

# Return on Investment for Ergonomics Interventions



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Within two years of the start of my career as an ergonomic consultant, I had lost count of the number of times I had been asked by prospective clients to provide return on investment data. Most companies seemed to have a grasp on the importance of ergonomics, yet they were struggling to cost justify their programs. Human resource professionals and risk managers often requested to see evidence of lowered injury rates and reduced workers' compensation costs whereas facilities managers, architects and designers were interested in productivity data. Today, the list of metrics has been expanded to include turnover, absenteeism, morale and employee satisfaction.

To an ergonomist or health and safety professional, the benefits of a sound ergonomics program might seem obvious. Improved workstation design should result in reduced discomfort levels and increased worker output. Healthier workers are less likely to develop debilitating injuries, resulting in reduced need for medical treatment and lowered costs. In the absence of physical ailments, employee morale and job satisfaction are also likely to improve.

Despite overwhelming evidence that ergonomics interventions result in a return on investment ranging from 3:1 to 15:1,<sup>1</sup> organizations continue to struggle to obtain appropriate funding for their programs. Former president of the International Ergonomics Association (IEA) Hal Hendrick once asked, 'Why is it that organizations with their strong need to obtain employee commitment, reduce expenses, and increase productivity, are not banging down our doors for help?'<sup>2</sup>.

Part of the challenge is that practitioners struggle to demonstrate the value of ergonomics beyond health and safety<sup>3</sup>.

Unfortunately, managers often do not consider ergonomics to be part of a business strategy or a means to achieving business goals. To many, the field of ergonomics is associated with costly injuries, specialized equipment and legal expenses. Dul & Neumann argue that managers are not necessarily to blame for these perceptions. A review of articles in 97 business and management journals including popular journals like Harvard Business Review and Fortune, during a 10 year period revealed that in 90 journals (93%), no ergonomics papers were published. In only seven of the journals there were 10 articles on ergonomics topics. From this, we can conclude that the field of ergonomics has failed to reach a critical audience.

Organizational challenges have also hindered progress in this area. Poor communication between program stakeholders and the lack of clearly defined performance metrics often prevents pre and post comparisons. Understandably, few organizations are willing to invest in programs with unknown or theoretical returns. The inability to gauge a program's success directly impacts the allocation of resources and renders most programs underfunded and ineffective.

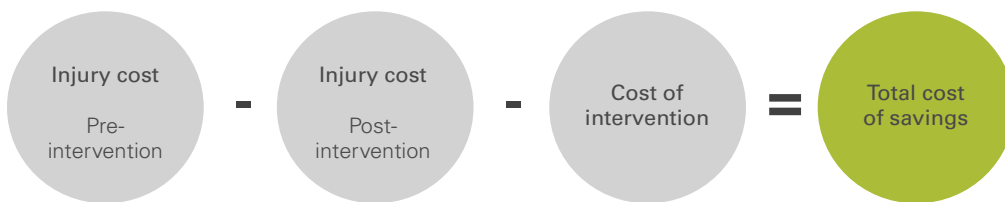
Luckily, the perceived value of health and safety investment among business leaders has been realized. A 2007 study by DeArmond, Huang, et al. focused on the perspectives of top-level financial decision-makers on workplace safety investments. Out of the 231 financial executives and managers surveyed, the majority recognized the need for safety measures and 87% believed that safety investments would lead to a positive return of investment. Those surveyed believed that for every dollar spent on direct costs, an additional \$2.12 would be spent on indirect costs such as workplace disruption, lost productivity, turnover, new employee training and increased insurance premiums. When asked to quantify the strength of this relationship, the average perceived return on investment was found to be \$4.41 per dollar. This study suggests that there may be more support for health and safety programs than previously thought. Business leaders appear to understand that safety investments should yield positive returns.

In 2005, BusinessWeek published a feature on business leaders of major companies endorsing ergonomics and the ROI of safety. Edmund F. Kelly, CEO of Liberty Mutual, has stated that, “Employees who work in a safe environment feel valued and are inclined to want to produce a quality product, increase productivity and make customers happy”<sup>4</sup>. In addition to implementing safety programs for both work and at home, Liberty Mutual developed a Research Institute for Safety dedicated to exploring ways to prevent workplace injuries and illnesses. Ed Galante, Senior Vice President of Exxon Mobil, has recognized that, “our focus on safety has also helped us achieve lower costs, better reliability and higher plant utilization.” He states that in the past decade, Exxon Mobil was able to reduce injuries by a factor of 10.

Over the course of the last several decades, the ergonomics research community has been able to link ergonomic interventions to a variety of cost savings. Many such efforts are highlighted in the subsequent sections of this chapter and are intended to assist practitioners in making a strong financial case for the implementation of an ergonomics program.

## CALCULATING RETURN ON INVESTMENT (ROI)

Fundamentally, measuring the financial impact of an ergonomic intervention should be rather straightforward. ROI calculations compare the financial benefits of a proposed solution to its costs. If for example, an organization was interested in measuring the impact of an ergonomics intervention on injury costs, they would need just a few data points to quantify cost savings:



Formula to calculate ROI

Simple cost savings models have been criticized, often due to the number and complexity of confounding variables. Injury risks are not completely contained within a work environment and certain individuals in our population are hereditarily more prone to injury than others. The underlying mechanisms of musculoskeletal injuries are complex and in some cases not completely understood making specific ergonomic interventions difficult to isolate and quantify. While these challenges can slow

progress, they have not proven to be insurmountable. Many organizations now realize the crippling impact of inaction on profitability and are willing to accept that ROI calculations are somewhat imperfect.

There are two types of costs that are considered when calculating return on investment. Direct costs are usually incurred in response to an injury or discomfort, most notably worker’s compensation and additional medical care costs. Indirect costs include increased insurance premiums due to accidents and claims, lost productivity and decreased work output, administrative time after accidents, turnover and new personnel, and replacement costs for damaged materials, tools and property. Indirect costs can have drastic financial repercussions and often outweigh direct costs by a ratio of more than 3:1. A study by Loeppke et al<sup>5</sup> found that the medical, pharmacy, absenteeism and presenteeism costs for back/neck pain and fatigue were much more costly than employers initially thought. Executives and managers can experience the same, if not greater, rate of monetized productivity loss as laborers and operators.

A few researchers have attempted to develop repeatable methods for quantifying ROI for an ergonomics program. Lahiri<sup>6</sup> created a net-cost model to measure the returns of office intervention in effort to reduce lower back pain and developed a scheme of positive outcomes that the intervention afforded. Hughes<sup>7</sup> also focused on low back pain creating a mathematical model for estimating net present value of cash flow resulting from investment in ergonomics. His extensive research looked at a variety of economic factors such as hourly labor cost, overhead and worker’s comp along with a biomechanical analysis of low back pain risk among workers. Kerr<sup>8</sup> developed what he

describes as a ‘novel probabilistic tool’ that creates financial ranges and likelihoods of outcomes and saved costs. There are also a number of publicly accessible online ergonomics ROI calculators. Among them is the Cornell University ROI Estimator, which uses salary data and anticipated productivity gains to calculate ROI.

## CATEGORIZING ROI

Return on investment can manifest in many different forms, and finding a way to categorize the myriad ways of calculating savings and growth can often become convoluted. Beevis<sup>9</sup> boils down each complicated aspect to three essential cases:

1) Costs saved 2) Costs avoided and 3) New opportunities, as illustrated by the table below.

<b>Benefits associated with specific ergonomics activities</b>			
<b>Ergonomics Interventions</b>	<b>Cost Saved</b>	<b>Costs avoided</b>	<b>New Opportunities</b>
Identify user requirements	√	√	√
Define operational, support and maintenance concepts	√	√	√
Identify and control factors that limit operator performance	√	√	
Identify user functions and tasks	√	√	√
Identify and control excessive operator workload	√	√	
Provide an acceptable working environment	√	√	√
Identify and control excessive operator stress	√	√	
Identify and implement user population stereotypes		√	√
Design for full range of potential users (gender, size, strength, vision, clothing, etc.)		√	√
Develop for user acceptability		√	√
Develop for flexibility of use			√
Reduce opportunity for operator error	√	√	
Reduce need for user manuals	√	√	√
Reduce requirements for new skills	√	√	√
Reduce likelihood of skill decay	√	√	√
Reduce personnel requirements	√	√	√
Develop lowest-cost training system (capital and/or operational costs)	√	√	
Improve personnel selection system	√	√	
Contribute to personnel retention	√	√	
Reduce time lost through accidents or injuries	√	√	

Figure 1. Benefits associated with specific ergonomics activities.<sup>9</sup>

Wilson and Rosenbaum<sup>10</sup> also assigned three categories that ROI can fall under: internal, external and social. Internal ROI refers to opportunities where the organization saves money. External ROI, which is a product of internal ROI, pertains to customer benefits due to increased profitability, leading to better product, sales and improved user experience. Social ROI involves both internal management buy-in and externally strengthened corporate image and branding for customers.

Employees are less likely to be concerned with or to appreciate the financial argument for ergonomics but they should be able to feel the impact of such interventions on their overall wellbeing.

Further, employees who see their company take an active and positive stand for employee health, safety, and wellness, are more likely to report higher levels of job satisfaction and to demonstrate higher commitment levels. When employees are more committed to the company, they may also demonstrate more “good citizenship behavior,” such as fewer complaints and grievances, increased work output and quality, better productivity and perhaps even more initiative and effort in tasks performed<sup>11</sup>. Additionally, an improved external corporate image may lead to better community relationships and a strengthened brand.

Employees react positively to demonstrated care for worker health and well-being, which in turn yields a variety of benefits like decreased turnover rates and better work quality and output, engagement and morale<sup>12</sup>. In a competitive age where companies actively compete for the best talent, an active ergonomics program and attention to worker comfort can also aid in talent recruitment and retention by setting a company apart from others. Dul and Neumann<sup>3</sup> use high-quality employee recruitment as an opportunity for the practitioner to bridge the gap between Human Resources and Operations to effect positive and motivating change to the employee work experience.

Lahiri<sup>6</sup> offers two case studies for which a calculation matrix was formed that categorizes potential cost factors into one of three areas; medical care, productivity loss or productivity enhancement. It should be noted that the value of ROI often exceeds quantifiable data. Increases in user satisfaction and overall sentiment cannot be measured in terms of cost, but can still play a significant role in daily work quality for employees. Pre- and post-intervention surveys present companies with an opportunity to capture worker satisfaction and commitment, which have the potential to maximize company output and maximize growth.

## THE BUSINESS CASE FOR ERGONOMICS

There is growing evidence to suggest that the absence of an organized approach to health and wellness has long term financial implications. In 2009, there were 3.2 million overexertion injuries in the United States alone, averaging one per 100 people. Eliminating or controlling repetitive motion injuries is estimated to save a company \$27,700 per case<sup>13</sup>.

The National Business Group on Health recently stated that employers who have health and productivity programs are able to reduce disability days by between 10% and 35%, improve return to work (RTW) rates by at least 6% and experience a return on investment (ROI) ranging from 3:1 to 15:1. Within six months, many are able to demonstrate reduced lost time, decreased incidence and lower absence rates<sup>14</sup>.

Ergonomics is often viewed as a required component of an occupational health and safety (OHS) program, rather than a component of an effective business strategy. In some regions, legislation associates the field of ergonomics with terms such as, 'compliance', 'regulation', and 'policy'. Unfortunately, these terms do not to inspire the minds of business leaders. As a result, the application of ergonomics is often regarded as a 'must' for an organization, rather than a 'want'<sup>3</sup> and progress is slowed. Rather than relying heavily on legislation to form the

backbone of an ergonomics program, practitioners should instead work to embed ergonomics within an organization's existing business strategy. This approach will help ergonomics become a 'want' for businesses and help drive organizations to make better investments in the health and wellness of their employees.

Dul & Neumann also suggest that practitioners need to present the case for ergonomics with the same language and thought process as a business leader. It is important to not only emphasize the direct cost benefits of ergonomics but also to address the positive impact an ergonomics program can have on output (physical goods or services) and quality.

The timing of an ergonomics intervention can also play an influential role. Hendrick<sup>11</sup> found that the earlier the program is implemented, the lower the overall costs will be, bolstering the argument for a more proactive approach. Earlier interventions take an advantageous stand on making smaller initial investments for larger future impacts, as well as curbing potentially ongoing losses.

## CASE STUDIES AND RESEARCH VALIDATION

Leading up to the release of the 2000 OSHA Ergonomic Program Standard, the U.S. government became interested in reporting on the financial benefits of ergonomics programs. In August of 1997, the General Accounting Office (GAO) released a 141 page report titled 'Worker Protection: Private Sector Ergonomics Programs Yield Positive Results.' Out of 132 organizations nominated for review for reducing worker's compensation costs, five organizations were chosen for the final case study. These companies span across several industries; financial planning, electronics assembly, medium and heavy truck assembly, healthcare and defense systems. Each organization had implemented a full ergonomics program a few years prior to the case study, with unique strategies and solutions that directly addressed the main risk factors observed in musculoskeletal injuries. Some change implementations included providing employee trainings, ergonomic tools in office environments (chairs, keyboard trays, glare filters), manufacturing tools with increased comfort and usability, as well as implementing physical design, workflow and system changes to reduce MSD risk factors in workers.

The five organizations demonstrated significant reductions in workers' compensation claims, ranging from 35% for Sisters of Charity Health System to a 91% reduction for Texas Instruments.

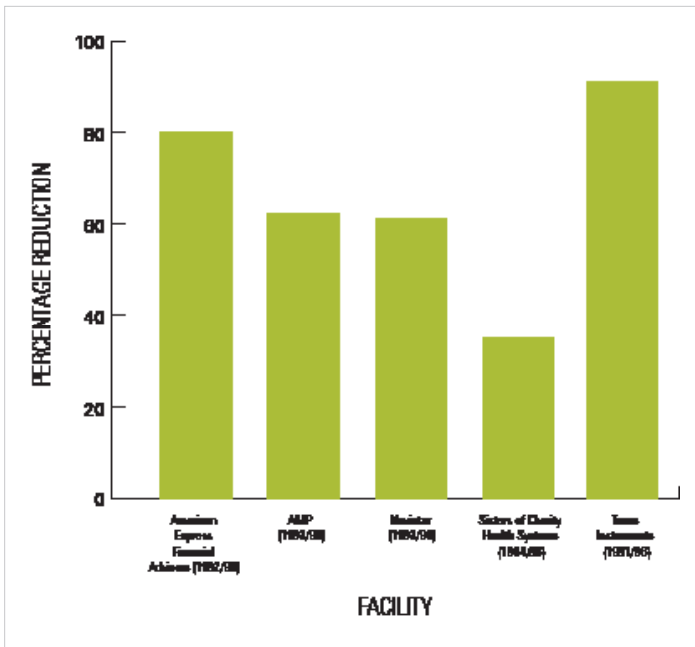


Figure 2. Percentage reduction in Worker's Compensation claims (Source: GAO, 1997)

The average cost per injury claim was also reduced by up to \$16,500. The table below summarizes the reductions for each organization before and after the ergonomic program implementation. Sisters of Charity Health System was the only organization in the study that did not experience a major drop in MSD claim costs at the time; officials attributed this to one particularly large claim during the study that was associated with a significant number of lost workdays.

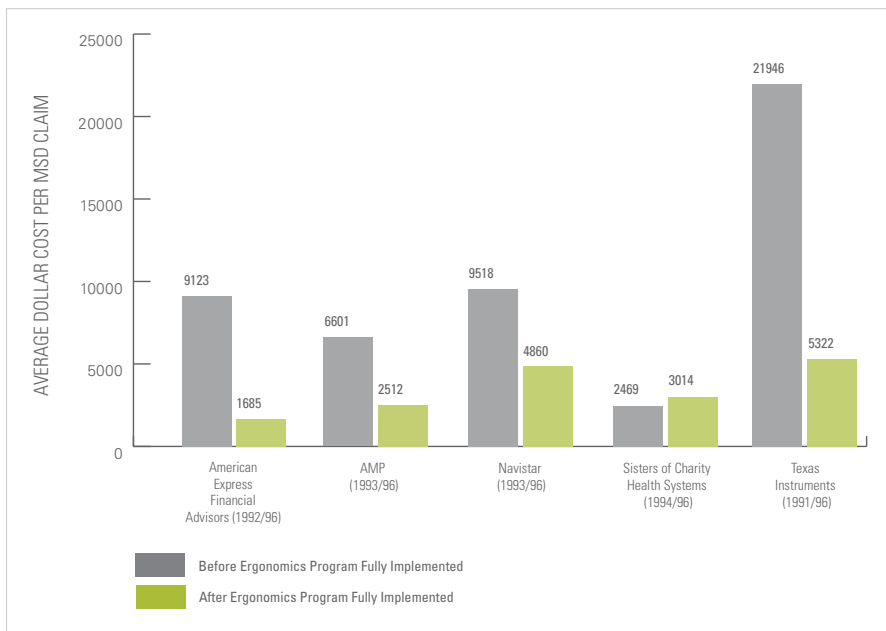


Figure 3. Average Dollar cost per MSD claim, before and after implementation of Ergonomics Program

The full GAO report provides details on each organization's approach to implementing an ergonomics program. The report

emphasizes the importance of management commitment, employee training and connecting ergonomics to medical management programs.

Goggins<sup>15</sup> aggregated 250 case studies that looked at beneficial ergonomic programs in manufacturing industries, office environments and healthcare and summarized their findings by each reported benefit. Many cases reported a reduction of WMSDs, injuries and turnover rate, along with an increase in productivity. Additionally, the average payback period for these interventions was less than a year.

Hendricks<sup>11</sup> noted a case study where an ergonomist made a workstation redesign in a fine assembly factory setting, which led to an increase of over 15% in productivity and work output. This translated to a \$2250-3000 increase in productivity per worker shift.

<sup>16</sup> measured the benefits of providing training along with equipment for over 200 office workers in a governmental agency. Over a one year time period, one group received basic office ergonomics training on injury risk factors and workstation adjustment. A second group received the same ergonomics training along with a highly adjustable task chair. The latter group that received both training and upgraded equipment realized a 17.8% increase in productivity, measured in increases of average daily production of tax collections. To calculate ROI, the study accounted for the cost of the task chair (\$800), ergonomics training (around \$200 per person) and lost work time associated with the 90-minute training session (\$32 per person). With an increase of around \$119 of tax collections per day, the annualized average increase in production was \$25,398. The benefit-to-cost ratio was 24.61 or nearly 25 times greater than cost of the intervention.

<sup>17</sup> performed a participative case study in one of the largest shoe manufacturers in Brazil, documenting an intervention that included modifications to the physical environment to reduce noise, providing seating options for workers and improving the overall safety of equipment and chemicals used. Working hours were also modified to allow workers additional time to sleep. Guimaraes et al (2012) performed a cost-benefit analysis of this case study and found an 80% reduction in industrial accidents, 100% reduction in WMSDs and turnover and a 45.6% reduction in absenteeism. A productivity increase of 3% was also reported. The benefit-to-cost ratio was 7.2, with savings of \$503,479 annually.

<sup>18</sup> detailed a handful of successful ergonomics interventions specifically with a monetary focus and outcome. A few are listed below:

Company	Intervention	Results
<b>Keyspan Energy</b>	Brought on ergonomic consultant to do comprehensive workplace assessments and low-cost changes	\$4 saved in injury prevention for every dollar spent
<b>Pratt &amp; Whitney</b>	Invested \$100,000 to implement low-cost ergonomic solutions	Positive ROI in less than 3 months
<b>Blue Cross Blue Shield</b>	Implemented ergonomics program with employee training, assessments, equipment implementation	70% reduction in lost work days 89% decline in workers compensation costs.
<b>Siemens Automotive</b>	Implemented ergonomics program with training, evaluation, and implementation	20,000 hours saved from previously lost time due to discomfort
<b>Aetna Life &amp; Casualty Co.</b>	\$500,000 total investment in ergonomic work tools	\$620,000 increase in measured productivity

## CONCLUDING REMARKS

For the field of ergonomics to continue to grow and prosper, practitioners must become more proficient at linking interventions to specific business goals. Until then, our field will continue to suffer from a public relations problem, whereby those that practice ergonomics are unnecessarily undervalued and misunderstood. It is our hope that the case studies provided in this chapter will allow ergonomists to facilitate more meaningful dialogues with business leaders so that the full potential of an ergonomics program can be realized.

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