

Introduction to Finance

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MGM 237
Capital Budgeting and Investment Decisions

Lecture 8



Chapter

8

Capital Budgeting and Investment Decisions

Learning Outcomes

Students will be able to:

- Explain the capital budgeting process, including its five stages.
- Classify project types and decision structures.
- Estimate project cash flows using incremental after-tax logic.
- Apply NPV, IRR, PI, MIRR, and payback decision rules.
- Connect investment decisions to firm value maximization.

What Is Capital Budgeting?

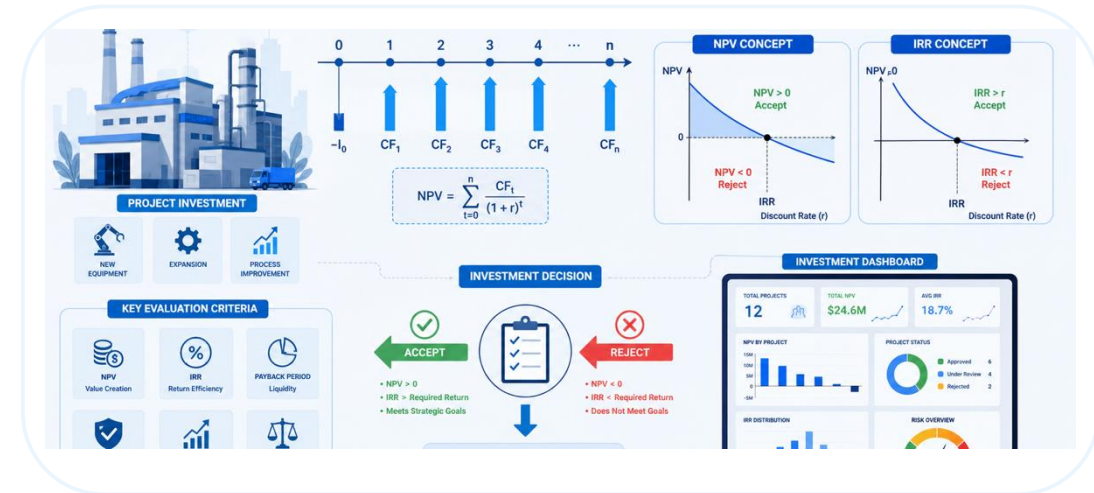
Capital budgeting identifies, evaluates, and implements investment opportunities that increase value.

Core explanation

- 01 Capital budgeting is the process of identifying, evaluating, and implementing investment opportunities.
- 02 It focuses on long-term assets that affect the firm for several years.
- 03 The five stages are identification, development, selection, implementation, and follow-up.
- 04 A good project should increase shareholder wealth.

Manager's Insight

Capital budgeting is where strategy becomes a financial commitment.



Quick Example

Buying a new machine is capital budgeting if it affects cash flows for many years.

Why Capital Budgeting Is Strategic

Large investment decisions shape future competitiveness and shareholder wealth.

Core explanation

- 01 Capital projects often require large up-front cash outlays.
- 02 The benefits and risks usually occur over many years.
- 03 Wrong decisions can lock the firm into costly assets.
- 04 Correct decisions can improve growth, efficiency, and firm value.

Manager's Insight

Strategic projects should be judged by long-term value, not short-term appearance.



Quick Example

Opening a new branch may reduce cash today but increase future cash flows.

Long-Term Investment Decisions

The focus is on decisions that affect the operating capacity of the business.

Core explanation

- 01 Long-term investments include machines, buildings, systems, and product lines.
- 02 These decisions determine the firm's earning power.
- 03 They must be evaluated before funds are committed.
- 04 The analysis compares expected benefits with project cost.

Scale

Large cost

Time

Multi-year effects

Risk

Uncertain cash flows

Goal

Increase value

Manager's Insight

A long-term asset should earn more than the return investors require.

Quick Example

A delivery company buying a fleet of vehicles is making a long-term investment.

Types of Capital Budgeting Projects

Projects can be classified by purpose and decision structure.

Core explanation

01

Common project types include replacement, expansion, and new product projects.

02

Some projects are independent; others are mutually exclusive.

03

Classification helps managers choose the correct decision rule.

04

The cash-flow logic must match the project type.

Manager's Insight

Good classification prevents using the wrong comparison.

Project type	Main question
Replacement	Should we replace an existing asset?
Expansion	Should we increase capacity?
New product	Should we enter a new product area?

Quick Example

Replacing a machine is different from launching a new product, but both require cash-flow analysis.

Replacement Projects

Replacement decisions compare old asset cash flows with new asset cash flows.

Core explanation

01

A replacement project asks whether a new asset should replace an existing asset.

02

The analysis focuses on incremental differences.

03

Include cost savings, efficiency gains, and disposal proceeds from the old asset.

04

Ignore sunk costs already incurred.

Manager's Insight

Replacement is not about whether the old asset was a mistake; it is about the best decision today.

Old asset

Current costs

New asset

New costs

Difference

Incremental cash flows

Decision

Accept or reject



Quick Example

A machine costing \$90,000 may be acceptable if it reduces annual costs enough to create positive NPV.

Expansion Projects

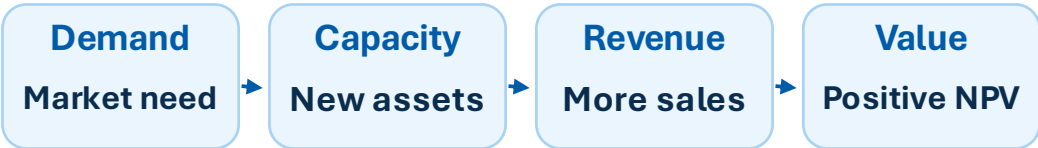
Expansion projects increase production capacity or market reach.

Core explanation

- 01 Expansion projects are used to grow sales or serve more customers.
- 02 They often require new equipment, facilities, employees, or working capital.
- 03 The key issue is whether added cash inflows justify the investment.
- 04 Risk may increase if demand forecasts are uncertain.

Manager's Insight

Expansion should be based on expected cash flows, not only optimism.



Quick Example

A firm adds a second production line to meet growing demand.

New Product Projects

New product projects create opportunities but also involve higher uncertainty.

Core explanation

- 01 New product projects involve entering new markets or launching new offerings.
- 02 They usually require forecasts of sales, costs, and adoption speed.
- 03 They may create strategic benefits such as brand growth.
- 04 They also bring demand, competition, and execution risk.

Potential

New revenue stream

Uncertainty

Demand risk

Investment

Development cost

Decision

Evaluate NPV and risk

Manager's Insight

New products should pass both financial and strategic tests.

Quick Example

A food company launching a new product line must estimate sales, margins, and launch costs.

Independent versus Mutually Exclusive Projects

The decision structure affects which projects can be accepted.

Core explanation

01

Independent projects do not compete with one another.

02

If capital is available, every independent project with positive NPV can be accepted.

03

Mutually exclusive projects compete; choosing one excludes the others.

04

For mutually exclusive projects, choose the alternative that adds the most value.

Type	Decision logic
Independent	Accept all value-creating projects
Mutually exclusive	Choose the best alternative
Capital rationing	Rank projects under a budget limit

Manager's Insight

The same NPV number has different meaning depending on whether projects compete.

Quick Example

Two machines that do the same job are mutually exclusive; a machine and a new store may be independent.

Project Cash Flow Estimation

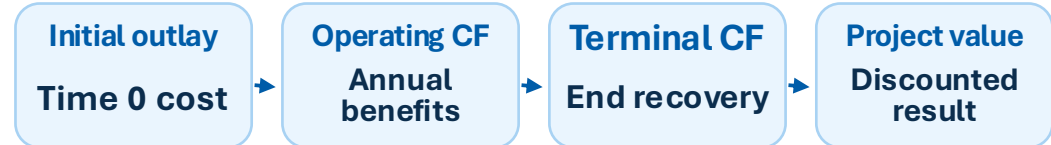
Capital budgeting uses project cash flows, not accounting profit alone.

Core explanation

- 01 Cash-flow estimation identifies the cash consequences of accepting a project.
- 02 The analysis usually includes initial outlay, operating cash flows, and terminal cash flows.
- 03 Only relevant incremental cash flows should be included.
- 04 Timing matters because cash flows are discounted.

Manager's Insight

The quality of capital budgeting depends heavily on cash-flow estimates.



Quick Example

A project can be profitable in accounting terms but still fail if cash flows are weak.

Initial Investment Outlay

The initial outlay is the cash committed at the start of the project.

Core explanation

01

Initial outlay usually includes purchase price, installation, and setup costs.

02

It may also include required working capital investment.

03

If an old asset is sold, after-tax sale proceeds reduce the initial outlay.

04

This cash flow normally occurs at time zero.

Initial outlay logic

$$\text{Initial Outlay} = \text{Asset Cost} + \text{Setup} + \text{NWC} - \text{After-tax Sale Proceeds}$$

NWC = net working capital investment
Use after-tax proceeds when an old asset is sold.

Manager's Insight

Treat the initial outlay as the project's starting cash cost.

Quick Example

Machine cost \$100,000 + installation \$8,000 + working capital \$12,000 = \$120,000 initial outlay.

Operating Cash Flows

Operating cash flows are the recurring annual cash benefits from the project.

Core explanation

01

Operating cash flows come from changes in revenues, operating costs, and taxes.

02

Depreciation is not a cash flow, but it affects taxes.

03

Use after-tax cash flows because taxes are real cash payments.

04

Operating cash flows are usually estimated for each year of the project life.

Operating cash flow formula

$$\text{OCF} = (\text{Revenue} - \text{Cost} - \text{Depreciation})(1 - T) + \text{Depreciation}$$

T = tax rate

Depreciation is added back because it is non-cash.

Manager's Insight

Operating cash flow is the engine of project value.

Quick Example

Sales \$80k, costs \$35k,
depreciation \$20k, tax 30% → OCF
= \$37.5k.

Terminal Cash Flows

Terminal cash flows occur at the end of the project.

Core explanation

- 01 Terminal cash flows often include after-tax salvage value.
- 02 They may include recovery of working capital invested at the beginning.
- 03 There may also be project shutdown costs.
- 04 Terminal cash flow must be discounted back to today.

Manager's Insight

Do not forget the end-of-project cash flows; they can change the decision.

Terminal cash flow logic

$$\text{Terminal CF} = \text{After-tax Salvage} + \text{NWC Recovery} - \text{Shutdown Costs}$$

Salvage may create taxable gain or loss.
Working capital is often recovered at the end.

Quick Example

If after-tax salvage is \$17,500 and NWC recovery is \$12,000, terminal CF = \$29,500.

Incremental Cash Flows

Only cash flows caused by accepting the project are relevant.

Core explanation

- 01 Incremental cash flow means the difference between accepting and rejecting the project.
- 02 Include cash flows that change because of the project.
- 03 Exclude cash flows that will occur anyway.
- 04 Capital budgeting decisions should be based on incremental effects.

Manager's Insight

Incremental logic is the most important cash-flow discipline in capital budgeting.

Relevant Cash Flow Test

Include it if it changes because of the project

Exclude it if it happens anyway

Quick Example

If current rent is paid whether the project is accepted or not, it is not incremental.

Sunk Costs

Sunk costs are past costs and should not affect today's decision.

Core explanation

- 01 A sunk cost has already been paid or committed.
- 02 It cannot be recovered by accepting or rejecting the project.
- 03 Including sunk costs can lead to bad decisions.
- 04 The decision should focus on future incremental cash flows.

Manager's Insight

Managers must avoid defending past mistakes with new investment.

Sunk Cost Rule

Past cost: ignore in
project NPV

Future incremental
cost: include

Quick Example

A \$20,000 feasibility study already paid is sunk and should not be included in NPV.

Opportunity Costs

Opportunity cost is the value of the best alternative use of a resource.

Core explanation

01

Opportunity costs are relevant because they represent benefits given up.

02

They may not appear in the accounting records.

03

Use the current market value of resources used by the project.

04

Ignoring opportunity costs overstates project value.

Opportunity cost idea

Project Cost includes benefits sacrificed by using existing resources

Use current value, not historical cost.
The question is: what cash benefit are we giving up?

Manager's Insight

Opportunity cost makes the analysis economically realistic.

Quick Example

If unused land could be sold for \$200,000, using it for a project has a \$200,000 opportunity cost.

Working Capital Effects

Projects often require extra current assets to support operations.

Core explanation

- 01 Working capital includes items such as inventory and receivables.
- 02 An increase in working capital is a cash outflow at the start.
- 03 Working capital is often recovered when the project ends.
- 04 Both timing and recovery must be included in the analysis.

Manager's Insight

Working capital is easy to forget because it is not a fixed asset.



Quick Example

A project requiring \$15,000 extra inventory has a time-zero cash outflow of \$15,000.

Depreciation Tax Shield

Depreciation reduces taxable income and therefore saves taxes.

Core explanation

01 Depreciation is an accounting expense, not a direct cash outflow.

02 However, depreciation reduces taxable income.

03 Lower taxable income reduces tax paid.

04 This tax saving is called the depreciation tax shield.

Depreciation tax shield

$$\text{Tax Shield} = \text{Depreciation} \times \text{Tax Rate}$$

The tax shield is a real cash benefit.
It is included through after-tax operating cash flow.

Manager's Insight

Depreciation matters because taxes matter.

Quick Example

If depreciation is \$20,000 and tax rate is 30%, tax shield = \$6,000.

After-Tax Cash Flows

Capital budgeting should use cash flows after taxes.

Core explanation

- 01 Taxes are real cash payments, so they affect value.
- 02 Revenues, operating costs, depreciation, and salvage values can affect taxes.
- 03 After-tax analysis prevents overestimating project benefits.
- 04 The required return should be applied to after-tax cash flows.

Manager's Insight

A project is acceptable only if it creates value after tax effects.

After-tax perspective

After-tax CF = Cash benefit after tax payments

Use taxes on operating income and taxable salvage gains.
Focus on cash, not accounting income alone.

Quick Example

A \$100,000 pre-tax benefit at 30% tax leaves \$70,000 after tax.

Payback Period

Payback measures how long it takes to recover the initial investment.

Core explanation

- 01 Payback focuses on cash recovery speed.
- 02 It is easy to understand and useful for liquidity concerns.
- 03 It ignores cash flows after the payback point.
- 04 It also ignores the time value of money.

Manager's Insight

Payback is a risk and liquidity screen, not the best value measure.

Payback rule

$$\text{Payback} = \text{Years before recovery} + \frac{\text{Unrecovered Cost}}{\text{Next Cash Flow}}$$

Shorter payback is generally preferred.
But payback does not directly measure value creation.

Quick Example

If \$20,000 remains unrecovered and next cash flow is \$40,000, add 0.5 year.

Enrichment: Discounted Payback Period

Discounted payback uses present values instead of nominal cash flows.

Core explanation

01

Discounted payback improves payback by recognizing time value of money.

02

Each cash flow is discounted before calculating recovery time.

03

It is more conservative than simple payback.

04

It still ignores cash flows after the discounted payback point.

Cash flow
Estimate



Discount
PV using r



Accumulate
PV recovery



Payback
Time to
recover

Manager's Insight

Discounted payback is better than simple payback, but NPV is still stronger.

Quick Example

A project may pay back in 3 years normally but require 3.6 years on a discounted basis.

Net Present Value

NPV is the present value of project cash inflows minus project cost.

Core explanation

01

NPV discounts future cash flows at the required return.

02

It measures the dollar amount of value added by a project.

03

Positive NPV means the project is expected to create value.

04

NPV is the most direct method for firm value maximization.

Net present value

$$\text{NPV} = \sum \text{CF}_t / (1+r)^t - \text{Initial Investment}$$

CF_t = cash flow in period t

r = required return or project discount rate

Manager's Insight

NPV is the primary capital budgeting decision tool.

Quick Example

If PV of cash inflows is \$118,000 and cost is \$100,000, NPV = \$18,000.

NPV Decision Rule

The NPV rule connects directly to shareholder wealth.

Core explanation

- 01 Accept a project if NPV is positive.
- 02 Reject a project if NPV is negative.
- 03 For mutually exclusive projects, choose the project with the highest positive NPV.
- 04 NPV shows the expected dollar change in firm value.

Manager's Insight

Positive NPV means the project earns more than investors require.

NPV Rule

Accept if $NPV > 0$

Reject if $NPV < 0$

Quick Example

A project with NPV of \$25,000 is expected to add \$25,000 to firm value.

Why NPV Maximizes Firm Value

NPV measures the value created after covering the required return.

Core explanation

01

Firm value is based on expected cash flows discounted for risk.

02

NPV uses exactly the same valuation logic.

03

If NPV is positive, the project adds value beyond its cost.

04

Therefore, NPV supports value maximization.

Project CF
Expected
benefits



Discount rate
Required
return



NPV
Value added



Firm value
Increases if
NPV > 0

Manager's Insight

NPV is not just a calculation; it is the value creation test.

Quick Example

A project with NPV = \$0 earns exactly the required return; positive NPV earns more.

Internal Rate of Return

IRR is the discount rate that makes NPV equal zero.

Core explanation

01

IRR expresses project attractiveness as a percentage return.

02

It is the rate at which present value of inflows equals the initial outlay.

03

Managers often like IRR because it is easy to communicate.

04

However, IRR can be misleading in some project comparisons.

Manager's Insight

IRR is useful, but it should not replace NPV when rankings conflict.

IRR definition

IRR is the rate where $NPV = 0$

At IRR: PV inflows = initial investment.
Compare IRR with the required return.

Quick Example

If IRR is 16% and required return is 10%, the project passes the IRR rule.

IRR Decision Rule

The IRR rule compares project return with required return.

Core explanation

01

Accept a project if IRR is greater than the required return.

02

Reject a project if IRR is less than the required return.

03

For independent conventional projects, IRR and NPV often agree.

04

For mutually exclusive or nonconventional projects, NPV is preferred.

Manager's Insight

IRR tells whether the project clears the minimum return hurdle.

IRR Rule

Accept if $IRR > \text{Required Return}$

Reject if $IRR < \text{Required Return}$

Quick Example

Required return = 12%; IRR = 14%
→ acceptable by the IRR rule.

NPV versus IRR

NPV and IRR answer related but different questions.

Core explanation

01 NPV measures value in dollars.

02 IRR measures return as a percentage.

03 Ranking conflicts can occur with different project sizes or timing.

04 When conflict occurs, the NPV rule is usually the better guide.

Manager's Insight

Percent returns can look attractive even when dollar value added is smaller.

Method	Best interpretation
NPV	How many dollars of value are added?
IRR	What percentage return is earned?
Conflict	Prefer NPV for value maximization

Quick Example

A small project may have high IRR but add less total value than a larger positive-NPV project.

Profitability Index

PI measures value created per dollar invested.

Core explanation

01

Profitability index is the ratio of PV of inflows to initial investment.

02

It is useful when capital is limited.

03

PI greater than 1 means PV benefits exceed cost.

04

PI does not replace NPV when total value matters most.

Profitability index

$$\text{PI} = \text{PV of Future Cash Inflows} / \text{Initial Investment}$$

Accept if $\text{PI} > 1.0$.

Useful for ranking projects under capital rationing.

Manager's Insight

PI is a value-per-dollar measure.

Quick Example

PV inflows = \$120,000; initial investment = \$100,000 → $\text{PI} = 1.20$.

Modified Internal Rate of Return

MIRR improves IRR by using realistic reinvestment assumptions.

Core explanation

- 01 MIRR assumes interim cash inflows are reinvested at a specified reinvestment rate.
- 02 It avoids some problems of multiple IRRs.
- 03 It is useful when cash-flow timing is complex.
- 04 Like IRR, it is a percentage measure rather than a dollar value measure.

Manager's Insight

MIRR is often more realistic than IRR, but NPV remains the value measure.

Cash outflows
PV at finance rate

Cash inflows
FV at reinvestment rate

MIRR
Rate linking PV and FV

Quick Example

If cash inflows are reinvested at 10%, MIRR may be lower than a very high IRR.

Capital Rationing

Capital rationing occurs when funds are limited.

Core explanation

- 01 Capital rationing means the firm cannot accept every good project.
- 02 Managers must allocate limited investment funds carefully.
- 03 Projects may be ranked using NPV, PI, strategic fit, and risk.
- 04 The goal remains maximizing value under a budget constraint.

Manager's Insight

Capital rationing turns capital budgeting into a portfolio selection problem.

Budget

Limited funds

Projects

Many options

Ranking

Value and risk

Choice

Best project mix

Quick Example

A firm with only \$1 million must choose the best combination of projects, not just one project.

Risk in Capital Budgeting

Project risk affects required return and value.

Core explanation

- 01 Project cash flows are forecasts, not guarantees.
- 02 Risk can come from sales volume, prices, costs, technology, or regulation.
- 03 Higher risk usually requires a higher discount rate.
- 04 Risk analysis improves decision quality.

Manager's Insight

Risk is included in capital budgeting through cash-flow scenarios and discount rates.

Uncertainty

Cash flow risk

Required return

Higher hurdle

PV

Lower value

Decision

Risk-adjusted



Quick Example

A project in a volatile market may need a higher required return than a stable replacement project.

Scenario Analysis

Scenario analysis evaluates the project under different complete cases.

Core explanation

01

Scenario analysis builds alternative sets of assumptions.

02

Common scenarios are best case, base case, and worst case.

03

Each scenario estimates project cash flows and NPV.

04

This helps managers see the range of possible outcomes.

Scenario	Interpretation
Best case	High sales, strong margins
Base case	Most likely assumptions
Worst case	Weak sales, cost pressure

Manager's Insight

Scenario analysis asks: what if the whole business environment changes?

Quick Example

NPV may be \$80,000 in the best case, \$20,000 in base case, and -\$30,000 in worst case.

Sensitivity Analysis

Sensitivity analysis changes one key variable at a time.

Core explanation

01

Sensitivity analysis shows which assumption matters most.

02

Change one input while holding other inputs constant.

03

Typical variables include sales price, unit sales, costs, and discount rate.

04

This helps identify where better information is needed.

Variable

Change one input

Output

Observe NPV

Purpose

Find key drivers

Action

Focus research

Manager's Insight

Sensitivity analysis identifies the assumptions that deserve the most attention.

Quick Example

If NPV changes sharply when sales volume changes, demand forecasting is critical.

Break-Even Analysis

Break-even analysis identifies the sales level needed to cover costs.

Core explanation

- 01 Break-even analysis connects volume, fixed costs, variable costs, and price.
- 02 It helps managers understand downside risk.
- 03 Accounting break-even focuses on profit equal to zero.
- 04 Financial break-even focuses on NPV equal to zero.

Manager's Insight

Break-even is useful because it translates risk into required sales volume.

Simple accounting break-even

$$\text{Break-even Units} = \text{Fixed Costs} / (\text{Price} - \text{Variable Cost})$$

Price – Variable Cost = contribution margin per unit.
Financial break-even is the sales level where NPV = 0.

Quick Example

Fixed costs \$100,000 and contribution margin \$25 → break-even = 4,000 units.

Real Options Overview

Real options recognize managerial flexibility after a project begins.

Core explanation

01

Some projects create options to expand, abandon, delay, or switch.

02

Traditional NPV may understate value when flexibility is important.

03

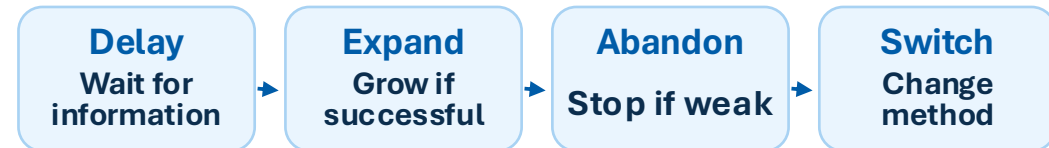
Real options are most useful when uncertainty is high.

04

Managers should identify flexibility before committing resources.

Manager's Insight

Flexibility has value when the future is uncertain.



Quick Example

A pilot project may be valuable because it gives the option to expand later.

Strategic Fit of Investment Projects

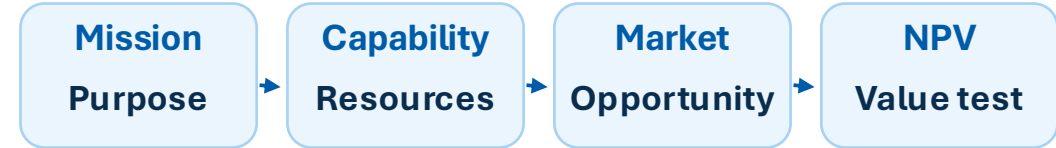
Financial value and strategic logic should support each other.

Core explanation

- 01 A project should fit the firm's mission, capabilities, and competitive position.
- 02 Strategic fit does not replace financial analysis.
- 03 A positive NPV project is stronger when it also supports strategy.
- 04 A project with weak strategic fit may create hidden execution risk.

Manager's Insight

The best projects make both strategic and financial sense.



Quick Example

A high-tech project may fail if the firm lacks the skills to operate it.

Ethical Issues in Project Evaluation

Capital budgeting must be honest, transparent, and disciplined.

Core explanation

01

Managers may be tempted to overstate revenues or understate costs.

02

Biased forecasts can lead to value-destroying projects.

03

Ethical evaluation requires realistic assumptions and clear disclosure.

04

Post-audits help hold managers accountable.

Ethical Forecasting Rule

Use realistic,
documented
assumptions

Avoid manipulating
numbers to get
approval

Manager's Insight

Ethical capital budgeting protects both the firm and its investors.

Quick Example

Do not hide environmental cleanup costs just to make the project NPV positive.

Environmental and Sustainability Considerations

Sustainability effects can change project cash flows and risk.

Core explanation

01

Environmental costs may include compliance, cleanup, or energy use.

02

Sustainable projects may reduce future costs or regulatory risk.

03

Some projects improve reputation and stakeholder support.

04

These effects should be translated into cash flows when possible.

Costs

Compliance and cleanup

Savings

Energy efficiency

Risk

Regulation exposure

Value

Long-term resilience



Manager's Insight

Sustainability belongs in capital budgeting when it affects cash flows, risk, or strategic value.

Quick Example

An energy-efficient machine may cost more now but reduce operating costs for years.

Worked Example: Project Cash Flows

Build the project cash flows before applying decision methods.

Core explanation

01

Assume equipment cost = \$100,000 and working capital = \$15,000.

02

Annual revenues = \$80,000; cash costs = \$35,000; depreciation = \$20,000.

03

Tax rate = 30%; salvage after tax = \$17,500.

04

Operating cash flow = $(\$80,000 - \$35,000 - \$20,000)(1 - 0.30) + \$20,000 = \$37,500$.

Cash-flow build

Time 0 = -\$115,000; Years 1–5 OCF = \$37,500; Terminal add = \$32,500

Terminal add = after-tax salvage \$17,500 + NWC recovery \$15,000.

Use these cash flows for NPV and IRR.

Manager's Insight

Good project analysis starts with a clean cash-flow timeline.

Quick Example

The final year cash flow equals OCF plus terminal cash flow.

Worked Example: Payback

Payback shows when cumulative cash flows recover the initial outlay.

Core explanation

01

Initial outlay = \$100,000.

02

Cash inflows: Year 1 = \$30,000; Year 2 = \$35,000;
Year 3 = \$40,000; Year 4 = \$35,000.

03

By end of Year 2, recovered cash = \$65,000.

04

Remaining amount = \$35,000; Year 3 cash flow =
\$40,000.

Payback calculation

$$\text{Payback} = 2 + 35,000 / 40,000 = 2.875 \text{ years}$$

Interpretation: the project recovers its initial cost during Year 3.

Payback does not measure total value created.

Manager's Insight

Use payback as a liquidity screen, then
rely on NPV for value.

Quick Example

If management requires payback
under 3 years, this project meets
the requirement.

Worked Example: NPV

NPV discounts each cash flow at the required return.

Core explanation

01

Initial outlay = \$100,000.

02

Cash inflows: \$30,000, \$35,000, \$40,000, and \$35,000.

03

Required return = 10%.

04

PV of inflows = \$110,156; NPV = \$10,156.

NPV calculation

$$\text{NPV} = -100,000 + 30,000/1.10 + 35,000/1.10^2 + 40,000/1.10^3 + 35,000/1.10^4$$

NPV = +\$10,156.

Decision: accept if the project is independent.

Manager's Insight

NPV translates the project into expected value added today.

Quick Example

Positive NPV means the project earns more than the required return.

Worked Example: IRR

IRR is the rate that makes the NPV equal zero.

Core explanation

01

Use the same cash flows: $-\$100,000$, $+\$30,000$, $+\$35,000$, $+\$40,000$, $+\$35,000$.

02

Solving for IRR gives approximately 14.46% (about 14.5%).

03

Compare IRR with the required return of 10%.

04

Because 14.46% is greater than 10%, the IRR rule says accept.

IRR interpretation

IRR = 14.46% > Required Return = 10%

Decision: accept by IRR rule.
If NPV and IRR conflict, prioritize NPV for value maximization.

Manager's Insight

IRR is easy to communicate but must be interpreted carefully.

Quick Example

A project with IRR above the hurdle rate passes the percentage-return test.

Case Discussion: Accept or Reject Project

Use all tools to make a complete investment recommendation.

Core explanation

- 01 A firm considers a project with initial outlay of \$250,000.
- 02 Expected annual cash flow is \$80,000 for 4 years.
- 03 Required return is 12%; payback target is 3.5 years.
- 04 Students should calculate NPV, IRR, payback, and explain strategic fit.

Manager's Insight

A strong recommendation includes both numbers and interpretation.

Question	What to decide
NPV	Does it create value?
IRR	Does it beat the hurdle rate?
Payback	Is recovery fast enough?
Strategy	Does it fit the firm?

Quick Example

Do not simply say “accept”; explain why the project increases value and what risks remain.

Common Mistakes in Capital Budgeting

Many errors come from cash-flow relevance and timing.

Core explanation

- 01 Including sunk costs in project cash flows.
- 02 Forgetting opportunity costs and working capital effects.
- 03 Using accounting profit instead of cash flows.
- 04 Ranking mutually exclusive projects by IRR when NPV gives a different answer.

Manager's Insight

Most mistakes are avoidable with disciplined cash-flow logic.

Exam Technique

Draw cash-flow
timeline before
calculations

Do not mix accounting
profit with cash flow

Quick Example

Before using NPV, label time 0, operating years, terminal cash flow, and discount rate.

Lecture Summary and Comprehensive Numerical Exercise

Capital budgeting converts long-term investment ideas into firm value decisions.

Key message

Accept projects that are expected to generate cash flows whose present value exceeds the required investment and risk.

Decision toolkit

NPV	IRR	Payback	PI
Dollar value added	Percentage return	Cash recovery speed	PV benefit per dollar

Comprehensive exercise

A project costs \$120,000 today. It generates \$38,000 per year for 4 years and has terminal cash flow of \$20,000 in year 4. Required return is 11%.

- 1 Build the cash-flow timeline
- 2 Calculate NPV
- 3 Estimate payback
- 4 Recommend accept or reject

Manager's Insight: Capital budgeting is the final link between finance theory and real strategic action.

Assessment Practice 1

Solved questions: concepts, calculations, and applications.

QUESTION 01/10

What is capital budgeting mainly concerned with?

A Daily cash collection

B Long-term investment decisions

C Preparing bank reconciliations

D Setting product colors

ANSWER

B Long-term investment decisions

EXPLANATION

Capital budgeting evaluates long-term projects that affect cash flows and firm value.

EXAM TECHNIQUE: Identify whether the decision affects many future periods.

Assessment Practice 2

Solved questions: concepts, calculations, and applications.

QUESTION 02/10

A project costs \$100,000 and requires \$20,000 in working capital. What is the initial outlay?

A \$80,000

B \$100,000

C \$120,000

D \$20,000

ANSWER

C \$120,000

EXPLANATION

Initial outlay includes the project cost plus required working capital: $100,000 + 20,000 = 120,000$.

EXAM TECHNIQUE: Initial outlay includes all cash needed at time zero.

Assessment Practice 3

Solved questions: concepts, calculations, and applications.

QUESTION 03/10

Which cost should normally be excluded from capital budgeting analysis?

A Incremental cost

B Opportunity cost

C Sunk cost

D Working capital investment

ANSWER

C Sunk cost

EXPLANATION

Sunk costs have already occurred and should not affect the accept-or-reject decision.

EXAM TECHNIQUE: Include future incremental cash flows; exclude past costs.

Assessment Practice 4

Solved questions: concepts, calculations, and applications.

QUESTION 04/10

A project requires \$90,000 and generates \$30,000 per year. What is the payback period?

A 2 years

B 3 years

C 4 years

D 5 years

ANSWER

B 3 years

EXPLANATION

Payback period = Initial investment ÷ annual cash flow = $90,000 \div 30,000 = 3$ years.

EXAM TECHNIQUE: Payback measures how quickly cash is recovered.

Assessment Practice 5

Solved questions: concepts, calculations, and applications.

QUESTION 05/10

If PV of cash inflows is \$120,000 and initial outlay is \$100,000, what is NPV?

A -\$20,000

B \$0

C \$20,000

D \$220,000

ANSWER

C \$20,000

EXPLANATION

$$\text{NPV} = \text{PV inflows} - \text{initial outlay} = 120,000 - 100,000 = 20,000.$$

EXAM TECHNIQUE: Positive NPV adds value and is normally acceptable.

Assessment Practice 6

Solved questions: concepts, calculations, and applications.

QUESTION 06/10

What does the internal rate of return (IRR) represent?

- A** The rate that makes NPV equal zero
- B The accounting profit margin
- C The tax rate on the project
- D The payback period in years

ANSWER

EXPLANATION

A The rate that makes NPV equal zero

IRR is the discount rate at which the project's NPV equals zero.

EXAM TECHNIQUE: IRR is a percentage return, not a dollar value.

Assessment Practice 7

Solved questions: concepts, calculations, and applications.

QUESTION 07/10

A project has PV inflows of \$125,000 and initial outlay of \$100,000. What is the profitability index?

A 0.80

B 1.00

C 1.25

D 2.25

ANSWER

C 1.25

EXPLANATION

Profitability Index = $\text{PV inflows} \div \text{initial outlay} = 125,000 \div 100,000 = 1.25$.

EXAM TECHNIQUE: PI above 1.00 indicates value creation.

Assessment Practice 8

Solved questions: concepts, calculations, and applications.

QUESTION 08/10

Annual depreciation is \$20,000 and the tax rate is 30%. What is the depreciation tax shield?

A \$6,000

B \$14,000

C \$20,000

D \$30,000

ANSWER

A \$6,000

EXPLANATION

Depreciation tax shield = Depreciation $\times$ tax rate = $20,000 \times 30\%$
= 6,000.

EXAM TECHNIQUE: Depreciation saves tax even though it is not a cash outflow.

Assessment Practice 9

Solved questions: concepts, calculations, and applications.

QUESTION 09/10

For mutually exclusive projects, which project should normally be selected?

- A The shortest project only
- B The project with the highest positive NPV**
- C The project with the lowest initial cost only
- D The project with negative NPV

ANSWER

B

The project with the highest positive NPV

EXPLANATION

When projects compete with each other, choose the alternative that creates the greatest value.

EXAM TECHNIQUE: NPV is the strongest value-based decision rule.

Assessment Practice 10

Solved questions: concepts, calculations, and applications.

QUESTION 10/10

What does capital rationing mean?

A The firm has unlimited funds

B The firm faces limited funds for investment projects

C The firm ignores project risk

D The firm must accept all projects

ANSWER

B

The firm faces limited funds for investment projects

EXPLANATION

Capital rationing exists when a firm cannot fund every acceptable project and must prioritize.

EXAM TECHNIQUE: Limited capital requires ranking projects by value contribution.