**CASE STUDY**

You work for a company which is evaluating a new product introduction.

The requires investment in new machinery. The following 5-year budgeted forecast relates to the new investment proposal

Initial cash investment: (£000)

New machinery 2,000

Incremental working capital 200

Marketing costs. 150

Health & safety training 30

Tooling costs 20

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Year | 1 | 2 | 3 | 4 | 5 |
| Budgeted sales revenues in £000s | 1500 | 1800 | 2000 | 1200 | 600 |

Cost of sales: 25% of sales revenues

Incremental operating costs: £220,000 per annum

Depreciation of new machinery: 20% on straight line with no scrap value.

Cost of capital is set at 20%. Payback required is 2.5 years

**Required:**

a) Prepare a cashflow analysis statement for the above.

b) Calculate the payback period, NPV and IRR for the new investment.

c) Advice your company on the viability of the new product investment using the

calculations in (b)

a) **Cashflow analysis statement (£000s)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Year | 0 | 1 | 2 | 3 | 4 | 5 |
| Cashflows |  |  |  |  |  |  |
| Initial investment (Note 1) | (2400) |  |  |  |  |  |
| Sales revenues (Note 2) |  | 1500 | 1800 | 2000 | 1200 | 600 |
| Cost of sales. (Note 3) |  | (375) | (450) | (500) | (300) | (150) |
| Incremental operating costs (Note 4) |  | (220) | (220) | (220) | (220) | (220) |
| Recovery of working capital (Note 5) |  |  |  |  |  | 200 |
| Net cashflow (Note 6) | (2400) | 905 | 1130 | 1280 | 680 | 430 |

Notes for the cashflow analysis statement

1. Total initial cash investment (outflow) required in year 0 (£000s): 2000 + 200 + 150 + 30

+ 20 = (2400).

2. Budgeted sales revenues (inflow)

3. Cost of sales is 25% of sales revenues (outflows)

4. Incremental operating costs per annum (outflows)

5. Recovery of working capital at the end of the investment period, year 5 (inflow)

6. Net cashflow = (Inflows – Outflows) for each year.

**b) Payback period**

Cumulative net cashflows for year 2 = £2,035,000

Cumulative net cashflows for year 3 = £3,315,000

From the above cumulative cashflows for years 2 and 3 it is observed that the initial investment of £2,400,000 is recovered somewhere between year 2 and year 3.

So, payback period is more than 2 years and less than 3 years.

Hence the payback period = 2 + [2400 – 2035] / 1280

= 2 + 365 / 1280

= **2.285 years**.

**Net Present Value @ 20%**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Net cashflows (£000s) | Discount factors @ 20% | Present values £000s |
| Year 0 | (2400) | 1 | (2400) |
| 1 | 905 | 0.833 | 753.86 |
| 2 | 1130 | 0.694 | 784.22 |
| 3 | 1280 | 0.579 | 741.12 |
| 4 | 680 | 0.482 | 327.76 |
| 5 | 430 | 0.402 | 172.86 |

NPV @ 20% (£000s) = (2400) + 753.86 + 784.22 + 741.12 + 327.76 + 172.86 = 379.82

**NPV @ 20% = £379,820**

**Internal Rate of Return (IRR)**

IRR is the discount rate or cost of capital at which the NPV is zero. As the cost of capital increases, the positive NPV at 20% decreases and tends towards zero and then becomes negative. The IRR can be calculated by interpolating between 2 NPVs, a positive NPV and a negative NPV.

Discount factors required at various cost of capitals:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Year | 1 | 2 | 3 | 4 | 5 |
| Discount factors at 25% | 0.8 | 0.64 | 0.512 | 0.41 | 0.328 |
| Discount factors at 30% | 0.769 | 0.592 | 0.455 | 0.35 | 0.27 |
| Discount factors at 35% | 0.741 | 0.549 | 0.406 | 0.301 | 0.223 |

NPV @ 20% = £379,820 [from (b)]

NPV @ 25 %

= (2400) x 1 + 905 x 0.8 + 1130 x 0.64 + 1280 x 0.512 + 680 x 0.41 + 430 x 0.328

= (2400) + 724 + 723.2 + 655.36 + 278.86 + 141.04 = 122.46

The above NPV @ 25% is still positive.

So, increase the cost of capital by 5% to calculate the NPV @ 30%

NPV @ 30%

= (2400) x 1 + 905 x 0.769 + 1130 x 0.592 + 1280 x 0.455 + 680 x 0.35 + 430 x 0.27

= (98.59)

The negative NPV calculations at 30% show that the IRR must lie between 25% and 30% [and in this case the IRR will be closer to 30%).

IRR = 25% + [122.46 / (122.46 + 98.59)] x (30 – 25) %

= 25% + [122.46 / 221] x 5%

= 25% + 2.77%

**IRR =** **27.77%**

**c) Summary of the results from the calculations in (b) for the new investment.**

Payback period is 2.285 years

NPV @ 20% = £379,820

IRR is estimated at 27.77%

All investment decisions should *primarily* (or mainly) rely on any discounted cashflow (DCF) method, i.e. either NPV or IRR. The reason for this is that these methods consider time value of money by discounting the cashflows, thus accounting for risks and the return required by the providers of capital for the new investment. In this case the return required (or cost of capital) is 20%.

Since the NPV @ 20% is positive (i.e. £379,820), the investment is viable and so can proceed subject to any other factors that need to be considered by the management. By allowing the investment to proceed the value of the company will increase by the amount of the positive NPV. This will simultaneously increase shareholders’ wealth by the same amount of the positive NPV.

Also, the investment’s IRR of 27.77% is greater than the company’s cost of capital. This also signals that the investment is viable.

In addition, the payback period of 2.285 years is less than the maximum of 2.5 years set by the management and so also qualifies for investment on this criterion. However, the payback method should only be used as a *secondary method* (i.e. after considering DCF methods) The reasons for *not using payback as the main method* in investment decisions is due its serious weaknesses: ignores both time value of money and the cashflows beyond the payback period.

**Note to students: See below an *alternative* format for (a)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Year | 0 | 1 | 2 | 3 | 4 | 5 |
| Cash flows | £000 | £000 | £000 | £000 | £000 | £000 |
| Initial investment costs [Note 1] | [2400] |  |  |  |  |  |
| Gross profit [Note 2] |  | 1125 | 1350 | 1500 | 900 | 450 |
| Incremental operating costs [Note 3] |  | [220] | [220] | [220] | [220] | [220] |
| Recovery of working capital |  |  |  |  |  | 200 |
| Net cash flows | [2400] | 905 | 1130 | 1280 | 680 | 430 |

**Notes**

1. Total initial cash investment (outflow) required in year 0 (£000s): 2000 + 200 + 150 + 30

+ 20 = (2400).

2. Gross profit (inflows): Budgeted sales revenues less cost of sales: 100% - 25% = 75% of

the sales revenues

3. Incremental operating costs per annum (outflows)

4. Recovery of working capital at the end of the investment period, year 5 (inflow)

5. Net cashflow = (Inflows – Outflows) for each year.

|  |
| --- |
|  |