soltius

seeing what you see

White Paper

Calculating Return on Investment (ROI) for Information Technology Projects

By Dr Peter Catt

When considering new information technology investments, it can be difficult to calculate the benefits – in both revenue gains and cost savings for the entire life-cycle – compared to the costs of purchasing, implementing and maintaining a new solution. The difficult economic climate is putting even greater pressure on IT spend and highlights the need to demonstrate acceptable return on investment (ROI).

This whitepaper explains the basic financial mathematics required to calculate ROI and associated measures including, discounted cash flow (DCF), net present value (NPV), internal rate of return (IRR), and payback period. All calculations are performed in Microsoft® Excel®.

These metrics form an important part of a well constructed business case for information technology projects. However, a complete business case requires much more than financial analysis. It must also answer questions around strategic direction, competitive advantage, cultural impact, risk management, overall project management, and other less tangible benefits such as end user experience.

The next section will step through the main elements of the financial analysis as a worked example.

Worked Example – SAP Supply Chain Management Solution

The spreadsheet used in the following example can also be downloaded from the Soltius website.

For our example we use the costs and benefits associated with the implementation of an SAP Supply Chain Management solution. The case study company is a medium sized New Zealand firm with a turnover of NZD$50m per annum and a cost of capital of 8%. The benefits are calculated with the SAP Value Calculator for Midsize Business which uses industry specific benchmark data from PRTM.

The worked example will consist of seven steps; Benefit Estimation, Cost Estimation, Return on Investment, Discounted Return on Investment, Net Present Value, Internal Rate of Return and Payback Period.

Step 1: Benefit Estimation

The first step in the process of determining return on investment (ROI) is to estimate the benefits of the proposed project. As already stated, some important benefits may be considered intangible, but for the

purposes of this example we will address benefits that we can quantify with relative ease. For those wanting further guidance on intangibles I recommend "Valuing Intangible Assets" by Robert F. Reilly and Robert P. Schweihs, McGraw-Hill 1998.

Supply Chain Management Solution Example

Estimated Benefits	Start	Year 1	Year 2	Year 3	Year 4	Year 5
Additional Revenue						
Improved on-time delivery		$35,000	$70,000	$70,000	$70,000	$70,000
Improved lead-time		$10,000	$20,000	$20,000	$20,000	$20,000
Cost Reductions						
Reduced order management cost		$85,000	$170,000	$170,000	$170,000	$170,000
Reduced inventory carrying cost		$350,000	$700,000	$700,000	$700,000	$700,000
Reduced purchasing cost		$75,000	$150,000	$150,000	$150,000	$150,000
One-time Cost Reductions						
Improved accounts receivable days outstanding		$20,000				
Improved total inventory days of supply		$50,000				
Total	$-	$625,000	$1,110,000	$1,110,000	$1,110,000	$1,110,000

Table 1: Estimated Benefits

Table 1 shows five years of estimated project benefits with Year 1 representing benefits achieved at the end of the first year, including one-time cost reductions totalling $70k.

Step 2: Cost Estimation

The estimation of costs is comparatively straightforward. However, care should be taken to include costs such as ongoing software maintenance and dedicated personnel. Note that Year 0 is the upfront project expenditure with Year 1 being the expenditure at the end of the first year (Table 2).

Supply Chain Management Solution Example

Estimated Costs	Start	Year 1	Year 2	Year 3	Year 4	Year 5
Software	$150,000		$33,000	$33,000	$33,000	$33,000
Hardware	$55,000					
Consulting (Implementation Services)		$180,000				
Personnel		$95,000	$80,000	$80,000	$80,000	$80,000
Training		$50,000				
Total	$205,000	$325,000	$113,000	$113,000	$113,000	$113,000

Table 2: Estimated Costs

Table 2 shows the Year 0 (Start) costs of software and hardware, noting the ongoing software maintenance costs every year. Consulting services for the project all take place within the first year (Year 1) and dedicated personnel costs are $15k higher in Year 1 due to recruitment costs.

Determining costs and benefits can be a major exercise and is likely to involve some estimation. Useful data sources include: Pilot studies, benchmarking data, reference sites, and value engineering studies.

Step 3: Return on Investment (ROI)

Project return on investment (ROI) is simply the ratio of money gained (or lost) relative to the amount of money invested (the total cost). The formula for expressing ROI as a percentage is shown below:

$$ROI = [(Return - Investment)/Investment)]*100$$

	Start	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Estimated Benefits	$0	$625,000	$1,110,000	$1,110,000	$1,110,000	$1,110,000	$5,065,000
Estimated Costs	$205,000	$325,000	$113,000	$113,000	$113,000	$113,000	$982,000
Return on Investment (ROI)	416%						

Table 3: Return on Investment

In our example (Table 3) the ROI is calculated by taking the total estimated benefits of $5,065,000, subtracting our total estimated costs (investment) of $982,000 and dividing by the total estimated costs then multiplying by 100 to arrive at the ROI of 416%. Our ROI uses a single calculation for the entire five year period. However, some analysts calculate ROI on an annual basis.

Step 4: Discounted Return on Investment (Discounted ROI)

As a general rule, a sum of money available today is worth more than the same amount of money at a future date. This is due to both its earning capacity, i.e. it can immediately start earning interest and the fact that over time inflation erodes its value. This concept is known as the "time value of money".

To account for the time value of money we can apply a "discount rate" to our calculations so that they more accurately reflect the true costs and benefits over the life of the project. The discount rate is often chosen based on the company's "weighted average cost of capital", i.e. the average cost of borrowing for the company from all sources, e.g. banks, shareholders, etc. In addition, the discount rate can be increased to account for project risk.

Discount Rate	10%						
	Start	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Discounted Benefits	$0	$568,182	$917,355	$833,959	$758,145	$689,223	$3,766,864
Discounted Costs	$205,000	$295,455	$93,388	$84,899	$77,181	$70,164	$826,086
Return on Investment (Discounted ROI)	356%						

Table 4: Discounted Return on Investment

By applying a discount rate of 10% (8% weighted average cost of capital plus a 2% risk premium) we have reduced both the project benefits and costs by 10% per annum to account for the time value of money (Table 4). The discounted return on investment for the project is 356%.

Step 5: Net Present Value (NPV)

Net Present Value (NPV) returns the net value of the cash flows — represented in today's dollars. Again, because of the time value of money, receiving a dollar today is worth more than receiving a dollar tomorrow. NPV calculates the present value for each of the cash flows and adds them together to get the net present value. An NPV>0 adds value to the company, an NPV<0 subtracts value from the company, and an NPV=0 is neutral in terms of value. Of course a project with an NPV<0 could still be important and necessary for strategic reasons.

Start	Year 1	Year 2	Year 3	Year 4	Year 5	Total	
Cash Flow	-$205,000	$300,000	$997,000	$997,000	$997,000	$997,000	$4,083,000
Discounted Cash Flow (DCF)	-$205,000	$272,727	$823,967	$749,061	$680,964	$619,059	$2,940,778
Net Present Value (NPV)	$2,940,778						

Table 5: Net Present Value

Table 5 shows project cash flow which is calculated by subtracting the estimated costs from estimated benefits. The cash flow is then discounted by 10% for each year to arrive at the discounted cash flow. The discounted cash flows are then simply totalled to get the net present value of $2,940,778.

Step 6: Internal Rate of Return (IRR)

The internal rate of return (IRR) answers the question, how high do interest rates have to be (the basis of the discount rate for NPV calculations) in order for the present value of benefits to just cover the present value of costs? Put another way, the internal rate of return for an investment is the discount rate that makes the net present value of the project equal to zero.

A project is a good investment if its IRR is greater than the rate of return that could be earned by alternate investments of equal risk, e.g. other projects, or money in the bank. Generally, if the IRR is greater than the project's cost of capital (hurdle rate), the project will add value to the company. For our Supply Chain Management solution example to have an NPV of zero the IRR would need to be 244%.

Step 7: Payback Period

The payback period of a project refers to the period of time required for the return on an investment to "repay" the sum of the original investment. The payback period is widely used due to its ease of use despite the obvious limitation of it not accounting for the time value of money or risk. For this reason it should always be used in conjunction with other measures such as NPV or IRR.

Start	Year 1	Year 2	Year 3	Year 4	Year 5	Total	
Cash Flow	-$205,000	$300,000	$997,000	$997,000	$997,000	$997,000	$4,083,000
Cumulative Cash Flow	-$205,000	$95,000	$1,092,000	$2,089,000	$3,086,000	$4,083,000	
Payback Period (Months)	8.2						

Table 6: Payback Period

Our example project has a payback period of 8.2 months (Table 6)

Summary

Our worked example has illustrated the use of the most common financial appraisal metrics; Return on Investment, Discounted Return on Investment, Net Present Value, Internal Rate of Return and Payback Period.

We have explored and applied the "time value of money" approach to ensure that our workings give an accurate assessment of project value. Importantly, the use of multiple financial metrics helps provide a more rounded view of the proposed project. However, irrespective of the expected financial contribution of a project it is vital that other considerations such as strategic importance, risk management and end user experience are included in any proposal.

Appendix A: Worked Example SAP Supply Chain Management Solution

Estimated Benefits	Start	Year 1	Year 2	Year 3	Year 4	Year 5
Additional Revenue						
Improved on-time delivery		$35,000	$70,000	$70,000	$70,000	$70,000
Improved lead-time		$10,000	$20,000	$20,000	$20,000	$20,000
Cost Reductions						
Reduced order management cost		$85,000	$170,000	$170,000	$170,000	$170,000
Reduced inventory carrying cost		$350,000	$700,000	$700,000	$700,000	$700,000
Reduced purchasing cost		$75,000	$150,000	$150,000	$150,000	$150,000
One-time Cost Reductions						
Improved accounts receivable days outstanding		$20,000				
Improved total inventory days of supply		$50,000				
Total	$-	$625,000	$1,110,000	$1,110,000	$1,110,000	$1,110,000

Estimated Costs	Start	Year 1	Year 2	Year 3	Year 4	Year 5
Software	$150,000		$33,000	$33,000	$33,000	$33,000
Hardware	$55,000					
Consulting (Implementation Services)		$180,000				
Personnel		$95,000	$80,000	$80,000	$80,000	$80,000
Training		$50,000				
Total	$205,000	$325,000	$113,000	$113,000	$113,000	$113,000

	Start	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Estimated Benefits	$0	$625,000	$1,110,000	$1,110,000	$1,110,000	$1,110,000	$5,065,000
Estimated Costs	$205,000	$325,000	$113,000	$113,000	$113,000	$113,000	$982,000
Return on Investment (ROI)	416%						

Discount Rate	10%						
	Start	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Discounted Benefits	$0	$568,182	$917,355	$833,959	$758,145	$689,223	$3,766,864
Discounted Costs	$205,000	$295,455	$93,388	$84,899	$77,181	$70,164	$826,086
Return on Investment (Discounted ROI)	356%						

Start	Year 1	Year 2	Year 3	Year 4	Year 5	Total	
Cash Flow	-$205,000	$300,000	$997,000	$997,000	$997,000	$997,000	$4,083,000
Discounted Cash Flow (DCF)	-$205,000	$272,727	$823,967	$749,061	$680,964	$619,059	$2,940,778
Net Present Value (NPV)	$2,940,778						

Start	Year 1	Year 2	Year 3	Year 4	Year 5	Total	
Cash Flow	-$205,000	$300,000	$997,000	$997,000	$997,000	$997,000	$4,083,000
Cumulative Cash Flow	-$205,000	$95,000	$1,092,000	$2,089,000	$3,086,000	$4,083,000	
Payback Period (Months)	8.2						