

## REPORT AND RECOMMENDATIONS FOR MORTONS ENGINEERING LTD

**TO: MANAGING DIRECTOR OF MORTONS ENGINEERING LTD**

**FROM: AMY JACKSON PRODUCTION ASSISTANT**

### INTRODUCTION

Mortons Engineering Ltd manufacture and supply parts for the railway industry. This report is designed to look into modernising and restructuring the production line. This will involve the purchase of a new computerised system, which will enable the company to expand its current level of output. Using the current level of output and production to forecast cash flows, the three systems will be evaluated using investment appraisal and recommendations made as to which one will be best suited to Mortons engineering Ltd.

### METHODOLOGY

Investment appraisal (also known as project appraisal) is used to make financial decisions on whether or not to invest in a project. It is a methodology for calculating the expected return based on cash flow forecasts of many, often inter-related, project variables. Risk emanates from the uncertainty encompassing these projected variables. The evaluation of project risk therefore depends, on the one hand, on our ability to identify and understand the nature of uncertainty surrounding the key project variables and on the other, on having the tools and methodology to process its risk implications on the return of the project. A capital investment decision is like any other decision with certain distinctive characteristics: it involves high levels of expenditure, it will be made for a long time scale, these decisions are not easily reversible and are taken relatively infrequently, consequently the decisions to invest become a critical part of the business plan. The types of investment decisions against which investment appraisal can be applied include:

- Expansion of buildings, plant, equipment and stock
- New product lines, business diversification and new enterprises
- Cost savings, such as technology versus labour
- Whether or when to replace a piece of capital equipment
- Choosing between alternative investments
- Determining optimum financing options, such as lease versus purchase.

Business decisions have to take into consideration a multitude of quantitative and qualitative factors. Financial appraisal should form only a part of the decision as to whether or not to invest in a capital project; there will be other factors that need to be considered before making the final decision. These include the ranking of risk and reward, the intangible benefits of undertaking a particular project, how each project fits in with the strategic aims of the business, the liquidity of the project and the return to shareholders. There are also legal, ethical, political and personnel issues and quality implications which need to be considered.

*“Financial analysis used in conjunction with an existing information base can give a real understanding of the strengths, weaknesses, opportunities and threats facing a company”. (McKenzie, 1994, p235)*

However, the financial appraisal does provide a quantitative analysis, which gives a firm basis from which a considered decision can be made. It is important to determine whether the project being analysed is one which is intended to benefit the business by cost reduction or by income generation (saving money or making it). The output of any of the following four techniques used for assessing capital projects tells us whether a project is viable - in financial terms only. (Limes Consultancy, 2000 – 2003) (Savvides, 1994) (Business support micro modules)

## 1. PAYBACK PERIOD

The payback period is one of the most tried and trusted of all methods (a report by Arnold & Hatzopoulos in 1999 based on research into a sample of companies from the Times 1000 showed 70% of respondents still used the payback method) and as its name suggests it measures the length of time it takes a project to repay its initial capital cost. Management tends to favour those projects which payback more quickly because the longer a project takes to repay the greater the uncertainty and therefore the higher the risk. Risk arises in capital budgeting as most decision-based data is estimated, especially the data derived for the later years of a project – the further away from today the value of cash flow is, the less reliable it is (and therefore more risky it would be to believe and act on it). Most people are risk adverse and therefore prefer to minimise or offset risk altogether. Payback tells management how quickly its cash inflows cover its cash outflows, the quicker the better as this minimises the risk of the project.

The payback method can be used as a guide to investment decision-making in two ways. When faced with a straight accept-or-reject decision it can provide a rule where projects are only accepted if they payback the initial investment outlay within a certain predetermined time. In addition, the payback method can provide a rule when a comparison is required of the relative desirability of several mutually exclusive investments. In such cases projects can be ranked in terms of "speed of payback", with the fastest paying-back project being the most favoured and the slowest paying-back project the least favoured. Thus the project which paid back the quickest would be chosen for investment. The payback period is considered more of an indication of risk rather than an investment criterion. It is mainly used as an initial screening device or to evaluate small short lived projects.

### Advantages

- Simplicity
- Favours quick return projects which may produce faster growth for the firm and increase liquidity
- Minimises time related risks

### Disadvantages

- Ignores the time value of money
- Ignores cash flows occurring after the payback period
- Concerned with cost recovery not profitability

(Williamson, 2003) (Limes Consultancy)

## 2. ACCOUNTING RATE OF RETURN (ARR) OR RETURN ON CAPITAL EMPLOYED (ROCE)

The ARR, as the previous method, is employed in the investment appraisal of independent or mutually exclusive projects. It expresses the average annual net cash flow as a percentage of the original investment (capital employed). A report by Arnold & Hatzopoulos in 1999 based on research into a sample of companies from the Times 1000 showed ARR is used by just over 50% of respondents. The advantages of the ARR are again its simplicity and its concern with profitability, however it still has the disadvantage of ignoring the time value of money and also is dependent on the depreciation policy adopted by the business. This method relies on profit rather than cash flows. Nevertheless, its calculations are not too onerous. The result is the average annual rate of profit earned by this asset or project, which can be compared with other projects or interest rates. In a situation of mutually exclusive projects, the best of the alternatives is the project with the highest ARR, and this is therefore the project chosen. It is mainly used as an initial screening device or to evaluate small, short-lived projects.

### Advantages

- Simplicity
- Concerned with profitability
- Comparability

### Disadvantages

- Based on accounting profits rather than cash flow
- Ignores the timings of inflows and outflows
- Ignores the time value of money
- Dependent on the depreciation policy adopted by the business

(Williamson, 2003) (Limes Consultancy) (Business Modules)

## 3. THE NET PRESENT VALUE (NPV) METHOD

Having examined the two "traditional" methods of capital investment appraisal, it is time now to turn to the other two main appraisal techniques. These techniques are known as the "discounted cash flows" methods and are: the Net Present Value (NPV) and the Internal Rate of Return (IRR). The IRR or yield of a project involves comparing the rate of return expected from the project calculated on a discounted cash flow basis with the rate used as the cost of capital. For an investment to be worthwhile the IRR must be greater than the cost of capital. This report does not look at the IRR in detail as this method is rarely used. A report by Arnold & Hatzopoulos in 1999 based on research into a sample of companies from the Times 1000 showed NPV is used more frequently than IRR.

The NPV investment appraisal method works on the simple, but fundamental, principle that an investment is worthwhile undertaking if the money got out of the investment is at least equal to (if not greater than) the money put in. It considers all relevant cash flows associated with a project over the whole of its life and adjusts those occurring in future years to their '*present value*' by discounting at a rate called the '*cost of capital*' thus the NPV technique is concerned with the time value of money, £1 is worth more today than £1 in the future. The reason being that it could be invested and make a return (even in times of low interest, so long as interest rates are positive). It works on the principle that over time, the value of money goes down

(inflation), £100 today will be worth less in two year's time. The cash flows are converted to their present value equivalents by multiplying them by an appropriate NPV discount rate.

In general terms we can express the NPV of an investment project as the sum of its net discounted future cash flows. To emphasise this point further, it is vital to understand that once the fact is accepted that money has a time value, then it follows that money at different points in time is not directly comparable: £1 now cannot be directly compared with £1 next year, and so the cash flows of a project that arise at different points through time all have to be converted to a value at one particular point in time. By convention, and because it has many practical advantages, the point in time normally chosen is the present. The annual cash flows are discounted and totaled and then the initial capital cost of the project is deducted. The excess or deficit is the NPV of the project; it goes without saying that for the project to be worth while the NPV must be positive and the higher the NPV the more attractive is the investment in the project. This method is consistent with the objective of maximising shareholder wealth.

Advantages of the discounting methods:

- Takes into account the time value of money
- Concerned with profitability
- Provide a common denominator, being today's value, for variable length's of investment

Disadvantages of the discounting methods:

- More complicated nature of calculations
- Choice of the rate of discount to a pply, giving rise to the possibility of multiple solutions existing and the assumption that cash surpluses can be reinvested at the same rate.

If the NPV is positive or zero the project is worth considering. If the NPV is negative, the project should be rejected because:

- It will be non-wealth creating
- It indicates that the project makes loss relative to a capital market investment (i.e. an opportunity loss)
- It is producing a return less than that available for a similar level of risk on the capital market
- It would not generate sufficient cash flow to repay the financial cost of undertaking it

Some would say that NPV fails because it doesn't fully take into account the size of the capital Investment required to produce an increased value and may not identify the most advantageous mix of projects when there is a capital shortage. (Business Support micro modules) (Limes Consultancy) (Williamson, 2003) (HNC Business, 2000)

#### **4. NET VALUE**

This is quite simply the total net inflows plus the residual value (scrap value) minus the initial capital cost. This will give a different answer to the NPV, as it does not take into account the time value of money.

## EVALUATION OF INVESTMENT APPRAISAL METHODS

Now we know how each method works and the advantages and disadvantages of each method it is important to realise that each method of investment appraisal is very different and they should all be used for different reasons. Most companies use a combination of methods, which is what I have done whilst analysing the three possible new systems for Mortons Engineering Ltd. A report by Arnold & Hatzopoulos in 1999 based on research into a sample of companies from the Times 1000 established that there is no one single method of investment appraisal used exclusively by respondents, rather they used a mixture of methodologies. (Limes Consulting)

*“Financial analysis involves taking isolated factors and tying them together to give a whole picture of financial performance”. (McKenzie, 1994 p129)*

The next section examines the results of all the investment appraisal methods of the three possible new systems for Mortons Engineering Ltd and evaluates these results in order to decide which is the best system to employ. As well as looking at these results, other factors will be taken into consideration, such as the time each system takes to be installed, the number of staff reductions and the product benefits of each system. There are other issues that will need to be considered before the final decision is made, which will not be included in this report as this is purely from a financial point of view.

*“As well as the non-financial factors, other issues need to be considered such as personnel, legal issues, ethical issues, changes to regulations, political issues, and quality implications”. (HNC Business, 2000, p201)*

## FINDINGS

This table shows the results of the investment appraisal techniques for each of the possible three new systems for Mortons Engineering Ltd. The full workings can be found in appendix 1.

	System 1	System 2	System 3
<b>Payback Period</b>	2 yrs 6 months	3 yrs	4 yrs 3 months
<b>Average Accounting Rate of Return</b>	37.04%	27.06%	33.33%
<b>Net Value</b>	£52,000	£60,000	£96,000
<b>Net Present Value</b>	£14,292	(£2,620)	(£508)
<b>Initial Outlay</b>	£120,000	£200,000	£180,000
<b>Installation</b>	3 months	6 months	6 months
<b>Staff Reduction</b>	30	10	15
<b>Number of different products</b>	3	6	Numerous

### System 1

This system has the shortest payback period, which shows there is the least risk involved, but does not look at cash inflow after the payback period, which actually decreases. It also shows the earlier cash inflows are higher, especially than system 3, which is less risky and improves liquidity. It has the highest ARR compared to the other two systems this shows the best return on investment. The NPV, looking at the cash inflows in real terms, is the highest of the three systems, and indeed the only positive result, going from this method it is the only system worth considering. The system also has the shortest installation time and lowest initial outlay.

However it also has the lowest net value, but when compared with the NPV I would consider this irrelevant. It would involve the highest staff reduction and only produces three different products.

### System 2

This system produces six different products, only reduces staff by ten and payback is only three years, which is only 6 months longer than system 1, so is also comparatively un risky. It also has high early cash inflows, which again are less risky and helps improve liquidity.

However this system has the lowest average accounting rate of return, which means the lowest return on investment of the three systems, even though it is still quite a high percentage, especially when compared with for example, bank interest rates. This is backed up with the lowest NPV out of the three systems, also a negative figure, so according to this method, system 2 is not worth considering. It has the highest initial outlay and takes six months to install, double the time it takes to install system 1.

### System 3

This system has a good average accounting rate of return although not as good as system 1, it would still produce a good return on investment. It has a high net value, only reduces staff by fifteen and produces numerous products.

It has the longest payback period suggesting it is the most risky system, a negative NPV, takes six months to install and quite a high initial outlay.

## CONCLUSIONS AND RECOMMENDATIONS

From the results of the investment appraisal techniques I recommend that Mortons Engineering Ltd purchase system 1. The reason behind this recommendation is purely from the financial view that this system has the highest return on investment and is the only system, which has a positive NPV. It also has the shortest payback period meaning it is the least risky of the three systems as well as covering the initial capital costs the fastest. It will need to be taken into consideration that these recommendations are based on cash flow forecasts, any variation in these forecasts, or if a different discount rate is used, could cause these results and therefore recommendations to change.

*“Cash flows are difficult to estimate, especially so when estimating for five or ten years ahead, therefore, variances in these estimates may affect overall decisions”.* (HNC Business, p201, 2000)

The main downside to system 1 is the high number of staff reductions required. This may demotivate remaining employees causing lower levels of output and production, the effects of which would be that future cash flow estimates will be incorrect.

If the Managing Director agrees with these recommendations and authorises the implementation of system 1, the project will need continuous monitoring so that changes can be made if any unforeseen events happen. At the end of the project, a post-completion audit should be carried out in order to make use of what can be learned from the experience in the planning of future projects. It will look at how it was thought of, analysed, chosen, implemented, monitored and so on. The purpose of the post audit is to test whether capital budgeting procedures have been fully and fairly applied to the project under review. This may point out mistakes or successes that may then be avoided or replicated in the future and provide feedback which can contribute to performance evaluation. (HNC Business, 2000) (Williamson, 2003)

## REFERENCES

Business support micro modules, Business planning and finance micro module - Capital Investment Appraisal

<http://www.brad.ac.uk/acad/mancen/micromods/busplan/bplan9.htm>

HNC Business. (2000) Managing Financial Resources. BPP Publishing, London

The Limes Consultancy Capital Investment Appraisal

[http://www.thelimesconsultancy.com/capital\\_investment\\_appraisal.htm](http://www.thelimesconsultancy.com/capital_investment_appraisal.htm)

McKenzie, Wendy (1994) The Financial Times guide to using and interpreting company accounts. Pitman Publishing

Savvakis C. Savvides, (March 1994) Risk Analysis in Investment Appraisal published in "Project Appraisal", Volume 9 Number 1, pages 3-18, Beech Tree Publishing

Williamson, Duncan (revised 8 May 2003) Capital Budgeting: the key numerical techniques

<http://www.duncanwil.co.uk/invapp.html>