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Calculating Payback for Safety and Training Programs



Calculating Payback for Safety and Training Programs

William B. Johnson, PhD and Katrina Avers, PhD, from the Federal Aviation Administration examine the research on ROI analysis techniques associated with training interventions.

The benefits of fatigue countermeasure training can outweigh the costs. The Federal Aviation Administration (FAA) demonstrates the value and impact of a fatigue countermeasure training intervention using a return on investment (ROI) calculator for safety interventions. A large, geographically dispersed aircraft maintenance organization implemented fatigue countermeasure training and used the calculator to assess expected safety and financial returns. Using the calculator, the company conservatively calculated an estimated annual return of more than 300% on a 205 thousand dollar investment. This real world example is pre-

sented to show the potential financial and safety returns of training.

ROI Revisited

CAT published an article on Return-on-Investment (ROI) six years ago (Johnson, *CAT 4/2006*). Although the topic, author, requirement, and math remain the same as 2006, important changes have occurred. There is a revived interest in quantifying the value of training and in selecting training and safety interventions that meet specific organizational needs. There is a stark realization in the industry that every part of the organization must show the value added to safety and to the bottom line.

Professional Safety recently made a compelling argument that safety interventions are an investment that improves the bottom line (Huang et al., 2009). International attention to safety management systems (SMS) places an increased emphasis on data driven decision making. The focus on data extends beyond identifying and eliminating hazards that create risk to measuring the influence of methods on risk reduction. That's where ROI comes into the picture.

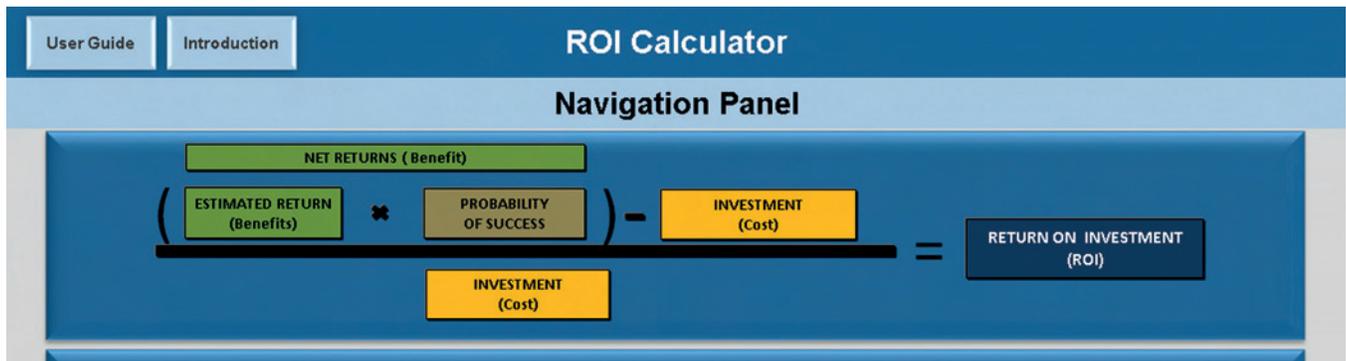
ROI Calculator

The ROI calculator, developed in cooperation with Boozé, Allen, Hamilton Consulting, is available at www.mxfatigue.com. The software is comprised of a sophisticated set of connected Excel spreadsheets. The ROI calculation is based on a straightforward math formula that subtracts the total cost from the net return (expected benefit times the probability of success) and divides that number by the total cost (see figure 1). The calculation can only be as accurate as the data you input. The user must commit a reasonable amount of effort upfront to establish the expected net investment (cost) and the expected net return (benefit).

Real World Example

Aircraft damage, maintenance delay, customer returns, worker injuries, and more have an impact on the annual earnings of any large maintenance organization. The costs of such errors should not be considered as "the cost of doing business" rather they are the cost of not doing business as well as possible. These incidents are indicators of organizational safety and potential predictors of aviation accidents.

▼Fig. 1: A screenshot of the ROI Calculator Navigation Panel showing the basic formula.



In this real world example, a large maintenance organization acknowledged human fatigue as a safety risk in their organization. The company began collecting data on the contribution of fatigue to company incidents and accidents. They used the FAA's objective fatigue questions to identify when fatigue was a possible contributor and instituted scheduling limits in 2009. In 2011, they instituted fatigue countermeasure training as a safety intervention for all of their maintenance technicians and management. The training was implemented from January 2011 to January 2012.

The training was developed by the FAA-Industry Maintenance Fatigue Workgroup. It was comprised of about 90 minutes of interactive training and testing, along with the video entitled "Grounded" (available for free at www.mxfatigue.com). The computer based training was delivered, with minimal logistics, at multiple locations across the company. They achieved substantial savings since the training was developed by the FAA and made available on-demand at no cost.

The remainder of this paper demonstrates the ROI calculations, using the FAA's calculator.

Estimated Investments for Fatigue Training

Figure 2 shows the company's personnel cost estimates for implementing the training. There is an additional section of the spreadsheet, not shown in the figure, for non-labor costs like hardware, facilities and supplies, and other such expenses. To identify these costs, the company answered a series of questions, not included in the calculator that can help the user collect the necessary data. Table 1 shows a simple list of questions that helps first-time users complete the investment form. Of course, you may have other expenses so don't stop with these questions if your investment requires more detail.

For this company, the responses to the Table 1 questions determined that the investment costs were limited to personnel time. Personnel expense was limited to the time of the trainees and some of the management and administrative support. The employees completed the training via the FAASAFETY.gov website. Company training personnel logged completions for corporate track-

Labor Role for Each Type of Employee on the Project	Notes About Employees' Roles	Hourly Employee Salary	# of Employees on the project	# of Hrs per Employee	Total Labor Hours	Total Safety Intervention Labor Cost
Management and Admin	Across 6 geographical units	\$ 30.00	6	25	150	\$ 4,500
Mechanics Trained outside normal hours (2 hours)	Did CBT away from work (40% of 2500)	\$ 25.00	1,000	2	2,000	\$ 50,000
Mechanics Trained at Work (2 hours)	Required lost opportunity (60%)	\$ 25.00	1,500	2	3,000	\$ 75,000
Lost profit on 1500 workers	Sell rate \$50	\$ 25.00	1,500	2	3,000	\$ 75,000
Training Investment						
\$ 204,500						
Sub-total Labor Investment			4,006	31	8,150	\$ 204,500

▲ Figure 2: Cost estimates for training

Financial Indicators that your Intervention will improve	Notes about Financial Indicators	Average Cost per Event*	# of Current issues per year	# of Current Issues per year to be addressed	Total Estimated Returns
Aircraft Damage	89 expected in 2011 @ average of 105,000	\$ 105,000	89	9	\$ 934,500
OSHA Reportable Injuries	183 expected in 2011 @ average of 6307	\$ 6,307	183	13	\$ 119,202
Total Financial Returns					
\$ 1,053,702					
Total Financial Returns			278	28	\$ 1,053,702

▲ Figure 3: Estimated returns for training

ing. Nearly half (40%) of the employees completed the training away from the worksite so there were no lost production costs. Others (60%) trained instead of working so cost was associated with their unavailability. As previously mentioned there was no cost to the company to develop the training.

Table 1: Example questions to determine costs associated with safety intervention.

1. How many personnel were trained?
2. How long was the training in hours?
3. What is the average hourly rate for mechanics? Is one average good enough?
4. Who else was trained, for how long, and at what price?
5. Is it appropriate to use the salary, without benefits?
6. If we have to use a multiplier for benefits how much?
7. Were there missed opportunity costs during training time?
8. Are management and clerical support

a sunk cost or do their hours need to be counted?

9. If not sunk cost, how many hours and at what rate?
10. Did you have to buy special hardware?
11. How do you want to amortize the hardware costs?
12. Special costs for training facilities?
13. Over how many quarters did the training occur? What % of training was delivered in each quarter for up to 6 quarters?

Data on investments and returns do not show the cash flow, or the timeline for financial and safety returns. The next steps in the tool require you to assign estimated spending and return rates by quarter. These data are not presented here.

Estimated Return for Fatigue Countermeasure Training

To estimate the return or benefit of the training, the company answered a series of questions regarding financial and safety returns (see Table 2).

Table 2: Example questions to determine benefits associated with safety intervention.

1. What safety incidents will be influenced by this intervention?
2. How many safety incidents are there currently?
3. How many safety incidents do you expect the intervention will resolve?
4. What key performance indicators will be influenced by this intervention?
5. For the selected performance indicators, what is the current performance level?
6. For the selected performance indicators, what will be the targeted change?
7. How much will personnel efficiency be improved?
8. What are the metrics you will use to measure these changes (e.g., aircraft damage, rework, delivery delay, employee injuries, lost time job injuries)?
9. What are the costs associated with each metric you selected?

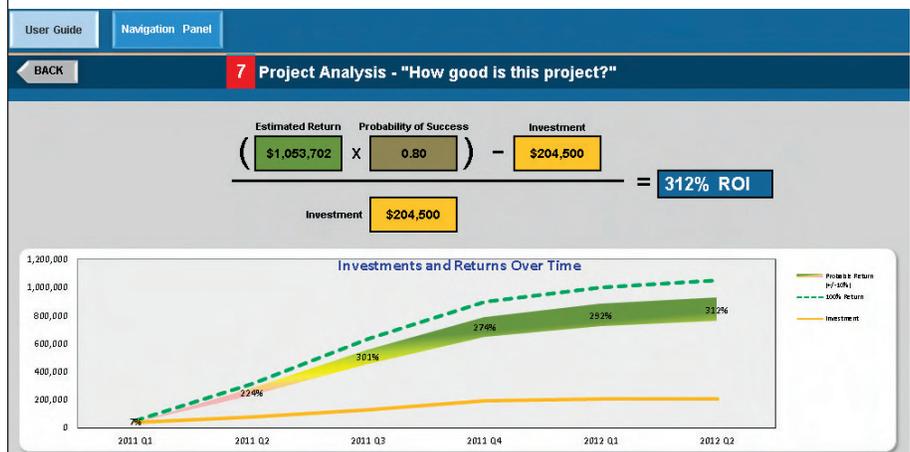
The company expected to see a reduction in aircraft damage and OSHA reportable injuries based on 2010 performance (see Figure 3). From the start, the company believed the training could target 10% of the predicted aircraft damage events (10% of 89 events in 2011, at an average cost of \$105K) and 10% of the predicted on-the-job injuries (10% of 189 OSHA reportable injuries in 2011, at an average cost of \$6307).

Probability that you can Achieve the Benefit

Best predictions of expected costs and

Success Categories	Select Score 1-5:
Prior Experience	
1 At least one person on the project team has a working knowledge and experience with Project Management processes	5
2 At least half of the project team has successfully completed more than two projects of similar size and function	4
3 The project sponsor has successfully led to completion more than two projects of similar size and function	3
4 The customer has signed off acceptance of more than two successfully delivered projects of similar size and function	4
5 The customer, leadership, and the project team have worked on a successful project of similar size and function in the past	3
Sub-section average score: 3.8	
Leadership and Customer	
6 The project has defined roles and responsibilities for customer, leadership, and project team members	3
7 The project has a sponsor with budget authority	4
8 The customer and project team have agreed to readily identifiable deliverables and success criteria	2
9 Leadership and the customer agree to participate in all milestone project review meetings	5
10 Leadership and the customer agree to sign-off deliverables according to the predefined success criteria	5
Sub-section average score: 3.8	
Resources	
11 Leadership and the project team agree there are sufficient resources available until the end of the project	4
12 The project team has matched the skills and abilities of the team members to the needs of the project	4
13 All materials required for the project are available, or have a committed delivery date in line with the project plan	5
14 The sponsor commits to support a request for additional resources, if required	4
15 The Safety and Quality departments are involved in the project planning, development and implementation	4
Sub-section average score: 4.2	
Planning	
16 Leadership and the project team have developed and approved a business case that aligns to organizational objectives	5
17 Leadership and the project team agree the project plan is SMART (Specific, Measurable, Achievable, Relevant, and Time-bound)	4
18 Leadership and the project team agree that appropriate milestones have been built into the project plan	3
19 Leadership and the project team have developed and approved a risk log with contingencies	4
20 A communications plan has been developed and will be implemented to inform stakeholders of progress	5
Sub-section average score: 4.2	
Probable returns - "How much of the estimated Returns will be realized?"	
80%	

▲ Figure 4: Screen showing calculation of probability of success



▲ Figure 5: Safety improvements equal financial returns

returns are rough estimates and likely not 100% accurate. Since most ROI is done before the fact, the likelihood (prob-

ability) of success is part of the calculation. The probability of success used in the formula to compute Net Return, is



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a function of prior experience, the level of corporate support, the availability of resources, and the amount of planning that is committed to the development of the safety intervention.

Figure 4 shows a screen of 20 questions, rated using a 5 point likert scale that assigns a probability of success. The software automatically assigns a +/-10% confidence level around the probability in the output. In this case, the company estimated that the probability of training successfully resolving the target safety and investment returns was 80%.

ROI Analysis

Figure 5 shows the ROI output chart in the project analysis summary. In this example, the ROI is extraordinarily high. This is partially attributable to the extremely low training costs since the FAA fatigue countermeasure training was free. The ROI over six quarters is 312%. The original investment of personnel time is paid back within the first quarter.

The company also made a conservative estimate that adherence to the fatigue training could improve worker efficiency at a rate of 1%. One percent of all hours worked in 2011 would mean a benefit of \$900,000 in efficiency. This is not reflected in the ROI calculation because the return becomes so large it is almost unbelievable. When the investment is low and the benefits are high the ROI can be hard to believe.

Realized Performance Improvements from 2010 to 2011

ROI calculations are not the end all. More importantly is a straight forward comparison of performance from one year to the next. In this company the cost of aircraft damages was reduced by nearly 30% for 2011. That is \$3,045,000 in savings. OSHA injuries were stable in 2011 but the average cost of an incident was reduced by nearly 15%, saving \$183,534. These performance improvements were achieved by a variety of programs, including the fatigue countermeasure training.

Bottom Line

Naysayers may say that ROI has too much focus on money and not enough on safety. Whichever way you look at it, money and safety are inseparably

linked. While return-on investment is a financial concept, the financial return is largely driven by the safety returns. Safety interventions can and do make a difference but it will take executive attention and ROI calculations like the example provided here to make these interventions a priority. Safety interventions like the fatigue countermeasure training can be the gateway to a competitive advantage instead of the first thing that gets cut when money gets tight.

Although the FAA ROI Calculator provides stepwise instructions and guidance, the software cannot check the quality of your input. The hard work is up to you.

The FAA maintains the fatigue countermeasure training and ROI calculator at www.mxfatigue.com on-demand at no charge. **cat**

References

1. Johnson, W.B. (2006). Return on investment in human factors. *The Journal of Civil Aviation Training*. Issue 4/2006.
2. Rosenkrans, W. (2012). Financial SMS. *Aviation Safety World*, Dec 11- Jan 12, www.Flightsafety.org.
3. Huang, Y.H., Leamon, T.B., Courtney, T.K., DeArmond, S., Chen, P.Y., & Blair, M.F. (2009). Financial decision makers' views on safety: What SH&E professionals should know. *Professional Safety*. April/2009.



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