BUSINESS ASPECTS OF OCCUPATIONAL SAFETY AND HEALTH INTERVENTIONS

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Abstract
Business aspects of occupational safety and health interventions model will be presented. The model addresses the challenges for an environmental, health, and safety (EHS) professional and presents learning opportunities how to convince the management to maximize the effectiveness of the EHS program and consequently increase productivity. Practical applications and the use of MS Excel software are presented. Concrete examples are presented for each phase and risk evaluations and financial benefits of the suggested model.

Key words*: risk, management system, environmental, health and safety risk, financial benefits, model*

1. INTRODUCTION

One of the many challenges for an environmental, health, and safety (EHS) professional is convincing the management to maximize the effectiveness of the safety program and consequently increasing productivity. EHS professionals have to help the management transform safety into an accepted business value for their organization. To gain recognition, EHS professionals and managers have to learn how to make the "business case" for EHS interventions by measuring and comparing the performance of programs with another similar successful organization or safety program. In order to be successful, the EHS professionals have to learn to use the tools and language of the business managers effectively.

If the EHS professional does not understand financial loss or benefits to an organization, senior business management will find it difficult to understand the financial benefit of the safety program. The undesirable outcome is that EHS issues are not fully integrated into the standard business framework and value chain. As a result, the management views the EHS function in terms of a compliance-oriented, reactive strategy that would cost a significant amount of money without providing considerable benefits.

In order to develop and improve EHS professionals' business skills, both American Industrial Hygiene Association (AIHA) and American Society of Safety Engineers (ASSE) initiated a Value of the Profession studies. AIHA's Value of the Profession (AIHA VoP) study was completed and the results were unveiled in June 2008 at AIHCe in Minneapolis. The research results from the study showed difficulties in separating Industrial Hygiene/Occupation Hygiene (IH/OH) data from EHS data. AIHA's value strategy has eight steps:

1. Identify key business objectives and IH hazards
2. Evaluate and prioritize value opportunities
3. Assess risk reduction
4. Select approach of the value proposition
5. Identify changes
6. Assess impacts
7. Determine value
8. Present value proposition

The ASSE Value of the Safety Professional has three focus areas:

1. Repositioning Safety
2. Repositioning the Safety Professional
3. Preparing the Safety Professional to be Value-Add Employee

One of the weaknesses of EHS professional education is the lack of business practices instruction. Areas for improvement were mentioned in Professional Safety May 2008 issue. The business managers noted that the EHS managers need improvement in the following skill areas:

- Plan and react strategically.
- Transform data/insights into practical solutions.
- Develop methods that integrate safety performance into business productivity.
- Align the group's project plans with overall business strategy.
- Understand financial-related terms and information.
- Evaluate proposed investments against their projected payoff.

Historically, the quantification of safety theories has been a difficult subject for EHS students. The lack of freely available electronic and interactive tools led us to believe that the development of such tools was a necessary step for enhancement of EHS programs. Excel based tools were developed to exploit statistical evaluation of different EHS theories.

One of these tools was developed by Dr. Georgi Popov, QEP, Safety Sciences Programs, University of Central Missouri. The tool is designed to help EHS professional by determining the overall value of the improvement program or Step 7 of AIHA's value strategy. The tool is used as a part of "Making a business case for safety" practical exercise for UCMs Statistical Analysis for Risk Management course.

Making a business case for EHS module complies with the following program specific educational objectives:

1. Industrial Hygiene Programs

- assess qualitative and quantitative aspects of exposure assessment, dose-response, and risk characterization based on applicable pathways and modes of entry;
- calculate, interpret, and apply statistical and epidemiological data;
- recommend and evaluate engineering, administrative, and personal protective equipment controls and/or other interventions to reduce or eliminate hazards;
- demonstrate an understanding of applicable business and managerial practices

2. Safety Programs

- Demonstrate the application of business and risk management concepts;
- Design and evaluate safety, health, and/or environmental programs

The "Making a Business Case for Safety" tool is based partially on AIHA's Value of the Profession study and includes: Gross Cost Savings from EHS Programs or Activities, Expanded Return on Safety, Health and Environmental Investments (ROHSEI) Framework, Net Present Value (NPV), Payback Period, Simple ROI and Internal Rate of Return interactive calculators. Also included is a calculations worksheet to compare four different proposals. The EHS tool is based on existing concepts and models. The model utilizes real world safety improvements examples and business concepts to increase the understanding of the system. It is also representation of a system, which

provides the means for demonstration of a value-add EHS program.

The EHS professional has to consider and calculate the cost of the intervention. He/She may need to assemble a team of engineers, financial officer, supervisors, and affected employees and other professionals. Based on their program of study, the students use different real world examples, suggest improvement solutions, and calculate the costs associated with implementation of new EHS programs. Examples include a storm water pollution prevention plan, better chemical storage, ventilation system to reduce airborne particulate exposure, scaffolding, use of substitution two hands lift trash bags, personal protective equipment (PPE), etc. Different solutions are evaluated and prioritized.

To demonstrate the business aspects of health and safety interventions, the authors utilized the following case study.

2. CASE STUDY

Management of a large not-for-profit hospital planned to replace all existing soiled linen and trash collection receptacles with new containers of a single size and shape. This provided an opportunity for the EHS professionals responsible for the risk management, safety and health of workers to explore alternative trash bags with the goal of reducing occupational injury and illnesses associated with lifting and carrying bags containing linen and trash.

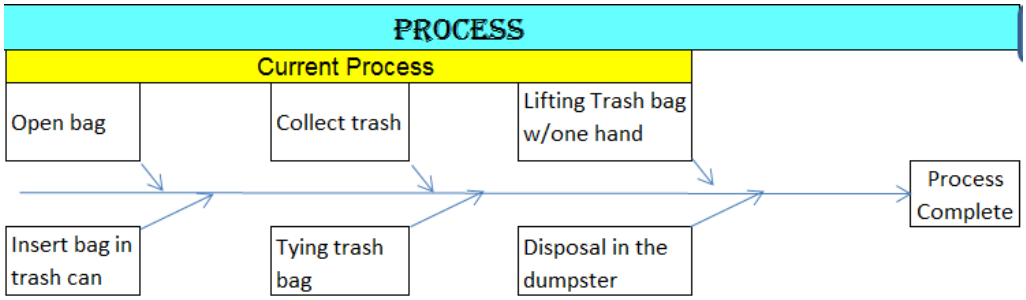
The decision was to evaluate the ergonomic advantages of Litelift™ ergonomic bags compared to the current bags being used in trash collection and disposal. Litelift™ bags are specially designed with a handle in the bottom of the bag, and as the employees tie the top of the bag the tie becomes a second handle. Use of two handles allows the carriers to balance the load while lifting and carrying. Please see the digital image (Fig. 1) below.

Fig. 1 Litelift™ ergonomic bags

Various applications of Litelift™ ergonomic bags

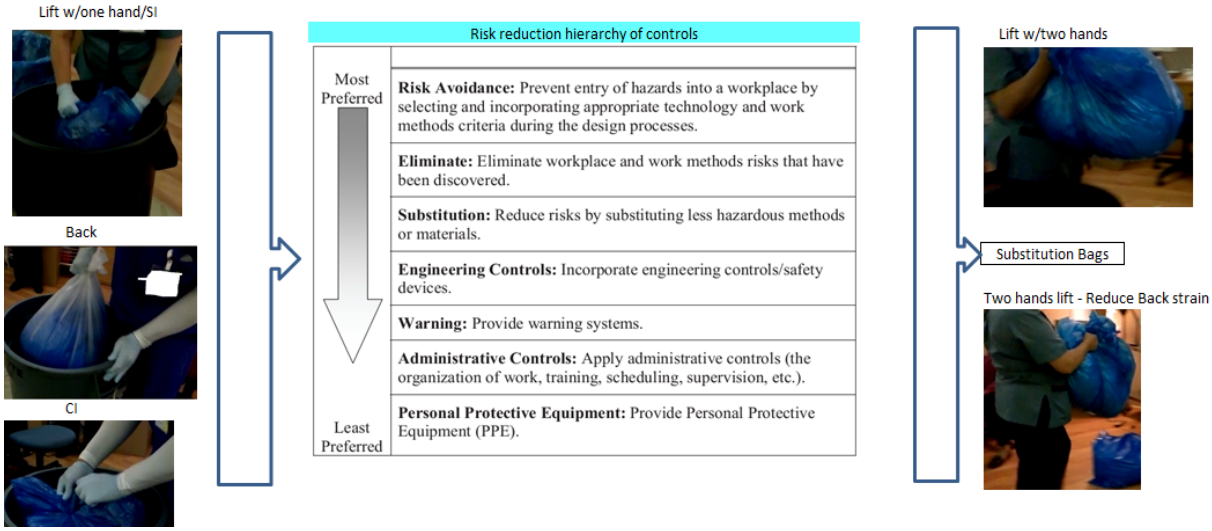
The project began by establishing a team of staff who had either interest in the project, were safety and health professionals, or had resource allocation authority or understanding of the ergonomics risk. The risk assessment of the conventional linen bags began with the description of the following work process, illustrated in the fish-bone diagram (Fig. 2) below.

Fig. 2. Current process – "conventional" trash bags



The next step in developing a Business Case is to identify the main safety and health hazards. Three main ergonomic hazards were identified and recorded in the form (Fig. 3) below.

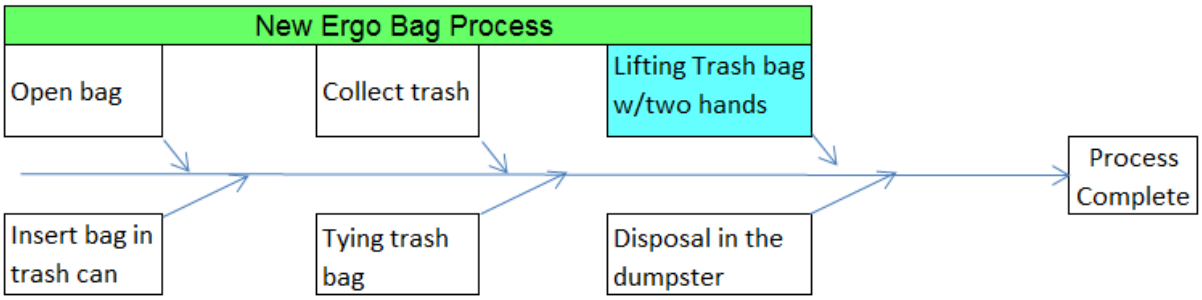
Fig. 3 Safety and health hazards associated with trash bags disposal process



With the hazards identified, the next step involved utilizing hierarchy of controls to determine possible benefits from the substitution bags. The readers will notice that two hands lift (pictures to the right) will potentially reduce back strain.

With the solution being agreed upon, the project continued with a pilot test using the Litelift™ to lift, carry, and dispose of trash bags. The same fish-bone diagram (Fig. 4) was used to visualize the process with the new Litelift™ ergonomic bags.

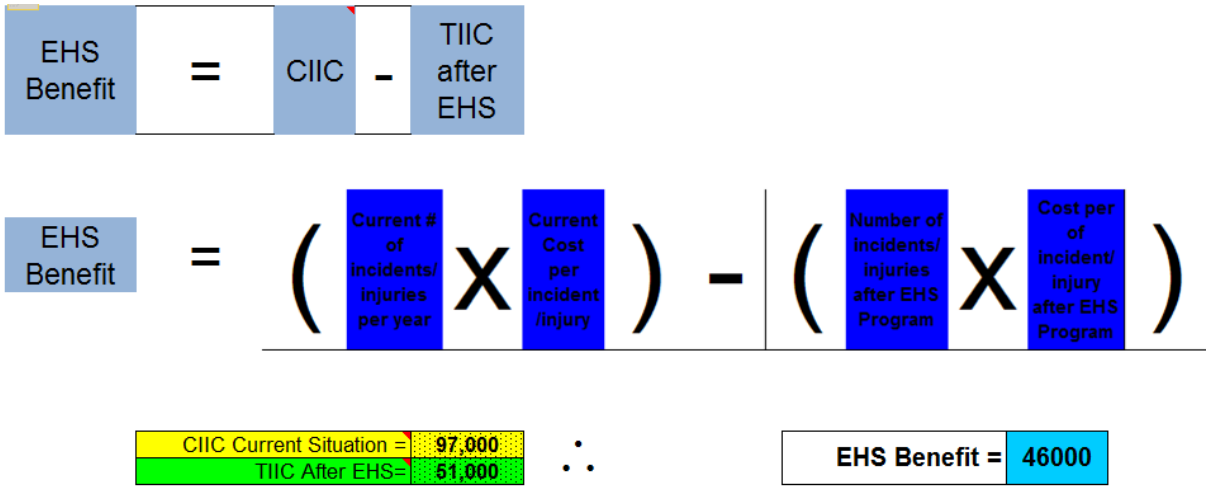
Fig. 4. Future sate process – Litelift™ ergonomic trash bags



The EHS professionals have used proper risk assessment tools to calculate changes in health and safety risk scores. The calculations showed 37% risk reduction. More detailed financial/non-financial analysis is definitely recommended if the financial losses related to health and safety injuries are available.

The Excel-based tool (Fig. 5) helps EHS professionals compare total annual incidence cost before the improvements/intervention; total annual incidence cost after the improvements/intervention, and calculates incident benefit and cost savings.

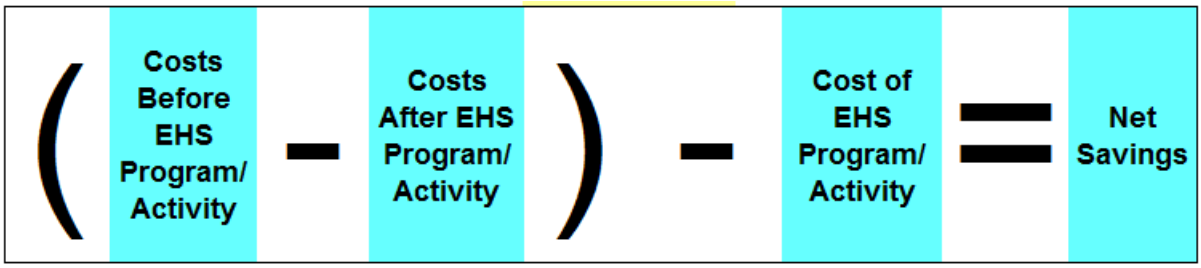
Fig. 5 EHS Incident benefit calculation

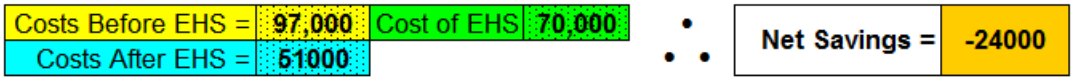


The EHS professional can next calculate the ROSHEI by simply adding net savings, new revenue (generated form increased productivity), and other benefits (increased employee morale, lowered turnover rates, etc).

Let's assume, EHS professional is informed by the accounting and risk management department that our injuries and illnesses cost related to trash disposal is averaging 97,000 USD annually. The user will enter $97,000 in "Cost before EHS" cell. If we estimate that will reduce the injury and illness cost to $51,000 after the implementation of the new Litelift™ ergonomic bags program, we'll enter $51,000 in "Cost after EHS" cell. Initial cost to implement the program and substitute the bags is estimated at $70,000. The formula below (Fig. 6) shows $24,000 losses due to initial EHS investment during the first year of the program implementation.

Fig. 6 Expanded Return on Health, Safety and Environmental Investments Framework

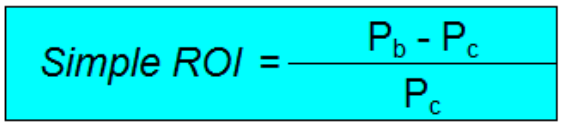




However, after the first year, the new program will generate $46,000 cost savings (difference between Cost before EHS and Cost after EHS) annually.

Simple return on EHS investment (Fig. 7) is calculated next and it is displayed as a numerical value as well as percentage.

Fig. 7 Simple return on EHS investment



Benefits			Costs	
Benefit 1:	$46,000.00	% Red Ergo Inj.	Cost 1:	$70,000.00
P_b =	$46,000.00		P_c =	$70,000.00

∴				
	Simple ROI =	-0.342857143	=	-34.29%

The reader will notice that we have negative ROI after the first year. That is it is important to calculate other financial benefits like Payback Period and Net Present Value (NPV).

Therefore, we can calculate NPV next. NPV is another important term used in business. Microsoft offers a free NPV calculator for Excel. A simplified version is included in ESH ROI v 1.0 tool developed by Dr. Popov, Safety Sciences Programs. NPV calculation (Fig. 8) for the above mentioned example is presented below.

Fig. 8 NPV Calculation

Net Present Value (NPV)

$$\sum_{t=0}^{n} A_t (1+i)^{-t}$$

***A_t represents the annual net discounted cash flow of program or intervention**
i represents the designated discount rate
$(1+i)^{-t}$ is called the 'Discount Factor' - DF

A_{t0} =	-70,000	A_{t1} =	46,000	A_{t2} =	46,000	A_{t3} =	46,000	A_{t4} =	46,000	A_{t5} =	46,000
i =	0.07										

For t=3, NPV =	50719

For t=5, NPV =	118609

After that, the EHS professional will have to calculate the payback period (Fig. 9) for the safety investment. Payback period is well defined in "Investopedia" and is calculated in years. The first year starts when the EHS improvement is completed.

Fig. 9 Payback period calculation

$$\sum_{t=0}^{p} A_{t,x} \geq 0$$

*$A_{t,x}$ represents the annual net cash flow of a program or intervention. The simple payback period does not consider the value of time; the cash flow entries are not discounted. The discounted payback period uses cash flow entries which have been discounted.

t =	0	1	2	3	4	5
A_t =	-70,000	46000	46000	46000	46000	46000
Cumulative Net Cash Flow =	-70000	-24000	22000	68000	114000	160000

Payback Date =		1.52174

* Payback Date is in years.
The first year starts the minute the project is finished
Thus 0<t<1 is in the first year, 1<t<2 is in the second year, etc…

In this case the payback period is approximately one and a half years.

Internal Rate of Return (IRR) is another business term and is usually considered a simplified alternative to NPV. The tool calculates and displays IRR (Fig. 10) as a percentage.

Fig. 10 Internal Rate of Return Calculation

$$\sum_{t=0}^{n} \frac{A_t}{(1+i)^t} = 0$$

* A_t represents the annual net discounted cash flow of program or intervention and 'i' represents the interest rate. Notice that the IRR formula is merely the NPV formula set equal to zero, with cash flows known.
Three basic methods are used to solve for the unknown interest value: trial and error, graphic representation, and financial calculator or computer solution.

Example:

Year:	0	1	2	3	4	5
Cash Flow:	-70,000	46000	46000	46000	46000	46000

IRR =	59%

* Excel usually succeeds if the internal rate of return value is close to typical returns (say, between -10% and 30%), but it sometimes has trouble with returns that are outside this range. In this case, supply a guess argument that's close to the actual internal rate of return value. The formula is: "=irr(Values,[GUESS])"
For values: simply click and highlight the row of CF values
GUESS should be a rough estimate of expected IRR value (i.e. 25)

This is just one example and a methodology to develop business cases for EHS interventions. To satisfy the new expectations and gain support for EHS improvements, the EHS professionals and students are expected to participate actively in the design of new products, program development, project improvements and many other activities. They are also required to complete at least a cost – benefit analysis for mitigating potential hazards.

3. CONCLUSIONS

The perception among senior managers is that in many respects, EHS professionals do not have the skills necessary to participate actively in the whole business decision making process. EHS professionals are often viewed as too technical and unable to look at issues from a big-picture perspective or to integrate safety programs into the business model. Academic modules will have to be developed to incorporate safety into business decision making process. The students should learn how to convince the management that organizations that eliminate or reduce hazards by making EHS investments, design or engineering changes generally improve their workplace safety and health and save money in the long run.

Since the business managers are more interested in profits and losses than EHS indicators, the students will have to learn to translate EHS technical details into business benefits. Finally, EHS professionals should acquire certain business skills to be more involved in the design, planning, and the financial aspects of the projects. Workplace safety investments should not be overlooked, because they are even more critical during economic downturns

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