



## Enhancing Operational Performance through Robust Benefit Validation

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### Abstract

*In today's fast-paced business environment, organizations are constantly seeking ways to optimize their operations, reduce costs, and improve their bottom line. However, the validation of claimed benefits from these optimization efforts is often overlooked, leading to a "check-the-box" mindset that can result in inaccurate or exaggerated claims. This can have severe consequences, including fraudulent financial accounting, damage to public and private institutions, and ultimately, the economy. To address these challenges, this paper presents a robust benefit validation framework that enables organizations to verify and validate claimed benefits from continuous improvement projects, ensuring accuracy, transparency, and accountability. The objective of this paper is to provide a roadmap that organizations can use to move beyond check-the-box mindset and approach to verify and validate any claimed benefits and improvements. The importance of benefit validation cannot be overstated. With the increasing pressure to deliver results, organizations may be tempted to overstate or misrepresent the benefits of their optimization efforts.*

*A Benefit Validation Framework to address these challenges is recommended and is based on three guiding principles: Standardization, Simplicity, and Sustainability.*

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### Introduction

Identifying claimed benefits and estimating an accurate return on investment (ROI) can be very challenging for most organizations. There are several possible reasons why ROI often goes unmeasured. First, some organizations are satisfied with the gen-

eral improvement in their financial statements after implementing a Business Improvement methodology, such as a Continuous Improvement methodology, and have not deemed it necessary to reconcile the benefits to the company financials because the company is holistically performing better. Secondly, some com-

panies focus intensely on training resources and executing projects in the early stages of a process improvement initiative, and place secondary emphasis on measuring ROI, believing that the benefits will come. Lastly, some companies attempt to measure ROI, yet they are unsure how to quantify project benefits, especially if their business is focused more in a services industry. In any case, it is evident that even after 35+ years after the introduction of continuous improvement methodologies, such as Six Sigma to the world, there is still a significant knowledge gap in how to quantify claimed benefits and truly link them to a company's financial performance.

### Objectives

The objective of this document is to provide a framework for the validation of any claimed benefits resulting from any improvement or optimization efforts. The framework is based on the following guiding principles:

- **Standardization:** Standardize process, definitions, and methodologies for the validation and reporting of benefits.
- **Simplicity:** Simplify the validation and reporting of benefits in a framework with ease of implementation.
- **Sustainability:** Sustain the process with best practices and compliance measures, ensuring adequate awareness and training.

The paper was developed based on research conducted, which highlights the importance of benefit validation in the oil and gas industry, encompassing economic, safety, environmental, and operational dimensions, and underscores the need for comprehensive frameworks to support decision-making and improve operational outcomes. To address this, potential research objectives include developing a comprehensive benefit validation framework that integrates these dimensions, investigating the impact of technological innovations on operational performance, examining the effectiveness of risk-based validation approaches for safety systems, quantifying environmental benefits of offshore operations, and developing a holistic approach to operational efficiency. Additionally, research objectives may focus on investigating the role of data-driven decision-making in enhancing operational performance, examining the relationship between benefit validation and organizational performance, and develop-

ing a methodology for integrating economic, safety, environmental, and operational benefits into a single framework. These objectives aim to address gaps and limitations in current research, contributing to a more comprehensive understanding of benefit validation in the oil and gas industry, and ultimately informing the development of systematic validation frameworks that can substantiate the value of technological and procedural innovations, facilitate continuous improvement in operational performance, and support sustained operational excellence. By exploring these research objectives, the study can provide valuable insights into the development and adoption of holistic benefit validation frameworks, which are essential for sustaining competitive advantage and achieving long-term success in the oil and gas industry.

### Literature Review

The oil and gas industry continually seeks to optimize operational performance while ensuring safety, environmental sustainability, and economic viability. Central to these efforts is the rigorous validation of benefits derived from technological, safety, and environmental initiatives. Recent research underscores the importance of comprehensive benefit validation frameworks to support decision-making and improve operational outcomes.

#### Economic Benefits Validation

Al-Hadhrami and Al-Ajlan (2017) conducted a cost-benefit analysis of enhanced oil recovery (EOR) techniques in Saudi Arabia, highlighting how validated economic assessments can demonstrate the profitability of adopting new recovery methods. Their work emphasizes that rigorous financial validation is crucial in justifying investments and guiding strategic decisions in resource management.

#### Safety and Risk Benefits Validation

Zio (2018) emphasizes the significance of risk-based validation approaches for safety systems in the oil and gas sector. The study advocates for systematic risk analysis and validation frameworks to ensure safety measures effectively mitigate operational hazards. Such validation is vital to prevent accidents, safeguard personnel, and maintain operational integrity.

#### Environmental Benefits Validation

Khan et al. (2019) focus on validating the environmental benefits of offshore operations, particularly in

emission reduction and spill prevention. Their assessment demonstrates that environmental benefits can be quantitatively validated through impact assessments, which inform regulatory compliance and corporate sustainability strategies.

### Technological Benefits Validation

Zhang and Zhang (2020) explore the validation of digital oilfield technologies, such as real-time monitoring and automation, which have been shown to enhance production efficiency and reduce costs. Their framework illustrates how technological benefits can be systematically validated to ensure they deliver expected performance improvements.

### Operational Efficiency and Benefits Validation

Bourne et al. (2018) examine the benefits of integrated project delivery methods, emphasizing that validated improvements in operational workflows lead to increased efficiency and project success rates. Their research underscores the importance of robust validation processes in translating technological and procedural innovations into tangible operational gains.

### Synthesis and Implications for Practice

Collectively, these studies demonstrate that benefit validation is a multifaceted process encompassing economic, safety, environmental, and operational dimensions. Implementing comprehensive validation frameworks enables organizations to make data-driven decisions, justify investments, and achieve sustained improvements in operational performance. Future research should focus on developing integrated validation models that encompass these dimensions, fostering a holistic approach to performance enhancement in the oil and gas industry.

## Methods

### Performance Improvement

These are actions that will lead to a claim of quantitative or qualitative improvement with benefits.

### Major Categories

These are the major categories of functional activities of that organization, examples of the categories are Operations Support, Project Support and Programs & Initiatives.

### Value Drivers

These are specific improvement actions under each of the major categories, examples, Production Improvement and Workforce optimization under operations support for ES. Scope Optimization and Compliance Assurance under project support. Finally, Technology deployment and patents under the programs and initiatives.

### Quantification

The process of calculating and measuring the quantitative benefits claimed.

### Value Sources

All improvement quantifications need to identify the primary value sources, examples, labor or manhour costs, material costs, equipment costs, maintenance costs, construction costs, schedule/ time reduction, contract costs, production value and others.

### Benefit Calculation

This is based on a specific methodology for each performance improvement category. A number of calculation guides and forms should be included. Users may create their own calculation forms and sheets that should be subject to review during the validation process.

## Validation

### Benefit Category

These are generally three benefits categories namely, cost avoidance, cost savings or revenue generation and finally, net present value.

### Cost Avoidance

This refers to any actions that avoid having to incur additional costs in the future. The categories covered include but are not limited to Scope Cancellations and funds avoided prior to budget approval. They represent potential increases in costs that are prevented through specific proactive actions. These measures will never be reflected in the budget or the financial statements. They will only be reflected in situations where the proposed action is not implemented, resulting in cost increase.

### Cost Savings

This refers to the cost of an activity that the organization can reduce from the budget or project once the project funds (budget) is approved and are made avail-

able. These are costs that have already been planned and allocated, but are now deemed unnecessary. Cost saving measures are any actions that lower current spending, investment, or debt levels. They result in a tangible financial benefit for the organization. The amount of money saved as a result of these measures must be reflected in the financial statements and subsequent year's budget.

**Revenue**

This refers to any additional income generated for the organization as a result of improved service or increased production. It is a measure by which the organization increases income/revenue through sale of products/services in order to generate income.

**Net Present Value (NPV)**

This is the net present value, or NPV, is a financial metric used to evaluate the financial value of a programs, project, or enterprise, using projections of its future cash flows. The NPV is for the purpose of benefits validation will only be used as a measure for the initiatives and programs major category. The objective of an NPV is to value the future cash flows of an investment undertaken by the program or initiative within the context of risk and the time value of money. For programs and initiatives major category, the total NPV value is usually claimed and reported in the first year of deployment or implementation, even though it may take the full lifecycle to realize the total NPV value.

**Validation Tiers**

This is described as the validation tiers identified to ensure appropriate management level review and endorsement is provided for all vetted performance improvements and subsequent benefit claims.

**Reporting**

**Targeted Channels**

This is described as the four targeted channels for improvement reporting categories namely, Monetary KPI's, Management Notifications, Presentations, and finally, Senior Management Reports.

**Realization**

**Knowledge Management Program (KM)**

This is defined as the planning, capturing, organizing, storing, disseminating and reusing knowledge assets to realize economic benefits. The vision for

KM in any organization is to transform the company into a learning organization and achieve mature operational excellence, and the mission is to grow and maintain corporate knowledge and increase intellectual capital to gain competitive advantage.

**Business Planning**

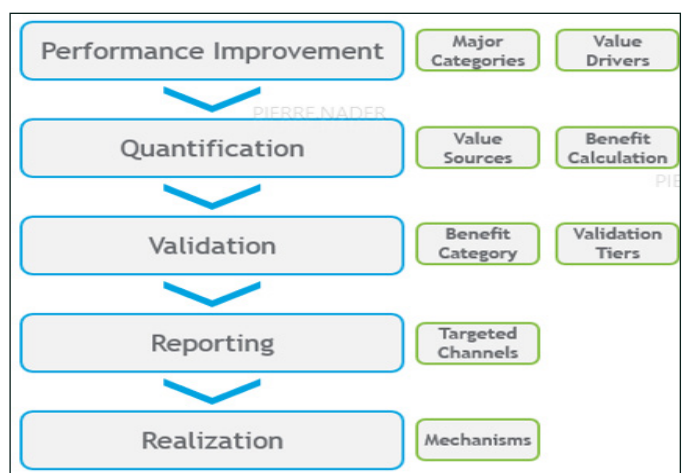
This is described as the principal document summarizes the consolidated operational and financial objectives of the company over the upcoming period (usually three-year period). The document contains the detailed plans and budgets by operating segment as approved by the board of directors. The Business Plan is the basis on which the board of directors will assess performance of the Group.

**Data Collection**

**Generic Process**

The organization's processes were mapped out with the goal of conducting the validation of any claimed benefit or improvement activities. With that in mind, it was acknowledged that mapping a process should begin with few steps prior to the validation step. As such, the starting point of the process is Performance Improvement then followed by Quantification, Validation, Reporting and Realization. Each process step has sub tasks associated with it. For example, Performance Improvement step has Major Categories and Value associated with it. Quantification step involves Value

Sources and Benefit Calculation. Validation consists of Benefit Category and Validation Tiers. Reporting and Realization have Targeted Channels and Mechanism.



**Figure 1:** Claimed Benefits Validation Process

**Results and Discussion**

**Numerical Results**

Due to confidentiality of data, this paper would only inference numerical results based on the literature

review only for illustration purposes. Please find below in Table 1, 2 and 3 examples of Numerical Results and Inferences.

**Table 1:** Economic Benefit Validation – Cost Savings from Digital Oilfield Implementation (Hypothetical Data)

Parameter	Before Implementation	After Implementation	Difference	Percentage Improvement
Production Cost per Barrel (\$)	25.00	20.0	-5.00	20%
Total Annual Production (Barrels)	1,000,000	1500,000	+500,000	50%
Total Annual Cost (\$ Million)	250	210	-40	16%
ROI on Digital Technologies	—	35%	—	—

The implementation of digital oilfield technologies resulted in a 20% reduction in production costs and a 16% decrease in total annual operational expenses. Additionally, increased production volume contributed to a 5% rise in total output, translating into improved profitability. The ROI of 35% indicates a highly favorable economic benefit, validating the investment.

**Table 2:** Safety and Environmental Benefits – Reduction in Spill Incidents and Emissions (Hypothetical Data)

Parameter	Before Implementation	After Implementation	Difference	Percentage Change
Spill Incidents per Year	15	5	-10	-66.7%
CO2 Emissions (Tonnes/Year)	1,200,000	900,000	-300,000	-25%
Methane Emissions (Tonnes/Year)	50,000	30,000	-20,000	-40%

The validation of safety improvements demonstrates a significant 66.7% reduction in spill incidents, directly enhancing operational safety and regulatory compliance. Environmental benefits are evident through substantial reductions in CO2 and methane emissions, which contribute to sustainability goals and potentially lower regulatory penalties.

**Table 3:** Operational Efficiency – Production Rate and Downtime (Hypothetical Data)

Parameter	Before Optimization	After Optimization	Difference	Percentage Improvement
Average Production Rate (BOPD)	40,000	45,000	+5000	12.5%
Equipment Downtime (Hours/Month)	50	30	-20	-40%

Operational validation indicates a 12.5% increase in daily oil production rates and a 40% reduction in equipment downtime. These improvements demonstrate the effectiveness of process optimization and maintenance strategies, leading to enhanced operational performance.

### Summary of Inferences

The numerical validation results clearly indicate that the strategic implementation of technological, safety, and operational improvements has yielded substantial benefits. Economic gains such as cost reductions and increased production volume demonstrate improved profitability. Safety and environmental metrics confirm enhanced risk management and sustainability performance. Operational efficiencies, evidenced by higher production rates and lower downtime, further support the overall objective of boosting operational performance. Collectively, these results validate the strategic initiatives and underscore the importance of systematic benefit validation in achieving sustained operational excellence.

### Proposed Improvements

**Due to confidentiality of data, this paper would only inference numerical results based on the literature review only for illustration purposes**

The document provides a set of guidelines, presented below, which outline the approach to be taken by the user when quantifying and preparing any performance improvement for validation:

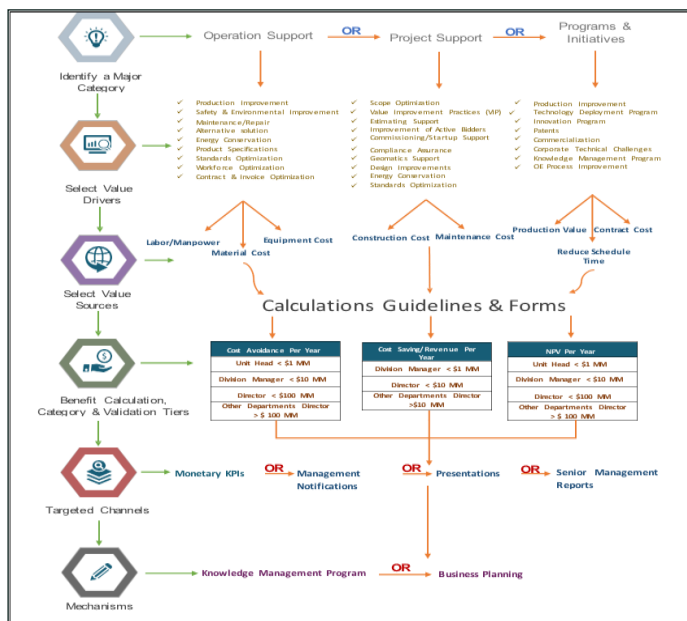
The detailed guidelines require the user to:

- Identify the major category of the source of performance improvement: Operations Support, Project Support or Programs & Initiatives.
- Select the value drivers for the specific performance improvement category, there may be more than one value drivers for the specific performance improvement.
- Classify the base line improvement in terms of labor or manhour costs, material costs, equipment costs, maintenance costs, construction costs, schedule/time reduction, contract costs production value and others.

For the specific value source, use an existing calculation methodology or form. For items that do not have a generic calculation, specific calculation methodology should be developed. Any calculation method utilized should describe the methodology and as-

sumptions used.

1. The validation should be performed based on the benefit category and the level of benefit quantified:
  - a. **For Cost Avoidance per year (Hypothetical Data):** That is for any benefits that has not been directly budgeted in the business plan or a project prior to funds made available and before budget approval, the validation tiers will be as follows:
    - Unit Head < \$1MILLION
    - Division Manager < \$10 MILLION
    - Director < \$100 MILLION
    - Other Departments Director > \$100 MILLION
  - b. **For Cost Savings per year (Hypothetical Data):** That is for any benefits that has an approved budget in the business plan or a project that has an approved funding, the validation tiers will be as follows:
    - Division Manager < \$1MILLION
    - Director < \$10 MILLION
    - Other Departments Director > \$10 MILLION
  - c. **For Net Present Value (NPV) (Hypothetical Data):** That is for any benefits from a program or initiative that has a calculated NPV, the validation tiers will be as follows:
    - Unit Head < \$1MILLION
    - Division Manager < \$10 MILLION
    - Director < \$100 MILLION
    - Other Departments Director > \$100 Million



**Figure 2:** Validation of Claimed Benefits and Improvement Process Map (Hypothetical Data)

The following examples below are used to reflect live scenarios and actual business case submission whereby the validation framework was customized and tested to validate performance improvement for different benefit categories.

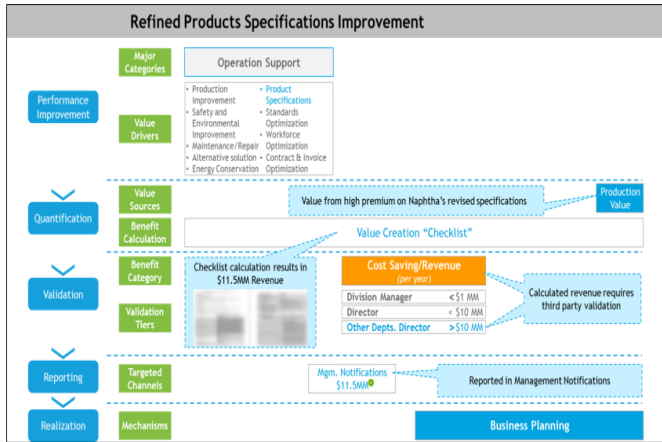


Figure 3: Example of Refined Products Specifications Improvement (Hypothetical Data)

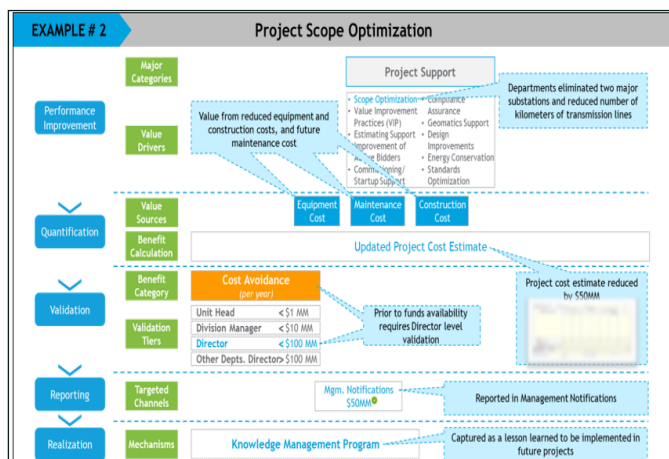


Figure 4: Example of Project Scope Optimization (Hypothetical Data)

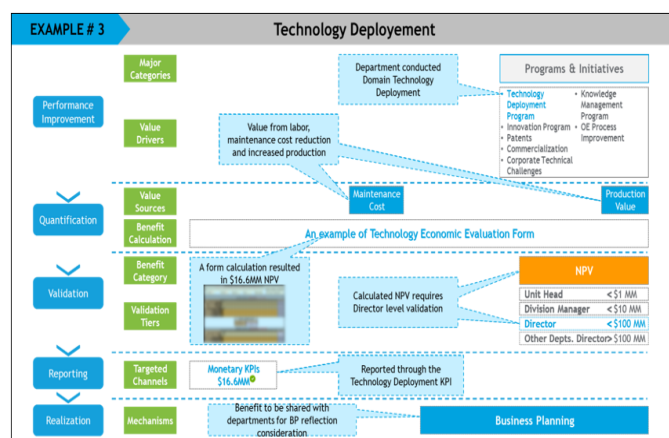


Figure 5: Example of Technology Deployment (Hypothetical Data)

Major Categories	Operation Support	Project Support	Programs & Initiatives	
Performance Improvement	<ul style="list-style-type: none"> <li>Production Improvement</li> <li>Safety and Environmental Improvement</li> <li>Maintenance/Repair</li> <li>Alternative solution</li> <li>Energy Conservation</li> </ul>	<ul style="list-style-type: none"> <li>Product Specifications</li> <li>Standards Optimization</li> <li>Workforce Optimization</li> <li>Contract &amp; Invoice Optimization</li> </ul>	<ul style="list-style-type: none"> <li>Scope Optimization</li> <li>Compliance Assurance</li> <li>Geomatics Support</li> <li>Design Improvements</li> <li>Energy Conservation</li> <li>Standards Optimization</li> </ul>	<ul style="list-style-type: none"> <li>Technology Deployment Program</li> <li>Knowledge Management Program</li> <li>Innovation Program</li> <li>OE Process Improvement</li> <li>Patents</li> <li>Commercialization</li> <li>Corporate Technical Challenges</li> </ul>
Value Drivers	<ul style="list-style-type: none"> <li>Product Specifications</li> <li>Standards Optimization</li> <li>Workforce Optimization</li> <li>Contract &amp; Invoice Optimization</li> </ul>	<ul style="list-style-type: none"> <li>Scope Optimization</li> <li>Compliance Assurance</li> <li>Geomatics Support</li> <li>Design Improvements</li> <li>Energy Conservation</li> <li>Standards Optimization</li> </ul>	<ul style="list-style-type: none"> <li>Technology Deployment Program</li> <li>Knowledge Management Program</li> <li>Innovation Program</li> <li>OE Process Improvement</li> <li>Patents</li> <li>Commercialization</li> <li>Corporate Technical Challenges</li> </ul>	
Value Sources	<ul style="list-style-type: none"> <li>Labor/Manhour</li> <li>Material Cost</li> <li>Equipment Cost</li> </ul>	<ul style="list-style-type: none"> <li>Maintenance Cost</li> <li>Construction Cost</li> </ul>	<ul style="list-style-type: none"> <li>Reduce Schedule Time</li> </ul>	<ul style="list-style-type: none"> <li>Contract Cost</li> <li>Production Value</li> </ul>
Benefit Calculation	Calculation guidelines and forms			
Benefit Category	Cost Avoidance (per year)	Cost Saving/Revenue (per year)	NPV	
Validation Tiers	Unit Head < \$1 MM Division Manager < \$10 MM Director < \$100 MM Other Depts. Director > \$100 MM	Division Manager < \$1 MM Director < \$10 MM Other Depts. Director > \$10 MM	Unit Head < \$1 MM Division Manager < \$10 MM Director < \$100 MM Other Depts. Director > \$100 MM	
Targeted Channels	Monetary KPIs \$XX	Management Notifications \$XX	Presentations \$XX	Senior Management Reports \$XX
Mechanisms	Knowledge Management Program		Business Planning	

Figure 6: Validation of Claimed Benefits Proposed Process (Hypothetical Data)

### Conclusion

The reviewed literature highlights the pivotal role of robust benefit validation in driving operational excellence within the oil and gas industry. By comprehensively validating economic, safety, environmental, and technological benefits, organizations can make informed decisions that enhance efficiency, mitigate risks, and promote sustainability. The integration of systematic validation frameworks not only substantiates the value of innovations but also facilitates continuous improvement in operational performance.

To effectively address the challenges of measuring project benefits and ROI, organizations should develop and refine a structured process and set of principles. A best practice is to establish an end-to-end financial tracking and reconciliation process that provides accurate and reliable results, enabling organizations to better understand and quantify the benefits delivered by their projects.

The implementation of a benefit validation process yields significant improvements in ROI accuracy, project reporting, and financial internal controls for Business Improvement projects. This process can be effectively integrated at any stage of a Business Improvement deployment, regardless of the presence of a project management portfolio database. When combined with a portfolio database solution, the process enables world-class project governance and successful project completion.

Ultimately, the development and adoption of holistic benefit validation frameworks are crucial for sustaining competitive advantage and achieving long-term

success. By incorporating guidelines, tools, and templates into an existing validation framework governance process, organizations can ensure the effective validation of claimed benefits and drive informed decision-making.

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