1. Accounting for decision making

1.7 Capital Investment Decisions
Introduction

- Capital budgeting methods deal with how to select projects that increase rather than decrease the capital value of a business.
- These methods assist managers in analysing projects that span multiple years.
Learning Objectives

1. Understand the time value of money concept and opportunity costs
2. Apply the net present value (NPV) method and the internal rate-of-return (IRR) method
3. Identify relevant cash flows used in discounting
4. Apply the payback method
**Learning Objective 1**

Understand the time value of money concept and opportunity costs

Identify the six stages of capital budgeting for a project
Cost Analysis

- The life of the project is usually longer than one year, so capital budgeting decisions consider revenues and costs over relatively long periods.

- They do this by considering the *time value of money*. This takes into consideration the fact that £1 today may be worth £1.03 next year, given inflation.
Capital Budgeting

- Capital budgeting is the making of long-run planning decisions for investments in projects and programmes.

- It is a decision-making and control tool that focuses primarily on projects or programmes that span multiple years.
Capital Budgeting (Continued)

- Capital budgeting is a six-stage process:
  1. Identification stage. To distinguish which types of capital expenditure projects are necessary to accomplish organisation objectives.
  2. Search stage. To explore alternative capital investments that will achieve organisation objectives.
Capital Budgeting (Continued)

3 **Information-acquisition stage.** To consider the expected costs and the expected benefits of alternative capital investments.

4 **Selection stage.** To choose projects for implementation.

5 **Financing stage.** To obtain project funding.

6 **Implementation and control stage.** To get projects underway and monitor their performance.
Healthy Living is a non-profit organisation.

One of its goals is to improve the diagnostic capabilities of its Geneva facility.

Management identifies a need to consider the purchase of new, state-of-the-art equipment.

The search stage yields several alternative models, but management focuses on one machine as being particularly suitable.
The administration next begins to acquire information to do more detailed evaluation.

The required net initial investment consists of the cost of the new machine (£245,000) plus an additional cash investment in working capital (supplies and spare parts) of £5,000.

Management expects the new machine to have a three-year useful life and a £0 terminal value at the end of the three years.
This proposed investment will yield net cash savings of £125,000, £130,000 and £110,000 over its life.

The working capital investment of £5,000 is expected to be recovered at the end of year 3.

Operating cash flows are assumed to occur at the end of the year.
Management also identifies the following non-financial quantitative and qualitative benefits of investing in the new diagnostic machine.

- Improved diagnoses and patient care
- Reduced inconvenience of transporting patients to other facilities for diagnoses
Non-financial benefits are not incorporated into the analysis.

In the *selection stage*, management must decide whether Healthy Living should purchase the new machine.

Assume that the required rate of return for Healthy Living is 10%.
Learning Objective 2

Apply the net present value (NPV) method and the internal rate-of-return (IRR) method
Discounted Cash Flow

- Discounted cash-flow (DCF) methods measure all expected future cash inflows and outflows of a project, as if they occurred at a single point in time.

- The discounted cash-flow methods incorporate the time value of money.
Discounted Cash Flow (Continued)

- The time value of money means that a £ received today is worth more than a £ received at any future time.

- Why?

- Because it can earn income and become greater in the future.
Discounted Cash Flow (Continued)

- There are two main DCF methods:
  1. Net present value (NPV) method
  2. Internal rate-of-return (IRR) method.
Net Present Value

- The NPV method computes the expected net monetary gain or loss from a project by discounting all expected cash flows to the present point in time, using the required rate of return.

- Management’s minimum desired rate of return is also called the discount rate, hurdle rate, required rate of return or cost of capital.
Only projects with a zero or positive net present value are acceptable.

What is the net present value of the diagnostic machine?
Net Present Value (Continued)

Sketch of Relevant Cash Flows

Net initial investment (£250,000)

Annual cash inflow

<table>
<thead>
<tr>
<th>Year</th>
<th>£125,000</th>
<th>£130,000</th>
<th>£115,000</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
### Net Present Value (Continued)

<table>
<thead>
<tr>
<th>Year</th>
<th>10% Col.</th>
<th>Net Cash Inflows</th>
<th>NPV of Net Cash Inflows</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.909</td>
<td>£125,000</td>
<td>£113,625</td>
</tr>
<tr>
<td>2</td>
<td>0.826</td>
<td>130,000</td>
<td>107,380</td>
</tr>
<tr>
<td>3</td>
<td>0.751</td>
<td>115,000</td>
<td>86,365</td>
</tr>
</tbody>
</table>

**Total PV of net cash inflows**

**£307,370**

**Investment**

**£250,000**

**Net present value of project**

**£57,370**
This project is acceptable because its net present value is £57,370.

Assume that Healthy Living is considering another investment that will generate £80,000 per year for three years, and have a residual value of £4,000 at the end of the third year.
The cost of this investment is £250,000, including working capital.

The working capital investment of £5,000 is expected to be recovered at the end of year 3.

Healthy Living expects a return of 10%.

Should the investment be made?
Net Present Value (Continued)

No, the net present value is negative.

<table>
<thead>
<tr>
<th>Years</th>
<th>10% Col.</th>
<th>Net Cash</th>
<th>NPV of Net Cash Inflows</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–3</td>
<td>2.487</td>
<td>£80,000</td>
<td>£198,960</td>
</tr>
<tr>
<td>3</td>
<td>0.751</td>
<td>9,000</td>
<td>6,759</td>
</tr>
<tr>
<td>Total PV of net cash inflows</td>
<td></td>
<td></td>
<td>£205,719</td>
</tr>
<tr>
<td>Investment</td>
<td></td>
<td></td>
<td>250,000</td>
</tr>
<tr>
<td>Net present value of project</td>
<td></td>
<td></td>
<td>(£44,281)</td>
</tr>
</tbody>
</table>
Internal Rate of Return

- IRR is another model using discounted cash flows.

The internal rate-of-return (IRR) method calculates the discount rate at which the present value of expected cash inflows from a project equals the present value of expected cash outflows.
Internal Rate of Return (Continued)

n Investment = expected annual net cash inflow × PV annuity factor

n Investment ÷ expected annual net cash inflow = PV annuity factor
Assume that Healthy Living is considering investing £303,280 in a scanning machine that will yield net cash savings of £80,000 per year over its five-year life.

What is the IRR of this project?

\[
\text{IRR} = \frac{\text{Initial Investment}}{\text{Net Annual Cash Savings}} = \frac{\£303,280}{\£80,000} = 3.791
\]

(PV annuity factor)
Internal Rate of Return (Continued)

- The annuity table shows that 3.791 is in the 10% column for a five-period row in this example.

- Therefore, 10% is the internal rate of return of this project.

- If the **minimum desired rate of return** is 10% or less, Healthy Living should undertake this project.
Comparison of NPV and IRR

- The NPV method has the important advantage that the end result of the computations is expressed in money and not in percentage.
- Individual projects can be added to see the effect of accepting a combination of projects.
- It can be used in situations where the required rate of return varies over the life of the project.
The IRR of individual projects cannot be added or averaged to derive the IRR of a combination of projects.
Learning Objective 3

Identify relevant cash flows used in discounting
Relevant Cash Flows

- Relevant cash flows are expected future cash flows that differ among the alternatives.
- Capital investment projects typically have three major categories of cash flows:
  1. Net initial investment
  2. Cash flow from operations
  3. Cash flow from terminal disposal of assets and recovery of working capital.
Typically, net initial investment components are:

1. Initial asset investment
2. Initial working capital investment
Net Initial Investment

The original Healthy Living example included the following:

Initial machine investment £245,000
Initial working capital investment £5,000
Current disposal value of old machine 0
Cash Flow From Operations

- Cash inflows may result from producing and selling additional goods or services, or, as in the Healthy Living example, from savings in cash operating costs.
- Depreciation is irrelevant in DCF analysis because it is a non-cash allocation of costs.
- DCF is based on inflows and outflows of cash.
Terminal Disposal Price

- At the end of the machine’s useful life the terminal disposal price may be zero or an amount considerably less than the initial machine investment.

- The original Healthy Living example assumed zero disposal value of the new diagnostic machine.
The initial investment in working capital is usually fully recouped when the project is terminated.

The relevant working capital cash inflow is the £5,000 that Healthy Living will recover in Year 3.
Learning Objective 4

Apply the payback method
Payback Method

Payback measures the time it will take to recoup, in the form of expected future cash flows, the initial investment in a project.
Assume that Healthy Living is considering buying some equipment (Machine 1) for £210,000, with an estimated useful life of 11 years, and zero predicted residual value.

Managers expect use of the equipment to generate £35,000 of net cash inflows from operations per year.
n How long would it take to recover the investment?

\[
\text{\textsterling 210,000} \div \text{\textsterling 35,000} = 6 \text{ years}
\]

n 6 years is the payback period.
Payback Method (Continued)

- Suppose that an alternative to the £210,000 piece of equipment is another one (Machine 2) that also costs £210,000 but will save £42,000 per year during its *five-year life*.

- What is the payback period?
- £210,000 ÷ £42,000 = 5 years

- Which piece of equipment is preferable?
Machine 1 is preferable because it will continue to generate net cash inflows for four years after its payback period. This will give the company an additional net cash inflow of £140,000.
Payback Method (Continued)

- When cash flows are uneven, calculations must take a cumulative form.
- Assume that Healthy Living’s diagnostic machine investment is going to yield net cash savings of £160,000, £180,000 and £110,000 over its life.
- The initial investment is £250,000.
- What is the payback period?
Payback Method (Continued)

- Year 1 brings in £160,000.
- Recovery of the amount invested occurs in Year 2.
Payback Method (Continued)

\[ \text{Payback} = 1 \text{ year} \]

\[ + \text{\£90,000 needed to complete recovery} \]

\[ + \text{\£180,000 net cash inflow in Year 2} \]

\[ = 1 \text{ year} + 0.5 \text{ year} = 1.5 \text{ years or,} \]

\[ = 1 \text{ year and 6 months} \]
End of Chapter 1.7