



CAPITAL PROJECT APPRAISAL BUSINESS REPORT

Abstract

This business report focusses mainly on the investment in Aftermarket business to improve, lead-time of the supply of spare parts, improve business relationships, generate profits and increase business opportunities. Our company has seen an investment into Additive manufacturing to replace the current conventional manufacturing method of Vacuum Forming used for spare parts manufacturing. The various elements of the investments and their impact on the business for the next five years are explained in this report.

Introduction

The spares business in Aftermarket is one of the most lucrative business of our organisation. Being an organisation delivering Business class and First Class suites to the Aircraft industry, the cost of the spare parts are highly priced, with low volumes. With the data in our company, most of the parts that fail due to abuse in-service are cosmetic non-critical plastic parts, like bumpers, monitor face, Trims etc which are in direct contact with the passengers on the aircraft. There is a very high demand to these parts. Aircrafts, may have to ground sometimes and wait for the parts to arrive from the manufacturers. To reduce the current lead-time of delivery of spares and improve customer relationships, an investment proposal is made to invest on Additive manufacturing (Additive Manufacturing reduces Aerospace part lead time by 95%, n.d.). For spare parts supply in aftermarket business, the advantages of additive manufacturing over conventional manufacturing method is that it is quick and efficient for low volumes where the setup time of tooling is less. The machine used is Stratasys Fortus 900mc (Stratasys, n.d.) and the material used for manufacturing the parts is Ultem 9085 (Stratasys, n.d.). The investment involves future returns by the current cash outflow to a given investment. The management decision is very crucial in deciding whether to go with the business proposal or not. Hence, it is highly critical that the investment proposal is adequately appraised. A business study is performed and the rationale for the investment is created to prove that additive manufacturing is the most viable solution for low volumes of spares for Business class and First class suites in aftermarket business.

Capital Investment Appraisal

Capital Investment is defined as the process by which the company determines, prior to investing, whether a project is worth the investment to be made. The investment is a management decision that is dependent on the returns of the investment. Capital investment appraisal techniques are applied to evaluate different investment options and to decide which one to go ahead with (Kenton, 2022). Hence, additive manufacturing method and the current Vacuum forming method are studied in terms of capital investment appraisal and to choose amongst these two. In most investments, the cash inflow and outflow are calculated for the lifetime of the machine or the project or any new emerging technologies making that could make the proposed process obsolete. In this report, we have considered only 5 years to study the investment appraisal as shown in **Figure 1**.

Additive Manufacturing:

Investment (*Machine Cost + Trim + Bumper + Face*) = **€ 258,100** (€160,000 + €16,000 + € 32,600 + € 49,500)

Vacuum Forming:

Investment (*Machine Cost + Trim + Bumper + Face*) = **€ 203,750** (€70,000 + €25,550 + € 58,700 + € 49,500)

The cash inflow is for manufacturing of 3 parts (Bumper, Monitor Face and Trim) as these were being qualified for production under one single project. The capital appraisal investment will be based on the Payback Period (PB), Weighted average cost of Capital (WACC), Net Present Value (NPV) and Internal Rate of Return (IRR) as discussed in the following sections of this report (Kenton, 2022).

Payback Period

The time expressed in months or years, taken for the project to recover its initial capital investment. It is a very simple calculation of finding the breakeven point at which the capital investment is completely recuperated. **Figure 1** shows the Payback period is 1.9 years for the investment of €258,100 in case of Additive Manufacturing in comparison to 3.3 Years Payback for investment of €203,750 in case of Vacuum

Forming ref. in **Figure 2**. Hence, Additive Manufacturing is the most desirable venture with quick recovery of the investment (Kagan, 2022).

Capital Appraisal Models

Additive Manufacturing						
	Investment	No. of Years (t)				
		1	2	3	4	5
Present Value (PV)	€(258,100)	€ 138,140	€ 138,140	€ 138,140	€ 138,140	€ 138,140
Payback	1.9	Break even point is at 1year 10 months (1.9 years)				
Discount Rate (WACC)	10.00%					
		From Present Value Table				
Future Value((PV t/1+10%)^t)	€(258,100)	€ 125,581.82	€ 114,165.29	€ 103,786.63	€ 94,351.48	€ 85,774.07
Net Present Value (NPV)	€ 265,559				Profitability Index (PI)	2.03
					Benefit Cost Ratio (BCR)	1.03
Internal Rate of Return (IRR)	45.24%					

Figure 1 Additive Manufacturing

Conventional Vacuum Forming						
	Investment	No. of Years (t)				
		1	2	3	4	5
Present Value (PV)	€(203,750)	€ 61,736	€ 61,736	€ 61,736	€ 61,736	€ 61,736
Payback	3.3	Break even point is at 3year 3 months (3.3 years)				
Discount Rate (WACC)	10.00%	From Present Value Table				
Future Value((PV t/1+10%)^t)	€(203,750)	€ 56,123.64	€ 51,021.49	€ 46,383.17	€ 42,166.52	€ 38,333.20
Net Present Value (NPV)	€ 30,278			Profitability Index (PI)	1.15	
				Benefit Cost Ratio (BCR)	0.15	
Internal Rate of Return (IRR)	15.66%					

Figure 2 Vacuum Forming

Discounted Cash Flow (DCF)

This is to determine the value of the investment today based on projections that the invested money will generate in future (Fernando, 2022). This is calculated in terms of Future Value (FV) considering the Present Values by applying a discounted rate of 10% Weighted Average Cost of Capital (WACC) for a particular period . WACC of 10% is the rate at which the business has to pay €0.10 to the investors in return of every €1. Based on WACC, the Future values are determined, which in turn helps to find out the Net Present Value (NPV).

Net Present Value (NPV)

This is the time value of the money (Gallo, A refresher on Net Present Value, 2014). It is the function of the Future Value (FV) and the investment made. The greater the value of the NPV, the greater the chances

of certainty of the pursuing the project. Although the Payback period is simple to calculate and simple to understand, the NPV is the most promising and superior method of capital appraisal techniques. The investment that passes the NPV test i.e, $NPV > 0$, will increase the confidence of the investor & the value of the shareholder and where it fails $NPV < 0$, it will hurt the company (Gallo, A refresher on Net Present Value, 2014).

The NPV of Additive Manufacturing **Figure 1** is nearly 9 times compared to Vacuum forming **Figure 2**. Hence, Additive Manufacturing is the most attractive business to invest.

Internal Rate of Return (IRR)

The rate of discount at which the NPV becomes Zero. In other words, the rate at which the project break even point is and is mainly used for comparative analysis (Vaidya, n.d.). This is the annual average rate of return from the proposed investment. The greater the value of the IRR, the better the returns from the business proposed (Gallo, Financial Analysis, 2016). Although, the IRR of Additive Manufacturing is greater than Vacuum Forming, it should always safer to use NPV and Payback periods alongside, to get a clear picture on the returns from the investment (Gallo, Financial Analysis, 2016).

Profitability index (PI)

Profitability index give us whether to proceed with a project or not (Profitability Index, n.d.). In case of a comparative study between a number of projects, it will be easy to rank the projects based on the profitability index to see which project gives more profit. Profitability should be greater than one to make sure the project is profitable (Dan, 2013).

Between Additive Manufacturing (PI of 2.03) and Vacuum forming investments (PI of 1.15), Additive manufacturing ranks higher with 2.03 in Profitability Index. Hence, Additive Manufacturing project investment can be pursued.

Benefit to Cost Ratio (BCR)

This is the ratio of the total future cash flows to the investment. If the $BCR > 1$, then the investment makes profit and if $BCR < 1$ then it incurs (Hayes, 2022). Hence BCR should be greater than one to pursue a project.

The BCR for Additive Manufacturing proposal is greater than one as compared to the Vacuum forming method. Hence, Additive Manufacturing is a safe and profitable investment.

Conclusion

Considering the cost benefits established in this report, it is a strong indication that the implementation of Additive Manufacturing is a perfect investment in Aftermarket business.

Although, the parts manufactured by Additive Manufacturing are highly priced, the process itself brings down the lead time of spares drastically from 60 days to 8 days. The Airlines would appreciate that their aircrafts will not be on ground for long for replacing the damaged parts. The more the aircraft is on the ground, the more the airlines will incur the loss. The Airlines need not wait on ground for long to get the seat repaired as they did before.

Therefore, this is a great win-win situation to both our company and to our Airline customers.

Recommendation

Since our company is a manufacturer of the First class and Business class suites, the cost of the parts are generally high with low volumes. The Payback, Net Present Value, Profitability index and Internal Rate of return etc strongly indicate to implement Additive Manufacturing. Therefore, the recommendation is to implement Additive Manufacturing.

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