



Calhoun: The NPS Institutional Archive
DSpace Repository

Faculty and Researchers

Faculty and Researchers' Publications

2012-01-04

Return on investment analysis: Applying a private sector approach to the public sector

Jones, LR

Prime Journal of Business Administration and Management (BAM), ISSN: 2251-1261,
Vol. 2(1), pp. 426-435, January 4th, 2012
<https://hdl.handle.net/10945/40469>

This publication is a work of the U.S. Government as defined in Title 17, United States Code, Section 101. Copyright protection is not available for this work in the United States.

Downloaded from NPS Archive: Calhoun



Calhoun is the Naval Postgraduate School's public access digital repository for research materials and institutional publications created by the NPS community. Calhoun is named for Professor of Mathematics Guy K. Calhoun, NPS's first appointed -- and published -- scholarly author.

Dudley Knox Library / Naval Postgraduate School
411 Dyer Road / 1 University Circle
Monterey, California USA 93943

<http://www.nps.edu/library>



**Return on investment analysis:
Applying a private sector approach to
the public sector**

Full Length Research

Return on investment analysis: Applying a private sector approach to the public sector

LR Jones

Distinguished University Professor and George F. A. Wagner Professor of Public Management, Graduate School of Business and Public Policy, NPS, Monterey, CA USA 93942. E-mail: dukedmb@aol.com or lrjones@nps.edu

Accepted 19th December, 2011

In an environment of scarce resources and rising government deficits the public not only expects but demands greater accountability for the spending of public funds. This demand has created a trend in the public sector, not only in the United States, but worldwide, towards the importation of private sector business analysis practices to improve government accountability-oriented analysis. One example is increased emphasis on return on investment (ROI) analysis in public sector organizations. Development and application of ROI analysis is challenging in the public sector since most government organizations do not generate profit necessary for calculation of ROI in the manner in which it is done in the private sector. This paper addresses previous attempts at using ROI in the public sector, identifying whether these attempts properly used ROI and what prevented their ultimate success in terms of use value. This paper argues that properly designed and conducted ROI analysis, based on methods used successfully in the private sector, can better reveal how and for what goods and services public money is spent and a means for evaluating whether it was spent well in providing goods and services. The methodology developed in this study provides a means for comparing the value derived from investment and work performed by and for government using an approach to ROI based on private sector methods.

Keywords: Return on investment (RIO), public sector, private sector.

INTRODUCTION

Return on investment (ROI) is one of the key methods used to quantify the level of success achieved or achievable in a business endeavor. The concept of ROI is used throughout private industry not only to determine past results, but also to evaluate the current situation and as a decision making tool for the future. The advantages of ROI are clear in that it provides the flexibility to anticipate output changes in advance. This benefit results in the ability to not only preview the future in a real world sense, but also to modify the inputs to the numerator and denominator of the equation to model potential courses of action for the enterprise.

Although a useful concept, ROI does not easily transition for use in the public sector. Unlike private enterprise, the public sector has no "profit" or "total sales" to use in the equation (With respect to total sales, revenue isn't directly relevant to ROI, but asset turnover ratios can be calculated). The increasing need for some method to quantify ROI in the public arena has led to multiple attempts from a diverse group of public enterprises with varying results (We may note this is the purpose of cost benefit analysis wherein, for service centers, through estimation of a shadow price a quasi

profit may be estimated to produce a measure of ROI or EVA. This approach is not followed in this paper. On this methodology see Anthony E. Boardman, D. H. Greenberg, A. R. Vining, *Cost Benefit Analysis: Concepts and Practice*, (Upper Saddle River, NJ: Prentice Hall, 2001). The Australian government placed increased emphasis on what they termed the "value added" approach in an effort to determine the output they were receiving as a result of budgetary expenditures. The Royal New Zealand Navy desired a determination of ROI for the implementation of a retention bonus plan used to control the attrition problem that was being experienced with marine engineers. Both of these results were somewhat mixed with valuable lessons learned. The United States Postal Service (USPS) met with a greater level of success in their effort, due largely to the fact that they are run much more like a private enterprise. Although not seeking to be "profitable," the USPS does generate revenue which can be used in the numerator of the formula which when divided by the USPS asset base in the denominator results in a fairly conventional ROI. Finally, the US Navy Dental community effort was much more ambitious in that it attempted to convert non cash

Table 1: Selected Financial Data for PepsiCo: 2001 (in millions of dollars)

Earnings Before Interest and Taxes	\$4, 181
Net Income (after Interest and Taxes)	\$2, 662
Total Assets	\$21, 695
Total Shareholder Equity	\$8, 648

Source: Author, 2009

outputs into cash equivalents in order to closely adhere to the traditional ROI formula. The resulting Navy Dental ROI was dogged by the questionable accuracy of some inputs, but the overall approach remained fundamentally sound.

The previous efforts focused on in this study have helped define the need for a new method to determine ROI in public sector enterprises. The intent of this paper is to review the previous efforts and to develop a new approach for attaining this important goal.

Traditional versus notional ROI

Traditional ROI

ROI has traditionally been measured in the private sector to quantify an organization’s past, present, and potential future performance. There are several methods by which an organization can determine its ROI. Most compare the net financial output of a company, or profit, to the financial input. One of the most common methods is to compute a percentage return on a company’s assets. An organization can determine how efficiently it has used its assets by comparing a period’s operating income to the total amount the company has invested in the assets that produced that income. ROI is traditionally calculated as follows (Ray H. Garrison and Eric W. Noreen, *Managerial Accounting* (San Francisco: McGraw-Hill Irwin, 2003), 542. It may be noted that private sector finance researchers sometimes refer to this method as "accounting ROI" (or Return on Assets -- ROA)):

$$\text{Return on investment} = \frac{\text{Net operating income}}{\text{Average operating assets}}$$

Net operating income is the difference between revenue and expenses, usually before taxes and interest. An average asset base is normally used since the amount of assets in use may have changed during the period of measurement. Regardless of the exact method of measurement, a higher return indicates a more proficient use of organizational assets and ultimately a higher return for its shareholders.

ROI calculations also may be used to determine the potential reward of a single investment decision or to assist in choosing between multiple investment options. For a single investment decision, forecasted streams of revenue are estimated and compared to the expected capital investment and operating costs. Under traditional

formulations these are compared over the life of the proposed project and used to determine an internal rate of return (IRR), actually a forecasted ROI. The IRR is then compared to a firm’s cost of capital for a single investment decision. It can also be compared to the IRR forecasted from other investment decisions in the case of multiple options to assist in choosing between them. With reasonable forecasting accuracy, this becomes an effective tool used in the private sector for deciding between capital venture decisions.

There are two methods frequently used to determine a corporation’s ROI. Consider an investor deciding whether or not to make an investment in PepsiCo in 2002. One method for estimating PepsiCo’s future performance is to look at its previous year’s use of assets. This is commonly referred to as an organization’s return on assets, or ROA. This was the method discussed in the previous section. Selected data for PepsiCo taken from 2001 are presented in table 1 (Richard et al. 2004).

To determine PepsiCo’s ROA for 2001, their earnings before interest and taxes are taken from the income statement and must be divided by their total assets from the balance sheet. The result is then multiplied by one hundred to produce a percentage ROA. Thus, for PepsiCo in 2001;

$$\text{ROA (\%)} = \frac{\$4.2\text{B}}{\$21.7\text{B}} \times 100 = 19.3\%$$

This indicates that every dollar invested in assets at PepsiCo yielded 19.3 cents of return in 2001 (The best numerator is free cash flow, with depreciation added back in).

Another, more relevant method to the investor would be to determine PepsiCo’s return on equity, or ROE for 2001 (A significant difference between public and private entities is the method of financing. A private entity can be financed through both debt and equity, which leads to a difference between ROI and Return on Equity or ROE. The method of financing a public entity can be taken into account in choosing ROE over ROI, such as when a project is financed through both bonds and taxation, but this subtlety is not explored further in this paper). This explicitly gives the return on investor equity in PepsiCo. ROE is determined by dividing the net income (income after interest and taxes) by the corporation’s total shareholder equity. The result is then multiplied by one hundred to produce a percentage ROE. Thus for PepsiCo in 2001;

$$\text{ROE (\%)} = \frac{\$2.7\text{B}}{\$8.6\text{B}} \times 100 = 31.4\%$$

This indicates that every dollar invested in PepsiCo by investors yielded 31.4 cents of return to the shareholders in 2001.

It is important to keep in mind that taken on its own the ROI is of limited value. In this example it would be wise to compare the ROA and ROE for PepsiCo to prior years or with other companies in the same business during the same year. This comparability is very helpful in determining if the ROI is superior, average, or mediocre. Careful evaluation of the inputs to the ROI formula can uncover what may be the root of the success or problem.

Public sector ROI calculations are considerably more problematic to utilize than in private industry. The traditional method of determining investment returns in the private sector is not directly compatible with many public sector organizations. Consider how a public sector organization would determine its financial output. Many public sector organizations do not produce revenues or generate profits as outputs. Therefore, their outputs are difficult to quantify in dollars. Instead, they provide a service or capability to the public. Oftentimes this service or capability is unique to the public sector and is not produced by the private sector. This increases the difficulty when trying to value these unique services or capabilities. For example, how much value is added to the respective service when another tank or fighter jet is produced? Certainly these costs are known, at least approximately. However, it is difficult to quantify their value added to the Army or Air Force. Placing dollar values on these items is complex since similar items are not valued in the private sector. The value added to the services from these items cannot be easily measured in dollars. This makes the use of traditional ROI criteria impossible (There is a way around this problem in some cases. For example, for a municipality it may be argued that there is a direct analog to private sector share price, that is, the market value of the land within the jurisdiction's boundaries).

Some public sector organizations could be measured by the equivalent value of the service or capability provided in the private sector. For example, a comparison could be made between the United States Postal Service and United Parcel Service of America, Inc. Perhaps a cost comparison for compatible services between private and public sector organizations could be used to measure performance. However, many public sector companies do not have comparable organizations in the private sector. For example, consider the Department of Defense. The DoD provides defensive and offensive capability for the United States. This capability cannot be measured against the private sector due to the uniqueness of the services it provides. Therefore, to facilitate a ROI metric for many public sector organizations, a different approach needs to be used.

Notional ROI

ROI measurements are under exploration in the public sector for three primary reasons. First, as with private sector corporations under specified circumstances, there are always significantly more investment opportunities

than public funds available (Despite the common view that this is always the case for private sector firms, this assumption is not made in private finance. The assumption is that if an investment is wealth creating it should be made. This logic is even more relevant to the public sector, although as we know from our understanding of public budgeting, typically there are liquidity issues that prevent some investments that would produce positive returns from being made, especially in fiscally constrained jurisdictions). There is intense competitive pressure between organizations to continually prove their need for additional or even continued program funding. Deciding between these alternatives is oftentimes subjective in nature since objective data is not available. Realistically, some public programs will be funded regardless of their ROI. However, ROI measurements could provide one metric to objectively decide between investment alternatives in public programs. They could also be used by organizations to show their value added to the public, and consequently provide support for their continued funding. Second, increased public spending and rising budget deficits have considerably raised the public's concern for the way the public sector spends its money. There has been a notable increase in the required accountability of the public sector to the taxpayers. Evidence of this is the Government Performance and Results Act of 1993. The general purpose of this legislation is to establish metrics within the United States government to hold organizations accountable (Phillips and Phillips 2002). ROI measurements are one way this accountability requirement to taxpayers might be better met. Finally, there is a long-term trend importing selected successful business practices from the private sector and adapting them for use in government, for example, from PPBS in the 1960s to just in time logistics in the 2000s. This is no surprise since many elected officials and public sector leaders have had previous careers in the private sector. Further, the private sector is viewed by much of the American public as more efficient than the public sector. The public appears to assume that unless a private organization produces a unique product or service that is in demand and meets customer preferences efficiently the firm will not survive. Despite examples to the contrary, there is the perception that private firms must perform efficiently to survive in competitive markets. While market pressures are not present in the public sector to the same degree, fiscal exigencies such as those present when the economy is in recession are likely to promote efforts to increase efficiency and cost effectiveness in the public sector. ROI measurement is a private sector financial measure that may be found useful in application in the public sector.

Past experience demonstrating the inability to apply ROI techniques to many organizations in the public sector indicates that to do so successfully require a different approach than used before. One such approach

includes the use of cost effectiveness analysis to provide a useful framework with which to assign weights to the numerator variables. Boardman et al. (2001) addresses this issue as follows:

If the analyst is unable...to monetize the major benefit, then cost effectiveness analysis may be appropriate. Because not all of the impacts can be monetized, it is not possible to estimate net benefits. The analyst can, however, construct a ratio involving the quantitative, but non-monetized, benefit and total dollar costs (Boardman et al. , 2001).

This is the approach used in this paper, with the resulting formula producing a non-monetary output considered to be the notional return on investment, or NROI (The first chapter of Boardman et al. , (2001) explains why ratio measures are usually inappropriate. The authors argue that cost benefit analysis is clearly preferable to ratio analysis for use in the public sector. However, this paper argues that this is not always the case). In order for the NROI formula to be of credible value, weights must be assigned to each of the numerator variables. Weights are indicative of how the decision makers prefer to balance the impact of the attributes. This step is extremely important since the weight distribution has a tremendous impact on the output. Determination of weights can be an objective result of models and data analysis, a subjective result of discussion by the decision makers, or a combination of both. There are four common methods for determining weights: equal weighting, rank reciprocal, pair-wise comparison, and direct assessment.

The equal weighting method simply assigns equivalent weights to all of the variables. The rank reciprocal method has four steps. First, each variable is ranked in order of relative importance. Next the reciprocal of the ranks is taken (1/1, 1/2, 1/3, etc). The resulting fractions are then added together using a common denominator to create a new base ($60/60 + 30/60 + 20/60 + 15/60 + 12/60 + 10/60 = 147/60$). Finally, the original reciprocals for each variable are divided by the new base (147/60) with the resulting distribution being used for weighting. The equal weighting and rank reciprocal methods generally do not provide a high enough level of subjective scrutiny to be of value in a detailed project. With the pair-wise comparison method, the decision makers are provided a specific number of points to be distributed as they see fit between the variables. After discussion, each variable is assigned a numerical value. The sum of the values is then used as the denominator for the variable weighting, with the numerator being the assigned numerical value. Like the previous two methods; pair-wise also fails to provide enough ability to fine-tune the weighting distribution for a detailed project. The direct assessment method uses deductive reasoning to determine and assign weights to each variable. Although this method is purely subjective, it is less random and can easily be modified as necessary. The subjective nature of

direct assessment can be alleviated to some extent by using a number of technical experts to develop the weighting values to be used in the formula.

Once weightings have been assigned, the non-monetized value of the numerator variables can be determined. After adding the variables together, the resulting numerator value is divided by the asset base to provide an NROI output. The validity of this NROI on its own is minimal. Trend analysis is required, using subsequent alterations to the numerator variables for the first ship in the class as it is completed and compared with independent data from the second ship in the class as it progresses. Essentially, the first NROI developed sets a baseline that is used to compare with subsequent outputs for the same project. The trend data from the first project can then be analyzed to determine if priorities can be adjusted for the second project in order to improve the output. Additionally, comparisons can be made between projects provided the category modifiers are the same and the scope of the project is similar.

While it is important to provide weights to the categories used in the numerator of the equation, it is even more important if at all possible to use monetary values for the NROI formula. In *The Bottomline on ROI*, while discussing the determination of ROI in the public sector, Patricia Phillips states that "converting data to monetary benefits is critical...the process is challenging, particularly with soft data, but can be methodically accomplished" (Phillips and Phillips 2002). For the formula to be most applicable for the purpose of comparing the past, present, and future NROI of a number of projects, it was determined that the effort must be expended to convert the data to monetary values. This would also serve to provide an NROI as near to traditional as possible for a public sector organization.

Previous efforts at developing ROI in the public sector

Australia

In an attempt to justify government acquisitions, Australia's government continues to focus on improving its own ability to develop and implement ROI criteria. In a society vigorously competing for scarce public resources, receiving the best value for money spent has become central to government policy. The Australian Commonwealth demands this accountability. In response, Australia's government has taken strides to emphasize the development of ROI criteria to make acquisition decisions throughout its governmental departments. However, the research supporting this study was unable to find a specific example where ROI criteria were successfully developed and implemented by a governmental organization. Dr. Allen Hawke, Australia's previous Secretary of Defense, acknowledges the public's frustration with their lack of success to date. According to Dr Hawke's address in February of 2000, "there is a widespread dissatisfaction with Defense's

Performance (regarding Australia's Defense Organization use of funds). In essence we have a credibility problem" (Hawke 2000).

Australia's Department of Finance and Administration (ADOFA) is responsible for providing direction to Australia's ministries in making procurement decisions. Instead of simply choosing the lowest cost alternative, ADOFA emphasizes the "achievement of value for money" (Australia Department of Finance and Administration, 2003). Among other things, this method weighs the ability of the alternatives to meet the stated objectives, the reliability and reputation of the contractor, and the whole of life costs instead of just the initial procurement cost. Instead of providing structured guidance to determine ROI, ADOFA provides a substantial list of things to consider and leaves it to the particular agency to identify and weigh those things that apply. Due to the unique benefits of each procurement decision, this general approach may be appropriate. However, recent comments from Australia's Defense Procurement Review indicate a lack of success thus far within the acquisition community. The review concludes with the following comment;

Our review of the acquisition process has led us to conclude that there is no single cause of the failures that have become apparent in the development of capability and the acquisition and support of defense equipment (Australia Dept. of Defense, 2003: 47).

The Australian government does acknowledge the need to consider ROI when making procurement decisions. However, by merely emphasizing value for money in broad terms, they are not actually implementing quantitative ROI criteria within their government. They do highlight the need to consider many important factors other than costs for procurement decisions such as quality and contractor performance. Yet, they do not provide a universal method for considering the weighting of these factors so that decisions can be consistently made the same way across the different ministries. Perhaps this inconsistency is one of the reasons for their continued lack of success within the Department of Defence acquisition community.

New Zealand

The following ROI case concerning the Royal New Zealand Navy (RNZN) is summarized from a case study authored by Beryl Ann Oldham, Paul Toulson, Brenda Sayers, and Graham Hart. The RNZN had encountered considerable difficulty retaining their marine engineers (ME) in the mid 1990s due to high attrition rates. The ME community is responsible for many of the complex systems aboard the RNZN's fleet ships including operation and maintenance of diesel engines, gas turbines, electrical generators, and air conditioning and refrigeration plants (Royal New Zealand Navy, 2004). The attrition problem was so significant that the ability of the RNZN to maintain an acceptable operations tempo

was threatened. Several suggestions were made in an effort to reduce the ME attrition rate. These measures included improved ME career management initiatives, better management of leave and maintenance periods, improved pay, compensation time for working weekends, and the more controversial Marine Engineer Retention Bonus Scheme (MERBS). It was believed that implementation of an immediate retention bonus was imperative to control the attrition problem in the short run since the other proposed initiatives would be slower to take effect (Oldham, et al. , 2002).

The MERBS was an expensive human resource endeavor for the RNZN. MERBS costs included both administrative program set up costs and the retention payments to personnel themselves. These overall costs were estimated at almost five million Australian dollars (144). However, the MERBS was considered a successful initiative since it did reduce attrition rate for the MEs to an acceptable level. Unfortunately, it was difficult to determine just how successful the MERBS was, especially considering that other retention initiatives were occurring simultaneously. Consequently, an ROI study was conducted to determine the isolated effect of the MERBS on ME retention in the RNZN.

The monetary benefits of any retention program are the avoided expenses for replacement and training of new personnel and the separation costs incurred for personnel leaving the military. There are also some less tangible benefits including higher experience levels, improved morale and increased flexibility. However, in order to remain objective, the focus of the study was placed on the monetary benefits achieved by the MERBS. There were two approaches taken to isolate the monetary benefits of the MERBS on retention.

The first approach was more subjective in nature and involved the use of a questionnaire taken by both the participants in the MERBS and their managers. The questions were tailored to evaluate the effectiveness of the MERBS and its isolated impact on the ME participants to stay in the RNZN. It was ultimately determined, based on these questionnaires, that forty one percent of the participants' decisions to stay in the RNZN were influenced by the MERBS. These forty one percent were then asked to rate the accuracy of their answer regarding the influence of the bonus payments on their decision to stay. The reply indicated they were ninety-three percent confident in the accuracy of their answer regarding the MERBS influence on their decision to stay (Oldham, et al. , 2002). The actual monetary benefit was determined by multiplying the participants' impact estimation of the retention payments by the estimated savings of retention for each of the 170 personnel participating in the MERBS. The estimated savings per participant and the detailed calculation of the ROI from this approach is shown in table 2.

The second approach involved a more objective approach using retention trend data. Predicted turnover

Table 2a: Determining ROI with the Participant Impact Estimation

Number of participants in the MERBS at the end of three year period	<i>A</i>	170
Estimated separation cost per ME leaving the service	<i>B</i>	\$4,260
Average replacement cost per ME leaving the service	<i>C</i>	\$105,133
Percentage of decision to stay influenced by retention payments	<i>D</i>	41%

Table 2b: Determining ROI with the Participant Impact Estimation

Number of participants in the MERBS at the end of three year period	<i>A</i>	170
Estimated separation cost per ME leaving the service	<i>B</i>	\$4,260
Average replacement cost per ME leaving the service	<i>C</i>	\$105,133
Percentage of decision to stay influenced by retention payments	<i>D</i>	41%
Percentage confidence in decision to stay influenced by retention payments	<i>E</i>	93%
Participants' estimation of retention payment's impact	$F = D \times E$	38%
Monetary benefits	$G = (B + C) \times A \times F$	\$7,066,789
Program costs	<i>H</i>	\$4,926,504
ROI from participant impact estimation	$\frac{G - H}{H}$	43%

Source: Author, 2009.

Table 3: Determining ROI with the Forecasting Method

Number of personnel retained attributed to MERBS initiative	<i>A</i>	73
Estimated separation cost per ME leaving the service	<i>B</i>	\$4,260
Average replacement cost per ME leaving the service	<i>C</i>	\$105,133
Monetary benefits	$D = (B + C) \times A$	\$7,985,689
Program costs	<i>E</i>	\$4,926,504
ROI from participant impact estimation	$\frac{D - E}{E}$	62%

Source: Author, 2009.

of ME personnel without the retention payments was estimated based on historical trends in both ME and non-ME personnel prior to the MERBS period. Based on previous trends of non-ME and ME personnel before the MERBS initiative, ME turnover averaged 5.5 percent higher than non-ME personnel (Oldham, et al., 2002). These data were used to determine an expected ME turnover without the retention payments. This was compared to the actual turnover during the MERBS period to determine an actual number of ME participants that were retained as a result of the bonus payments. Based on this comparison, it was concluded that seventy-three additional personnel were retained during the MERBS period than was predicted based on trend data without the MERBS initiative. The detailed determination of the ROI based on this second approach is shown in table 3.

It is interesting to note the similarities and differences between the two approaches. Both approaches determine program costs the same way. Even though the methods of determining monetary benefits are very different, the results are surprisingly similar. The participant impact estimation yields a monetary benefit of approximately seven million dollars while the forecasting method yields a monetary benefit of approximately eight million dollars. However, these numbers do yield significantly different ROI for the MERBS initiative.

The question then becomes which approach is more valid? Both approaches are logical and defensible. The forecasting approach is more objective since it is based entirely on data and trend analysis. However, the shortcoming is that it does not entirely isolate the effect of the MERBS initiative from the other retention initiatives occurring simultaneously. It is plausible that most of the

seventy-three additional personnel retained were a result of the MERBS, but it is certainly possible that other proposed initiatives played a factor. The participant impact estimation approach is clearly more subjective since it is based on responses from a questionnaire. Conversely, it does better address the isolated effect of the MERBS initiative through the inclusion of specific questions in the questionnaire. Unfortunately, ROI methodologies based on nontraditional methods cannot always be purely objective. This is what makes it so challenging in the public sector. The objective is to develop a credible methodology, which is what was accomplished here. Therefore, both methodologies are valid as long as their shortcomings are kept in mind.

One lesson learned in the case of the RNZN relates to data collection. Ideally, the decision to perform an ROI determination is made prior to program implementation. This way data required can be determined and recorded while the program is taking place. For this case, the decision to determine the ROI for the MERBS was not made until after the program was implemented and well under way. Therefore, many data collection opportunities were missed. The recommendation of the study is to consider ROI evaluations and associated data collection needs during the development phase of program initiatives if possible (Oldham, et al. , 2002). Another lesson learned from the case was the extent taken to keep the ROI methodology simple. The RNZN could have attempted to determine monetary values for more complex but less tangible benefits. For example, they could have attempted to determine the monetary benefit of the increased operations tempo or increased experience levels available because of the higher retention rate. However, it is easy to imagine that this would involve potentially long and complex mathematical formulae and additional subjectivity. By avoiding these attempts, the ROI methodology is easier to understand and more credible. In this example there is a service center, a shadow price, and a quasi profit measure can be calculated.

United States Postal Service

The United States Postal Service used an Economic Value Added (EVA) program to determine their ROI from 1996-2002. EVA was calculated by determining the net operating income and subtracting a fee proportional to the cost of the assets used to produce that income (United States Postal Service, 2004). This difference represented a positive net cash flow that added financial value to the post office. A higher EVA indicated a more efficient use of assets. Consequently, senior post office executives were rewarded for performance at the USPS based on this figure. This provided financial incentive for post office employees to seek out new and better ways to improve efficiency within the organization. This program was credited with contributing to the \$3.5 billion in net income earned by the USPS from 1996-2000 (United

States Postal Service, 2004). However, amid strong controversy relating to the calculation of EVA program incentive bonuses, the effort was abandoned in 2002.

The USPS 2003 Annual Report cites the continued use of ROI criteria for capital venture decision-making. Unlike many public sector organizations, the USPS is one of the few public sector companies that generate revenue. This facilitates using the traditional method of calculating ROI. The USPS continues to invest in automation equipment to reduce personnel work hours in mail processing and delivery (United States Postal Service, 2003). The cost savings realized from automation is then compared to the cost of acquiring the required equipment for making procurement decisions. The USPS also uses a Cash Flow/Capital Expenditure (CAPEX) ratio as a benchmark for assisting in making capital purchase decisions (United States Postal Service, 2004). The additional yearly cash flow to operations is compared to the yearly cash outlays to support the project. This helps to determine the attractiveness of the proposed project and the required need to borrow funds to support it.

The basis for determining economic value added at the USPS had significant flaws. The idea of subtracting additional costs from increased benefits to determine value added from a given investment is sound. However, the application of the EVA Variable Pay Program was inconsistent when overall USPS performance is considered. For example, the USPS lost \$199 million in fiscal year 2000 but still paid out over \$280 million in performance bonuses (Lexington Institute, 2001). As have observed during the U. S. federal government bank and insurance company bailout as part of the response to the financial stress conditions of 2008-2009, some critics deemed it improper and unethical for organizations that lose money to pay out significant sums of money in performance bonuses. In fact, the reason USPS lost money in the year in question was due to their bonus payouts. Of course, USPS is not supposed to earn a profit; their objective is to break even. Still, ROI measurements including those employing EVA appear not credible if they indicate positive results when other metrics such as negative net income indicate the contrary.

The USPS uses simple and intuitive methods for determining ROI for evaluating investment decisions. The use of cost savings as a basis for determining ROI is a commonly used method for public sector organizations. This is because many procurement decisions made by public sector organizations involve investments that will ultimately improve efficiency. If these efficiencies are able to be quantified, they can be used as a basis for comparison to the required capital expenditure to determine an ROI. The CAPEX ratio used by the USPS to evaluate capital purchase decisions is also an intuitive way to determine an ROI. Comparing cash flows to required capital expenditures is very similar to a net present value calculation commonly used in the private

sector to evaluate investment alternatives. It is important to emphasize that the USPS does generate annual revenues which lends itself to the use of traditional ROI metrics. This is uncommon among most other public sector organizations.

U. S. Navy Dental Corps

In response to the United States’ Chief of Naval Operations’ call for better decision-making tools, the Navy Dental Corps (NDC) has developed a simple metric to determine ROI at the branch clinic level. Captain York, the Navy representative at the Tri-Service Center for Oral Health Studies, spearheaded the effort to determine a practical method for defining NDC’s return for investment dollars. While not using the traditional method of ROI that compares earnings to assets, this effort provides an easily understood metric to quantify performance at the branch clinic level.

NDC’s ROI formula compares a branch clinic’s quarterly output, defined as Dental Weighted Values (DWVs), to its required investment in funding (APF) and military labor (Milab). The formula is as follows (Mitton 2004):

$$ROI = \frac{(DWV \times 100) - [(APF + Milab) \times 0.25]}{(APF + Milab) \times 0.25}$$

Branch APF is the operation and maintenance funding allocated to the clinic. Both Branch APF and Annual Branch Milab are converted to quarterly values to determine quarterly ROI. DWVs and Annual Branch Milab are determined through separate data collecting programs described next.

DWVs are determined by input from the branch clinic into a program known as DENCAS. The clinic enters the different procedures performed on a given day using American Dental Association (ADA) procedural codes, known as Common Dental Terminology (CDT) codes. CDT codes are converted into DWVs that are essentially equal to one hundred dollars worth of dental services. This result is multiplied by one hundred to convert the DWVs directly into dollars for use in the ROI formula. Annual branch clinic labor is determined by the collection of data into the Medical Expense and Performance Reporting System (MEPRS). Branch clinic employees specifically document their hours worked performing a variety of individual tasks on MEPRS sheets. Different tasks such as various medical duties, training, and even leave/liberty times are documented. These data are correlated at the comptroller level to determine military labor hours and is converted into a dollar figure based on the rank and rate of the military employees working at the clinic.

The Navy Dental ROI formula discussed above is no longer used for three reasons. First, there is significant skepticism regarding the quality of the data being tracked for use in the calculation of ROI. Specifically mentioned was the inaccurate data collected by MEPRS. Many

dental employees failed to log their hours on a daily basis; instead, they would record their hours on a weekly or monthly basis. This brings the accuracy of the type and number of hours into question due to the delay time in recording. Many times employees would wait until the end of the month and simply log eight hours of work arbitrarily for each day. Commander Mitton, from the Navy Bureau of Medicine and Surgery in Washington DC, referred to this popular method as “logging straight eights” (Mitton 2004). It is also difficult to use this formula for comparison. Different branch dental clinics may be responsible for different operating costs. For example, some of the clinics are responsible for paying their rent and utilities while other clinics are provided with these resources free of charge directly by the base command. This directly affects the amount of Branch APF the clinic would receive and, consequently, affected the results of the ROI formula.

Finally, the Navy Dental ROI formula does not include many of the cost elements required to staff and operate a branch dental facility. For example, large expenses such as the cost of training Navy dentists and dental technicians are not included. Other large costs such as accession bonuses for dentists and depreciation expenses for major equipment are also not included. Therefore, ROI for the Navy branch dental clinics needed to be more adequately defined. As a consequence, Captain York developed a more robust formula to be used in calculating ROI for Navy Dental clinics. Although similar to the previously discussed formula, it also includes many of the lacking cost elements. ROI is calculated as shown below (York 2004):

$$ROI = \frac{\text{Production Value} - \text{Cost of Production}}{\text{Cost of Production}}$$

Production value is determined similar to the DWVs calculated in the original formula. The cost of production, however, includes significantly more cost elements; these include system costs, which are the allocated training costs to the particular dental clinic from the dental training pipeline. These were not included in the original formula but are real costs burdened by the NDC and should be included. These system costs are divided between all the clinics proportionately based on the number of dental technicians and dental officers employed at the clinic.

There is still significant variation between the branch dental clinics use of the improved ROI formula. Table 4 compares the ROI calculated by the above formula for all the Navy branch clinics. Note that the ROI varies from approximately negative ten percent to over one hundred percent. These variations are not due solely to differences in performance levels. For example, NNDC is responsible for the costs of the Naval Dental Postgraduate School. Due to this fact, the NNDC ROI includes the impact of manpower costs and low productivity of the student-body significantly reducing their ROI. Therefore, even though this formula is more

Table 4: ROI for Navy Branch Dental Clinics

Command	Cost	Production Value	Prod. Val. Cost	ROI
Great Lakes	\$28,476,040	\$60,746,220	\$32,270,180	113.3%
Okinawa	\$18,156,185	\$30,022,556	\$11,866,371	65.4%
Mid Atlantic	\$29,003,564	\$46,150,165	\$17,146,601	59.1%
Parris Island	\$10,81,353	\$15,747,470	\$4,937,117	45.7%
Camp Pendleton	\$19,227,602	\$26,027,670	\$6,800,068	35.4%
Southwest	\$34,282,076	\$45,365,397	\$11,083,321	32.3%
Southeast	\$19,366,135	\$24,946,372	\$5,580,237	28.8%
Gulf Coast	\$14,541,505	\$18,741,273	\$4,199,768	28.9%
Camp Lejeune	\$17,474,322	\$22,031,239	\$4,556,917	26.1%
Europe	\$12,454,115	\$15,642,759	\$3,188,644	25.6%
Pearl Harbor	\$8,796,897	\$9,973,433	\$1,176,536	13.4%
Far East	\$13,896,531	\$15,376,018	\$1,479,487	10.6%
Northeast	\$11,073,148	\$12,213,250	\$1,140,102	10.3%
Northwest	\$9,987,892	\$9,711,583	-\$276,309	-2.8%
NNDC	\$32,151,242	\$29,096,131	-\$3,055,111	-9.5%
All NDCs	\$279,697,607	\$381,791,536	\$102,093,929	36.5%

Source: Author, 2008

robust, one must consider more than just the final ROI output to fairly compare commands.

CONCLUSIONS

There are several challenges ahead for the development and implementation of notional return on investment. First, the subjective nature of the value-added factors will require senior level management buy-in to strengthen the formula's credibility. Phillips and Phillips point out three audiences which must buy in to the ROI process for it to be useful. They include the practitioners who are responsible for implementing the formula and held accountable by the results, senior level management who hold the practitioners accountable for these results, and researchers (Phillips and Phillips 2002). The NROI formula will not be used by the practitioners if it will not hold weight with their managers. This is true of any new process initiatives in the work place. Segregation of responsibilities with regard to data collection and evaluation must also be achieved to strengthen the credibility of the results. Also, the NROI process should be implemented at the inception stage of a project instead of during or after the project is in progress.

The NROI development methodology of defining how an organization adds value via its products or services can be applied to any public sector organization that is willing to go through the necessary steps to define how they create value in the products or services they provide. Several public sector organizations have already successfully implemented ROI metrics as one benchmark to demonstrate their performance. However, due to the distinct public sector outputs, this endeavor is often times challenging. Private sector organizations typically have the common goal of producing profit. Conversely, public sector organizations have a myriad of different goals most of which do not include the generation of profit.

This paper has probed the efforts of diverse institutions in the quest for a workable method of determining ROI in the public sector. Past efforts provided valuable lessons learned which were identified and discussed. The United States Postal Service was notably successful, but perhaps only because they function much more like a private company than is the norm for public sector entities. In Australia, the bold effort to develop a "value added" approach within the entire government budget process made some progress, but fell short primarily due to a focus on analysis lacking a quantifiable formula for determining the output. The Royal New Zealand Navy enjoyed relative success but was hampered in some ways by an inability to screen out other influences besides the bonus scheme for retention of marine engineers. The United States Navy Dental community effort was largely successful in the development of an ROI methodology, but fell short in their ability to use the output since they lacked trust in the method developed for determining some of the inputs.

Perhaps the most important lesson learned throughout this process was that the scope of such an effort must remain focused to be successful. Once NROI formulae are established at the project level and successfully demonstrated, an expansion of utilization may ultimately lead to the availability of ROI data for senior management decision making.

REFERENCES

- Upper Saddle River, NJ: Prentice Hall, 2001)
 Ray HG, Eric WN (2003). *Managerial Accounting* (San Francisco: McGraw-Hill Irwin, 2003), 542. It may be noted that private sector finance researchers sometimes refer to this method as "accounting ROI" (or Return on Assets -- ROA).
 Richard B, Alan JM, Stewart CM (2004). *Fundamentals of*

- Corporate Finance, 4th ed. (New York: McGraw-Hill/Irwin, 2004), 450-451
- Phillips P, Phillips JJ (2002). *Measuring ROI in the Public Sector*, (Alexandria, VA: ASTD, 2002), 4.
- Anthony E, Boardman et al (2001). *Cost Benefit Analysis: Concepts and Practice*, (Upper Saddle River, NJ: Prentice Hall, 2001).
- Phillips P (2002). *The Bottomline on ROI*, Series Ed. Jack J. Phillips, (Atlanta: CEP Press, 2002).
- Hawke A (2000). "What's the Matter – A Due Diligence Report," (Address, Defence Watch Seminar, 17 Feb. 2000). <<http://www.defencfor.exampleov.au/media/2000/sec1.html>> [16 Nov 2004].
- Australia Department of Finance and Administration (2003). "Value for Money Considerations," *Procurement Guidance*, 24 June 2003 <http://www.financfor.exampleov.au/ctc/toolkits/valueformoney/value_for_money.html> [18 Feb. 2004].
- Australia Department of Defence. *Defence Procurement Review 2003*. GPO, 2003.
- Royal New Zealand Navy (2004). "What the Job Involves," *Marine Engineering Officer*, <http://www.navy.mil.nz/future/role_detail.cfm?role_id=2> [16 Nov. 2004].
- Oldham et al. (2002). "Calculating the Return on Investment of the Royal New Zealand Navy's Marine Engineering Retention Bonus Scheme." *Measuring ROI in the Public Sector*. Ed. Patricia Phillips. Series Ed. Jack J. Phillips. (Alexandria: ASTD, 2002) 132.
- Oldham et al. (2002). "Calculating the Return on Investment of the Royal New Zealand Navy's Marine Engineering Retention Bonus Scheme." *Measuring ROI in the Public Sector*. Ed. Patricia Phillips. Series Ed. Jack J. Phillips. (Alexandria: ASTD, 2002) 138
- Oldham et al. (2002). "Calculating the Return on Investment of the Royal New Zealand Navy's Marine Engineering Retention Bonus Scheme." *Measuring ROI in the Public Sector*. Ed. Patricia Phillips. Series Ed. Jack J. Phillips. (Alexandria: ASTD, 2002) 145
- Oldham et al. (2002). "Calculating the Return on Investment of the Royal New Zealand Navy's Marine Engineering Retention Bonus Scheme." *Measuring ROI in the Public Sector*. Ed. Patricia Phillips. Series Ed. Jack J. Phillips. (Alexandria: ASTD, 2002) 141
- Oldham et al. (2002). "Calculating the Return on Investment of the Royal New Zealand Navy's Marine Engineering Retention Bonus Scheme." *Measuring ROI in the Public Sector*. Ed. Patricia Phillips. Series Ed. Jack J. Phillips. (Alexandria: ASTD, 2002) 144-145
- Oldham et al. (2002). "Calculating the Return on Investment of the Royal New Zealand Navy's Marine Engineering Retention Bonus Scheme." *Measuring ROI in the Public Sector*. Ed. Patricia Phillips. Series Ed. Jack J. Phillips. (Alexandria: ASTD, 2002) 146
- United States Postal Service (2004). "Income-Economic Value Added," *United States Postal Service 1997 Annual Report*, 7 Nov. 1997 <http://www.usps.com/history/anrpt97/management_analysis8.htm> [02 Mar. 2004].
- United States Postal Service (2003). "Setting the Record Straight," *USPS Public Affairs and Communications*, 31 July 2002 <http://www.usps.com/news/fyi/lex_response.htm> [13 Mar. 2004].
- United States Postal Service. *2003 Annual Report*. GPO, 2003. 25
- USPS, *2003 Annual Report*, 24
- Lexington Institute (2004). "U. S. Postal Service Set Productivity Bar Low to Trigger Management Bonus Payouts This Year.....even as the Service will lose more than \$1 billion," *Postal Reform*, 17 July 2001 <<http://www.lexingtoninstitute.org/postal/productivity.asp>> [09 Nov. 2004].
- R. H. Mitton, Navy Bureau of Medicine and Surgery. Telephone Interview. 17 Mar. 2004.
- York C (2004). "FY 00 Cost Value Model." *Excel Spreadsheet*. 17 Mar. 2004.
- Phillips P, Phillips JJ (2002). *Measuring ROI in the Public Sector*, (Alexandria, VA: ASTD, 2002), 12