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Section 1: Project Overview

1.1 Overview of the project – The capital project appraisal of a flexible cardboard packaging machine proved many potential benefits: not only with regards to financial opportunities. Whilst the major driver of the project was to reduce current spend on die-cut cardboard parts. There were also opportunities to reduce inventory levels, increase manufacturing flexibility and increase in-house capabilities. To conduct an appraisal of the project feasibility, a cost versus benefits analysis needed to determine the cost of the project, including fixed costs, running costs and any costs associated with funding the project.

1.2 Project findings – By utilising the expertise of Ribble packaging, a leading UK independent packaging supplier, it became apparent that there were two options for acquisition of the new machine. These were a purchase or loan option. With any investment decision there is an element of risk, therefore it was important to consider the issues surrounding implementation such as downtime, disruption, and the effect on the supply chain. With planning, these risks could be mitigated. Communication was also key to ensuring the objectives of the project were clear to all stakeholders. The availability of internally sourced cash for the investment allowed the company to capitalise on benefits of the purchase option for the machine, such as lower raw material costs and a shorter tie-in supply period with Ribble. Nevertheless, it was important to consider the impact that this decision had on the financial statements of the company. The decision to depreciate the asset across a 10-year period ensured a more accurate reflection of the business' financial condition in this regard.

1.3 Recommendations – The company utilised the payback period method to validate the decision-making between the purchase and loan agreement for the machine. This financial appraisal method was also used more extensively to consider what if scenarios such as 20% volume reduction and 25% energy surcharge increase. Nevertheless, it is recommended that more comprehensive financial appraisal methods should be used for future projects. For example, net present value would allow for the future time value of money to be considered. Additionally, the WACC could be used to build an element of contingency into project planning. Other methods can calculate predicted profitability for the project (PI), and ratios allow easier comparison of different size projects (BCR). A more detailed financial appraisal can help to build confidence in investments – which is particularly important when resources are limited. It is recommended that the company explores the opportunities presented by smart partnerships and knowledge transfer partnerships as an external source of funding. Investment in plant and technology is crucial to operating with efficiency and effectiveness to create a profitable business long-term.

Section 2: Financial Appraisal Tools

2.1 Types of financial appraisal tools - (e Finance Management, 2022) states that finance appraisal tools are classified into two types that are, discounted cash flow techniques and non-discounted cash flow techniques. Under non-discounted cash flow techniques, future cash flows are not discounted to arrive at their present value. In other words, they do not consider the time value of money. Two examples of these tools are payback period and accounting rate of return (ARR) – some would argue that their ignorance to the future time value of money is a major drawback of these methods.

2.2 Payback Period - This technique is used to determine the amount of time it takes to recover the cost of an investment (Kagan, 2022) or how long it takes for an investor to reach a breakeven position. Shorter paybacks present a more attractive investment, while longer payback periods are less desirable. The payback period is calculated by dividing the amount of the investment by the annual cash flow or benefits from the project. Benefits to using this method are that the calculation is simple

– it offers a quick evaluation which highlights liquidity. Conversely, its concentration on liquidity means that profitability can be overlooked (Srivastav, 2022).

2.3 Accounting Rate of Return - ARR measures the annual operating profit over the average investment as a percentage. This is calculated using the equation average annual profit divided by average investment multiplied by one hundred percent. The average investment is taken to be the sum of the initial investment plus the future residual value all divided by two (Bitesize, 2022). Like the payback period method, this technique is commonly used as it is a relatively simple calculation which offers a quick comparator against the companies expected return. However, the future residual value may not be realistic, and it is based on accounting profits and not cashflow (e Finance Management, 2022).

All of the financial appraisal methods we have used during the module have looked at cashflows in and out of the business; but ARR is an exception to this as it concentrates on net profit. This carries the risk that the residual value may not be realistic – meaning that risks and uncertainties are ignored.

2.4 Net Present Value (NPV) & concept of time value of money - The time value of money is a concept that recognises the relevant worth of future cash flows arising as a result of financial decisions by considering the opportunity cost of funds. Money loses its value over time which can make it more desirable to have it now rather than later. This is as a result of inflation, interest rates, risk appetite and opportunity (Fernando, 2022). NPV explores cash flows in and out of a project with an adjustment for the future value of money based on a discounted rate. This is also known as the weighted average cost of capital adjustment (WACC). The WACC value is the average rate of return a company is expected to pay to all its shareholders, including debt holders, equity shareholders, and preferred equity shareholders (Hargrave, 2022). A positive net present value calculation shows the project adds value to the business. Net present value adjusts the cash value of each year with the following formula:

$$\text{NPV} = \text{cash flow} / ((1 + \text{discount rate})^{\text{time periods}})$$

The benefits of using NPV are that it takes account of the time value of money, and it informs whether the project will add value to the business. Additionally, the calculations can be simplified using excel therefore the method is considered more user friendly. The major disadvantage is that results are determined by how the business defines the cost of capital. It can also be difficult to compare different size projects using this method (wallstreetmojo, 2022).

2.5 Profitability Index - PI is a calculation of the potential profit of the proposed project. The rule is that a profitability index or ratio greater than one indicates that the project should proceed. Conversely, a rule below one indicates that the project probably isn't feasible. Profitability index is a variation of the net present value method. The formula for PI is the net present value of the future cash flows divided by the initial cost of the project. Similarly, to payback period, this method reviews the liquidity of a project and is a simple calculation. It is advantageous though that future value of money is also considered with PI. A disadvantage is that this ignores the size of projects, and it can also be unclear as to how the business defines the cost of capital (e Finance Management, 2022).

2.6 Internal rate of return – IRR calculates discount rate that causes the net present value of future cash flows from an investment to equal zero. In other words, it is the same concept as NPV however it is working as the rate of growth based on NPV being equal to zero. Therefore, IRR shows the expected annual rate of growth of an investment.

The formula for IRR is:

$$\text{IRR} = R1 + [(\text{NPV1} \times (R2 - R1)) / (\text{NPV1} - \text{NPV2})]$$

Where: R_1 = lower discount rate, R_2 = higher discount rate, NPV_1 = higher net present value (derived from R_1), and NPV_2 = lower net present value (derived from R_2) (Wall Street Mojo, 2022).

Despite this method accounting for the future value of money, reviewing a project's liquidity and being a simplified process using Excel, this method can be tedious to calculate manually. It also doesn't allow for a clear comparison of different size projects. The most practical use is for comparing capital budgeting projects to understand potential rates of annual return over time. The higher the IRR the more desirable the project will be considered (Storyteller, 2019).

Businesses may use more than one method to assess each investment decision – this is particularly so in larger businesses. Payback period methods continue to be popular as a screening tool, although there has been increased use of discounting methods including NPV and IRR over time. All projects appraised that pass the decision rule should be selected, but this assumes unlimited funds available for investment. This is rarely the case, and therefore decisions have to be made regarding project selection. In other words, capital has to be rationed.

2.7 Capital Rationing - There are several types of capital rationing – the first being soft rationing. These are internally imposed limits by the business. Conversely, hard rationing relates to capital made available from external sources. The other type is one-period rationing; this is the simplest form because limits are placed on finance availability for one year only. For subsequent years, funds are unlimited. One-period rationing has two options either divisible or indivisible projects. Divisible projects are those for which a fraction can be undertaken whereas indivisible ones have to be completed in full (Hayes, 2022). Determining the optimal combination for project selection within the capital constraints is important. Selecting the high NPV projects in order of rank will favour large projects, when a combination of smaller projects may be optimal.

2.8 Benefit cost ratio – BCR or PI can be beneficial in this regard. Both ratios provide a measure of profitability per unit of monetary value invested. PI considered gross present value (a total present value of all cash flows excluding the initial investment) and divides it by the initial outlay. Whereas benefit cost ratio divides net present value by the initial outlay (e Finance Management, 2022).

Section 3: Project Funding Options

3.1 Types of funding - A business needs finance for various reasons including for start-up, working capital gain or business expansion. Different sources of finance have different implications for a business, so it is important that the most appropriate method of finance is chosen for the purpose that the business has in mind (Rawat, 2009). Types of finance can generally be categorised by internal (money obtained from within the business) or external (money obtained from outside the business). Internal finance is usually cheaper, but it means that the money can't be used for anything else. External finance typically requires interest to be paid on the money obtained (BBC Bitesize, 2022). These two categorises can be split according to whether they are considered as short- or long-term options. Some examples of each were discussed during the presentation.

3.2 Protecting cash flow - Cash flow is the money that flows in and out of the business, whereas profit is what remains from revenue after all business expenses have been deducted. Profitability is needed for the long-term sustainability of the business, but cash flow is needed to survive and pay liabilities in the short term. (Dheeraj Vaidya, n.d.) suggests that depreciation is a non-cash business expense incurred by a company for employing a tangible asset such as machinery for business use. It is accounted for throughout the asset's life expectancy. After that, the asset is discarded at salvage or residual value.

3.3 R&D tax credits - These have the advantage that they seek to help companies that are themselves prepared to invest in R&D (HM Revenue & Customs, 2020). This begins with the desire to achieve an advance which involves resolving scientific or technological uncertainties – and ends when the advance has been achieved and all the uncertainties are resolved. Costs can be claimed against consumables, scrap, demo and trial units / prototypes and utilities (Ball, 2022).

3.4 Smart Partnerships (SPs) and Knowledge Transfer Partnerships (KTPs) - are part-funded government programmes aimed at boosting organisational performance and productivity through collaboration with UK Universities (Innovation UK, 2021). They provide collaborative partnership between a highly qualified associate and a company whereby the associate is recruited specifically to deliver a project under the supervision of an academic team. A KTP project is designed specifically to address a business need and allows the academic institute to apply their theory in a practical way. KTP's are grant funded. 2/3rd of the total project cost is grant funded for SME's and 50% of the total project cost is grant funded for large companies. A company needs to be able to prove its suitability for a KTP and projects typically last between one and three years (UK Research and Innovation, 2022).

Section 4: References and Appendices

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4.2 Project model

Purchase option	Annualised
No. SKU's for top 81% of volume, 28% of variety	31
Volume for these SKU's	600,000
Current annualised spend	£ 478,000
Proposed cardboard spend inc. waste	£ 340,000
Additional labour & utilities	£ 40,000
Annualised savings	£ 98,000

Investment cost	£ 132,500
Payback period	1.35 years

Loan option	Annualised
No. SKU's for top 81% of volume, 28% of variety	31
Volume for these SKU's	600,000
Current annualised spend	£ 478,000
Proposed cardboard spend inc. waste	£ 374,000
Additional labour & utilities	£ 40,000
Annualised savings	£ 64,000

Initial investment	£ 25,000
Purchase of machine	£ 66,250
Total investment	£ 91,250
Payback period	1.43 years

Assuming 20% reduction in volume	Annualised
No. SKU's for top 81% of volume, 28% of variety	31
Volume for these SKU's	600,000
Current annualised spend	£ 382,400
Proposed cardboard spend inc. waste	£ 299,200
Additional labour & utilities	£ 40,000
25% surcharge of shortfall	£ 18,700
Annualised savings	£ 24,500

Initial investment	£ 25,000
Purchase of machine	£ 66,250
Total investment	£ 91,250
Payback period	3.72 years

Connect option - increase in energy surcharge to 25%	Annualised
No. SKU's for top 81% of volume, 28% of variety	31
Volume for these SKU's	600,000
Current annualised spend	£ 478,000
Proposed cardboard spend inc. waste	£ 425,000
Additional labour & utilities	£ 40,000
Annualised savings	£ 13,000

Initial investment	£ 25,000
Purchase of machine	£ 66,250
Total investment	£ 91,250
Payback period	7.02 years

Project model over five-year period – WACC 10%

		Year					
	Investment	1	2	3	4	5	
Present Value	(132,500)	98000	98000	98000	98000	98000	
Payback	1.35 years	Manually Calculated		1.35			
Discount Rate (WACC)	10.00%						
Denominator	1.00	0.909	0.826	0.751	0.683	0.621	Taken from present value table
Future Value	(132,500)	89,082.00	80,948.00	73,598.00	66,934.00	60,858.00	
NPV	238,920						
NPV (Excel Calculated)	238,997			PI	2.80		
				BCR	1.80		
				IRR	69%		

Project model over five-year period – WACC 5%

		Year					
	Investment	1	2	3	4	5	
Present Value	(132,500)	98000	98000	98000	98000	98000	
Payback	1.35 years	Manually Calculated		1.35			
Discount Rate (WACC)	5.00%						
Denominator	1.00	0.952	0.907	0.864	0.823	0.784	Taken from present value table
Future Value	(132,500)	93,296.00	88,886.00	84,672.00	80,654.00	76,832.00	
NPV	291,840						
NPV (Excel Calculated)	291,789			PI	3.20		
				BCR	2.20		
				IRR	69%		

Project model over 10-year period – WACC at 10%

	Investment	Year 1	2	3	4	5	6	7	8	9	10			
Present Value	(132,500)	98000	98000	98000	98000	98000	98000	98000	98000	98000	98000			
Payback	1.35 years	Manually Calculated		1.35										
Discount Rate (WACC)	10.00%													
Denominator	1.00	0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467	0.424	0.350	Taken from present value table		
Future Value	(132,500)	89,082.00	80,948.00	73,598.00	66,934.00	60,858.00	55,272.00	50,274.00	45,766.00	41,552.00	34,300.00			
NPV	466,084													
NPV (Excel Calculated)	469,668			PJ	4.52									
				BCR	3.52									
				IRR	74%									

Project model over 10-year period – decreased projected savings

	Investment	Year 1	2	3	4	5	6	7	8	9	10			
Present Value	(132,500)	98000	98000	88000	88000	78000	78000	68000	58000	48000	38000			
Payback	1.35 years	Manually Calculated		1.35										
Discount Rate (WACC)	10.00%													
Denominator	1.00	0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467	0.424	0.350	Taken from present value table		
Future Value	(132,500)	89,082.00	80,948.00	66,088.00	60,104.00	48,438.00	43,992.00	34,884.00	27,086.00	20,352.00	13,300.00			
NPV	351,774													
NPV (Excel Calculated)	353,224			PJ	3.65									
				BCR	2.65									
				IRR	70%									