Ergonomics

Return on Investment

Show Me the Money

By Winnie Ip, Jennie Gober and Walt Rostykus

Musculoskeletal disorders (MSDs) continue to account for largest proportion of recordable workplace injuries (45% to 65%), and employers are focusing on establishing or improving their ergonomics programs to address this loss. Benchmarking studies (Humantech, 2011; 2014a, b) suggest that a common challenge with ergonomic programs is the lack of resources such as people, time and money. Why don't these alarming statistics justify the resources for improving workplace ergonomics? Part of the problem is demonstrating the value or financial return produced by ergonomic improvements and programs. OSH professional must be able to calculate and demonstrate this value to sell these programs to upper management.

This article aims to 1) share various models of cost justification and the elements of determining the return on investment (ROI) of an ergonomics program; and 2) provide guidance on the investment and results data needed to calculate the return.

IN BRIEF

•Ergonomic programs often lack resources: people, time and money. Part of the problem is demonstrating the financial return of ergonomic improvements and ergonomic programs.

•OSH professionals can measure the value of improved workplace ergonomics in more ways than the traditional reduction of injury costs. Improved productivity, quality and employee retention can provide greater returns.

•This article shares various models of cost justification and the elements of determining the return on investment, and provides guidance on the investment and results data needed to calculate the return.

Cost Justification

In today's business climate, any initiative that does not deliver measurable (short- to medium-term) value is considered an option, not a requirement. Ergonomic improvements and programs are more likely to be supported and accelerated if they fit into a cost justification process.

Cost justification is a normal business process that managers and executives use to weigh the costs and benefits of various improvement initiatives. Managers are challenged each day to do more with less and are often measured on how quickly they can improve productivity and quality.

Cost justification:

•enables communication between safety, engineering and management;

•takes the focus away from injuries (a reactive measure);

•focuses on taking action before an injury occurs (a proactive measure);

•enables a firm to prioritize countermeasures (e.g., compare payback periods);

•makes good business sense and affects the bottom line.

Management must often weigh the merits of ergonomic improvements against other potential projects. Ergonomic projects that produce an ROI are both effective and efficient in reducing hazard exposures.

Typical Cost Justification Models

Many business reasons support ergonomics initiatives. Primary drivers typically include factors such as regulatory compliance, OSH performance and production enhancement. Three common cost justification models are (Table 1):

1) Cost effectiveness: The improvement's effect on the number of injuries prevented.

2) Cost benefit: The improvement's effect on the costs saved.

3) Cost utility: The improvement's effect on worker satisfaction.

When using each model, one must understand that the ease of obtaining and analyzing data varies among each. Additionally, the type of management (proactive vs. reactive) also varies within each model.

While one might easily obtain past injury costs (cost effectiveness), the resulting focus on reactive

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injuries may be ineffective. Team member satisfaction (cost utility) can be a proactive approach, but analyzing these data is difficult since the data are subjective and can vary greatly across team members or work groups. Middle ground is capturing various benefits that might relate to factors such as ergonomic risk, productivity or quality (cost/benefit). These can be both reactive and/or proactive types of management and data are moderately easy to analyze.

Return on Investment

ROI is a commonly used calculation to determine the value of and payback on an investment. Industry managers use ROI to cost justify the purchase of equipment or an investment in supporting services and infrastructure. In most cases, operations managers ask for the ROI of ergonomic improvements. However, information on the payback of engineering controls to improve workplace ergonomics is limited. As a result, ROI principles are not widely used to demonstrate the value of an ergonomics program.

Calculating ROI involves a simple ratio or division equation. The benefit (return) is the numerator and the cost (investment) is the denominator. The resulting quotient is ROI = benefit/cost. To demonstrate the ROI for ergonomics, one must include specific variables unique to the program's elements and resources.

Measures Needed to Calculate ROI for Ergonomics

Two measures or variables make up the equation of calculating ROI for ergonomic programs. Let's start with the costs, which include set costs, resource costs and performance costs.

Set costs consist of training delivery and materials, and engineering controls for both capital projects and expensed projects. Resource costs include the hourly cost of people supporting the ergonomics program to complete training, conduct assessments, apply ergonomic design guidelines, implement improvements and controls, and/or manage the program. This includes the ergonomics program manager, ergonomic team members, engineers and leadership/sponsor. Performance costs include the costs of MSD injury treatment and compensation, as well as the costs of decreased productivity, poor quality work and employee turnover.

Benefit is the other measure needed to calculate ROI. Benefit measures are not limited to the reduction of MSD injuries. Effective occupational ergonomics has been proven to improve many aspects of human performance in the workplace. These include:

Table 1
Cost Justification Models

Model	Ease of analysis	Type of management
Cost effectiveness	Less difficult	Reactive
Cost benefit	Moderate	Can be either proactive or reactive
Cost utility	More difficult	Proactive

•decreased incidence and severity of MSD injuries by reducing MSD risk factors;
•decreased cycle time (improvement in productivity) by reducing nonvalue-added motions;
•improved product and work quality by removing barriers to quality;
•improved employee retention (reduced turnover) by providing a workplace and conditions that enable people to stay at work.

To fit into the ROI equation, each benefit must be stated as a monetary value that reflects the true cost to the organization.

ROI of Ergonomics Programs

In 2014, Humantech (the authors' firm) conducted a study to calculate the ROI of a single-site ergonomics programs. This study aimed to test the hypothesis that program ROI should be two to three times the investment.

The benchmarking study focused on U.S.-based sites with established ergonomics programs. Participants were asked to complete an online survey that asked for detailed measures of ergonomics program investment and results.

Because not all companies can provide this type of information, 50 companies were identified as study candidates. Of these, 52% (26) agreed to learn more about the study. A representative then contacted each interested company to explain the study and to provide a worksheet that detailed the program data requested as well as a link to the online survey. Of these 26 companies:

•42% (11) chose not to complete the survey. Nine stated that after reviewing the checklist they did not have the information to complete the survey.
•35% (9) partially completed the survey.
•23% (6) fully completed the survey.

The final participants included five manufacturing companies and one utility. The types of manufacturing firms represented consumer motor vehicles, food production, packaging materials, commercial air handling systems and photovoltaic electronics. Each participant's responses related to an established, ongoing ergonomics program at a single location.

Table 2
Investment in Ergonomics Program Resources

Investment	Findings
Size of ergonomic support team	1 to 28 people; average = 11.8
Ratio of ergonomic support team members to total employees	1:11 to 1:500
Time allocated for ergonomics process lead to manage the program	Majority = 4 to 8 hours/month
Time allocated for ergonomics support team for activities	Majority = 1 to 8 hours/month
Annual cost for expensed improvements	Majority = $10,000 to $50,000/year
Annual cost for capital improvements	$0 to $100,000/year

Site program characteristics varied widely. Program age varied from young (1 to 3 years) to mature (10 to 15 years). MSDs accounted for 21% to 82% of recordable injuries/illnesses (average 42%) at these sites.

Although the low number of participants resulted in a limited study, the research team chose to view it as a learning opportunity to improve future studies. Because of the low sample size (6), the statistical significance of the data provided by participants is low. However, as a first attempt to study ROI of ergonomics program management, the results provide some insight for OSH professionals who manage ergonomics (e.g., what program information is needed to calculate ROI) and for researchers who investigate ergonomics program management and payback.

As noted, the team used an online survey tool to collect data. Data were collected as both unique values and within a range of values. Ranges were used to ease survey completion with the understanding that this could affect the definition of the findings. For this initial study, the study team accepted the lack of statistical validity to gain general findings of a previously unexplored aspect of OSH program management.

Through the survey, participants provided information about the investments of time, resources and cost, and about results achieved. These two categories of variables were used to calculate the ROI of each site program.

Investment

Survey questions collected information about the people, their time and the costs invested in site ergonomics programs.

People

All participants had established a support structure of designated people to maintain the site ergonomics process. The size and makeup of each team varied according to site culture, need and available resources. Some teams represented cross functions of the organizations, while others relied primarily on one or a few departments.

All participanting companies had designated a person as the ergonomics process lead or manager. Only two sites identified engineers on their ergonomics teams; the engineers accounted for 27% to 60% of the people supporting the ergonomics process. Heavy reliance on engineers to manage ergonomics is a best practice identified in previous benchmarking studies.

When comparing the number of ergonomics program support team members to the number of employees at the site, the ratio ranged from one support team member for every 65 to 120 employees. Note that a range is provided because the number of support team members was determined based on a range selected as the survey response.

Time

Hiring personnel who have the right skills and roles is important for any ergonomics program; their availability to work on the job improvement process is critical.

When asked about the time available for an ergonomics process leader to manage the program, 50% had 4 to 8 hours allocated each month. When asked about the time dedicated for ergonomics team members and designated support people to conduct assessments, lead improvements and attend meetings, most participants (83%) indicated fewer than 4 hours each month per person. Similarly, when asked about the time engineers spent each month addressing ergonomic designs of new and existing equipment, most participants (83%) reported it was fewer than 4 hours each month.

Money

Money costs encompass people and training. In calculating the ROI of any program, the investment of people involved and their time must be expressed in terms of cost. In the survey, participants were asked for the hourly burdened cost for people in each role supporting the ergonomics program (e.g., ergonomics process lead, senior management, engineer). In addition, a company must invest in developing the skills and abilities of people serving in their respective roles. The same is true for an ergonomics program. Typically, training is provided for people with specific roles.

Engineering Controls

The primary and most effective way to reduce MSDs is through engineering controls—changes to the design, geometry and adjustability of workstations and tools to fit the workplace to the people. Engineering controls were organized into two categories based on the cost and the requirements for funding approval.

The thresholds of capital and expensed purchases vary by organization based on each surveyed firm's financial policies. Typically, capital purchases cost more, require planned budgeting and justification, and depreciate over time. Expensed improvements have a lower cost associated with them. Table 2 provides a summary of the key investments to manage site ergonomic programs.

Benefits

Injury & Illness Cost Reduction

Effective ergonomics programs focus on identifying and reducing the risk factors that cause MSDs. These risk factors include awkward posture, high force and time (long duration, high frequency). By identifying and mitigating these well-known causal factors, a company can reduce the incidence of MSD injuries and the resulting workers' compensation costs.

Figure 1 presents the results received when participants were asked for information about change in the injury and illness (I/I) rate since starting their ergonomics program. Of the participants reporting a reduction in their injury and illness rate, the average annual reduction was 4.9% to 9.0%. Note that a range is provided because the length of the site program was derived from a response based on a range of years.

Based on participant reports of injury cost management, only a few participants provided complete data from which to calculate the value of the impact of improved ergonomics on injury reduction.

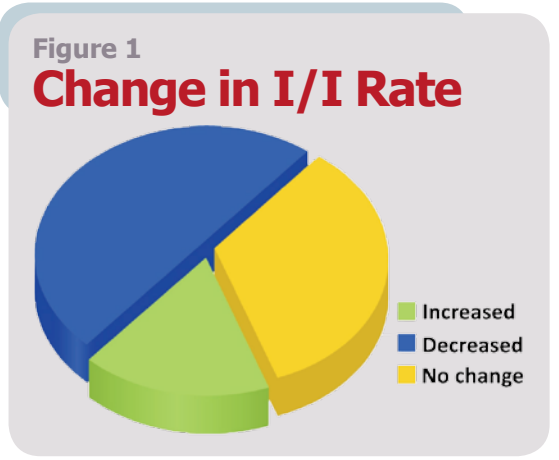

Figure 1 presents the results received when participants were asked for information about change in the injury and illness (I/I) rate since starting their ergonomics program.

This amount ranged between $2,977 and $4,854 per year (based on the incidence of MSDs and workers' compensation costs of the participating sites).

Productivity Improvement

Removing MSD risk factors from a task typically reduces nonvalue-added motions and is measured as an improvement in throughput or productivity. All participants tracked throughput improvement. Among the participants, the value of the impact of improved ergonomics ranged between $42,538 and $305,833 per year (based on the assumption that ergonomic improvement had at least a 5% impact on productivity).

Quality Improvement

Ergonomic improvements can also help remove barriers to quality and improve employee performance. When asked for the annual rate of scrap/rework, 86% of the participants tracked this measure. Of these, half saw no improvement. Only a few sites identified improvement in quality. Of these, the value of the impact of improved ergonomics ranged between $12,500 and $25,000 per year (based on the assumption that ergonomic improvement had at least a 5% impact on quality).

Employee Retention

Improved workplace ergonomics has been identified as a contributor to improving employee retention. When asked for annual rate of employee turnover, 86% of the survey participants measured this.

Participants reported that the average cost to manage the turnover of one employee ranges from $3,000 to $30,000 (average = $14,625). The average value of the impact of ergonomics on improving employee retention was calculated to range between $12,469 and $52,500 per year (based on the assumption that ergonomic improvement had at least a 5% impact on employee retention). Table 3 (p. 52) presents a summary of the recognized benefits (results) of ergonomic programs.

Calculating the ROI of Study Participants

As noted, this study's sample size was smaller than desired, and the survey was designed for some responses to be a range of numbers. This made it easier for participants to complete the survey and to protect company information. Since a range was used for several responses, an ROI range was calculated for most participants based on the investment and return data they provided.

Table 3

Benefits of Investing in Ergonomics Programs

Results	Findings
Annual reduction of recordable injury/illness	4.9% to 9% $2,977 to $4,854
Annual improvement in productivity	0% to 25% $42,538 to $305,833
Annual improvement in quality	$12,500 to $25,000
Annual savings from employee retention	$3,000 to $30,000

The equation used to calculate ROI was:

$$ROI = \frac{P + Q + E + I - Cost}{Cost\ of\ People,\ Equipment\ and\ Program}$$

where:

- Cost = total cost of people's time supporting the ergonomics program, training, capital and expensed improvements, plus any additional costs;
- Performance (P) = % change in cycle time x annual revenue x % of jobs improved through ergonomics;
- Quality (Q) = % change in scrap/rework x annual revenue x % of jobs improved through ergonomics;
- Employee retention (E) = % change in employee turnover/absenteeism x cost of employee turnover x % of jobs improved through ergonomics;
- Injury/illness (I) = % change in injury/illness rate x total workers' compensation costs x % of injuries attributed to poor ergonomics.

Based on participants' data, ROI was calculated for each site. The results ranged from 77% to 1,513% per year, with an average of 378%.

Conclusion

Calculating the ROI of individual ergonomic improvements has been demonstrated for many distinct engineering projects (Goggins, Spielholz & Nothstein, 2008; Mallon, 2012). Calculating ROI requires good planning and discipline to capture key measures before and after the project. However, calculating the ROI of a site ergonomics program requires a bit more work.

This benchmarking project was a first attempt to measure and calculate the ROI of a full site ergonomics process. The hypothesis was that the return should be 2 to 3 times the investment. Despite the low number of participants, incomplete data and design of some survey questions, the team completed calculations for four sites that confirmed the hypothesis. This calculated range of return is consistent with the ranges reported by varioius sources for safety management systems and safety programs (ASSE, 2002; Jervis & Collins, 2001; Liberty Mutual, 2001).

Other key conclusions:

1) Determining the ROI of an ergonomics program is of interest to many OSH professionals. However, they lack a clear understanding of the process and variables involved in making the calculations.

2) Many organizations are not collecting or have no access to the data required to measure all investments and returns on ergonomic improvements, and to calculate ROI.

- The investment of resources in an ergonomics program is not well documented or tracked.
- Assigning a dollar value to the resources invested and benefits returned by ergonomic improvements (and other safety programs) is not clearly understood or practiced.
- Other than traditional safety measures (e.g., injury/illness rate, workers' compensation cost), many sites do not track other values of improved ergonomics (e.g., quality, productivity, employee retention).
- The simple formula for ROI allows safety/ergonomics program managers to demonstrate and link the value of their program to an organization's bottom line. **PS**

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