Lecture 1

Agency problem

- Managers suffer from:
  - Lack of motivation
  - Lack of direction
  - Personal limitations: Lack of information, resources, skills, etc.

Use of accounting information

- Planning
- Decision making
- Performance evaluation

Financial accounting vs managerial accounting

	Financial acc.	**Managerial acc.**
Target audience	External	Internal
Customization	No, standardization	Yes, tailored
Level of detail	Summarized	Detailed
Time focus	Mostly historical, quarter of a year	Historical & future projections (now to 10 – 15 years)
Type of information	Financial	Financial & non-financial

Cost object – Any product, service, customer, organizational unit, etc. to which costs are assigned
Cost driver – A variable that causes changes in total costs (eg. Production volume, level of supervision)
Actual cost – A cost that has been incurred
Budgeted cost – Anticipated or predicted costs
Cost – Meaningful groups of cost grouped in many ways including:

- **Type of cost:** product design costs, distribution costs
- **By responsibility:** Manager 1, manager 2
- **By source:** department 1, department 2
- **Origin of cost:** cost of labour, costs of material

Cost assignment

- The process of assigning resource costs to cost pools, then from cost pools to cost objects
  - Resource costs → cost pools → cost objects
- **Direct costs**
  - Costs directly traced (conveniently and economically) to a cost pool or cost object
    - Eg. A hard drive to a laptop
  - **Cost tracing**
    - Assigning direct costs to cost objects
- **Indirect costs**
  - When costs cannot be (conveniently or economically) traced to a cost pool or cost object.
    - Employee supervision costs cannot be directly traced to a product
    - Costs for a laptop service line cannot be directly traced to a product
  - **Cost allocation**
    - The assignment of indirect costs to cost pools and cost objects.
    - Indirect costs allocated using cost drivers

Fixed and variable costs

- **Variable costs**
  - A cost that changes in response to a change in volume of a cost drivers
- **Fixed costs**

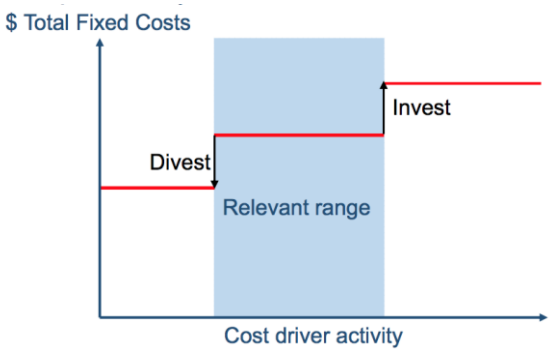
- Costs that do not change in proportion with volume of a cost driver

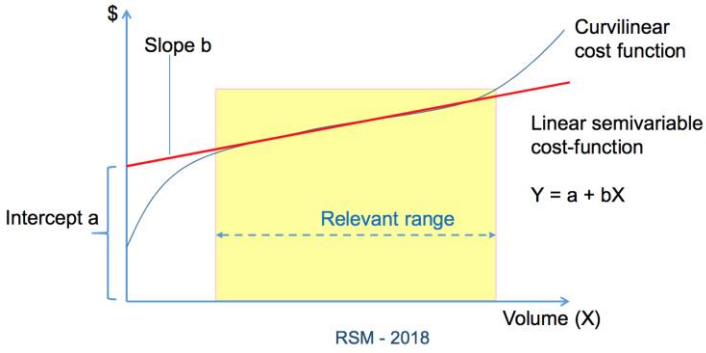
Types of cost

- **Cost of goods sold**
  - The cost of the product transferred to the income statement only once it is sold.
    - Finished goods inventory beginning + COG manufactured = COG available
    - COG available – finished goods ending inventory = COGS
- **Product cost**
  - Only the costs necessary to completing the product
    - Direct materials
    - Direct labour
    - Factory overhead
- **Period cost**
  - All non-product expenditures for managing the firm and selling the product
    - Interest expense
    - Advertising expense
    - Office expense
  - Costs like indirect/direct labour, materials, factory supplies don't count
- **Total manufacturing cost (COG manufactured)**
  - Sum of direct materials used
    - Beginning inventory + direct material purchases = direct materials available
    - Direct materials available – ending inventory = direct material used
  - Labour cost
    - Direct
  - Overhead amount
    - Indirect costs that support the manufacturing process (utilities, rent, indirect labour)
    - Includes indirect materials
    - Machine hours * cost per hour
- **Costs of goods manufactured**
  - The cost of goods finished and transferred out of the WIP inventory account this period

Fixed costs over the long-term

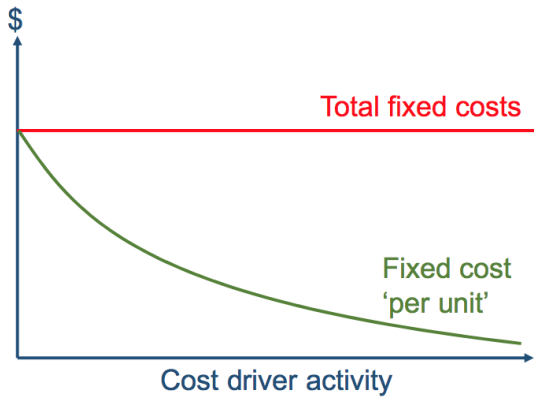
- **Relevant range**
  - The range for where a cost driver and its cost is approximately constant/linear
    - Eg. When business activity declines, firms divest to eliminate excess capacity
    - Eg. When business activity rises, firms invest to increase capacity
  - The range of observations provided for the cost driver
    - You cannot predict observations outside the relevant range
  - Over the long-term fixed costs behave like step functions





Fixed cost per unit over changes in volume

- As volume increases, fixed costs are spread over more cost driver units
- Marginal cost per unit doesn't change
- Fixed cost per unit is an 'artificial number'



Take away

- Average cost/unit cost are useful in many contexts but usually a bad foundation for decision making
- Combine accounting information with strategic information for decision making
    - Eg. Will declining a deal to produce more units at a lower cost for a customer influence the relationship?

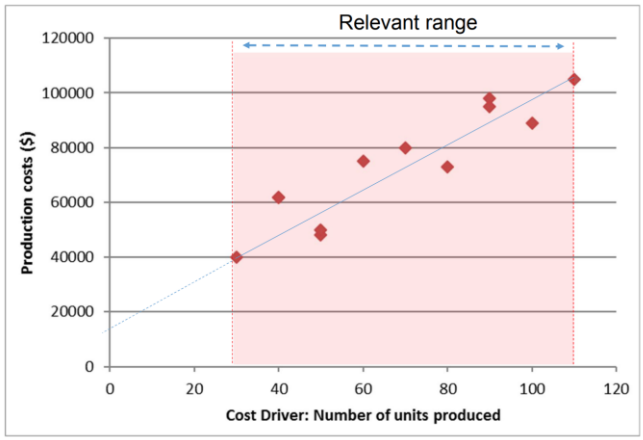
Lecture 2

Cost estimation

- The development of a well-defined relationship between a cost object and its cost drivers in order to predict its cost
- Facilitates strategic management by:
  - Helping predict costs
  - Helping identify the key cost drivers
  - Useful in planning and decision making (performance measures, target pricing, etc.)

High low method

- Used to determine a unique estimation line between the highest points and lowest points in the data
- Translate the data into the formula Y=mx+b
  - Slope = variable costs (m)
  - Y-intercept = fixed costs (b)
- Simplest method of quantitative analysis



High low method: pros and cons

- **Advantages**
  - Simple to calculate
  - Provides a first overview of a cost and its cost driver
- **Disadvantages**
  - Inefficient use of cost information. Only two points are chosen to create the estimation line and the rest are ignored
  - Highly sensitive to outliers at the highest/lowest observation of the cost driver

Regression analysis

- Minimizes the *sum of the squares* of the estimation errors
- Minimizes the estimation errors
- **Simple regression**
  - When only one independent variable is used
- **Multiple regression**
  - When multiple independent variables are used

$$y = mx + b + e$$

- e = the estimation error (the amount the regression differs from the data point)

Evaluating regression analysis

- **Goodness of fit (R^2)**
  - Measure of explanatory power; The degree to which changes in the DV can be explained by changes in the IV(s)
- **Standard error (SE)**
  - The measure of dispersion of the actual observations around regression line
  - Gives a measure of accuracy
- **t-value**
  - The measure of the reliability of each IV (the higher the better)
  - The degree to which an IV has a valid, stable, long-term relationship with the DV
  - Calculated by:

$$t - value = \frac{Slope}{Standard\ Error}$$

- **p-value**
  - Measures the risk that an IV has only a chance relationship to the DV
  - Translation of the t-value into probability
- **Economic plausibility**
  - Assessment of causal relationship

Summary of regression analysis

- Provides an objective measure that can be judged from predetermined evaluation criteria
- Uses information from all observations
- Caution with outliers: they alter the regression estimates

Cost-Volume-Profit (CVP) analysis – Break-even analysis

- Method for analyzing how various operating and marketing decisions affect short-term profit
- Examines relationship between revenue and cost at a certain volume
- **Contribution margin (CM) -** difference between selling price and variable cost
- Break-even/CVP used for:
  - Setting prices for products/services
  - Deciding to introduce a new product/service
  - Conducting a sensitivity/what if analysis
    - What happens if R&D is cut by 50%/if prices increase by 10%?

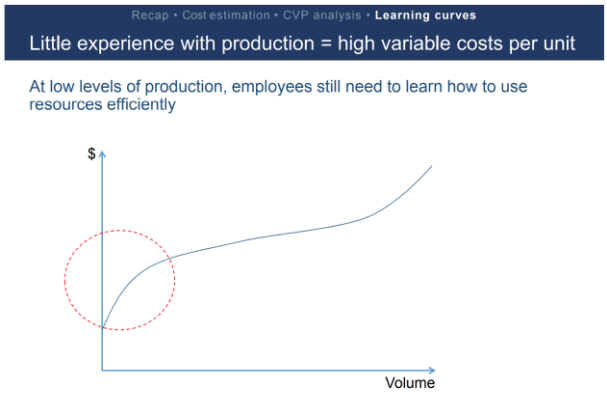
$$Q_{BE} = \frac{FC}{(P-VC)} \qquad R_{BE} = \frac{FC}{\frac{P-VC}{P}} = Q_{BE} * P$$

CVP summary

- Assumes only one product is sold/produced
  - Not realistic, since companies usually sell multiple products
  - The same formula is used to overcome this, but use **average contribution margins** for bundles of products

Learning curves

- Variable costs are initially very high for low expertise
- Resource consumption (direct labour, direct material, etc.) is **not a linear function** of output overtime
- Production efficiency increases as production increases
    - Learning (labour costs)
    - Less waste (material costs)



CATLM learning curves

- Cumulative average-time learning model (CATLM)
    - The average time per unit declines by a **constant percentage** each time the units produced **doubles**
- Important for profitability forecasts and long-term pricing decisions

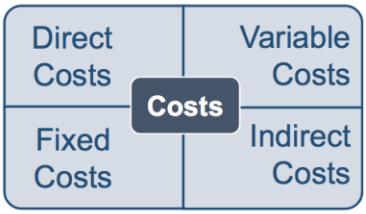
Lecture 3

Cost classifications for different purposes

- Any non-diagonal combination is possible

Variable & direct:
e.g., engine and tires (cost object: car)
- *Direct:* we know how many of the parts a car needs
- *Variable:* making one more car requires one more part

Direct & fixed:
e.g., Marketing for E-class (cost object: E-class product line)
- *Direct:* advertisements for E-class only, not for other product lines
- *Fixed:* spending is pre-committed, doesn't change with # cars



Variable & indirect:
e.g., machine power of plant that makes several car types (cost object: car product line)
- *Variable:* producing one car less leads to less power usage
- *Indirect:* electricity costs are metered to plant, not to product line

Fixed & indirect:
e.g., Tesla's battery R&D (cost object: car)
- *Fixed:* R&D spending is pre-committed, doesn't change with # cars
- *Indirect:* R&D benefits all Tesla models

Introduction to cost allocation

- Multiproduct firms have to estimate the costs of each product
  - Total cost of a product = $\sum(direct\ costs, indirect\ costs)$
- Direct costs are easily traced to a product
  - Assembly line labour traced using employees time sheets
  - Components and materials traced using bill of material
- Indirect costs are difficult to trace to a product
  - Cost of support functions (HR, finance, marketing, etc.)
  - Production overheads (maintenance, setting up machines, depreciation, etc.)
- **Cost allocation is the process of assigning indirect costs to products**
  - Indirect costs are allocated using cost drivers
  - Cost centers → cost drivers → products

Importance of cost allocation

- Product portfolio decisions
  - Cost allocation helps determine product profitability
- Performance evaluation of business unit (BU) managers
- Execute cost reduction programs

Cost allocation step 1 - Job costing & Process costing

- **Job costing**
  - Cost object is a unit or multiple unit (batch) of a distinct product/service/job
  - A **Job cost sheet** is used
  - Appropriate when costs can be readily identified to a specific job
    - Eg. Construction, advertising, consulting, etc.
- **Process costing (NOT RELEVANT TO THE COURSE)**
  - For mass production of identical/similar products
  - In this case it is economically impractical to trace most costs to individual products

        - Instead: direct material, direct labour and overhead costs are accumulated at the department level and then averaged to products

Cost allocation – Step 2: Applying overhead costs to products

- **Volume based approach**
    - Use volume-based cost drivers to allocate overhead
        - In a multiproduct firm, volume is better measured with a common input factor
        - Eg. Labour hours, machine hours
    - Overhead should be proportional to labour hours/machine hours needed to manufacture that unit
        - Eg. Maintenance, set-up times, packing and shipping, etc.
    - Limitation:
        - Relies heavily on the assumption that each product uses the same amount of overhead. (not accurate)
        - Relies that overhead should be proportional to direct labour hours (not accurate)

- **Activity based approach**
    - Allocates overhead costs to products using cause-and-effect criteria with multiple cost drivers
        - Uses volume & non-volume based cost drivers

How costs are measures

- **Actual costing**
    - Uses actual costs incurred for products including direct labour, direct materials and factory overhead
        - **Actual costs = actual direct cost rates * actual usage for the job**
        - **Overhead costs = <u>Actual</u> overhead rate * actual usage for the job**
- **Normal costing**
    - Uses <u>actual</u> <u>costs</u> for direct materials and direct labour, but uses <u>normal</u> <u>costs</u> for factory overhead
        - Involves estimating a portion of overhead to assigned to each product using predetermined rates (budgeted overhead rates)
    - A normal costing system provides a timely estimate of the cost of producing each product.
        - **Pre-determined overhead rate = Estimated overhead / cost driver amount**
        - **Actual costs = actual direct cost rates * actual usage for the job**
        - **Overhead costs = <u>Budgeted</u> overhead rate * actual usage for the job**

Normal costing with service firms

$$Cost = (budgeted\ direct\ labour\ rate + budgeted\ overhead\ rate) * actual\ labour\ hours$$

- **Budgeted direct labour rate = total budgeted labour cost / total budgeted labour hours**

Over/under applied overhead

- **Over applied overhead**
    - The amount by which the estimated overhead <u>exceeds</u> the actual overhead
- **Under applied overhead**
    - The amount by which the estimated overhead <u>misses</u> the actual overhead

Accounting for overhead

- Using a pre-determined overhead rate means that actual costs will rarely equal budgeted costs
    - If allocated overhead < actual overhead, then overhead is under-allocated
    - If allocated overhead > actual overhead, then overhead is over-allocated
- The difference has to be accounted for. Done through:
    - **Proration approach**
        - The difference is allocated between COGS, WIP, and finished goods based on relative sizes
        - Done if the overhead difference is significant
    - **Write-off approach**
        - The difference is simply written off to cost of goods sold
        - Done if the overhead over/under applied is not large

Errors in overhead application

- **Aggregation error**
    - Only one plant-wide rate is used instead of specific departmental rates
- **Specification error**
    - Arises when the wrong cost driver is used in the application rate
    - Eg. When labor costs are small and machine costs are large, it is better that the rate is based on machine hours for the overhead application.
- **Measurement error**
    - Estimating errors (wrong values/process used)

Allocating overheads from supporting departments (marketing, HR, finance, IT etc.) → production

- **Direct method**
- **Step-down method**
- **Reciprocal method**

Direct method

- Simplest method because it ignores reciprocal flows
- Allocates support costs only to production departments
- Does not allocate support-department costs to other departments

Step-down method

- Partially recognizes provision of mutual services
- Begins with the department with the highest cost to be distributed to other supporting departments.

Reciprocal method

- Allocates by fully recognizing the mutual services provided across support departments
- Makes 2 linear equations

Activity based costing

- Splitting up heterogeneous overhead into smaller pools of homogenous pools for better allocation

Lecture 4 – budgeting & variance analysis

Budget – A detailed plan for the acquisition and use of financial and other resources over a period

- **Operational budget**
  - For production, marketing, personnel, etc.
- **Financial budget**
  - To identify sources of funds
- **Master budget**
  - Operational + financial budgets for a future time period
  - Known as the **static budget** because it is developed for a single output level
  - Made up of:
    - **Sales forecast**
    - **Production budget**
    - **Direct material budget**
    - **Direct labour budget** (wage rates, hiring, standard hours, etc.)
    - **Factory overhead budget**
    - **COGS budget**
    - **Selling, general & administrative budget** (marketing, customer service, etc.)

Incentive problems:

- **Budget slack**
  - Underestimating budget revenues or overestimating budgeted expenses, in an effort to make the budgeted goals more easily attainable
    - Eg. Managers reporting lower targets to increase their bonus (actual sales – reported sales)
- **Target ratcheting**
  - Setting targets based on the subordinate's prior performance
- Can be solved with a non-linear compensation function with a maximum bonus cap

Relative performance evaluation

- Solution for performance and managers setting false targets
  - Bonuses awarded based on performance of peers, not on company targets
- **Problems:**
  - **Fairness issues** – If some other managers don't have the same working conditions making it more difficult for them to do well.
  - **Lack of teamwork and sabotage**
  - **Doesn't provide a target to aim for**

Goal setting theory

- A challenging and specific, but attainable objective maximizes motivation (and performance)

Steps in budgeting

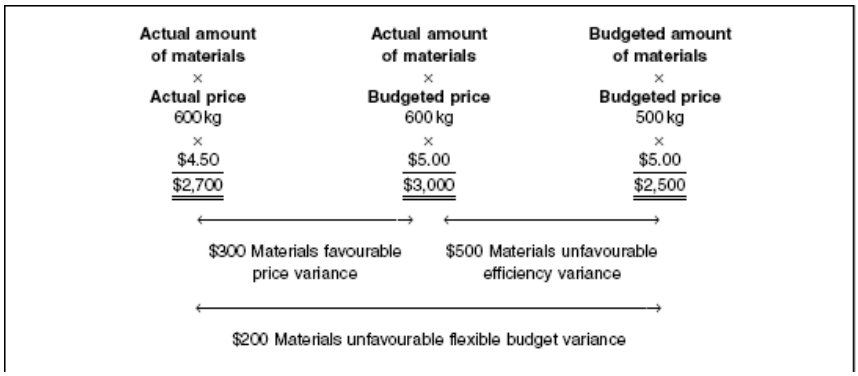
- Proposal
- Negotiation
- Review and approval
- Revision

Flexible budget

- A budget that adjust revenues and expenses to the actual output level and sales mix achieved.
- Used for short-term financial performance
  - Any changes are immediately altering the forecasts

Variance analysis

- Favourable (F) variances – if the actual result is better than the budget
- Unfavourable (U) variances – If the actual result is worse than the budget
- **Selling price variance**
    - The difference between budgeted and actual selling price based on operating income
    - Looks at the difference in **sales revenues** between **actual and flexible budget**
    - Selling price variance = (Actual price – Planned price) * (Actual quantity sold)
- **Direct material and direct labour variance**
    - Differences in actual input factor compensation from flexible budget,
    - Split into price variance (rate for direct labour) and efficiency variance (usage for direct labour)
    - **Price variance** results in paying more/less for inputs than expected
    - **Efficiency variance** results from input factor usage not being in line with expected usage



Actual → Flexible budget → Master (static budget)

- **Flexible budget variance**
    - Difference in operating incomes between actual and flexible budget
- **Sales volume variance**
    - Difference in operating incomes between flexible and master (static) budget
- **Total operating income variance**
    - Difference in operating incomes between actual and master (static) budget

Direct material variance = (Actual DM cost – Planned DM cost) * (Actual quantity sold)
Direct labour variance = (Actual DL cost – Planned DL cost) * (Actual quantity sold)

Material price variance

- MPV = (Actual price – Standard price) * Actual quantity

Material efficiency variance

- MEV = (Actual quantity – Standard quantity) * Standard price

Lecture 5

Opportunity costs

- Represents a benefit that could have been received, but was given up, because an alternative was chosen.

Types of decisions

- **Capacity**
  - Working with constraints in production
- **Avoidable costs**
  - It must be considered some fixed costs are continued to be incurred even if production is outsourced.
- **Other qualitative or quantifiable non-financial factors**
  - Eg. Making a lower price for a one-time order has negative future consequences

Outsourcing vs in-house production

- Involve opportunity costs into the costs. Eg. When outsourcing means an incremental profit of $60,000 per year.
- Other factors to consider when outsourcing:
  - Demotivation among workforce
  - Dependence on suppliers
  - Lower quality control
  - Etc.

Product-mix decisions with capacity constraints

- When choosing between two products and cannot produce both due to capacity constraints is:
  - Maximize the production of the product with the highest contribution margin per unit of the **constraining resource** (NOT the highest contribution margin per *unit* of the product). Eg. If the constraining resource is in direct labour, find the CM for each product based on DL.
  - Once the demand for that product is satisfied, use the rest of the remaining capacity to produce as much of the other product as possible.

Relevant cost difference

- The difference in costs between two options
- Eg. $1,950 more cost to replace machine rather than repair

Minimum selling price (for open questions)

- *Manufacturing cost + opportunity cost*
  - Opportunity cost – eg. You have a capacity of 20,000 and you're producing at 16,000. You get an order of 5000 units and you have to decide to accept it. Opportunity costs in this case would be losing out of 1000 units of regular sales.
- For no capacity constraints – minimum selling price = variable costs

Pricing

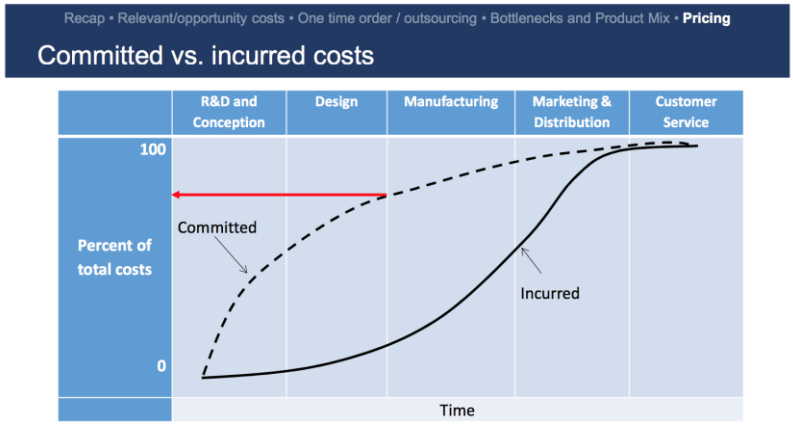
- **Market-based pricing**
  - Price is determined by the market interaction between supply and demand.
  - In this case, there are no differences between competitor's products
  - The cost leader sets the price
  - **However,**
    - This pricing theory doesn't work well:
    - Martin Shkreli increasing prices to a critical drug
    - Patents eliminate competition for a considerable period of time
    - As the number of generic competitors increases, the price per unit decreases

Cost-based pricing

- Requires the firm to have a product with some unique features and shouldn't have any perfect substitute. Hence, no 'market indicator' of what the price should be.
- In this case, firms set prices by:
    - Determining the costs to produce and sell
    - Identifying a desired return (mark-up)
    - Adding the mark-up to cost
    - Adjusting the mark-up in response to market forces
- **Full cost pricing**
    - **Advantages**
        - **Stability and cost recovery**
            - Prices cover all costs in the long run and a normal profit margin
        - **Simplicity**
            - Full cost information is easily available
        - **Fairness**
            - Easily justifiable and tends to be considered equitable by all parties
    - **Drawbacks**
        - Requires allocation of common fixed costs to individual product lines
        - Allocating fixed costs requires an estimate of future sales (inaccurate)
- **Variable cost pricing**
    - Doesn't require allocation of fixed costs to individual product lines
    - **Drawbacks**
        - Managers can perceive variable costs as the 'price floor'
        - Fixed costs may be overlooked in pricing decisions, resulting in prices too low to cover total costs

Target costing

- Opposite of cost-plus pricing
- Determining price based on customer's perceptions, therefore in some way, the customer sets the price
- Once the desired profit is determined, the firm sets the **target cost**
    - **Target cost** – the cost that can be incurred
    - $target\ cost = selling\ price - desired\ profit$ per unit



- As major costs are already **committed** at the design stage due to decisions made there (eg. to use cheap wood vs expensive wood). However, they are only **incurred** in manufacturing

- Target costing forces firms to start thinking about their costs at earlier stages, and not only once manufacturing is complete (dotted line)

Target costing vs traditional standard costing

Characteristic	Target costing	Traditional standard costing
When is it applied?	At the planning and design stage of a products life cycle	At the production stage of the product's life cycle
What is the approach?	Involves a proactive cost planning approach, where pricing is considered prior to production	Involves a reactive cost control approach during production

Lecture 6

Balanced scorecard

- A balanced scorecard is a performance measurement system to assess whether strategy was successfully implemented.
    - These measures are known as **key performance indicators (KPI)**
- **Key performance indicators** need to be '**SMART**'
    - **Specific**
    - **Measureable**
    - **Achievable**
    - **Relevant** – Indicator has a strong link with value creation
    - **Time-bound**
- The balanced scorecard balances:
    - Financial and non-financial KPIs
    - Backward-looking and forward-looking KPIs
    - 'Outcome' measures and 'value' measures

Balanced scorecard KPI perspectives

- **Customer Perspective**
- **Financial Perspective**
- **Business Processes**
    - Internal actions required to meet customer expectations
    - Eg. R&D, operations, selling, marketing, etc.
- **Learning & Growth**
    - Reflects the company's ability to innovate, improve and learn
    - Eg. Culture, information flow, investments in employees, etc.

To each performance indicator, the following is applied:

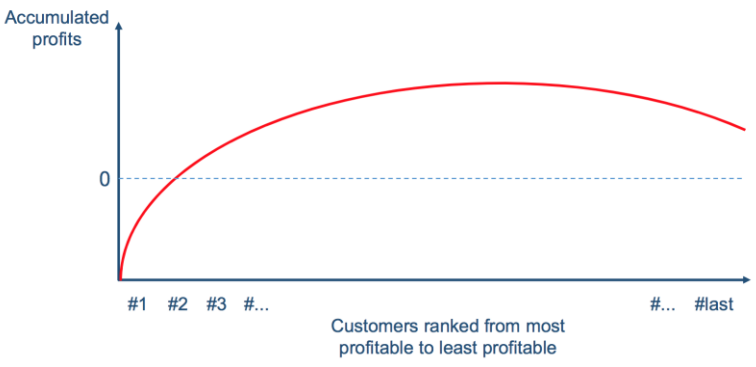
1. **Objectives** – What the strategy is trying to achieve
2. **Measures** – How success/failure is measures
3. **Targets** – Level of performance
4. **Initiatives** – Key action required to achieve this (eg. Optimize cycle time)

Financial vs. non-financial measures

- Non-financial measures are *leading*
    - Used to anticipate future results
- Financial measures are *lagging*
- Quantifying business model is essential to understand value is creation and to track performance

The whale-curve

- 'flattening the whale-curve' – companies determining which customers to terminate
    - Changing customer mix to ensure optimal profitability



Sales variances

- **Sales volume variance** – change in profitability due to changes in volume. Four volume factors:

Market size variance = (Actual size – Planned size) * (planned market share) * (planned CM)

Market share variance = (Act. market share – Planned market share) *(Act. market share) * (planned CM)

Lecture 7

Problem with managers actions strongly reflected in performance measures

- Alignment problems between managers and firm
    - Evaluating managers on ROIC can distort investment decisions (as mangers will always choose the highest ROIC to increase their performance)
    - Measuring managers performance on residual income measures solves this.

Residual income = Profit after tax – WACC * Invested capital

Transfer pricing

- The amount charged when one division of an organization sells goods/service to another division in the same firm
    - Independent centers in a firm (eg. Buying and selling division) motivate managers to maximize their own results
    - **Objective:** to ensure managers make decisions aligned with the firm's interests
- **Why is transfer pricing important**
    - Impacts profits by affecting income taxes
    - Impacts profits by Affecting manager's incentives
    - A third of global trade occurs *within firms*

Market-based transfer pricing

- Use the price of a similar product sold externally.
- TP bust be set below external market price but above the selling division's variable costs

Cost-based transfer price

- **Variable cost TP**
    - Appropriate in the case of excess capacity
- **Full-cost TP**
- **Negotiated TP**
    - The price is settled between the buying and selling division in the firm
    - Price is below market price, but above VC

Transfer pricing influences business unit (BU) decision making

- Lower transfer prices reduce selling BU willingness to sell internally
- Higher transfer prices reduce buying BU willingness to buy internally

Can you force BU managers to buy/sell internally?

- Yes, but reduces manager's autonomy
- BU managers P/L becomes less controllable

Activity vs volume based calculations

- **Volume based**
    - Take the overhead as a total cost
    - Volume based rate = total overhead / total direct labor hours
        - Units in $ per DLH
- **Activity based**
    - Find an activity base rate for individual parts of the overhead
- **Capacity based**
    - Practical capacity based rate = budgeted costs / practical capacity
- Rates are different between activity and capacity based allocation because there is a significant level of unused capacity in many activities. (total level of cost driver not equal to practical capacity).