Maximizing Return on Investment With Lean Six Sigma

June 2, 2017
8:00 – 9:30 AM
Segura 6
Bob Seemer, COO
ets, inc.

Purpose:
To understand the Return on Investment (ROI) concept and how it can be used to ensure the maximum value of Lean Six Sigma projects.

Agenda:
1. Why is ROI important and how is it used?
2. What are the limitations of ROI?
3. What applications does ROI have in the Lean Six Sigma (LSS) DMAIC methodology?
4. How are ROI and the Cost of Poor Quality (COPQ) related?
5. How can ROI be maximized?
6. How can ROI be used to improve LSS projects?

Limit:
- 90 Minutes
Return on Investment

Key Learning Points

• ROI is useful for selecting projects and allocating resources.

• The COPQ can be used for determining the potential benefits and overall value of a project.

• ROI can be integrated with DMAIC to maximize value “throughput”.

• By updating ROI and evaluating critical checkpoints in the DMAIC process, value throughput can be maximized.

Return on Investment

RETURN ON INVESTMENT

Which one to choose?

- Project #1
- Project #2
- Project #3
Return on Investment - Definition

• **RETURN ON INVESTMENT** or “ROI” is a performance measure used to evaluate the value of an investment or to compare the values of many different investments over a specific time period.

• ROI measures an investment’s net benefits relative to the investment’s cost.

Return on Investment - Formula

• To calculate ROI, the net benefit (or return) of an investment is divided by the cost of the investment, and the result is expressed as a ratio (e.g. 5:1) or a percentage (%).

The Return on Investment Formula:

\[
\text{ROI} = \frac{\text{Net Benefit of Project}}{\text{Cost of the Project}}
\]
Return on Investment - Formula

- In the previous formula, "Net Benefit from Investment" refers to the savings obtained from the implementation of the countermeasures less the costs.

- Because ROI is measured as a ratio, it can be easily compared with ratios (returns or benefits) from alternative countermeasures or other projects, allowing one to measure a variety of types of projects and countermeasures against one another.

Return on Investment - Example

<table>
<thead>
<tr>
<th>ITEMIZED COSTS (DESCRIPTIONS)</th>
<th>$ VALUE (ANNUALIZED)</th>
<th>ITEMIZED BENEFITS (DESCRIPTIONS)</th>
<th>$ VALUE (ANNUALIZED)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Content Management System</td>
<td>$125,000</td>
<td>1. Reduction in Patients Leaving Without Being Seen</td>
<td>$800,000</td>
</tr>
<tr>
<td>2. Content Technician - Part-Time</td>
<td>$40,000</td>
<td>2. Increase in New Patients</td>
<td>$400,000</td>
</tr>
<tr>
<td>3. Course Development</td>
<td>$30,000</td>
<td>3. Reduced Rework</td>
<td>$110,000</td>
</tr>
<tr>
<td>4. Staff Training</td>
<td>$100,000</td>
<td>4. Reduced Overtime</td>
<td>$90,000</td>
</tr>
<tr>
<td>5. Administrative</td>
<td>$80,000</td>
<td>5. Reduced Employee Hiring</td>
<td>$110,000</td>
</tr>
<tr>
<td>6. Security</td>
<td>$50,000</td>
<td>6. Reduced New Employee Training</td>
<td>$250,000</td>
</tr>
<tr>
<td>7. Miscellaneous</td>
<td>$15,000</td>
<td>7. Reduced Inventory</td>
<td>$120,000</td>
</tr>
<tr>
<td>TOTAL ANNUALIZED COSTS</td>
<td>$420,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL EXPECTED ANNUALIZED BENEFITS</td>
<td>$1,880,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ROI = \frac{\text{BENEFITS - COSTS}}{\text{COSTS}}

- $1,880,000 - $420,000
- $1,460,000
- $1,460,000
- $420,000
- 3.5:1

Tips:

1. Ensure strong linkage between the ROI Worksheet and the COPQ Matrix.
2. Base your benefits on the calculations used in DMAIC checkpoints #3, 9, 15, 22 and 27.
Return on Investment - Limitations

Understanding ROI

- Return on Investment is a very popular measure because of its versatility and simplicity.
- Essentially, Return on Investment can be used as a rudimentary gauge of an investment’s benefits.
- ROI is easy to calculate and to interpret and can apply to a wide variety of investments.
- That is, if an investment does not have a positive ROI, or if a funder has other opportunities available with a higher ROI, then these ROI values can inform as to which investments are preferable to others.

For example, suppose an agency invested $10,000 in a countermeasure in August and realized $300,000 in financial benefits 12 months later.

To calculate the ROI, we would divide the net benefits ($300,000 - $10,000 = $290,000) by the project’s costs ($10,000), for a ROI of $290,000/$10,000, resulting in a ratio of 29:1.
Return on Investment - Limitations

Understanding ROI

- With this information, we could compare the value of this project with those of other projects.

- Suppose the agency also invested $15,000 in another project's countermeasures in August and realized benefits of $250,000 six months later.

- The "simple" ROI on the second project would be $250,000 - $15,000 = $235,000 divided by $15,000 = 15.7:1.

- If a choice had to be made between the two projects, we would normally select the one with the higher ratio, or the first one, in this case which had a 29:1 ratio.

Limitations of ROI

- Examples like this reveal one of several limitations when using ROI, particularly when comparing investments or the value of projects.

- While the ROI of the second project was much lower (15.7:1) than that of the first investment (29:1), the time to realize the benefits of the second project was much less.

- The ROI for the first investment was 29:1 in one year and the ROI for the second project was 15.7:1 in only six months.
Return on Investment - Limitations

Limitations of ROI

- At first glance, it would appear that the first project was more financially beneficial; however, if the time to achieve the benefits were considered, the second project yielded its benefits in only half the time of the first project.

- To properly compare the value or potential value of both projects, they must use the same time factor.

- Therefore, by annualizing the second project, the calculations would be as follows: $250,000 \times 2 = 500,000 - 15,000$ divided by $15,000 = 32.3:1.

Return on Investment - Limitations

Limitations of ROI

- If one considers that the duration of the second investment was half as long as that of the first, it becomes apparent that we should have questioned our initial conclusion that the second investment was the less financially viable one.

- When comparing these two projects on an annual basis, we needed to adjust the ROI calculation accordingly.

- While the first project returned more total financial benefits than did the second, the second investment was actually the more beneficial choice since its annualized ROI was higher.
Return on Investment - Limitations

Limitations of ROI

• This is why ets recommends annualizing the project's time to calculate benefits when determining simple ROI.

• If other adjustments are incorporated into the ROI calculation, inform your audience and provide the calculations in the appendix of your project story or presentation.

Return on Investment - Limitations

Limitations of ROI

• Examples like this indicate how a cursory comparison of investments using ROI can lead one to make incorrect conclusions about their value or profitability.

• Given that simple ROI does not inherently account for the amount of time during which the investment in question is taking place, this measure is often used in conjunction with Rate of Return, which necessarily pertains to a specified period of time, unlike simple ROI.
Return on Investment - Limitations

Limitations of ROI

- One may also incorporate Net Present Value (NPV), which accounts for differences in the value of money over time due to inflation, for even more precise ROI calculations.

- The application of NPV when calculating Rate of Return is often called the "Real Rate of Return."

Limitations of ROI

- Keep in mind that the means of calculating a Return on Investment and, therefore, its definition as well, can be modified to suit the situation.

- It all depends on what one includes as returns and costs.

- The definition of the term in the broadest sense simply attempts to measure the profitability or benefit of an investment and, as such, there is no one "right" calculation.
Return on Investment - Limitations

Limitations of ROI

- For example, a non-profit may compare two different services by dividing the benefits that each service has generated by its associated administrative and delivery expenses.

- A funding agency, however, may compare the same two services using an entirely different ROI calculation, perhaps by dividing the benefits by the total value of all resources that have been expended to create and deliver the services, including outreach and promotion costs.

- When using ROI to assess real estate investments, one might use the initial purchase price of a property as the “Cost of Investment” and the ultimate sale price as the “Benefit from Investment,” though this fails to account for all of the intermediary costs, like renovations, property taxes and real estate agent fees.

- As noted earlier, ROI can be calculated many ways, so it is advisable to understand, or to be clear, as to how it is being determined.
Return on Investment - Limitations

Limitations of ROI

- This variability of ROI calculations, then, reveals another key limitation of using ROI.

- ROI calculations can be easily manipulated to suit the user's purposes, and the results can be expressed in many different ways.

- As such, when using this metric, the savvy funder would do well to make sure he or she understands which inputs are being used.

- A Return on Investment ratio alone can paint a picture that looks quite different from what one might call an “accurate” ROI calculation—one incorporating every relevant expense that has gone into the development and maintenance of an investment over the period of time in question—and funders should always be sure to consider the bigger picture.

- Many organizations factor “life cycle” or “cradle to grave” costs into the ROI calculation to present a more comprehensive and realistic picture of the investment under consideration.
Return on Investment - DMAIC

Application of ROI in the DMAIC Method

- Recently, many investors, businesses and funders have taken an interest in the development of a new form of the ROI measure, called "Social Return on Investment," or SROI.

- SROI was initially developed in the early 2000s and takes into account social impacts of projects and strives to include stakeholders affected by these decisions in the planning of financial allocations and other resources.

- For this reason, ets recommends the inclusion of social and intangible “costs” when determining the Costs of Poor Quality (COPQ), and quantifying these costs in financial terms whenever possible.

Examples of SROI impacts might include the following:

1. The effects administrative cycle time reduction had on new hires receiving their first paychecks two weeks earlier than before. The social benefits would be the total value of the earlier paychecks for one year.

2. The total value of the benefits available to qualified recipients because their benefits debit cards were delivered late by mail due to incorrect mailing addresses in the state’s welfare system offices.
Return on Investment - DMAIC

Application of ROI in the DMAIC Method

3. The total life time earnings of a high school graduate compared to a non-graduate as the school district addressed the graduation rate gap.

4. The economic impact on a community or state from the reduction of pollution in the local river or bay.

5. The impacts on society by improvements made to recidivism rates in the juvenile justice system.

Return on Investment - DMAIC

Application of ROI in the DMAIC Method

- Maximizing the ROI of Lean Six Sigma initiatives begins with the “Costs of Poor Quality”, or the costs of not achieving stakeholders’ requirements.
- The goal of the DMAIC process, as with all processes, is to maximize value throughput.
- The following example will demonstrate how ROI can be affected throughout the DMAIC process, and what teams and sponsors can do to maximize results.
Return on Investment - DMAIC

DMAIC Project Example

Project Theme:
“Reduce Workforce Turnover from 25% to 10% by June 30, 2018”

Return on Investment - DMAIC

DEFINE

% Workforce Turnover

Theme: Reduce Workforce Turnover from 25% to 10% by June 30, 2018
Return on Investment - DMAIC

DEFINE

The costs below represent the gap between 25% and 10%

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Negative Impact (Pain)</th>
<th>Cost of Poor Quality (COPQ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers</td>
<td>Poor return for services</td>
<td>6% rebuild = $60,000</td>
</tr>
<tr>
<td></td>
<td>Service was incomplete or unsatisfactory</td>
<td>13% partial shipments = $110,000</td>
</tr>
<tr>
<td>Employees</td>
<td>Increased rework</td>
<td>6% rework = $60,000</td>
</tr>
<tr>
<td></td>
<td>Mandatory overtime</td>
<td>3% mandatory OT = $30,000</td>
</tr>
<tr>
<td></td>
<td>Lower morale</td>
<td>38% employee satisfaction = N/A</td>
</tr>
<tr>
<td></td>
<td>Increased absenteeism</td>
<td>7% absenteeism = $50,000</td>
</tr>
<tr>
<td>Management</td>
<td>Increased hiring costs</td>
<td>For new hires $50,000 each = $450,000</td>
</tr>
<tr>
<td></td>
<td>Increased overtime costs</td>
<td>7% overtime = $70,000</td>
</tr>
<tr>
<td></td>
<td>Lower Productivity</td>
<td>13% loss in productivity = $120,000</td>
</tr>
</tbody>
</table>

Total Annualized COPQ = $1,000,000

Define Measure Analyze Improve Control

• COPQ = $1,000,000 (potential project benefits)

• Known project expenses = $10,000

• ROI = $1,000,000 - $10,000 = 99:1
  $10,000
**Return on Investment - DMAIC**

**MEASURE**

- 35 months average Length of Service = 10% turnover.
- 15 months average Length of Service = 25% actual turnover.
- Technicians account for 80% of all excess turnover.
- We will reduce technician turnover by 50%.
- $1,000 cost for analytical statistical software.

- **COPQ = $1,000,000**
- Technicians account for 80% of excess turnover; $1,000,000 x 80% = $800,000
- Target: Reduce Technician turnover by 50%; $800,000 x 50% = $400,000
- Known project expenses = $11,000
- **ROI = \( \frac{$400,000 - $11,000}{11,000} = 35.4 : 1 \)**

---

Copyright © 2017 ets, inc. - www.etsfl.com – (321) 636-2212
Return on Investment - DMAIC

ANALYZE

1. No standard position description for Technicians.
2. No consistent interviewing procedure.
3. No standard on-boarding training and process.

Major verified Root Causes account for 80% of the Technician turnover.
Spent $4,000 to conduct survey.

Root causes selected account for 80% of Technician turnover;

$400,000 x 80% = $320,000

Known project expenses = $15,000

ROI = ($320,000 - $15,000) = 20.3 : 1
$15,000
### Return on Investment - DMAIC

#### Countermeasures Action Plans

<table>
<thead>
<tr>
<th>Steps</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

- Performed Feasibility analysis on countermeasures.
- Conducted Barriers and Aids analysis.
- Were not able to address all potential barriers.

#### The team expects the countermeasures to have 90% impact on the root causes.
- Licensing and training fees for an on-boarding training course and material cost $20,000.

### Return on Investment - DMAIC

#### IMPROVE

- Countermeasures selected will be 90% effective in reducing the root causes;
- $320,000 \times 90\% = $288,000
- Known project expenses = $35,000
- \[ \text{ROI} = \frac{\$288,000 - \$35,000}{\$35,000} = 7.2 : 1 \]
Countermeasures were implemented.
Performance was improved.
Gap remains.
Where did the team fail?

Return on Investment - DMAIC

CONTROL

• Countermeasures were implemented.
• Schedule slippage, rework, and compliance issues caused countermeasures to be only 85% effective and added $15,000 more expenses to the project.

• $288,000 x 85% = $244,800

• ROI = $244,800 - $50,000 = 3.9 : 1

$50,000
Return on Investment - DMAIC

Potential project value can diminish throughout the DMAIC process

<table>
<thead>
<tr>
<th>Step</th>
<th>Define</th>
<th>Measure</th>
<th>Analyze</th>
<th>Improve</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCP #</td>
<td>3</td>
<td>9</td>
<td>15</td>
<td>22</td>
<td>27</td>
</tr>
<tr>
<td>ROI</td>
<td>99 : 1</td>
<td>35.4 : 1</td>
<td>20.3 : 1</td>
<td>7.2 : 1</td>
<td>3.9 : 1</td>
</tr>
</tbody>
</table>

CCP = Critical Check Point
- Final Project ROI Ratio = 3.9 : 1
- Overall Value Throughput = $244,800 = 24.48% 
  $1,000,000

Return on Investment – Lessons Learned

Lessons Learned by DMAIC Step

1. Define
   a. Validate target and Gap.
   b. Develop accurate COPQ estimates.

2. Measure
   a. Stratify the Gap from many perspectives.
   b. Set an aggressive target for the problem.
   c. Determine the impact of the problem’s target on the Gap in the Define step Theme Indicator.

3. Analyze
   a. Verify the root causes.
   b. Evaluate the impact of root causes on the problem and, therefore, the Gap.
   c. Select enough root causes to achieve problem’s (Pareto) target.
**Return on Investment – Lessons Learned**

Lessons Learned (Continued)

4. **Improve**
   a. Use “Work Breakdown Structure” method to define all countermeasure tasks.
   b. Use Risk, or Barriers and Aids analysis to anticipate and mitigate risks to implementing countermeasures.

5. **Control**
   a. Review project action plans regularly during countermeasures implementation and adjust as needed.
   b. Avoid schedule slippage and change orders. Strive to recover any losses immediately.
   c. Confirm project benefits with sponsor and stakeholders.
   d. Plan for on-going process improvement.

**Return on Investment - Exercise**

**Purpose:**
To calculate the ROI for a DMAIC project at each step and overall; and determine the project’s overall **Value Throughput %**.

**Agenda:**
1. Form a team or work individually.
2. Review the ROI Exercise Worksheet.
3. Using the figures and comments provided, fill in the blanks.
4. Determine the **Final Project ROI Ratio** and **Value Throughput %**.
5. Discuss results with class.

**Limit:**
- 15 Minutes
Return on Investment – Exercise Worksheet

### DMAIC ROI WORKSHEET

<table>
<thead>
<tr>
<th>STEPS</th>
<th>COPQ/ BENEFITS ($)</th>
<th>THROUGHPUT %</th>
<th>COSTS/ EXPENSES ($)</th>
<th>NET BENEFITS ($)</th>
<th>CALCULATED ROI (Ratio)</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEFINE</td>
<td>500,000</td>
<td>100.0</td>
<td>10,000</td>
<td>500,000</td>
<td></td>
<td>Initial expenses = $10,000</td>
</tr>
<tr>
<td>MEASURE</td>
<td></td>
<td>50.0</td>
<td></td>
<td></td>
<td></td>
<td>Additional expenses = $3,000</td>
</tr>
<tr>
<td>ANALYZE</td>
<td></td>
<td>80.0</td>
<td></td>
<td></td>
<td></td>
<td>Additional expenses = $7,000</td>
</tr>
<tr>
<td>IMPROVE</td>
<td></td>
<td>90.0</td>
<td></td>
<td></td>
<td></td>
<td>Additional expenses = $5,000</td>
</tr>
<tr>
<td>CONTROL</td>
<td></td>
<td>85.0</td>
<td></td>
<td></td>
<td></td>
<td>Additional expenses = $10,000</td>
</tr>
</tbody>
</table>

FINAL PROJECT ROI RATIO = _______:1  THROUGHPUT = _______ % OF INITIAL COPQ

Return on Investment – Key Learning Points

### Key Learning Points

- **ROI** is useful for selecting projects and allocating resources.

- The COPQ can be used for determining the potential benefits and overall value of a project.

- ROI can be integrated with DMAIC to maximize value “throughput”.

- By updating ROI and evaluating critical checkpoints in the DMAIC process, value throughput can be maximized.
## Return on Investment – Exercise Answer Sheet

### DMAIC ROI WORKSHEET

<table>
<thead>
<tr>
<th>STEPS</th>
<th>COPQ/ BENEFITS ($)</th>
<th>THROUGHPUT %</th>
<th>COSTS/ EXPENSES ($)</th>
<th>NET BENEFITS ($)</th>
<th>CALCULATED ROI (Ratio)</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEFINE</td>
<td>500,000</td>
<td>100.0</td>
<td>500,000</td>
<td>10,000</td>
<td>490,000</td>
<td>49:1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Initial expenses = $10,000</td>
</tr>
<tr>
<td>MEASURE</td>
<td>500,000</td>
<td>50.0</td>
<td>250,000</td>
<td>13,000</td>
<td>237,000</td>
<td>18.2:1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Additional expenses = $3,000</td>
</tr>
<tr>
<td>ANALYZE</td>
<td>250,000</td>
<td>80.0</td>
<td>200,000</td>
<td>20,000</td>
<td>180,000</td>
<td>9:1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Additional expenses = $7,000</td>
</tr>
<tr>
<td>IMPROVE</td>
<td>200,000</td>
<td>90.0</td>
<td>180,000</td>
<td>25,000</td>
<td>155,000</td>
<td>6.2:1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Additional expenses = $5,000</td>
</tr>
<tr>
<td>CONTROL</td>
<td>180,000</td>
<td>85.0</td>
<td>153,000</td>
<td>35,000</td>
<td>118,000</td>
<td>3.4:1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Additional expenses = $10,000</td>
</tr>
</tbody>
</table>

**FINAL PROJECT ROI RATIO = 3.4:1**

**THROUGHPUT = 15.3% OF INITIAL COPQ**

---

### Contact Information

Robert H. Seemer  
Electronic Training Solutions, Inc. *(ets, inc.)*  
P.O. Box 457  
Cocoa, FL 32923  
Phone: (321) 636-2212  
info@etsfl.com