12. Product costing and pricing

Business models and finance

Strategic decisions for entrepreneurs

Cost control and pricing strategy are essential components of a successful startup or scaleup enterprise. Many new enterprises fail due to an incomplete understanding of their true product and operating costs, or a failure to set an effective price point that balances profit per unit with sales volume. This topic introduces these key concepts.

Royal Academy of Engineering

Understanding costs

Many new enterprises fail due to an incomplete understanding of their product and operating costs. A startup may achieve strong and growing sales but, unless every cost is rigorously controlled, it may not make a profit. The business will be economically unsustainable and will fail.

Costs are variable or fixed, and direct or indirect.

	Direct	**Indirect (overheads)**
	Direct costs are only incurred when a product is made.	Indirect costs are incurred whether or not a product is made.
Variable Variable costs change according to how much is produced.	Costs that are directly linked to producing a product and which vary with output: • materials or parts • labour • machine time	Costs that are not directly linked to producing a product, but which vary with output: • energy • maintenance
Fixed Fixed costs remain the same regardless of production changes.	Costs that are directly linked to producing a product, but which do not vary with output: • supervision • factory building maintenance	Costs that are not linked to producing a product and which also do not vary (in the short term): • office rent • insurance • administration

These cost types also apply to **non-physical goods** like software. For example, variable costs for software may include direct costs for hosting and bandwidth, and indirect costs for customer support.

They also apply to **engineering services** providers, for example, companies providing installation, repair, and maintenance. In these situations, direct costs include variable costs of installers or maintenance workers, and fixed costs include their team supervisors or schedulers.

Check your understanding:

1. Suggest other examples of each type of cost that might be associated with software or service provision. Organise these ideas in a table on the board, to which your whole class can contribute.

2. Consider machining a block of material in your workshop to produce a finished part. Identify what costs are involved and how they fit into the cost table above.

Marginal and absorption costing

Organising costs as direct or indirect, fixed or variable, helps a company calculate the marginal and full (or absorption) cost of a unit of product or service.

- **Marginal costing** helps a company make informed decisions about production and pricing.
- **Full or absorption costing** helps a company understand profits and control costs.

The starting point for both is the **prime cost**.

The prime cost is the variable direct cost of labour and materials needed to make one unit.

Labour	£0.50
Materials	£2.00
	£2.50 prime cost per unit

The **marginal cost** adds **variable indirect costs** like energy or maintenance to the prime cost.

The marginal cost is the full extra cost of making one more unit of a product, or the saving if one fewer is made.

Prime cost	£2.50 (from above)
Energy	£1.00
	£3.50 marginal cost per unit

Marginal costing shows how variable costs will change when planning an increase or decrease in production. It can help to set a selling price by considering how much each unit should contribute towards paying for overheads. This avoids the need to make sure every unit contributes its full share of overheads, which is useful when negotiating a discount.

The **absorption cost** adds a portion of **direct and indirect fixed costs** to the marginal cost, for example, a portion of administration or office costs.

The full or absorption cost is the full cost of one unit including its full share of overheads.

Marginal cost	£3.50 (from below left)
Administration	£0.50
	£4.00 absorption cost per unit

Absorption costing is complex and depends on a detailed calculation of how much of each expense (called an **activity** or **cost pool**; an example is administrative time) is needed to produce one unit of each product. Absorption costing is needed to calculate whether a product is truly profitable. It can also be used to control fixed costs and increase overall profitability.

Check your understanding:

3. Suggest a reason to use marginal costing when pricing a product. How can it help to decide a selling price even if it does not account for indirect fixed costs like administration?
4. Why does the portion of a fixed indirect cost allocated to each product unit change as more product lines are added?

Pricing models for enterprise

To make a profit, your selling price must be more than your costs. Setting the right price for a product or service requires balancing factors that include:

- your costs of production and profit expectations
- customer demand and purchasing power
- competitors' products and pricing
- customers' perception of your product
- regulations or industry standards.

Pricing models (also called pricing strategies) include the following.

Cost-plus pricing adds a fixed markup, for example 20%, to the costs of a product or project. Example: machining a fixed run of parts for a customer	Advantages: • simple and predictable, if costs are accurately calculated Disadvantages: • does not take demand or competition into account and does not encourage efficiency or cost reduction
Value pricing sets the price based on what customers feel a product is worth, compared to its competition. Example: a new industrial robot with significantly improved performance	Advantages: • maximises potential profit margins and can enhance brand value Disadvantages: • depends in part on competitors' products and does not apply where the customer value is lower cost
Feature pricing sets several price points for product options with increasing features. Example: basic, middle, and top-tier versions of engineering software	Advantages: • helps support different customer groups and can encourage upgrading Disadvantages: • basic product needs to be good enough but not too good

Remember that your pricing model (how you set your sales price) is different to your revenue model, which describes how customers will pay for your product or service, for example, through sales, a subscription, or leasing. The resource **7. Business models for enterprise** explores this.

Check your understanding:

5. Why is it vital to understand customer expectations when choosing and applying a pricing strategy?

Case study: Costing decisions

Background

WidgetCo produces high-pressure metal gaskets and seals for specialist engineering applications. The sales team needs to understand how changes in production volumes and future costs may change the direct, marginal, and absorption costs they use when negotiating contracts for their most popular product.

Your task

Use the **Product costing and pricing online interactive tool** to answer the following questions.

1. Assign each production cost as direct, variable, or fixed, to find the direct, marginal, and absorption cost per unit for a production run of 1000 units.

2. The sales team have orders for 500 and 2000 units. How will the total direct, marginal, and absorption cost change compared to your answers for (1), and why?

3. The company adds two more production lines. All lines will have production runs of 1000 units. Predict how this will change each type of cost from your answers to (1), then use the model to test your prediction.

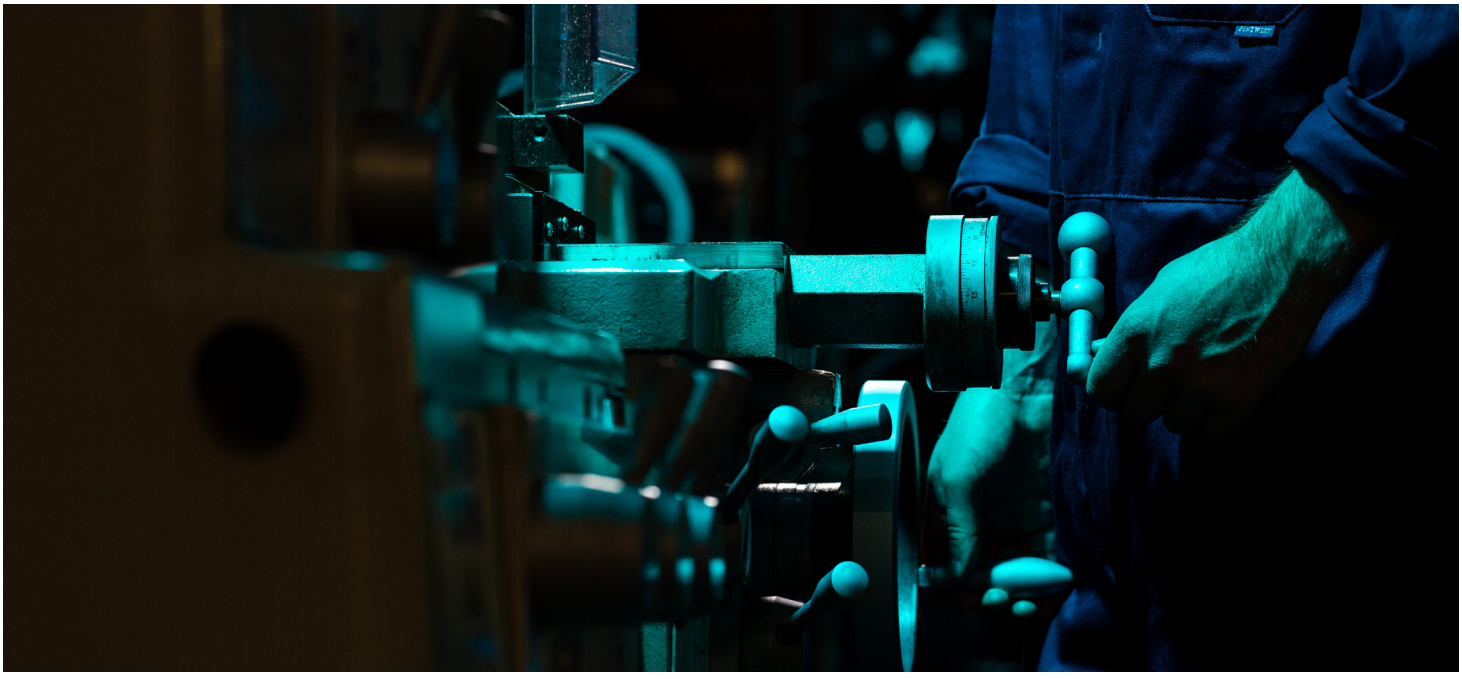
4. Reset the number of product lines to 1. The company anticipates that over the next year:

   - material costs will rise to 1.5 x the original price
   - energy costs will drop to 0.75 x the original cost
   - rent will rise to 1.25 x the current amount.

   Predict how, together, these changes will affect each type of cost from your answers to (1), then use the model to test your prediction.

Extend your learning

- Research the meaning and function of 'breakeven analysis'.



Answers: Check your understanding

These are example answers – your own suggestions may differ.

Understanding costs

1. Other costs for software or service provision like installation might include:

	Direct	Indirect (overheads)
Variable	• travel • connection parts (wire, pipe, conduit, connectors)	• installer training
Fixed	• vehicle leasing	• Fixed overheads will be the same as those for products.

2. Machining a block of material in your workshop might involve:

	Direct	Indirect (overheads)
Variable	• material • operator time	• electricity • tool heads
Fixed	• workshop manager • materials store costs	• college office costs • college insurance

Marginal and absorption costing

3. Marginal costing determines the minimum selling price at which the product's direct costs are covered, which can be helpful if a customer asks for a discount. While the full or absorption cost includes a full 'contribution' towards fixed indirect costs, the marginal cost sets a 'floor' above which selling prices can be set (or negotiated) depending on how much of this full contribution is desired. However, note that when calculating the profit and loss for the business, the full cost must be used.

4. The portion of a fixed indirect cost allocated to each product unit changes as more product lines are added because there are more units across which these costs can be shared (as there would also be if the production run were increased). If these other products are more or less complex or time-consuming to make, the portion of fixed costs assigned to each one may also increase or decrease proportionately or may be the same.

Pricing models for enterprise

5. Customer expectations can affect a pricing strategy through:

   - perception of your brand and products compared to your competitors
   - industry standards for how complex products or projects are priced
   - buying power and optimism about the economy and market
   - needs and desired value, which affect value pricing
   - technical needs, which affect product options and feature pricing
   - how your product will influence their own personal or business outcomes.

Answers: Case study

1. For a production run of 1000 units:
   - direct cost: £2.50
   - marginal cost: £3.20
   - absorption cost: £3.95

2.

	For 500 units	For 2000 units
Direct cost	£3.50	£1.75
Marginal cost	£4.20	£2.45
Absorption cost	£5.70	£2.83

   The direct cost varies because of changes in the material and labour required. The material cost will gain (or lose) economies of scale (a reduction in unit cost when the size of a production run increases) with the size of the order.

   The variable costs that also contribute to the marginal cost stay the same – at these scales of change in production, the amount of each incurred per unit is likely to stay the same, for example, energy cost per unit.

   The proportion of each fixed cost assigned to each unit will reduce as the size of the order increases, or increase with fewer orders, so the proportion of the absorption cost that comes from fixed costs becomes less for a large order and more for a smaller order.

3. Adding production lines changes each type of cost.

   Direct and variable costs only relate to this particular product line, while fixed costs are the only costs that relate to all product lines, so:
   - the direct cost does not change as material and labour costs relate only to this product line
   - the marginal cost also does not change as, again, the variable costs are only incurred as units of this product line are added
   - the absorption cost is reduced as the proportions of fixed costs that need to be included in each unit are shared across all units in all product lines.

   Hence adding product lines changes the meaning of 'total cost' slightly: for any direct or variable costs, 'total' still means in relation to this one product line, while for any fixed costs, 'total' relates to a total cost that will be shared across more than one product line.

4. As material, energy, and rent costs change in the coming year, their individual effects will be:
   - material: all types of cost will increase
   - energy: marginal and absorption costs will reduce slightly
   - rent: absorption costs will increase.

   Overall, the effects of all three changes will be that all three types of costs will increase, with the largest increase in the absorption cost.

Explore the interactive

Reset the number of production lines to 1 and the rent, material and energy cost to 1.0 again. Calculate the total of each cost (production run x cost) for runs of 500, 1000, and 2000 units to see how the total cost changes.

When negotiating a selling price, why might the sales team have freedom to set a price that is somewhere between the marginal and absorption cost? What does this choice say about how much of the fixed costs they are including in each unit price?

Which type of cost would the finance department need to use when calculating the real profitability of a product or the business as a whole?