

The Business Benefits of Ergonomics

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Some managers still think that ergonomics means simply providing a new chair or an antifatigue mat, or having a committee make adjustments to a workstation. In fact, ergonomics can help organizations maximize the capabilities and productivity of their workforces, make wise capital expenditures, minimize the costs of manufacturing and employee benefits, and avoid lawsuits. In this article we offer several examples of the business benefits of ergonomics, as well as some suggestions about how to consider the business implications of ergonomics for your organization.

The Interface Between People and Technology

Ergonomics addresses human performance and well-being in relation to jobs, tools, workplaces, and other environments. Ergonomics is at the heart of decisions regarding the design of products and buildings meant for human use and of jobs that require high attentiveness because of productivity or safety concerns. A complex science based on the disciplines of engineering, biomechanics, physiology, psychology, anthropometry, and kinesiology, it addresses both the physical and cognitive aspects of performance.

In other words, ergonomists focus on the interface between people and technology. Their involvement can improve not only the human side of that interface, but the technology side as well.

For example, an ergonomist helped Fisher-Price, a division of Mattel, enhance a product and reduce costs by redesigning both a manufacturing process and the product itself. The product was a child's plastic chair that had a cut-out design in it, requiring a deburring task that was causing injuries to workers. Working in a team with the product designers and manufacturing engineers, the ergonomist was able to analyze the root causes of the injuries and labor costs and to collaborate on solutions. One solution – replacing the cut-out with an indentation – not only eliminated injuries but reduced the cost per item by 11 cents, a significant amount, while saving production time and improving the product.

Fisher-Price has benefited from a number of other ergonomics-based improvements. By eliminating a lifting task, the firm saved \$33,000 in the first year; by eliminating two fasteners, it saved another \$17,000 in the first year; and by modifying the means of supporting tools, it cut product changeover time by 20 percent. These examples are also important from another perspective: they established the company's Environmental Health and Safety group – the group that brought in the ergonomics consultant – as a value-adding function that can contribute directly to business objectives. In an era in which the safety function is too often viewed as a cost center or a deterrent to production, such successes are invaluable.

Another company completely redesigned its packaging because of ergonomics input. The change had a positive impact on the environment by reducing the quantity of packaging and substituting a more benevolent material. It also reduced the repetitive motions and force required to assemble the packaging, as well as the costs of materials, labor, and workers' compensation. The savings represented 50 percent of the packaging costs alone.

The Macroergonomics Approach

To achieve results like these, an organization must consider ergonomics from a „macroergonomics“ perspective. That is, the organization needs to address both its technical subsystems (e.g., equipment, workstation design, lighting, processes) and its social subsystems (e.g., job design, organizational culture, management style, and training). Organizations that are successfully implementing ergonomics are making changes in many or all of these areas.

Their reasons for doing so vary. For example, in surveys completed last year of 45 organizations actively implementing ergonomics programs, virtually all of them reported that „concern about health of employees“ was a motivator. In addition, 84 percent reported that „escalating medical/insurance costs“ was also important in their decision to employ ergonomics, while 56 percent reported „productivity improvement“ and „quality goals“ as key motivators. Survey participants also indicated that their ergonomics efforts are integrated with other aspects of the organization, including 40 percent whose health and safety efforts are integrated with engineering design.

Moreover, these organizations are achieving their goals. Seventy-six percent reported decreases in workers' compensation costs or medical insurance costs; 70 percent reported increases in productivity on one or more measures (e.g., increased units/time, decreased labor costs, decreased cycle time, decreased turnaround time); and 30 percent reported increases in quality as measured for example by amount of rework and number of defects. Participants in the survey represented a wide range of businesses, including the *Baltimore Sun*, Bank of America, Hasbro, National Semiconductor, Raytheon, Rochester Gas and Electric, Texaco, and Textron Fuel Systems.

The macroergonomics approach is a systems approach that involves strategic planning on a companywide and facilitywide basis, as well as cross-functional participation by those who control the key resources of the organization, both human and technological.

Who Needs Ergonomics?

The need for ergonomics can arise in a number of circumstances, including changing demographics, changing technology and job demands, fear of consequences of human error, high demand for creativity and accuracy, high workers' compensation and insurance costs, and highly competitive markets.

Changing Demographics. One of the triggers for beginning to implement ergonomics is a change in the demographics of a work force. For example, a reorganization often leaves a high percentage of aging workers performing a wide range of tasks because younger workers have been laid off. Because older workers may have diminished physical capacities and decreased reaction times, jobs and workplaces need to be redesigned to accommodate these limitations, while capitalizing on the capabilities that experience brings. Changes can be as simple as revising materials-handling procedures and equipment or providing better lighting to help aging eyes. For example, the United States Air Force is initiating an extensive ergonomics program to enhance its state of readiness. The program recognizes that many civilian personnel, in particular those who are involved in maintenance, inspection, warehouse, and administrative tasks, are long-term employees who are no longer young.

Change in the ethnic makeup of a work force is also a trigger. If smaller-statured people are now expected to do jobs that were designed for larger, stronger workers, injuries can skyrocket. It is important to change the workplace, the tools, the work organization, and the processes to enable these workers to be both productive and safe. For example, we worked with a pharmaceutical company that had an increase in Asian and Latin American workers to redesign its workstations and to design an armrest to accommodate the kind of work being done.

Changing Technology and Job Demands. All organizations that invest in new technologies need to consider human interaction with those technologies in order to realize the full benefit of their investment. For example, in offices where the increasing sophistication of computer systems and applications can overwhelm many workers, ergonomics can help by addressing job and workplace design issues. At the Ergonomics Exposition and Conference, Textron reported that two high-production computer units minimized lost time and workers' compensation costs by implementing ergonomics. Specifically, the company addressed psychosocial issues, training managers and supervisors to be aware of the importance of work organization, rest pauses, and attitudes toward workers. The firm also produced an ergonomics-based guidebook for maintenance personnel, explaining how to respond to employees' needs for adjustments, and trained in-house staff members to conduct ergonomics awareness training.

Fear of Consequences of Human Error. Ergonomics plays a key role in industries or jobs where human error can cause loss of life or severe damage to the environment. For example, in chemical plants or petrochemical sites, alertness and attentiveness to visual displays in a control room can determine reaction time and the appropriateness of decisions. The design of the control room, the nature and position of the controls and displays, and work organization issues all need to be addressed.

The most frequently quoted example of the consequences of human error is the Three Mile Island incident, in which the accident at a nuclear facility was attributed to human error caused by faulty design and processes. However, safety issues need not be so dramatic to be important. If an organization experiences frequent near-misses or minor incidents, it should consider ergonomics.

A major computer components manufacturer engaged an ergonomist to undertake a human-factors evaluation of manufacturing equipment to identify hazards for catastrophic accidents related to the human-machine interface. The ergonomist used a task-analysis method based on human information processing capabilities to structure operator comments and identify aspects of the machine design that encouraged or permitted operator errors.

High Demand for Creativity and Expertise. In environments in which the product is „great ideas,“ ergonomics becomes a critical element. For example, ergonomics can enhance the performance of talented experts in laboratories, hospitals, and high-technology companies. There are many examples of high return – in a hospital that implemented ergonomics in its operating rooms, in laboratories at the Centers for Disease Prevention and Control, and in an aerospace company that redesigned the workstations and lighting for its CAD operators involved in plane design. In the hospital, back injuries to nurses were reduced by over 25 percent in an 18-month period.

High Productivity and Quality Demands. In manufacturing environments, where productivity is measured in terms of units/time, ergonomics can have a dramatic effect in a relatively short period, and often with minimal costs. A major multinational office products manufacturer saved more than \$300,000 a year in one small operation by applying ergonomics to a few jobs. By changing the locks on machine guards that had to be opened

and closed repeatedly during the manufacturing process, the company boosted productivity by 20 million sheets of vinyl per year. They also saved over \$6,000 in scrap, improved the method of changing paper rolls, and decreased downtime.

Customers of Milton Bradley, the games manufacturer, had been returning an unacceptably high number of games because of damaged packaging. By making ergonomic changes, such as reconfiguring the packing lines, slightly modifying the cartons, and training the workers in package insertion, the company improved its quality by 90 percent – and reduced injuries to workers.

In an office environment where employees use keyboards most of the day and are monitored for performance, the application of ergonomics – to workers who were already working at well-designed and comfortable workstations – improved productivity and quality. Within two weeks the employees' key strokes per hour were 7,150; operators not in the program were taking 12 weeks to reach that speed.

High Workers' Compensation and Insurance Costs. Many kinds of organizations initiate ergonomics efforts as a means of reducing costs related to injuries. Injury and illness costs are escalating, particularly in companies where there is a high demand for materials handling, highly repetitive tasks, and tasks that require considerable force. One automotive parts manufacturing facility, for example, reduced its workers' compensation costs by 75 percent over a three-year period and received an award from its corporate headquarters for Most Improved Safety Record. Recognition of the correlation between the causes of injuries and the lack of ergonomics has led some governments to consider ergonomics legislation. In 1990 the European Union issued directives that each member country adopt ergonomics standards. The first two of a series that are to be implemented are the Video Display Units and the Materials Handling standard. The directive on working with display screen equipment is part of Article 16 of Directive 89/391EEC. It lays down minimum health and safety requirements concerning display screen equipment for workers primarily in office settings who use display screen equipment as a significant part of their normal work. Article 16 also addresses the manual handling of loads where there is a risk particularly of back injury to workers. In the United States, the Occupational Health and Safety Administration has proposed standards that would require employers to address ergonomics issues.

Safety professionals from Boeing Commercial Aircraft made ergonomics changes in the skins and spars area, which had been plagued by injuries. After implementing ergonomics changes, the area completed an entire year with no injuries. United Technologies, which has implemented ergonomics throughout many of its companies, has also reported significant reductions in injuries.

Most organizations are finding, however, that even though they may introduce ergonomics primarily as a means of preventing injuries and reducing compensation costs, they achieve other real business benefits.

Highly Competitive Markets. If a company is in a highly competitive market, cost per item and quick turnaround time are vital. Ergonomics can contribute to both the manufacturing of the product and its market acceptance. For example, capacity and turnaround time was a critical component in the success of a mattress manufacturer, Serta/Adam Wuest. The company was plagued with back injuries, as are many companies with high materials demands. By redesigning the sequencing of the product's manufacture, the company increased its plant production capacity by 50 percent. At the same time, it saved \$65,700 in one year by reducing injury costs and labor costs. And it reduced workers' compensation insurance costs by 71 percent.

After Microsoft incorporated ergonomics counsel into the design of its input devices, including a new mouse and keyboard, demand for the new keyboard exceeded the firm's most optimistic projections. Microsoft originally projected sales at 250,000 units in the first year; in fact, for several months in the first year they sold 250,000 a month!

The Outlook for Ergonomics

As more and more organizations recognize the real business value of ergonomics, they will incorporate it earlier into their strategic planning and design processes, thus allowing it to create even more value for them. Meanwhile, research programs are continuing to expand our understanding of both physical and cognitive/emotional factors in the interface between people and work. And, practitioners are developing metrics to assess the effectiveness of ergonomics programs, while regulators are debating ergonomics standards.

We believe that as this important science matures, it will become an integral part of the way we live and work. It will be used extensively to meet the needs of aging and injured workers, to help companies compete for talented members of the work force who value quality of life, and to play a major role in architecture and space planning. Once ergonomics becomes an integral part of the design of the organization, it will provide a forum for the real participation of the work force. In short, ergonomics will become yet another way that successful organizations compete for business and for qualified employees.

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