

Cost Benefit Analysis Form Handbook for the Commonwealth of Virginia



Virginia Information Technologies Agency

Table of Contents

1	Introduction	4
2	Definitions	4
3	Guideline.....	4
4	Identify Benefits.....	5
4.1	Determine Tangible Benefits	6
5	Estimate and Document Project Cost Related to each Alternative.....	6
5.1	Collect Cost Data	7
5.2	Return on Investment.....	8
5.3	Payback.....	8
5.4	Breakeven.....	9
5.5	Net Present Value (NPV)	10
5.6	Return On Investment Percentage	11
6	CTP CBA Form	11
6.1	General Information tab.....	11
6.2	Current Operational Expenditures tab	11
6.2.1	Organizational Numbers / Staffing Levels	11
6.2.2	Operational Expenditures.....	12
6.2.3	Operational Benefits.....	13
6.2.4	Cumulative Totals	13
6.3	Maintain Current State tab	14
6.3.1	Organizational Numbers / Staffing Levels	14
6.3.2	Operational Expenditures.....	14
6.3.3	Revenues and Benefits	15
6.4	Solution tabs	16
6.4.1	Project Expenditures	16
6.4.2	Organizational Staffing and Operational Expenditures	18
6.4.3	Revenue Projection.....	19
6.5	Cost Benefit & ROI Summary tab.....	21
6.5.1	Discount Rate	21
6.5.2	Maintain Current State Summary	22
6.5.3	Solution Summaries	22
6.5.3.1	Revenue	23
6.5.3.2	Operational Costs	23
6.5.3.3	Total Project Cost	23
6.5.3.4	Year to Year Staffing Change	23
6.5.3.5	Net Benefit	24
6.5.3.6	Payback Period.....	24
6.5.3.7	Breakeven Fiscal Year	24
6.5.3.8	Net Present Value.....	24
6.5.3.9	Return On Investment Percentage	25
6.6	Graphs tab	25
7	Appendix.....	28
7.1	Expanded services or products delivered to public and internal or external customers:.....	28
7.2	Cost Savings/Cost Avoidance:	28
7.3	Enhanced Work Environment:.....	29

Cost Benefit Analysis Form Handbook

8	Cost/Benefit Analysis Guide	29
8.1	Cost Savings/Cost Avoidance:	29
8.2	Enhanced Work Environment:.....	30
9	Cost/Benefit Analysis Guide	30
10	Cost/Benefit Analysis Guide	31

1 Introduction

Decision makers must make the most of scarce resources and at the same time respond to ever increasing demands for improved performance and new technology. The importance of investment management in information technology continues to increase. The failure rate of many IT investments raises legitimate concerns about the value of those investments. As a result, IT investment proposals often require a rigorous business case to justify new IT investments. The business case, and associated feasibility studies, will include methods of assessing the costs and returns expected from the investment. These methods include the Cost/benefit Analysis (CBA), which is the primary subject of this document.

Generally, feasibility studies help to determine if potential solutions are viable and provide a basis of comparison and selection between alternatives. Technical feasibility studies focus on the technology of the solution and are used to determine a preferred IT solution from a technology perspective. An economic feasibility study, such as a Cost/Benefit Analysis (CBA), determines if a solution is economically sound and cost effective. Based upon these analyses, a technology solution is proposed in the next step of the initiation process, and the results of the technical and economic feasibility studies are used to justify the proposed technology solution.

2 Definitions

CBA	Cost Benefit Analysis
CBT	Computer Based Training
COTS	Commercial off the Shelf
CTP	Commonwealth Technology Portfolio
NPV	Net Present Value
O&M	Operations and Maintenance
PM	Project Manager
ROI	Return on Investment
IV&V	Independent Verification & Validation

3 Guideline

Cost/Benefit Analysis is a systematic approach to estimating the strengths and weaknesses of technology alternatives that satisfy agency business requirements. This guideline will help individuals prepare cost/benefit comparisons with recommendations on how to gather information, present costs, determine benefits, identify risks, and draw economically sound conclusions.

Successful IT Investment Management decision-making begins with the identification of benefits and costs. These two factors are essential items regardless of the nature of the investment, metrics applied, or approach used to value them. Investments in the public sector are generally undertaken for one, or a combination, of four general purposes:

- Expansion or improvement in service or function of agency.
- Reduction of operating costs/increasing revenues.
- Research and development.
- Mandate

Benefits should clearly answer the question, "What does this investment provide the customer, public, or agency?" Whether expressed in qualitative or quantitative terms, benefits should relate directly to the fulfillment of specific, expressed needs.

4 Identify Benefits

Every proposed IT project for an agency should have identifiable benefits for both the agency and its customers. Identifying these benefits will usually require an understanding of the business processes of the agency and its customers. Some benefits realized by the agency are flexibility, organizational strategy, risk management and control, organizational changes, and staffing impacts. For example, new IT projects may allow some personnel to perform two different jobs with little or no extra training; or the new system may allow organizational changes that reduce the number of managers, or the new system may allow some jobs to be eliminated. These benefits are often measured in terms of productivity gains, staffing reductions, and improved agency effectiveness. Possible benefits to customers include improvements to the current IT services and the addition of new services. These benefits can be measured in terms of productivity gains and cost savings, but the customers must be the ones to identify and determine how to measure and evaluate the benefits. Customer surveys are often needed to identify these benefits. At a minimum, the customers should be interviewed to identify the potential impacts of new or modified systems. Consider the potential impact of a new or modified system in terms of:

- **Accuracy** -The degree of conformity of a measured or calculated value to its actual or specified value.
- **Availability** -The degree to which a system, subsystem, or equipment is operable and in a committable state at the start of a mission
- **Compatibility** - Capability of two or more items or components of equipment or material to exist or function in the same system or environment without mutual interference.
- **Efficiency** -measure of speed and cost.
- **Maintainability** - the ease with which a software system or component can be modified to correct faults, improve performance, or other attributes, or adapt to a changed environment.
- **Modularity** - the extent to which a system is made up of pieces independent in their own right, which makes for the easy assembly of simple autonomous parts into complex structures, is a hallmark of new software; software that's built for networking.
- **Reliability** - The probability that a functional unit will perform its required function for a specified interval under stated conditions.
- **Security** - A condition that results from the establishment and maintenance of protective measures that ensure a state of inviolability from hostile acts or influences.

4.1 Determine Tangible Benefits

Tangible benefits originate from increased revenue, cost reduction, and cost avoidance. They measure, in dollar savings, the impact of an alternative on people, equipment, time, space and facilities, and support materials.

5 Estimate and Document Project Cost Related to each Alternative

Estimated costs are the potential resources consumed by the technology being considered. The cost categories include Internal Staff Labor, Services, Software Tools, Hardware, Supplies and Materials, Facilities, Telecommunications, Training, IV & V and Contingency (Risk). If the technology warrants, the cost categories can be further subdivided.

Category	Definition	Cost Items
Personnel		
Internal Staff Labor (Personnel Services)	Internal staff labor costs include the salaries and benefits of employees assigned at least part time to the project.	Project Manager Administrative Support IT Analyst Application/Programming Analyst Network Analyst/Engineering IT Support
Other Full-time Staff	Internal staff labor costs include the salaries and benefits of non IT employees assigned at least part time to the project.	
Services (Contractual Services)	Costs incurred as a result of the work performed by individual staff members that are contractors or vendors. (i.e. staff augmentation)	Contractor supplied development and maintenance
Services	Costs incurred as a result of a contract with a contractor or vendor.	Contractor supplied development and maintenance
Software Tools	All applications software, whether packaged or requiring development, and all systems software such as assemblers, compilers, CPU performance measurement systems, database management systems, file back-up and recovery, job accounting, operating systems,	Purchased COTS applications Desktop/workgroup software Network operating systems Applications development tools

Cost Benefit Analysis Form Handbook

	programming aids and development systems and soft-merge utilities.	
Hardware	Machinery and equipment (CPU, disks, tapes, modem, cables, etc.).	Desktop workstations Laptop computers Peripheral servers Communications hardware Network Cabling Auxiliary Furnishing
Maintenance and Support	Include expenditures for services provided to maintain computer software and/or hardware.	
Facilities	System or project related floor space and utilities cost.	Systems related floor space and utility cost Project related floor space and utility cost
Telecommunications	Includes expenditures necessary to facilitate user access from geographically separate locations within the commonwealth.	
Training	Includes expenditures such as registration fees and materials for attending training courses, workshops, and conferences on information technology.	Computer based training (CBT) On site training Off site training Training materials
IV & V	IV&V is a quality assurance process carried out by an independent third party. The best practice is to acquire the services of a qualified service provider.	
Contingency (Risk)	A contingency is defined as an unforeseen condition that affects costs of a capital project.	
Other 1 and 2	Other miscellaneous Project costs like project related supplies and materials.	

5.1 Collect Cost Data

Historical contract data for an agency can be used to estimate the future purchase price of hardware, software, and services. If contracts were used to provide system support in the past, they can give you the costs for leasing and purchasing hardware and hourly rates for contractor personnel. Contracts for system support services for other systems in your agency can provide comparable cost data for the development and operation of a new system. Adjust the cost to reflect current year price levels. Document all adjustments for future reference.

5.2 Return on Investment

Return on Investment (ROI) is a financial accounting measurement for determining the value of making a specific investment. ROI is a ratio of the net benefits to the total cost of an investment for the same specific period. The two principle concerns with ROI are that the calculations do not account for the time value of money and the calculations assume a consistent annual rate of return. ROI is a useful measure when comparing alternatives using the same cost and benefit criteria for the same period. The formula for calculating ROI is:

$$\text{ROI}\% = \left(\frac{\text{Revenue} - \text{Operational Costs} - \text{Project Costs}}{\text{Project Costs}} \right) * 100$$

The difficulty inherent in calculating the ROI for an investment arises from the problems associated with identification of all the benefits received and all the costs incurred from an investment. ROI may be calculated for any time period; but when making investment decisions, calculate ROI for the total life of the investment.

Agencies need to revisit their assumptions on a regular basis, update their data, and reevaluate their ROI calculations. A solid and thorough ROI analysis comfortably nestles in the life cycle approach to IT investment and management. A well-performed analysis will build a comprehensive and reliable history of costs and decision-making outcomes that are updated throughout the life of the project.

Agencies should build an accessible record of this archived information to facilitate better and easier evaluation of future projects.

5.3 Payback

The payback method determines the time necessary for a new investment to pay for itself. Payback does not measure profitability, but cash recoverability. Payback tends to show the risk factor by pointing out the recovery time of an investment. Its primary advantage is its simplicity - it is quick to calculate and easy to understand. Its limitations include:

- Does not consider the benefit of net results after the investment has been repaid
- it is a break-even measurement, not a profitability measurement;
- And
- Does not take into account the time value of money.

Table 1 - Payback example

	Fiscal Year					
Project A	0	1	2	3	4	5
Total Net Benefit		60	60	60	60	60
Initial Investment	200					
Project B	0	1	2	3	4	5
Total Net Benefit		80	75	70	65	0
Initial Investment	200					

In the above example, the payback of project A is 3.3 years. This is determined by adding the expected annual cash flows until the original investment has been recovered. Thus by the end of year 3, \$180,000 of the original investment has been recovered; and, about one third of the way into year 4, the final \$20,000 of the initial investment would have been recovered. Following this procedure for investment B, the customer discovers that the payback for this equipment is 2.6 years.

5.4 Breakeven

The break even value represents the number of units (months, years, quarters) it will take for the net revenue generated by the product to recover the costs expended creating it. Break even analysis is one of the data points used when determining whether to pursue the project or product development. Though impacted by external events and somewhat subjective, it allows the decision maker to measure the potential costs against the window of opportunity concerning the product and profit potentials both tangible and intangible. It's subjective from the perspective the benefits may not be entirely monetary. Benefits could also come from improved operations and/or streamlined management involvement.

An example, using Table 1 - Payback example would be

Table 2 - Break even analysis

	Fiscal Year					
Project A	0	1	2	3	4	5
Total Net Benefit		60	60	60	60	60
Initial Investment	200					
Amount of Unrecovered Investment	200	140	80	20	-40	-100
Project B	0	1	2	3	4	5
Total Net Benefit		80	75	70	65	0
Initial Investment	200					
Amount of Unrecovered Investment	200	120	45	-25	-90	-90

As you can see from the table above, the 'Amount of Unrecovered Investment' declines until a negative number appears. The first occurrence of a negative number is the point at which investment has recovered its investment costs. In the example above Project A is projected to recover its investment costs during fiscal year 4, project B is projected to recover it's investment costs during fiscal 3.

5.5 Net Present Value (NPV)

The net present value (NPV) of an investment is the present (discounted) value of future cash inflows minus the present value of the investment and any associated future cash outflows. By considering the time value of money, it allows consideration of such things as cost of capital, interest rates, and investment opportunity costs.

NPV is important because without using the net present value of benefits and cost the comparisons drawn between solutions in the out years are not accurate. This metric recognizes that money has different real value over time and makes the values of money constant by discounting costs and benefits over a specific period of time—an asset’s life cycle or any selected period of analysis. NPV allows managers to compare, on purely financial factors, investment alternatives with widely disparate cash flows. NPV facilitates objective evaluation of projects regardless of scale differences or the existence of capital rationing, and can be used to compare independent or mutually exclusive projects.

For each year of the analysis period, cash inflows (benefits) and cash outflows (costs) are totaled and then summed to arrive at the net impact on cash. The net cash flow is then multiplied by an appropriate discount factor to arrive at a discounted cash flow for each year. NPV is the total of these discounted cash flows over the period of analysis. Generating a meaningful NPV requires sound estimates of the costs and benefits of a project, use of the appropriate discount rate, and the identification of the timing of cash receipts and disbursements. NPV focuses on an investment’s impact on cash flow rather than net profit, or savings in the case of non-revenue generating entities. Thus, only an investment’s effects on cash are considered.

In the example below, we see that project B is the more favorable investment with a NPV of \$5,448. The projected cash flow each investment generates are discounted at a 16% rate and then totaled with the initial investment cash outflow of \$200,000. The result is the Net Present Value.

Year	Present Value of \$1	Project A		Project B	
		Cash Flow	Discounted Cash Flow	Cash Flow	Discounted Cash Flow
0	1.0	(200,000)	(200,000)	(200,000)	(200,000)
1	.862	60,000	51,724	80,000	68,966
2	.743	60,000	44,590	75,000	55,737
3	.641	60,000	38,439	70,000	44,846
4	.552	60,000	33,137	65,000	35,899
5	.475	60,000	28,567	0	0
	NPV		(3,543)		5,448

5.6 Return On Investment Percentage

The Return On Investment (ROI) Percentage measures the efficiency of an investment. To calculate this, the total benefit for all fiscal years is divided by total project costs for all fiscal years. The resulting percentage is an expression of the projects viability. Simplified, the higher the ROI the better and if the calculation returns a negative percentage then the project should not be undertaken.

6 CTP CBA Form

This form is will capture information for up to four potential solutions. The information is filled out by the PM and captures;

- cost of current business
- cost of maintaining current business in outyears
- projected project performance metrics (3 possible solutions)
- projected O&M metrics
- projected revenue and cost savings

The data, once captured, allows for; staffing, ROI, Breakeven, and NPV analysis. Additionally, the individual analyses are graphed for comparative purposes. The form is composed of several components. These components are described in the balance of this section.

6.1 General Information tab

This tab contains general references to ensure the user is viewing the correct project.

6.2 Current Operational Expenditures tab

This tab contains the performance metrics for the current/legacy implementation and is used to help determine if it should be replaced with one of the other solutions recorded in the form.

6.2.1 Organizational Numbers / Staffing Levels

The table below contains information regarding the current staffing levels. The information entered here forms a baseline and will be referenced by all the 'solutions' documented in the form.

Cost Benefit Analysis Form Handbook

	2011	2012	2013	2014	2015	2016	2017	2018
Total Staffing Required								
# of Full-time IT Staff Required								
# of Other Full-time Staff Required								
# of Contractors Required								

	2019	2020	2021	2022	2023	2024	2025
Total Staffing Required	111.55	111.55	111.55	111.55	111.55	111.55	
# of Full-time IT Staff Required	0.30	0.30	0.30	0.30	0.30	0.30	
# of Other Full-time Staff Required	17.25	17.25	17.25	17.25	17.25	17.25	
# of Contractors Required	94.00	94.00	94.00	94.00	94.00	94.00	

Figure 1 – Current Organizational Expenditures

The “Total Staffing Required” row is a summary of the individual rows below it, each fiscal year having its own summary.

6.2.2 Operational Expenditures

The table below contains information regarding the current cost levels. The information entered here forms a baseline and will be referenced by all the ‘solutions’ documented in the form.

	2011	2012	2013	2014	2015	2016	2017	2018
Internal Staff Labor (Salary & Ben...								
Full-time IT Staff (Salary & Benefit...								
Other Full-time Staff \$								
Contract Staff \$								
Other Operational Costs \$								
Services								
Software Tools								
Hardware								
Maintenance								
Facilities								
Telecommunications								
Training								
Contingency								
Misc. Operational Costs								
Total of Operational Costs \$								

	2019	2020	2021	2022	2023	2024	2025	Total
1 Internal Staff Labor (Salary & ...	15,912,110.00	16,263,600.00	16,573,100.00	16,990,600.00	17,368,100.00			83,107,510.00
Full-time IT Staff (Salary & Ben...	32,110.00	32,600.00	33,100.00	33,600.00	34,100.00			165,510.00
Other Full-time Staff \$	1,090,000.00	1,145,000.00	1,202,000.00	1,262,000.00	1,325,000.00			6,024,000.00
Contract Staff \$	14,790,000.00	15,086,000.00	15,338,000.00	15,695,000.00	16,009,000.00			76,918,000.00
2 Other Operational Costs \$								
Services								
Software Tools								
Hardware								
Maintenance								
Facilities								
Telecommunications								
Training								
Contingency								
Misc. Operational Costs								
3 Total of Operational Costs \$	15,912,110.00	16,263,600.00	16,573,100.00	16,990,600.00	17,368,100.00			83,107,510.00

Figure 2 –Current Operational Expenditures

The table contains three summary lines.

- The “Internal Staff Labor (Salary & Benefits)” line 1 is the sum total of the three lines below it.
- The “Other Operational Costs \$” line 2 is the sum total of the detail below it.

- The “Total of Operational Costs \$” line 3 is the sum of the “Internal Staff Labor (Salary & Benefits)” and “Other Operational Costs \$” lines.

6.2.3 Operational Benefits

The table below contains information regarding the current benefits. The information entered here forms a baseline and will be referenced by all the ‘solutions’ documented in the form.

Benefits	2011	2012	2013	2014	2015	2016	2017	2018
Total Revenues								
Revenues								
Other								

	2019	2020	2021	2022	2023	2024	2025	Total
Total Revenues								
Revenues								
Other								

Figure 3 – Current Operational Benefits

The “Total Revenues” line is the sum total of the “Resources” and “Other” lines.

6.2.4 Cumulative Totals

The table below contains the ‘bottom line’ of the current operations. The information displayed here forms a baseline and will be referenced by all the ‘solutions’ documented in the form.

	2011	2012	2013	2014	2015	2016	2017	2018
Net Benefit								
Cumulative Net Benefit								

	2019	2020	2021	2022	2023	2024	2025	Total
Net Benefit	-15,912,110.00	-16,263,600.00	-16,573,100.00	-16,990,600.00	-17,368,100.00			-83,107,510.00
Cumulative Net Benefit	-15,912,110.00	-32,175,710.00	-48,748,810.00	-65,739,410.00	-83,107,510.00	-83,107,510.00	-83,107,510.00	-83,107,510.00

Figure 4 – Current Operations Cumulative Totals

There are three summary rows;

- The “Net Benefit” line 1 is the result of subtracting the operating costs from Revenue.
- The “Cumulative Net Benefit” line 2 affects the bottom line. This line will be negative until total revenue exceeds operating cost. The values are cumulative in the previous fiscal year is summed with the current fiscal years Net Benefit.

6.3 Maintain Current State tabs

These tabs contains the performance metrics adjustments that will be necessary should we decide to maintain the current state. Please keep in mind the figures in this section only show fiscal years 2011 and 2012, but the form tabs will show all fiscal years the user will need.

6.3.1 Organizational Numbers / Staffing Levels

The table below contains information regarding the change to the expected number of staff that will be necessary to support the Current State.

	A. 2011 Current Staff	B. 2011 Impact on Staff (Addtn'l Staff Required)	C. 2011 New Staff Total	A. 2012 Current Staff	B. 2012 Impact on Staff (Addtn'l Staff Required)	C. 2012 New Staff Total
Total Staffing Required						
# of Full-time IT Staff Required						
# of Other Full-time Staff Required						
# of Contractors Required						

Figure 5 – Staffing Levels

The “Total Staffing Required” line is the sum total of the three lines below it regardless of the column. The three columns also work in unison – (A+ B = C). Column A is the Current Staff and is pre-populated by entries previously entered on the Current Operational Expenditures tab. Column B - Impact on Staff(Additional Staff Required) - the user will enter new staff required to supplement the current staff; i.e the impact on staffing level (number of personnel) required to maintain the current state. And column C will contain the new value that will be used when evaluating maintaining the current state. If the user wishes to add additional staff they enter a positive number, if they wish to reduce staff they enter a negative number.

6.3.2 Operational Expenditures

The table below contains information regarding the change to the expected costs that will be necessary should we stay with the asset in its current state.

Cost Benefit Analysis Form Handbook

	A. 2019 Current Costs	B. 2019 Impact on Costs	C. 2019 New Costs	A. 2020 Current Costs	B. 2020 Impact on Costs	C. 2020 New Costs
1 → Staffing Costs	15,912,110.00	0.00	15,912,110.00	16,263,600.00		16,263,600.00
Full-time IT Staff (Salaries & Benefits)	32,110.00	63,188.00	95,298.00	32,600.00		32,600.00
Other Full-time Staff (Salaries & Benefits for FT staff from dep...)	1,090,000.00	-63,188.00	1,026,812.00	1,145,000.00		1,145,000.00
Contract Staff	14,790,000.00		14,790,000.00	15,086,000.00		15,086,000.00
2 → Other Operational Costs						
Services						
Software Tools						
Hardware						
Maintenance						
Facilities						
Telecommunications						
Training						
Contingency						
Misc. Operational Costs						
3 → Total Operational Costs	15,912,110.00	0.00	15,912,110.00	16,263,600.00		16,263,600.00

Figure 6 – Operational Expenditures

This table contains three summary lines, each column identifying a unique fiscal year.

- The “Staffing Costs Subtotal” line **1** is the sum total of the three lines below it.
- The “Other Operational Costs Subtotal” line **2** is the sum total of the detail below it.
- The “Total of Operational Costs” line **3** is the sum of the “Staffing Costs Subtotal” and “Other Operational Costs Subtotal” lines.

Additionally, the three fiscal year columns work in unison. Column A will be prepolulated by entries previously enter on the Current tab. Column B is where the user will enter information to adjust the current column to bring it in line with projected expectations. And column C will contain the new value that will be used when evaluating the solution. As an example, if the user should decide that more training is necessary they will enter a positive number; if they wish to reduce the training dollars they enter a negative number.

6.3.3 Revenues and Benefits

The table below contains information regarding the change to the expected revenues and benefits that will be necessary should we stay with the IT asset in its current state. The information will be summarized on the Cost Benefit & ROI Summary tab.

	2011 Current Revenue	2011 Impact on Revenue	2011 New Revenue	2012 Current Revenue	2012 Impact on Revenue	2012 New Revenue
1 → Total Revenues/Tangible Benefits						
Revenues						
Other						
2 → Net Benefit						
3 → Cumulative Net Benefit						

Figure 7 - Revenues and Benefits

There are three summary rows;

- The “Total Revenues / Tangible Benefits” line 1 reflects the sum total of the “Revenues” and “Other” lines.
- The “Net Benefit” line 2 reflects the result of subtracting the operating costs from “Total Revenues/Tangible Benefits”.
- The “Cumulative Net Benefit” line 3 reflects the bottom line. This line will be negative until total revenue exceeds operating cost. The values are cumulative in the previous fiscal years are summed with the current fiscal years Net Benefit.

Additionally, the three fiscal year columns work in unison. The “Current Revenue” will be prepopulated by entries previously enter on the Current tab. The “Impact on Revenue” column is where the user will enter information to adjust the current column to bring it in line with projections, otherwise known as the “New Revenue” column, which will be used when evaluating the solution. As an example, if the user should decide that more revenue will be realized they will enter a positive number, if they realize that revenue will decline they will enter a negative number.

6.4 Solution tabs

These tabs contain the performance metrics for solutions other than maintaining the current state and are used to help determine if the current asset(s) should be replaced with one of the other solutions recorded on the form. The information is grouped by fiscal years, on two tabs for each solution.

Keep in mind the individual solution tabs (solution 1, solution 2, solution 3) all function the same. This section will use the Solution 1 tab as a source for the examples and figures.

6.4.1 Project Expenditures

The tables below contain the amount and the types of expenditures expected for the project.

Cost Benefit Analysis Form Handbook

	Specify	2011	2012	2013	2014	2015	2016	2017	2018
Full-time IT S...									
Other Full-ti...									
Contract Staff									
Services									
Software Tools									
Hardware									
Maintenance									
Facilities									
Telecommun...									
Training									
IV & V									
Contingency									
Other 1									
Other 2									
Total Project...									

CBA-Solution1-Project Cost Other 1:

CBA-Solution1-Project Cost Other 2:

Figure 8 - Organizational Operational Expenditures (from the 1st solution tab)

	Specify	2019	2020	2021	2022	2023	2024	2025	Total
Full-time IT St...		151,320.00	321,960.00						473,280.00
Other Full-time...		151,320.00	321,960.00						473,280.00
Contract Staff		1,912,616.00	3,414,156.00						5,326,772.00
Services			1,575,461.00						1,575,461.00
Software Tools									
Hardware									
Maintenance									
Facilities									
Telecommun...									
Training			76,707.00						76,707.00
IV & V		11,000.00	17,000.00						28,000.00
Contingency			641,000.00						641,000.00
Other 1			7,500.00						7,500.00
Other 2			22,000.00						22,000.00
Total Project C...		2,226,256.00	6,397,744.00						8,624,000.00

CBA-Solution1-Project Cost Other 1:

CBA-Solution1-Project Cost Other 2:

Figure 9 - Organizational Operational Expenditures (from the 2nd solution tab)

The “Total Project” line represents the summation of all of the individual columns for each fiscal year.

Please note the ‘Other 1’ and ‘Other 2’ labels in the table, just to their right are text boxes (limited to 250 characters) where the user can store a short hint or description of what costs are being covered. And just under the table are two text boxes (limited to 300 characters) where the user can provide a better description of the types of costs being covered.

6.4.2 Organizational Staffing and Operational Expenditures

The tables below contain information regarding the change to the expected staffing levels and the operational costs that will be necessary should the current asset not be replaced.

	A. 2019 Current Staff	B. 2019 Impact on Staff (Addn'l Staff Required)	C. 2019 New Costs	A. 2020 Current Staff	B. 2020 Impact on Staff (Addn'l Staff Required)	C. 2020 New Staff
Total Staffing Required	111.55	0.00	111.55	111.55		111.55
# of Full-time IT Staff Required	0.30	1.00	1.30	0.30		0.30
# of Other Full-time Staff Required	17.25	-1.00	16.25	17.25		17.25
# of Contractors Required	94.00		94.00	94.00		94.00

Figure 10 – Staffing Levels

The “Total Staffing Required” line is the sum total of the three lines below it regardless of the column. The three columns work in unison – (A+B = C). The current staff and costs (column A) are derived from the Current Operational Expenditures Tab: Internal Staff Labor and Operational Expenditures tables and are locked. Column B is where the user will enter information to adjust the Current Staff column. And column C will contain the new staff total that will be used when evaluating the solution. If the user wishes to add additional staff they enter a positive number, if they wish to reduce staff they enter a negative number.

	A. 2019 Current Costs	B. 2019 Impact on Costs	C. 2019 New Costs	A. 2020 Current Costs	B. 2020 Impact on Costs	C. 2020 New Costs
Staffing Costs	15,912,110.00	0.00	15,912,110.00	16,263,600.00		16,263,600.00
Full-time IT Staff (Salaries & Benefits)	32,110.00	63,188.00	95,298.00	32,600.00		32,600.00
Other Full-time Staff (Salaries & Benefits for FT staff from dept...)	1,090,000.00	-63,188.00	1,026,812.00	1,145,000.00		1,145,000.00
Contract Staff	14,790,000.00		14,790,000.00	15,086,000.00		15,086,000.00
Other Operational Costs						
Services						
Software Tools						
Hardware						
Maintenance						
Facilities						
Telecommunications						
Training						
Contingency						
Misc. Operational Costs						
Total Operational Costs	15,912,110.00	0.00	15,912,110.00	16,263,600.00		16,263,600.00

Figure 11 - Operational Expenditures

The table above contains three summary lines.

- The “Staffing Costs Subtotal” line **1** is the sum total of the three lines below it.
- The “Other Operational Costs Subtotal” line **2** is the sum total of the detail below it.
- The “Total of Operational Costs” line **3** is the sum of the “Staffing Costs Subtotal” and “Other Operational Costs Subtotal” lines.

Additionally, the three fiscal year columns work in unison. Column A will be prepopulated by entries previously enter on the Current tab. Column B is where the user will enter information to adjust the current column to bring it in line with projected expectations. And column C will contain the new value that will be used when evaluating the solution. As an example, if the user should decide that more training is necessary they will enter a positive number; if they wish to reduce the training dollars they enter a negative number.

Note: On the CPGA Project Charter form, Resources and CBA Summary tab, O&M Resource’s tables - The O&M costs summary tables are locked and derived from the CBA chosen solution (non-editable). Each FY cost column is derived from the Project CBA form, the chosen Solution tab (Solution 1, 2, 3), Operational Costs Breakdown tables – the columns denoted with a “C” (e.g. C. 2011 New Costs). Completion of the Project CBA form’s data and the selection of a Solution on the CBA Cost Benefit & ROI Summary Tab are required to auto-populate these tables in the CPGA Project Charter.

On the CPGA Closeout Report, O&M Costs tab, the “Approved Charter Baseline Planned O&M Costs” and “Approved Charter Baseline Planned O&M Funding Source” tables are prepopulated by the values locked and derived from the CBA chosen solution (non-editable) and displayed on the CPGA Project Charter (see above).

6.4.3 Revenue Projection

	A. 2011 Current Revenue	B. 2011 Impact on Revenue	C. 2011 Net Revenue	A. 2012 Current Revenue	B. 2012 Impact on Revenue	C. 2012 Net Revenue
1 → Total Revenues/Tangible Benefits						
Revenues						
Federal Financial Participation (Grants)						
Cost Reduction/Avoidance						
Increased Activity Speed						
Improved Management						
Error Reduction						
Other						
2 → Net Benefit						
3 → Cumulative Net Benefit						

Figure 12 - Revenue Projection

There are three summary rows;

- The “Total Revenues / Tangible Benefits” line 1 affects the sum total of the “Revenues” and “Other” lines.
- The “Net Benefit” line 2 affects the result of subtracting the operating costs from Revenue.
- The “Cumulative Net Benefit” line 3 affects the bottom line. This line will be negative until total revenue exceeds operating cost. The values are cumulative in the previous fiscal year is summed with the current fiscal years Net Benefit.

Cost Benefit Analysis Form Handbook

Column A - Current Revenue is derived from the cost and revenue/tangible benefits data entered on the "Current Op Expenditures" and "Maintain Current State" tabs . In Column B - The 'Impact on Revenue' column information is to be provided by the user. If a negative number is provided it means that less revenue is to be expected. If a positive number is provided it means additional revenue is to be expected. The tool will auto-calculate Column C - Net Revenue.

A data entry example would be; if the user should decide that more revenue will be realized they will enter a positive number, if they realize that revenue will decline they will enter a negative number.

6.5 Cost Benefit & ROI Summary tab

6.5.1 Discount Rate

The first set of tables provides the user with the current discount rates as recognized by the Commonwealth. These are not constants and can change through the year. The user must enter the current discount rates in the second set of tables when they fill out the information in the CBA form. At this point the rates the user entered will be the rates used to calculate Costs Benefits and ROI and are recorded as of when the CBA was submitted. At some point the values in the top two tables will be changed by the CTP administrator based on changes to the discount rate by the Federal Reserve. The values in the second table are not to be changed once the project CBA is submitted, unless the CBA form is updated.

Cost/Benefit and Return on Investment Analysis Summary Report								
CBA Discount Rates - Treasury - This table contains the treasury discount rates provided by the CTP. They are volatile in nature and will be updated as the official discount rates change as prescribed by the treasury department.								
	2011	2012	2013	2014	2015	2016	2017	2018
Discount Rate	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
CBA Discount Rates - Treasury (2)								
	2019	2020	2021	2022	2023	2024	2025	
Discount Rate	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Cost/Benefit and Return on Investment Analysis Summary Report								
CBA Discount Rates - This table is used to hold the discount rates in effect when the information was provided. At that time, when the information was first provided, the contents of this table was the result of a copy-and-paste from the discount rates provided by the system in the table above.								
	2011	2012	2013	2014	2015	2016	2017	2018
Discount Rate	0.7500	0.7500	0.7500	0.7500	0.7500	0.7500	0.7500	0.7500
CBA Discount Rates (2)								
	2019	2020	2021	2022	2023	2024	2025	
Discount Rate	0.7500	0.7500	0.7500	0.7500	0.7500	0.7500	0.7500	0.7500

Figure 13 - Discount Rate tables

The discount rate is the interest rate charged to commercial banks and other depository institutions on loans they receive from their regional Federal Reserve Bank's lending facility--the discount window. The Federal Reserve Banks offer three discount window programs to depository institutions: primary credit, secondary credit, and seasonal credit, each with its own interest rate. All discount window loans are fully secured.

The discount rate charged for primary credit (the primary credit rate) is set above the usual level of short-term market interest rates. (Because primary credit is the Federal Reserve's main discount window program, the Federal Reserve at times uses the term "discount rate" to mean the primary credit rate.)

Information can be found at:

<http://www.frbdiscountwindow.org/index.cfm>

6.5.2 Maintain Current State Summary

This summary is limited in what it can display by its vary nature. This summary implies the continued use of the existing business process. This summary represents the cost of continuing the current operations, therefore the necessity of Breakeven, NPV, and ROI is not significant because there will be no project to recover from.

	2011	2012	2013	2014	2015	2016	2017	2018
Revenue								
Operational Costs								
Year to year Staffing Change								
Net Benefit								

CBA ROI Summary - Solution 0 (2)

	2019	2020	2021	2022	2023	2024	2025	Total
Revenue								
Operational Costs	15,912,110.00	16,263,600.00	16,573,100.00	16,990,600.00	17,368,100.00			83,107,510.00
Year to year Staffing Change	111.55	111.55	111.55	111.55	111.55			
Net Benefit	-15,912,110...	-16,263,600.00	-16,573,100.00	-16,990,600.00	-17,368,100.00			-83,107,510.00

Figure 14 - Maintain Current State Summary Tables

6.5.3 Solution Summaries

The tables below represent the summary of the detail information entered on the 'Solutions' tab. There are three sets of these tables and they will allow the different reviewers the opportunity to compare the various solutions against each other in an effort to determine the best alternative.

	2011	2012	2013	2014	2015	2016	2017	2018
Cost Benefit Analysis								
Revenue								
Operational Costs								
Total Project Cost								
Year to year Staffing Change								
ROI Analysis								
Net Benefit								

	2019	2020	2021	2022	2023	2024	2025	Total
Cost Benefit Analysis								
Revenue	25,882,500.00	26,400,500.00	26,841,500.00	27,466,250.00	28,015,750.00			134,606,500.00
Operational Costs	15,912,110.00	16,263,600.00	16,573,100.00	16,990,600.00	17,368,100.00			83,107,510.00
Total Project Cost	2,226,256.00	6,397,744.00						8,624,000.00
Year to year Staffing Change	111.55	111.55	111.55	111.55	111.55			
ROI Analysis								
Net Benefit	7,744,134.00	3,739,156.00	10,268,400.00	10,475,650.00	10,647,650.00			42,874,990.00
Payback Period (yrs)	0.000	Payback						How long it will t...
Breakeven Fiscal Year	2019	Payback						This is the year i...
Net Present Value (NPV)	16,323,658	NPV						NPV accounts for...
Return on Investment (ROI) %	497.16	ROI						

Figure 15 – Total Costs/Benefit and ROI Summary

Note: On the CPGA Project Charter form, Resources and CBA Summary tab, CBA Summary table - The Cost Benefit Analysis (CBA) Summary table is a locked (non-

editable) table displayed from the Project CBA form, Cost Benefit & ROI Summary tab, based on the chosen CBA solution. The Project CBA form MUST be completed to populate the table.

The values associated with the 'Net Savings' row are auto calculations using the 'Total Cost/Benefit' from the appropriate CBA solutions (i.e. solution 1, solution 2, solution 3) 3rd table in the 'Organizations Operational Cost / Impact Analysis' group box in the Project CBA form.

The values in the 'Total Project Cost' row are auto calculations using the 'Total Project Cost' from the appropriate solutions 'Project Cost Breakdown' group box in the Project CBA form.

On the CPGA Project Closeout Report, Expenditures And Funding tab, CBA Summary table - The Cost Benefit Analysis (CBA) Summary table is a locked (non-editable) table displayed from the Project CBA form, Cost Benefit & ROI Summary tab, based on the chosen CBA solution.

6.5.3.1 Revenue

Revenue is the Total Revenues / Tangible Benefits from the New column of the solution revenue tables (section 6.4.3).

6.5.3.2 Operational Costs

Operational Costs are the Total Operational Costs from the New column of the solution operational costs breakdown tables (section 6.4.2).

6.5.3.3 Total Project Cost

The values in this row were initially populated on the solution tab when the user entered the individual project costs (section 6.4.1).

6.5.3.4 Year to Year Staffing Change

The values associated with the 'Year to Year Staffing Change' row are auto calculations that sum the '# of Full-time IT Staff' + '# of Other Full-time Staff' + '# of Contractors Required'.

CBA Internal Staff Labor - 2011-2012 - Solution 1						
	A. 2011 Current Staff	B. 2011 Impact on Staff (Addtn' Staff Require.)	C. 2011 New Staff Total	A. 2012 Current Staff	B. 2012 Impact on Staff (Addtn'l Staff Required)	C. 2012 New Staff Total
# of Full-time IT Staff Required						
# of Other Full-time Staff Required						
# of Contractors Required						

Figure 16 - Year to Year Staffing Change source calculation

6.5.3.5 Net Benefit

The “Net Benefit” row is calculated as follows;

$$\text{Net Benefit} = \text{Revenue} - \text{Operational Costs} - \text{Project Costs}$$

6.5.3.6 Payback Period

Payback period calculates the number of years it will take to recover the investment costs. First it checks to see if the total net benefit is greater than zero, then it accomplishes its task by ‘walking’ through the individual ‘Net Benefit’ values until the sum is greater than zero.

The whole number is the number of years; the fraction represents the percentage of the remainder. It implies a constant revenue stream for the fiscal year which may not be appropriate.

6.5.3.7 Breakeven Fiscal Year

Breakeven Fiscal Year calculates the year breakeven will occur. First it checks to see if the total net benefit is greater than zero, then it accomplishes its task by ‘walking’ through the individual ‘Net Benefit’ values until the sum is greater than zero.

6.5.3.8 Net Present Value

Net Present Value calculates the NPV of the solution. It implements a standard calculation as shown below.

$$NPV = I_0 + \frac{I_1}{1+r} + \frac{I_2}{(1+r)^2} + \dots + \frac{I_n}{(1+r)^n}$$

- I_1 is the income, which is the value left after all costs/expenses have been subtracted. In this example we are referencing the “Net Benefit” row I_1 equating to the year 2020 in Figure 15 – Total Costs/Benefit and ROI Summary above.

- r is the discount rate. It's the value by which the present value is discounted so the estimate is viable in tomorrow's dollars.

6.5.3.9 Return On Investment Percentage

The Return On Investment (ROI) Percentage measures the efficiency of an investment. The calculation is as follows;

$$\text{ROI\%} = \left(\frac{\text{Total Revenue} - \text{Total Operational Costs} - \text{Total Project Costs}}{\text{Total Project Costs}} \right) * 100$$

The resulting percentage is an expression of the projects viability. Simplified, the higher the ROI the better and if the calculation should be negative then the project should not be undertaken.

6.6 Graphs tab

This tab has a total of five bar graphs associated with it; NPV, Payback Period, ROI Percentage, and Cumulative RIO. They are all self scaling ensuring an accurate relationship between the different solutions regardless of the values involved.

Cost Benefit Analysis Form Handbook



Figure 17 - Graphs form tab

7 Appendix

The information in this section illustrates the questions to ask when determining the potential benefits of a solution. They are provided to assist the agency or organization in identifying potential solutions listed in the CBA form.

7.1 Expanded services or products delivered to public and internal or external customers:

- **Improves ability to deliver** – Providing staff with access to information via desktop PC's allows them to respond to customer inquiries more accurately and quickly.
- **Improves access to services** – The investment increases the number of people reached. Customers can communicate with an agency by telephone, e-mail, or Internet in addition to existing mail services.
- **Improves access to information** – Internal users gain direct access to resources or information enabling them to perform daily tasks more efficiently. The Public can obtain information on tax issues, health services, etc. via the Internet or telephone.
- **Improves accuracy** – The investment improves accuracy by reducing the need for manual data entry or reducing number of data entry errors, thus improving integrity of data. This may also improve productivity and reduce operating costs by reducing time spent on error correction.
- **Improves compatibility** – One alternative is more compatible with existing facilities and procedures, requiring less training of personnel or less new equipment and software. System meets agency's IT architecture requirements.
- **Improves effectiveness and impact of information delivered** – On-line interactive training tutorials provide employees unlimited opportunities to improve skills, increase participation in training, and improve retention of new information. This may increase productivity, reduce turnover, etc.
- **Improves security** – System improves security in terms of fraud prevention, protection of confidential information, or enhances data integrity.
- **Reduces risk** – Back-up systems that reduce the risk of data loss or applications that improve timely delivery of critical information.

7.2 Cost Savings/Cost Avoidance:

- **Improves the ability to maintain a system** – Investments for which maintenance resources (personnel, experience, components) are more readily available. Ease of maintenance is relevant to both software and hardware.
- **Eliminates duplicate assets** – Investments that replace multiple, non-compatible, stand-alone systems.

- **Improves reliability** – System has better performance record (less down-time) than legacy process or system. Reductions in downtime inversely impact productivity and may also reduce labor costs.
- **Accommodates increases in workload or demand without additional costs** Systems that will 'avoid' hiring additional personnel to handle increased workload or new agency responsibilities in the future.
- **Reduces manual operations** – Systems that automate manual processes thereby freeing staff resources to perform other functions, reducing or eliminating FTE requirements. Systems that allow functions to be performed by lower level staff.
- **Improves efficiency** – Assets that improve access to information or tools that decrease time required to perform daily functions. A system may provide faster or more accurate aggregation and analyses of data.

7.3 Enhanced Work Environment:

- **Facilitates ease of use** – Although user-friendly systems are generally thought of in terms of increased efficiency or productivity, they can also improve the social and physical environment for employees.
- **Improves physical environment** – Systems that reduce the amount of paper clutter in the work area, noise, or eyestrain.
- **Improves response rates** – Assets that reduce stress by improving employees' ability to respond to customer inquiries.

8 Cost/Benefit Analysis Guide

8.1 Cost Savings/Cost Avoidance:

- **Improves the ability to maintain a system** – Investments for which maintenance resources (personnel, experience, components) are more readily available. Ease of maintenance is relevant to both software and hardware.
- **Eliminates duplicate assets** – Investments that replace multiple, non-compatible, stand-alone systems.
- **Improves reliability** – System has better performance record (less down-time) than legacy process or system. Reductions in downtime inversely impact productivity and may also reduce labor costs.
- **Accommodates increases in workload or demand without additional costs** Systems that will 'avoid' hiring additional personnel to handle increased workload or new agency responsibilities in the future.
- **Reduces manual operations** – Systems that automate manual processes thereby freeing staff resources to perform other functions, reducing or eliminating FTE requirements. Systems that allow functions to be performed by lower level staff.

- **Improves efficiency** – Assets that improve access to information or tools that decrease time required to perform daily functions. A system may provide faster or more accurate aggregation and analyses of data.

8.2 Enhanced Work Environment:

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- **Improves physical environment** – Systems that reduce the amount of paper clutter in the work area, noise, or eyestrain.
- **Improves response rates** – Assets that reduce stress by improving

9 Cost/Benefit Analysis Guide

The audience for these questions should be the project manager and project team.

Questionnaire for Initial Data Collection

1. What are the agency's/function's/group's major goals and strategies?
2. How will your agency change over the next five years?
3. Who are your customers/constituents? What do you provide to your Customers/constituents?
4. What is your "service"? How do your activities fit in with delivering that service?
5. What is success to you and to your stakeholders? How is that success measured?
6. What are the step-by-step activities that occur in your group to get your "service" to your "customer"?
7. How does your group interact with other groups? Who are you dependent on and who is dependent on you for success?
8. How many people are involved in your group? How many projects, activities? What is the average project time?
9. What are your average costs of labor and other factors?
10. Where do you see the most problems in accomplishing your job (in your group department, agency)?
11. What are the major problem areas you plan to address this year? How do you rank them in importance?
12. How does this problem hurt your group, department, agency, etc.? Are you losing time, money, quality, etc.? How much? What is the impact to your group and your agency?

10 Cost/Benefit Analysis Guide

The audience for these questions should be the project manager and project team.

Questionnaire for Benefits Verification

1. What benefits do you expect to see from these proposed changes? Can you see [specific benefit] occurring?
2. How much improvement do you expect in time, quality, cost reduction for labor, materials, etc., cost avoidance for labor, etc., revenue?
3. Will all the benefits occur in your area [direct benefits] or will some occur in other areas [indirect benefits]?
4. Do you agree that this proposal can help you address your problems?
5. Do the benefits look right to you and do you believe that this solution will generate benefits in the estimate ranges?
6. Here are some additional benefits that we have uncovered. Do you think you could see any of these occurring with this investment?
7. Are there any potential benefits missing from the list?
8. Are there any additional expenditures that you may need to make if you implement this solution that I am proposing?
9. How would you use any time benefits achieved by this investment? To lower labor costs, increase revenues or a mixture of the two?
10. I have made a summary sheet of the expected amount of benefits that we agreed could result from this investment, could you please help me estimate the dollar value for each of these?
11. What percentage of each of the benefits we discussed earlier do you feel could be attributed to the proposal?
12. Do these benefit estimates look okay? If not, how would you change them?
13. What is high, low, most likely levels of benefits you would expect to see from implementing this proposal?
14. Do you feel that you have all the information you need and that your managers need to understand the value of this proposal to your business?
15. Do you understand the strategic impact of this investment; how it will change the way you do business, and how to manage it to achieve your desired goals and benefits?
16. How can we prove the value of this investment to your senior managers?