	60 min	
Tot Set Up			180min
Quantity Set Up	1	1	20 min
			2

What are the activities for which the machine is used?



How can we identify the cost of these activities?

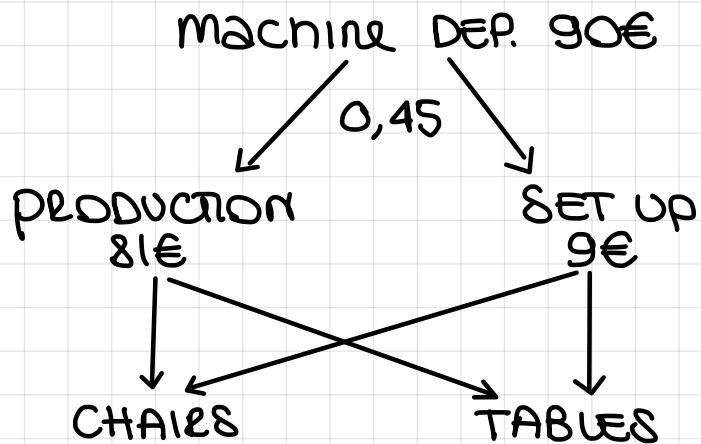
→ by calculating K of our machine depreciation

$$K_{MD} = \frac{OVH_{TOT}}{AB_{TOT}} = \frac{90\text{€}}{180\text{min} + 20\text{min}} = 0,45\text{€/min} = AC$$

$$OVH_{production} = K_{MD} \times AB_p = 0,45\text{€/min} \times 180\text{min} = 81\text{€}$$

$$OVH_{setup} = 0,45\text{€/min} \times 20\text{min} = 9\text{€}$$

→ now we have to do this process again since we have to share the value of the two different activities between the two different products



$$K_p = \frac{\text{COST OF PROD.}}{AB_T} = \frac{81\text{€}}{120 + 60} = 0,45\text{€/m}$$

$$\text{COST OF prod. of chairs} = 0,45 \times 120 = 54\text{€}$$

$$\text{COST OF prod. of Tables} = 0,45 \times 60 = 27\text{€}$$

$$K_{setup} = \frac{\text{COST OF SETUP}}{AB_T} = \frac{9\text{€}}{2} = 4,5\text{€/min}$$

*we use  
the # of setups since we don't have the time*

$$\text{COST OF chairs setup} = 4,5 \times 1 = 4,5\text{€}$$

$$\text{COST OF tables setup} = 4,5\text{€}$$

$$\text{TOTAL chairs COST} = 54\text{€} + 4,5\text{€} = 58,5\text{€}$$

$$\text{TOTAL tables COST} = 9\text{€} + 4,5\text{€} = 13,5\text{€}$$

## Ex on ABC

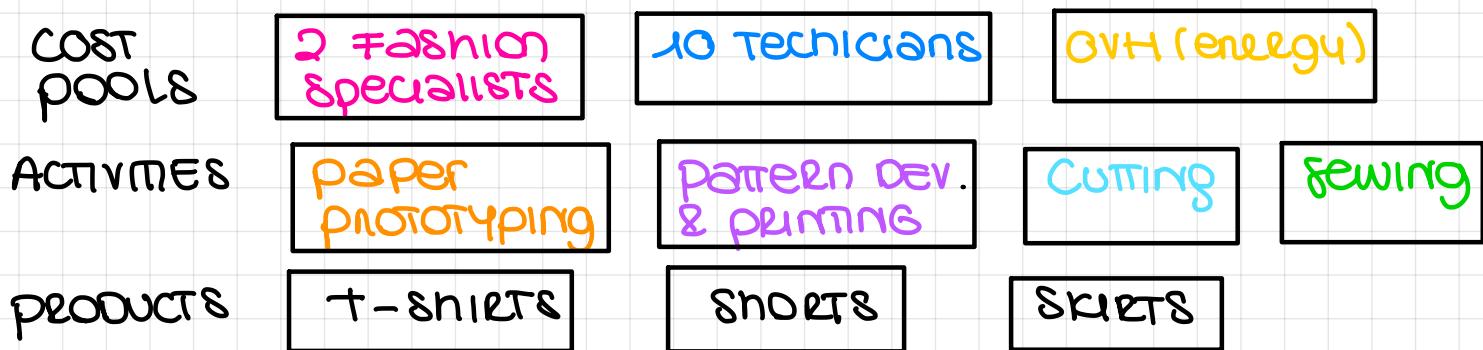
Treasury Group produces 3 types of products  
Production during May-June:

- T-Shirts = 1500u
- Shorts = 1250u
- Skirts = 500u

It is required to find the value of the products by using ABC

3 steps:

- 1) Identify the overheads, also defined as cost pools since we are grouping together similar indirect resources
- 2) Activities for which the resources are absorbed
- 3) Identify the products & calculate the AC to assign the value of the cost pools to the activities & then the value of the activities to the final products



- 1) Find the cost of the OVHs or cost pools:

- 2 Fashion Specialist:

$$\text{COST} = 2,500\text{€} \times 2 \text{ person} \times 2 \text{ months} = 1000\text{€}$$

- 10 technicians:

$$\text{COST} = 1,500\text{€} \times 10 \text{ ppl} \times 2 \text{ months} = 30,000$$

- OVH (energy)

$$\text{COST} = 5225\text{€}$$

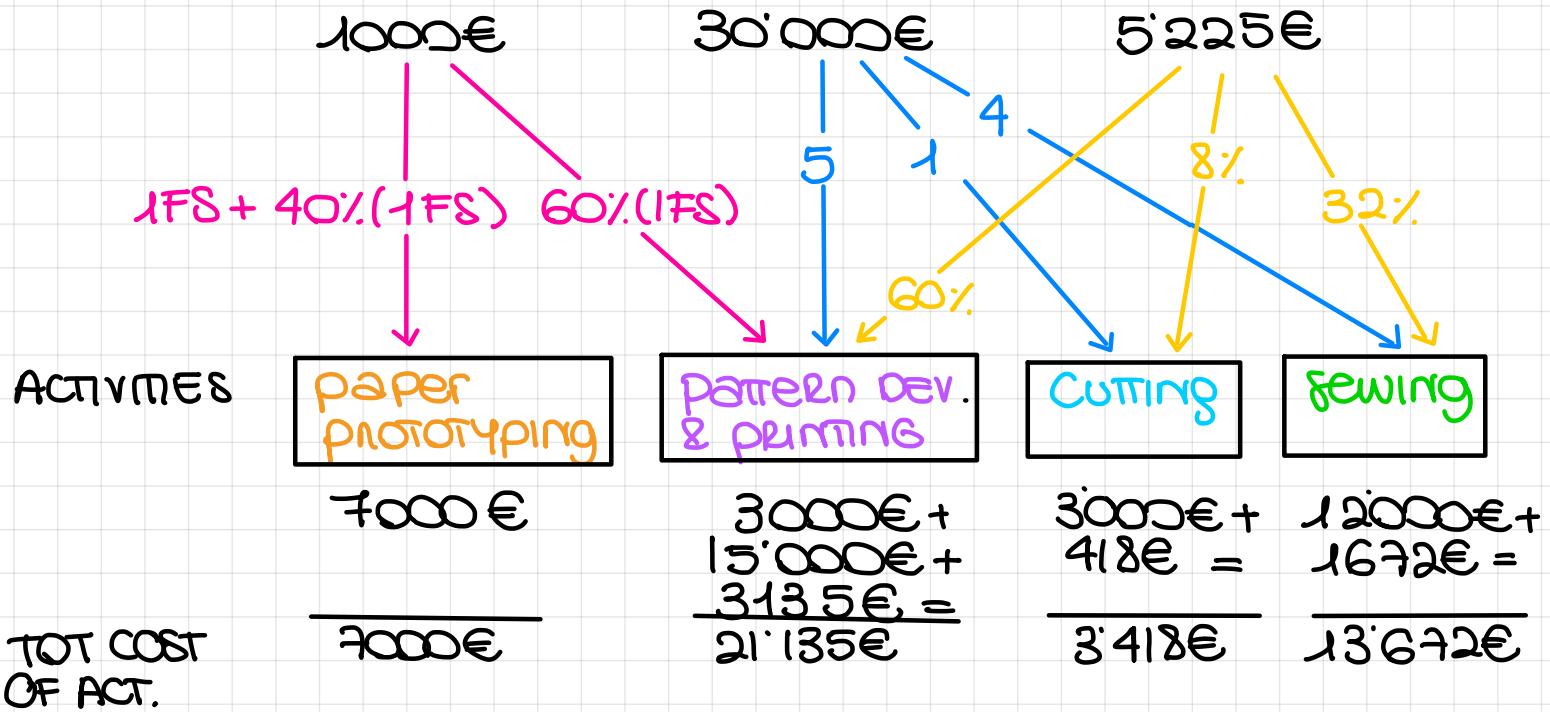
2) Assign the value of our cost pools among the different activities & find the total cost of each activity

COST POOLS

2 Fashion Specialists

10 Technicians

OH (energy)



3) Identify the activity drivers

ACTIVITIES

PAPER PROTOTYPING

PATTERN DEV. & PRINTING

CUTTING

SEWING

ACTIVITY DRIVER

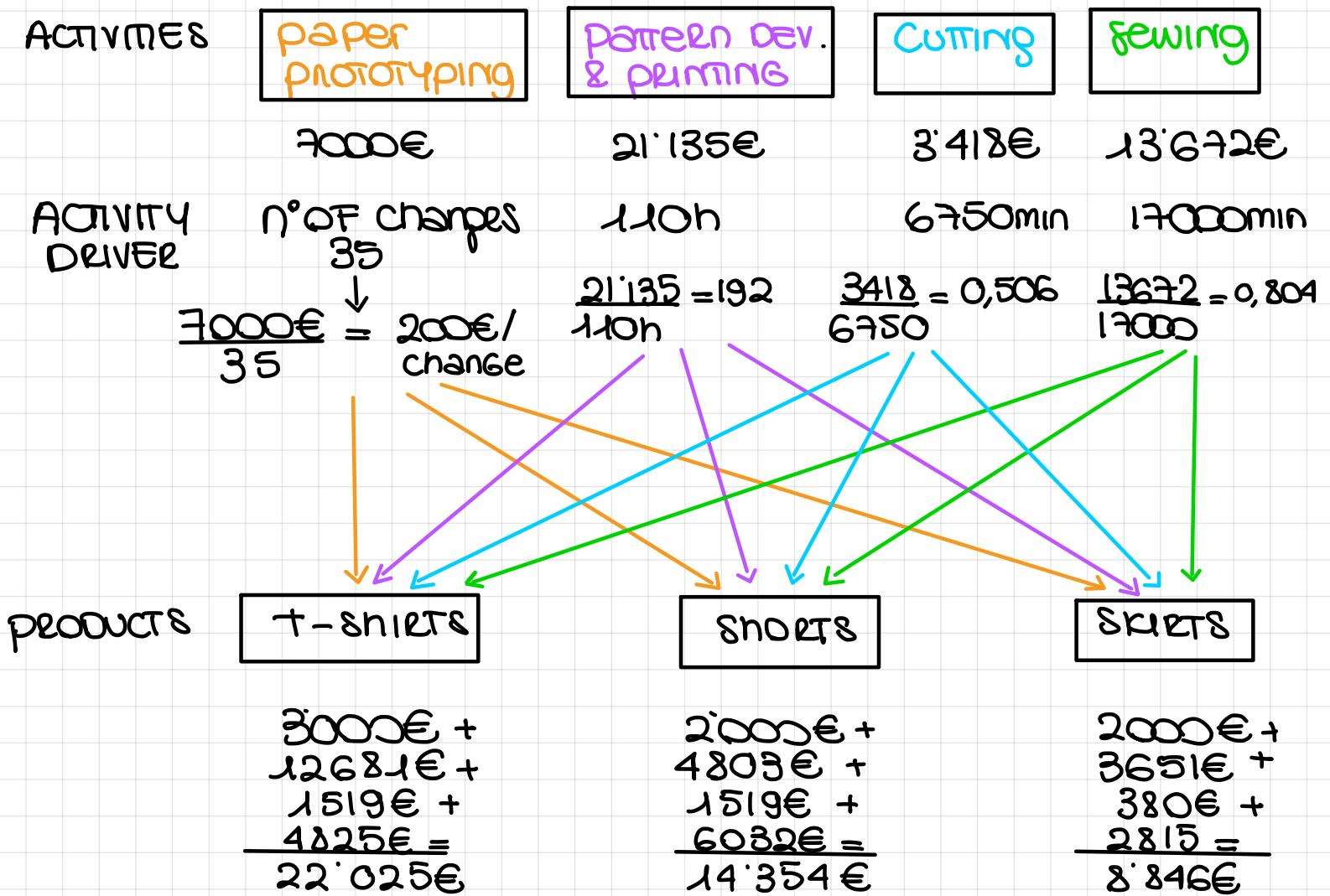
\* changes requested by the customer  
= 35

requires overall 110h

requires overall 112,5h

requires overall 283,8h

4) Share the value of these activities among the 3 different products



+

# Investment Appraisal

- everything that is going to change the asset structure of the balance sheet can be defined as an investment
- characteristics of an investment:
  - 1) the fact that the investment requires a cash out flow at the beginning
  - 2) this will generate a future cash inflow but we do not know exactly the payback time & amount
- a company can have 3 types of decisions

	Time Horizon	Impact on the ability of the company to generate economic value
1) SHORT-TERM decisions	< 1 year	LIMITED
Ex:	Δ in prod. mix Δ in quantity Δ in price	
2) MEDIUM- LONG term decisions	> 1 year	MEDIUM - HIGH
Ex:	projects that are going to change the asset structure → purchase a new equipment	
3) STRATEGIC DECISIONS	> 10 years	VERY HIGH
Ex:	enter a new business, etc that can undermine the survival of the company	

If we want to evaluate these decisions we can use the net present value

$$NPV(0) = \sum_{t=0}^{\infty} \frac{NCF(t)}{(1+k)^t}$$

If we only consider medium-long-term decisions we can simplify:

$$NPV(0) = \sum_{t=0}^{T} \frac{NCF(t)}{(1+k)^t} + \frac{TV(T)}{(1+k)^T}$$

the expected life cycle of our investment

Ex: If we purchase an equipment expected to be used for 10 years then  $T = 10$

the value of the investment at the end of the life cycle we could also have zero if we reach final depreci. ≠ if we sell it

## INVESTMENT APPRAISAL

there are 5 steps to evaluate an investment decision:

- 1) IDENTIFY ALTERNATIVES
- 2) VERIFY CONSISTENCY
- 3) IDENTIFY BOUNDARIES
- 4) ANALYZE COMPETITIVE IMPACTS
- 5) QUANTIFY FINANCIAL IMPACTS (NPV)

} Analysis of alternatives

} Analysis of the impacts of our alternatives

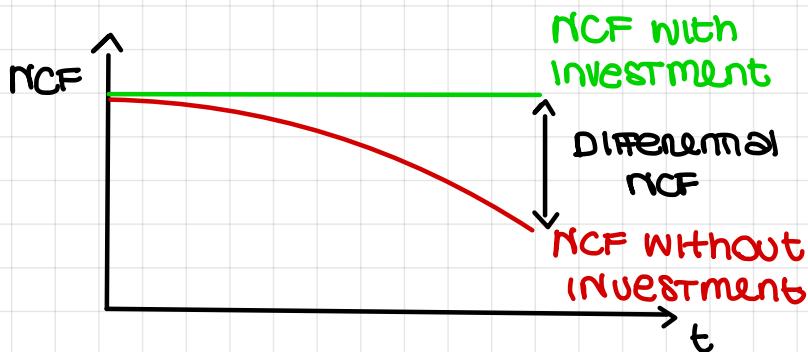
## 1) IDENTIFY ALTERNATIVES

non-mandatory investments

- possibility to not invest
- base case = the alternative not to invest so the alternative to maintain the status quo
- even if the status quo remains the same the NCF will decrease because the external environment (competitors) is evolving

mandatory investments

- the mandatory inv. is related to an economic perspective not legal one
- one of the alternatives is the best case
- investment A vs invest. B

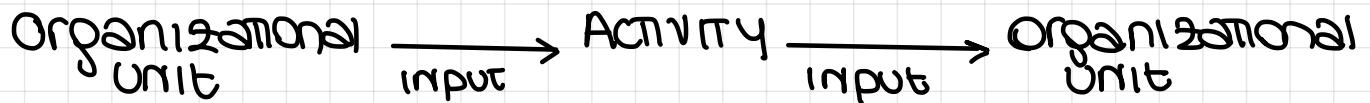


## 2) VERIFY CONSISTENCY

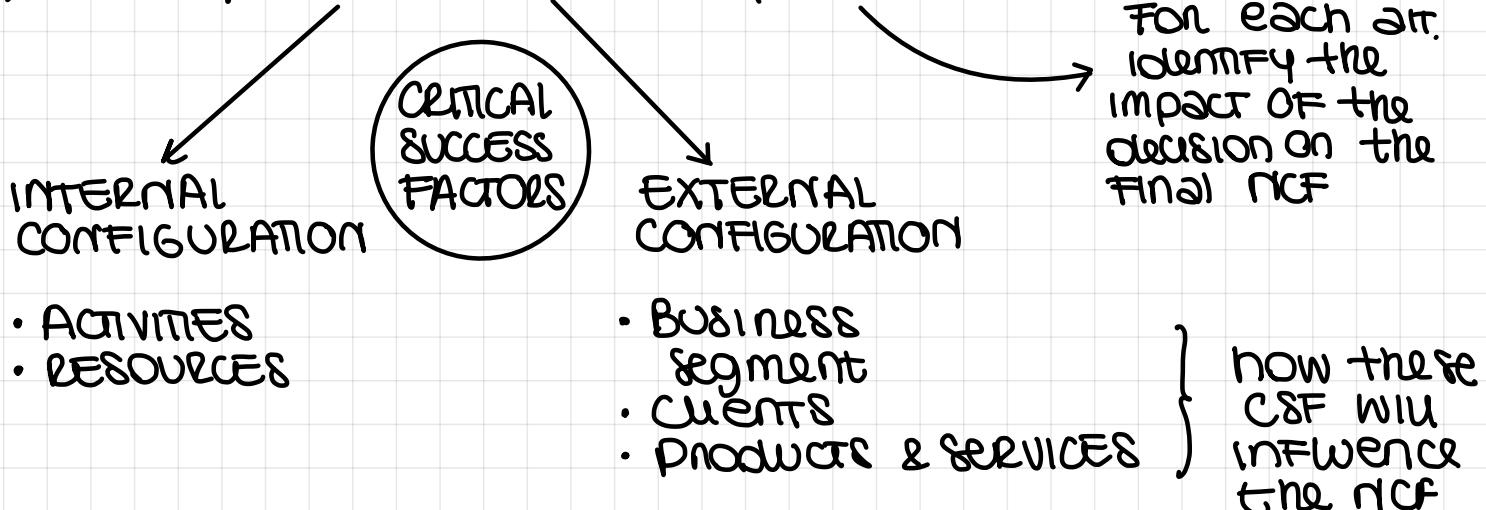
- identification of the main project
- Bundling of complementary projects (that are relevant to the investment)
- unbundling of independent projects

### 3) IDENTIFY BOUNDARIES

- IDENTIFY the organizational units affected the most by the investment
- INPUT/OUTPUT analysis with respect to our activities
  - ↳ IDENTIFY the activities affected the most by the investment & IDENTIFY INPUT & OUTPUT
  - ↳ the organizational units that will be responsible to provide the input & receive the output will be the ones affected the MOST by the investment



### 4) ANALYSE COMPETITIVE IMPACTS



### 5) QUANTIFY FINANCIAL IMPACTS

→ calculate the NPV

## 8 NPV Formula

- the NET PRESENT value is the formula that allows us to QUANTIFY the financial impact OF our decision itself

$$NPV(0) = \sum_{t=0}^T \frac{NCF(t)}{(1+k)^t} + \frac{TV(t)}{(1+k)^t}$$

### NPV without TAXATION & EXTERNAL FINANCING

$$NCF = CF_{gross\ operating} - I$$

the operating cash that the investment is able to generate every year

$$1) CF_{Go} = REV - CASH\ COSTS$$

( $\neq$  dep. & am. are costs but they don't give rise to cash outflows so we don't consider them)

$$2) \underbrace{CF_{Go} = EBIT + d\&A}_{\text{IF we can use the income st}}$$

$$I = I_{fixed\ A} - \Delta OWC_{f-i}$$

(operating working capital)

IF  $\Delta OWC > 0$

$$\begin{aligned}\Delta receivab. &= - \\ \Delta invent. &= - \\ \Delta payables &= +\end{aligned}$$

Concentrated in the initial years

In order to go from an accrual logic to a cash logic we need to consider this variation

EBITDA

- we need to adopt an INCREMENTAL LOGIC

with I  
2015

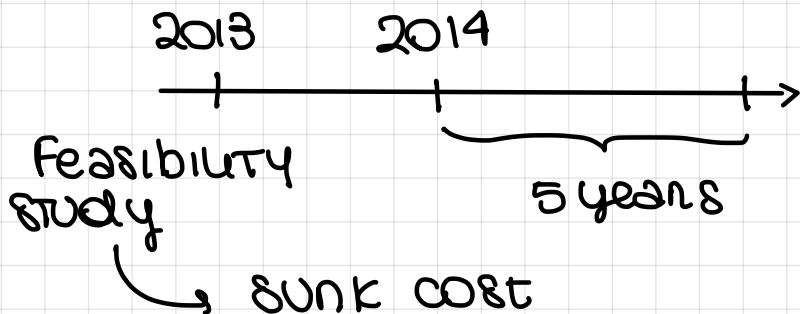
without I  
2015

REV

200

190 =  $\Delta REV = 10$

- We need to avoid the SUNK COSTS = Expenses that a company already paid for, so even if they are related to the investment they can't be recovered anymore so they don't enter in the analysis



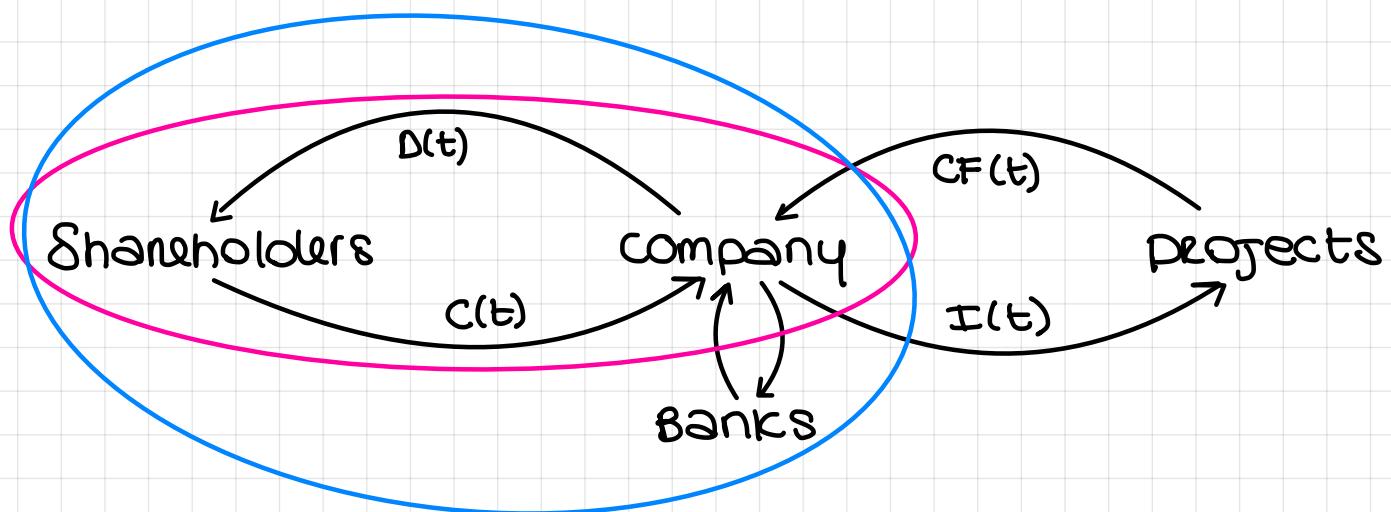
## NPV WITH TAXES

$$\begin{aligned}
 \text{NPV} &\xrightarrow{\text{without taxation}} CF = CF_{Go} = EBITDA = REV - \text{CASH COSTS} \\
 &\xrightarrow{\text{with taxation}} CF = CF_{No} = CF_{Go} - \text{Taxes} \\
 &\quad \downarrow \\
 &\quad \text{Taxes} = \text{NET PROFIT} \times \text{tax rate} \\
 &\quad \downarrow \\
 &\quad \text{NET PROFIT} = (REV - \text{CASH COSTS} - D&A) \cdot tr \\
 &\quad \downarrow \\
 CF_{Net operating} &= REV - \text{CASH COSTS} - [(REV - \text{CASH COSTS}) \cdot tr] \\
 &= (REV - \text{CASH COSTS})(1 - tr) + (D&A \cdot tr) \\
 &\quad \downarrow \\
 \text{cash flow in} & \\
 \text{the moment we} & \\
 \text{include taxation} & \\
 &\quad \downarrow \\
 &\quad \text{tax shield}
 \end{aligned}$$

IF tax shield is high also  $CF_{No}$  will be high

	$CF_{Go}$	$CF_{No}$
$REV = 100\text{€}$		
$\text{Cash costs} = 90\text{€}$	$REV - \text{CASH COSTS}$	$(REV - CC)(1 - tr) + (D&A \cdot tr)$
$D&A = 20\text{€}$	$= 100 - 90 = 10\text{€}$	$(100 - 90)(1 - 0,5) + (20 \cdot 0,5)$
$tr = 50\%$		$= 15\text{€}$

# NPV with EXTERNAL FINANCING



Shareholder  
LOGIC

$K = K_e \rightarrow$  COST OF capital  
OF the shareholders  
↓  
the level of RISK  
defined by the  
shareholders

$$CF = EBITDA - \underbrace{\text{Debt}}_{\text{Int}}$$

we are taking OUT the  
bank relationship

INVESTED CAPITAL  
LOGIC

→ everyone that has provided the  
money

$$K = WACC = \frac{K_e * E}{E+D} + \frac{K_d * D}{E+D}$$

E = money provided by shareh.  
D = money provided by banks

$$CF = CF \begin{cases} \nearrow CF_{no} \\ \searrow CF_{lo} \end{cases}$$

Ex:

$$\begin{aligned} I(0) &= 1000\text{€} \rightarrow E = 600\text{€} \rightarrow \text{amount financed by shareholders} \\ &\quad K_e = 10\% \rightarrow \text{COST OF CAPITAL OF Sh.} \\ &\quad D = 400\text{€} \rightarrow \text{amount financed by banks} \\ &\quad K_d = 5\% \rightarrow \text{bank's interest rate} \end{aligned}$$

$CF = 300\text{€} \rightarrow$  generated for the next 4 years by our I

	Shareholder Capital LOGIC	Invested Capital LOGIC
K	10%	$\frac{0,1 * 600}{600+400} + 0,5 * \frac{400}{400+600} = 8\%$
CF	$300 - 400(0,5) = 280\text{€}$	300€

Ex.

Treasury company does necklaces. Company is facing problems because market share is lower than competitors & production costs are higher.

- data: Necklace Market: 50'000 u/year  
Market Share: 8%  
Price: 700€/u  
Production Cost: 200€/u
- Company decides on an investment plan of 2 steps to increase revenues & reduce costs
  - 1) Investment (year 0): product redesign  
 $I = 400'000\text{€}$   
Market Share = 12% ↑  
 $\Delta \text{Costs} = -15\text{€/u}$   
benefits from year 1
  - 2) Investment (year 2): new machine  
 $I = 2,5 \text{ million €}$   
 $\Delta \text{Costs} = -30\text{€/u}$  (consequential to the first)  
Market Share = 5 years
- Company pays a consultancy company at year 3 of 300'000
- Is convenient for the company to invest in these projects? We have to calculate NPV of a time horizon of 7 years since the first investment covers the first two years & the second the last five
- 1) Identify cash in & cash outflow that occur in the 7 years using incremental logic

	40	41	42	43	44	45	46	47
Investment	-400		-2500	-300				
Δ Revenues		+1400	+1400	+1400	+1400	+1400	+1400	+1400
Δ Cost								
Δ Volumes		-370	-370	-310	-310	-310	-310	-310
Savings		+60	+60	+180	+180	+180	+180	+180
Δ CASH	-400	+1090	-1410	+970	+1270	+1270	+1270	+1270

## $\Delta$ Revenues (P\*Q)

the investment is non-mandatory to the company therefore we need to consider as base case the one in which we don't invest

BASE CASE (no investment)	INVESTMENT	$\Delta$
market = 50'000 u share = 8% ≈ units the company is able to sell every year: $50'000 \text{ u} * 8\% = 4000 \text{ u}$	new m. share = 12% $50'000 \text{ u} * 12\% = 6000 \text{ u}$	2000 u ↑

$$\Delta \text{ REVENUES} = 700 \text{ €} \times 2000 \text{ u} = 1'400'000 \text{ €}$$

$\downarrow$        $\downarrow$   
 P       $\times$       Q

## $\Delta$ COSTS

	PRODUCT Redesign $4_1, 4_2$	NEW machine $4_3, 4_4, 4_5, 4_6, 4_7$
$\Delta$ volume	$2000 * (200 - 15) = 370'000$  ADDITIONAL QUANTITY PRODUCED the additional cost for the company (it is a cash outflow so it will have a minus)	$2000 * (200 - 45) = 310'000 \text{ €}$  $(30 + 15)$
EXISTENT PRODUCT.	$4000 * 15 \text{ €/u} = 60'000 \text{ €}$  savings bc of lower production costs	$4000 * 45 = 180'000 \text{ €}$

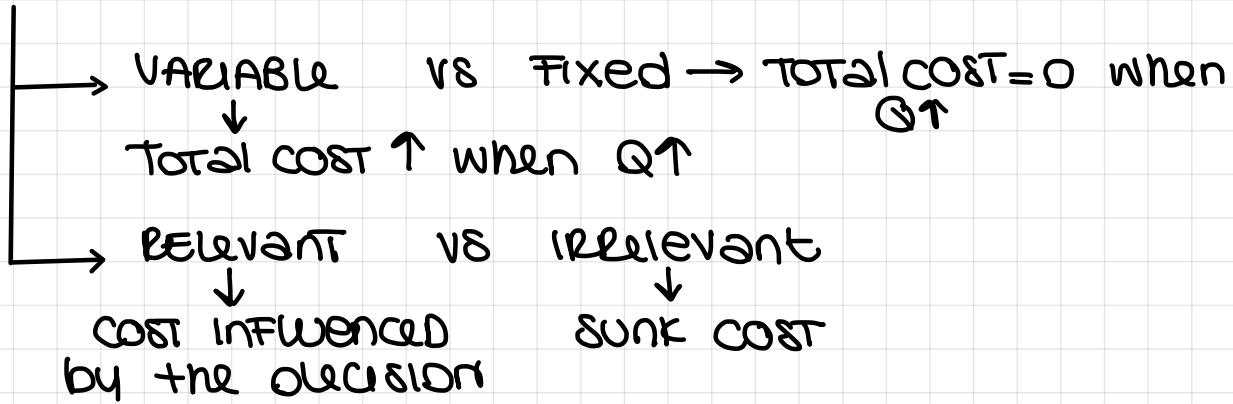
$$NPV(0) = \sum_{t=0}^T \frac{NCF(t)}{(1+k)^t} + \frac{IV(t)}{(1+k)^t} \rightarrow \text{we don't have it in this case}$$

$$NPV(0) = -400 + \frac{1090}{(1,06)} - \frac{1410}{(1,06)^2} + \frac{970}{(1,06)^3} + \frac{1270}{(1,06)^4} + \frac{1270}{(1,06)^5} \\ + \frac{1270}{(1,06)^6} + \frac{1270}{(1,06)^7} = 3882,737 \text{ €} \rightarrow \text{accept INVESTM.}$$

## 9 Short-term decisions

- < 1 year → limited impact
- do not require additional investment → the resources are fixed = asset side in the BS is the same
- 3 elements enter the decision:

- 1) selling price of a product
- 2) quantity = volume of production (how many units)
- 3) costs



EX:  $Q = 50u$   
 $P = 10\text{€}$   
 $VC = 6\text{€}$   
 $FC = 15\text{€}$   
 (marketing)

is it convenient to produce additional 10u?

$VC = 6\text{€} \times 10u = 60\text{€}$  more  
 ↳ relevant

$FC = 15\text{€} \rightarrow \text{sunk cost}$

# EVALUATION OF SHORT-TERM DECISIONS

limited decision < 1 year  
no investment

NEW NPV FORMULA:

$$NPV(0) = \sum_{t=0}^{\infty} \frac{CF(t) - I(t)}{(1+k)^t}$$

$EBIT/CF = CF_{in} - CF_{out} = \text{REVENUES} - \text{Operating costs}$   
NOI (net operating income)

↓  
is now called NPV

NORMAL INCOME ST.

$$\begin{array}{c} \text{Revenue} \\ \text{Cost of good sold} \\ \hline \text{Gross profit} - \\ \text{SGA costs} \\ \hline \text{NOI/EBIT} \end{array}$$

INCOME ST WITH ST DECISIONS

$$\begin{array}{c} \text{REVENUES} - \\ \text{Variable costs} \\ \hline \text{Contribution margin} - \\ (\text{contr. to our sales to} \\ \text{cover the variable costs}) \\ \hline \text{Fixed costs} \\ \hline \text{NOI} \end{array}$$

can also be calculated as:

$$CM(u) = P(u) - VC(u)$$

↓                      ↓  
Selling price      its variable  
of unit of our      cost  
product

relevant if we want to understand if our product is profitable

## Executive:

Brewery company is measuring beer type A  
beer type A

price (€/u)	1,10 €/u
VC (€/u)	0,85 €/u
Fixed cost (€)	25 €
Quantity (u)	80 u

Is beer type A profitable?

$$CM(u) = 1,10 - 0,85 = 0,25 \text{ €/u} \rightarrow 1 \text{ unit is able to cover the VC & FC}$$

In absolute terms:

$$CM\text{ ratio} = \frac{CM(u)}{P(u)} = \frac{0,25}{1,10} = 22,73\% = \text{IT IS ABLE TO CONTRIBUTE TO THE PROFIT BY THIS VALUE}$$

Impact on profit? NOI

$$REV = P \times Q = 1,10 \times 80 = 88 \text{ €}$$

$$VC = 0,85 \times 80 = 68$$

$$\begin{array}{r} 88 \text{ €} - \\ 68 \text{ €} = \\ \hline 20 - \\ 25 = \\ \hline -5 = NOI \end{array}$$

80 units of our production are not able to cover the fixed costs

Is π profitable? → YES, because  $CM(u)$  is positive since 1 unit is able to cover the variable cost

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# Examples of Short-term decisions

## BREAK EVEN POINT

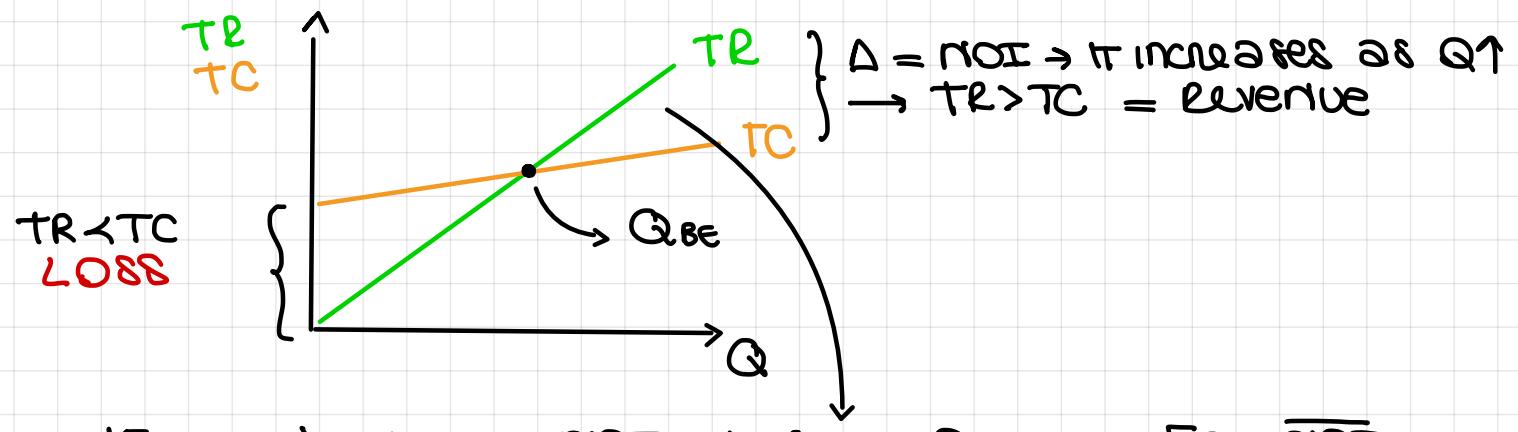
$$\text{NOI} = \text{REVENUE} - \text{COSTS}$$

$$P \times Q - VC \times Q - FC$$

Q? at which  $TC = TR$ ?  $\rightarrow NOI = 0$

$$P \times Q - VC \times Q - FC = 0 \rightarrow Q_{BE} = \frac{FC}{P - VC}$$

Graphically:



$$\text{IF we have a NOI target: } Q_{BE_{\overline{\text{NOI}}} = \frac{FC + \overline{\text{NOI}}}{P - VC}}$$

CONDITIONS FOR which we can apply the quantity to break even:

- 1) produce one type of product
- 2) we don't need inventories since Q<sub>sell</sub> = Q<sub>produce</sub>  
we need to sell exactly the amount we produce  
(this is feasible in ST)
- 3) Revenues & costs remains constant over time, so P & VC should remain the same

Example:

beer type A

price	1,10
VC	0,85
FC	25

1) How many units should we produce in order to break even?

$$Q_{BE} = \frac{FC}{P - VC} = \frac{25}{1,10 - 0,85} = 100 \text{ u}$$

2) How many units should we produce to achieve a target NOI of 200?

$$Q_{BE_{NOI}} = \frac{FC + NOI}{P - VC} = \frac{25 + 200}{0,25} = 900 \text{ u}$$

## PRODUCTION MIX

Given we have multiple products which is the Q of each product we need to realize?

Our reference is the contribution margin

$$CM(u) = P(u) - VC(u)$$

$$A \rightarrow CM(A) = 10 \text{ €}$$

$$B \rightarrow CM(B) = 15 \text{ €} \rightarrow \pi \text{ is more convenient since } \pi \text{ is more probable } \pi \text{ will cover VC}$$

but usually we have constraints such as time so we need to decide which product should be prioritized

we have to adjust the CM formula

In our example:

constraint = machine time  $\rightarrow$  we don't have enough machine h to realize the production required

Machine h(A) = 2h/u  $\rightarrow$  Scarce resource (A)

Machine h(B) = 5h/u  $\rightarrow$  Scarce resource (B)

Which is more convenient? Which is the order?

We have to calculate the CM per scarce resource

For A:  $CM(SR) = \frac{CM(A)}{\text{mach. } h(A)} = \frac{10}{2} = 5 \text{ €/h}$   $\rightarrow$  If we use the m. for 1h it will generate 5€ of CM

For B:  $CM(SR) : \frac{15}{5} = 3 \text{ €/h}$

$\downarrow$   
We will prioritize it in the production

$\rightarrow$  Without constraint = CM(u)

$\rightarrow$  With constraint = CM(SR)

Example:

	A	B	C
Price (€/u)	2,50	2,00	2,30
VC (€/u)	0,70	0,80	0,90
Weekly demand (u)	2.500	2.000	3.000
Machine time (min/u)	4	3	2,5

All 3 products use same machine

constraint = machine time = 9.300 min/week

which is the best product mix to produce the highest profit?

$$CM(A) = P \times VC = 2,50 - 0,70 = 1,8 \text{ €/u}$$

$$CM(B) = P \times VC = 2 - 0,80 = 1,2 \text{ €/u}$$

$$CM(C) = 2,30 - 0,90 = 1,4 \text{ €/u}$$

$$CM(SRA) = 1,8 / 4 = 0,45 \text{ €/min}$$

$$CM(SRB) = 1,2 / 3 = 0,40 \text{ €/min}$$

$$CM(SRC) = 1,4 / 2,5 = 0,56 \text{ €/min}$$

} ORDER OF PROD:  
1) C  
2) A  
3) B

How many units of each products should we realize?

The starting point is beer type C:

Since we are first producing C we are producing the whole quantity of 3000u

so now we have to calculate how much does it take to produce it & the time left for the next pr.

$$\text{Machine h} = 3000u * 2,5 \text{ min/u} = 7500 \text{ min needed}$$

$$\text{time left} = 9300 \text{ min} - \underset{\substack{\downarrow \\ \text{available}}}{7500} = 1800 \text{ min left in order to realize the other production}$$

NOW type A:

$$\text{Q we can produce with} = \frac{1800}{4} = 450 \text{ u}$$

So given the 3 diff. products the mix that maximizes the operating income, is the mix that is constituted by:

3000 u of type C & 450 u of type A

### EVALUATING ALTERNATIVES

The problem is to evaluate which is the best alternative

NOI approach is used  $\rightarrow$  is similar to inv. appraisal

STEPS:

1) IDENTIFY the ALTERNATIVES

2) IDENTIFY Base Case

3) calculate NOI = REV - Relevant costs (no sunk cost)

$\hookrightarrow$  the alternative with the highest NOI is the chosen one

Ex. usually is a MAKE TO BUY problem

We need to realize 50u → is it more convenient to make it internally or to buy it?

Data:

	MAKE		BUY
DM	20€	Purchasing price	60€
DL	25€		
OVH(en)	5€		

Base case: MAKE

If we buy outside we don't have DM, DL & OVH saving 50, but we pay 60€ to buy so as a Δ if we buy compared to make we will have additional 10€

↓  
so it is more convenient to make the product inside

→ we thought about the differential cost not tot cost of either the two

In sum:

APPLICATION	PROBLEM	APPROACH
BREAK-EVEN POINT	Q? When $TB=TC$	$Q_{BE} = \frac{FC}{P-VC}$
PRODUCTION MIX	Multiple products Q?	$CM(SR) = \frac{CM(u)}{SR(u)}$
ALTERNATIVE EVALUATION	Alt <sub>1</sub> vs Alt <sub>2</sub>	RELEVANT vs SUNK COST $\hookrightarrow NOI = REV - REL. COST$

## Example

	PROD. A	PROD B
price (€/u)	1,10	1,50
VC (€/u)	0,85	0,90
FC (€)		25
Q (u)	80	50
$\Delta \text{MKTG} (\text{€})$		20

relevant costs

IS IT CONVENIENT TO PRODUCE TYPE B?

NOW WE HAVE TO CALCULATE NOI ONLY IN INCREMENTAL TERMS SINCE WE ARE EVALUATING THE ALTERNATIVE

$$CM(uA) = P - VC = 1,10 - 0,85 =$$

$$CM(uB) = 1,50 - 0,90 = 0,6 \text{ €/u}$$

$$TOTCM = CM(uB) \times Q = 0,6 \text{ €/u} \times 50 = 30$$

$$NOI = TOTCM - FC = 30 - 20 = 10 \rightarrow \text{ADDITIONAL NOI}$$

$\downarrow$   
they are not the overall one (25) but  
only the incremental one

IT IS CONVENIENT TO INTRODUCE PROD B SINCE ITS CONTRIBUTION TO THE PROFITABILITY IS 10 € MORE