Database Application Development - Cash Flow Analysis

Fictious Company Name for Actual Fortune 100 Company: IT Company

The Software Budget Tracking (SBT) database application automates the budget and expense-tracking process previously accomplished manually using spreadsheets. The database application includes features which enables a user to manage current year payments, forecasts, and accruals as well as historical information per software manufacturer and product. To capture historical information, the database has a yearly rollover feature which automatically forwards all forecast information into the next year and retains the current year's information for future trend analysis. At any time, the user can select pre-defined reports to display or print out information in the database formatted for analysis by several IT Company organizations.

Because of the manually intensive nature of the budget and expense tracking process, this white paper attempts to justify the database development effort based on improvements in quality, time, and costs of these tasks. To present these improvements, the calculations use Net Present Value (NPV), Discounted Cash Flow, Profitability Index (PI), and their relative financial assumptions. Using this information and the Cost of Capital recommended by our Mini-MBA instructor, I plan to calculate the effective Internal Rate of Return (IRR) for this database application project.

The objective of the database application project was to reduce overtimes hour required to manage and track budget for software purchases by IT Company. Therefore, I quantified the project based primarily upon the reduction of manual labor required to accomplish the task. This calculation used the average overtime hours quoted by the manual spreadsheet user compared to the normal work hours required to use database application after it was delivered. This was an overtime-cost savings for IT Company.

Measurable Project Objectives

- The NPV of the project should be greater than zero (NPV > 0).
- The Internal Rate of Return (IRR) should be greater than the IT Company cost of capital (i.e. IRR > 15%).
- The Profitability Index (PI) should be greater than one (PI > 1)

This white paper includes the use of the following financial information and techniques.

- Discounted Cash Flows
- Net Present Value
- Internal Rate of Return
- Profitability Index

The present value of annual cash expenditures relative to productivity used the following formulas:

Net Present Value (NPV)
(Refer to **Appendix B**)

NPV indicates the total value of the opportunity over the specified number of years, taking into account the time value of money. The NPV is determined by subtracting the initial investment for a project from the discounted cash flows generated by the option. I performed these calculations without the new database application to determine if the NPV is greater than zero to illustrate the option which yielded the highest NPV.

$$\mathbf{PV} = \frac{\mathbf{CF(1)}}{\mathbf{(1+i)}} + \frac{\mathbf{CF(2)}}{\mathbf{(1+i)^2}} + \cdots \frac{\mathbf{CF(n)}}{\mathbf{(1+i)^n}} \mathbf{- CF(0)}$$

where CF = cash flow, *n* = the period (i.e. year), i = interest rate

or

NPV = PV - I, where PV = present value of annual cash outflow, I = initial investment.

Internal Rate of Return (IRR)

(Refer to **Appendix B**)

IRR is the rate of interest that equates the investment with the present value of future cash flow or NPV = 0. The decision rule is that the project should be accepted if the IRR exceeds the Cost of Capital. For IT Company CFO, the cost of capital is 15%.

$$\mathbf{NPV} = \sum \mathbf{CF}(n) \; * \frac{1}{(1 + \mathbf{IRR\%})^n}$$

where n is the current year, CF(n) is the current year's cash flow, and IRR% is the estimated Internal Rate of Return.

Profitability Index (PI)
(Refer to **Appendix C**)

The profitability index is the ratio of the total Present Value of future cash inflows to the initial investment. This index is used as a means of ranking projects that are competing for limited funding. The profitability index puts all projects on the same relative basis, regardless of size. A project should be selected when its PI is greater than one (PI > 1).

Additional data collected

- **Database user procedure times** - by considering each report and daily operations, the database user provided length of days and hours to complete her tasks.

- **Database user annual salary** - by referring to the IT Company Financial Database, determined the salary grade mid-point for the database user.

- **Database developer annual salary** - by referring to the IT Company Financial Database, determined the salary grade mid-point for a database developer.

Methodology
To account for the many hours originally spent by the user to manage about 7000 database records in a spreadsheet, I consulted the database user to estimate times for each manual report she generated. These report totals included number of manual hours for all data collection and entry into the original spreadsheet. Then by multiplying the hourly totals times the number of reports distributed per year, I calculated the total annual hours spent to generate these reports.

After determining the manual report generation times, we estimated the amount of time the user spent on each automated report she generated. These report totals included number of hours for all data collection and entry into the new database. Then by multiplying the hourly totals times the number of reports distributed per year, I calculated the total annual hours spent to generate these reports.

To isolate an amount of time spent by the database user per year, she provided me with her overtime hours before and after performing her tasks using the database application. Prior to the database availability, she reportedly spent approximately 10 to 15 hours overtime per week. After using the database, she spends no additional time. Based on the overtime hours, I averaged the number of hours saved per week to 12½ hours using the automated database.

To account for all expenses relative to the annual salary that would be saved, I referenced the CFO web page to obtain formulas to calculate the database user's fully loaded salary expense. To accommodate yearly Salary Merit Increases, I used an Inflation rate of 4%.

There was a strong correlation between the number of hours spent on manual spreadsheet management and number of overtime hours worked. After subtracting the number of hours spent to generate necessary

spreadsheets reports manually from database report generation hours, the total number of overtime hours were within 3 days of the overtime reported saved.

The original requirements materialized out of the need to reduce time spent tracking, managing, and budgeting annual software expenses. However, no one performed cash flow analysis to consider manual spreadsheet operational savings. This document provides quantitative evidence of the improvements provided by the database application.

All amounts provided in this white paper reflect the result estimates of this implementation based upon 3 months of operation.

Business Impact

There have been several changes since delivering the database application to the user. These changes have been reflected in improved the customer satisfaction, team satisfaction, and now quantified by this exercise in EVA.

In terms of PVA, the database application allows the database user to provide reports consistently and on demand when requested. This improves our team's ability to provide financial services more accurately and efficiently than without the application.

In terms of CVA, the database application received a Technology Innovation award and a letter of appreciation from the database user.

The database application became operational the beginning of the fourth quarter 1997. This exercise projects five years into the future as an estimate for its useful life expectancy. After that time, management expects to re-evaluate the application to consider alternative methods for accomplishing the same useful objectives.

Benefits

The IRR quantifies the value of the development effort regarding the investment or EVA. However, the additional CVA and PVA benefits of the database application are also very important.

Our organization gains benefits from this database application by having information available upon request and reports formatted consistently. Above and beyond the standard database availability, the inherent features of the database provide additional tools to access and present information. Features such as SQL query and historical records provide users with a powerful planning and tracking tools for many years.

For the database user, she gained work satisfaction by reducing the many hours dedicated to line-by-line scrutiny of spreadsheet values and formulas, cautious entry to prevent error repercussions, and manual report formatting. These functions are now automated so she can now provide more analytical evaluation of the information and a better balance of personal life.

For me, I gained satisfaction in providing a solution to improve user productivity and satisfaction. The database project provided me with an example to use for this Mini-MBA exercise to quantify my own contribution to our organization. And I won an award and recognition.

Bibliography/References
ITS 1998 Commitment Budget Guidelines for Fully Loaded Salary Algorithm

Appendix A

IT Company Developer and User Salary Calculations

		User Salary	Developer Salary Cost		
Overtime Hours	12.5				
Inflation Rate	4%				
Midpoint Salary		$ 47,328.00	$54,796.00		
Benefits % Salary	9.44%	$ 4,467.76	$ 4,467.76		
Payroll Taxes	8.45%	$ 3,999.22	$ 3,999.22		
Savings Plan	4.00%	$ 1,893.12	$ 1,893.12		
Misc. Benefits		$ 5,997.00	$ 5,998.00		
Total Salary Expense		$ 63,685.10	$ 71,154.10		
Description	**1997**	**1998**	**1999**	**2000**	**2001**
Database User Salary	$ 29,852.39	$ 31,046.49	$ 32,288.35	$ 33,579.88	$ 34,923.07
Developer Salary Cost	$ 35,577.05				

Discounted Cash Flows (DCF)

Discounted Cash Flows are also referred to as the Present Value (PV) of annual cash flows, and are calculated as follows:

$$PV = \frac{CF(1)}{(1+i)} + \frac{CF(2)}{(1+i)^2} + \cdots \frac{CF(n)}{(1+i)^n} - CF(0)$$

where CF = cash flow, *n* = the period (i.e. year), i = interest rate.

In this calculation, I used IT Company CFO Cost of Capital rate of 15%.

	Year 1		Year 2		Year 3		Year 4		Year 5
PV =	$ 29,852	+	$ 31,046	+	$ 32,288	+	$ 33,580	+	$ 34,923
	1.1500		1.3225		1.5209		1.7490		2.0114
PV =	$ 25,959	+	$ 23,476	+	$ 21,230	+	$ 19,199	+	$ 17,363
PV =	$107,227								

Payback Period

$$\text{Payback (PB) Period} = \frac{\text{Total Initial Investment}}{\text{Average Annual Cash Flow}}$$

	Year 1		Year 2		Year 3		Year 4		Year 5		
Average Annual Cash Flow =	$ 29,852	+	$ 31,046	+	$ 32,288	+	$ 33,580	+	$ 34,923	/	5
Average Annual Cash Flow =	$ 32,338										
Database Payback Period =	$ 35,577	=	1.10	Years							
	$ 32,338										

Appendix B

Discounted Payback Period

The Discounted Payback Period (DPB) is calculated by adding the present value of each year's cash inflows until they equal the initial investment.

$ 25,959	+	(	$ 35,577	-	$25,959	)	=	$ 25,959.41
			$23,476				-	$ 25,959.00
								0.41 Years
							+	1.00 Year
								1.41 Years

Net Present Value (NPV)

Net Present Value (NPV) is equal to the present value (PV) of annual cash inflows, also known as Discounted Cash Flows (DCF) minus the Initial Investment (I); or

$$NPV = PV - I = \sum \frac{CF}{(1+i)^n} - CF(0)$$

Database NPV =	$ 107,227	-	$ 35,577	=	***$ 71,650***

Time:	0	1	2	3	4	5
CF	$ (35,577)	$ 29,852	$ 31,046	$ 32,288	$ 33,580	$ 34,923
DCF	$ (35,577)	$ 25,959	$ 23,476	$ 21,230	$ 19,199	$ 17,363
DPB	1.41 Years					
NPV	$ 71,650					

Internal Rate of Return (IRR)

The Internal Rate of Return is the rate of interest where the initial investment is equal to the present value of future cash inflows, where I = PV, or NPV = 0.

Because of the unequal cash inflows, I used the formula below to interpolate the Internal Rate of Return.

$$NPV = \sum CF(n) * \frac{1}{(1 + IRR\%)^n} = 0$$

IRR%	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Total**
80.000%	$ (35,577)	$ 16,584	$ 9,582	$ 5,536	$ 3,199	$ 1,848	$ 1,173
82.923%	**$ (35,577)**	**$ 16,319**	**$ 9,278**	**$ 5,275**	**$ 2,999**	**$ 1,705**	$ 0
85.000%	$ (35,577)	$ 16,136	$ 9,071	$ 5,099	$ 2,867	$ 1,612	$ (792)

Therefore, by trial and error, the IRR for the database application is between 80% and 85% or approximately 83%.

Appendix C

Profitability Index (PI)

The Profitability Index is the ratio of the total present value of future cash inflows to the initial investment (i.e. PV/I). The decision rule is: "if the profitability index is greater than one, then accept the project."

Database PV/I =	$ 107,227	/	$ 35,577	=	**3.01**