



AN EFFECTIVE INTERDISCIPLINARY MATRIX FOR PREVENTION AND MANAGEMENT OF INJURY

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Effective ergonomics programs that are able to effect substantial change are still not very evident. Exploring the basic tenets of understanding through systems thinking and the application of both general and physical principles as a guide is important in understanding the human context and the fact that many of society's problems, including ergonomic ones, are related to a poor or absent alignment with this human context. A model of macro and microergonomics is proposed that takes these issues into account and examines the potential effects of such an organic approach that involves all aspects of the organization including wellness initiatives and disability management. A case study is used to highlight both the positive and negative consequences of this concept of alignment within the human context.

Ergonomics programs are being instituted in an increasing number of businesses as we approach the end of the century. They are doing this for a number of reasons, not the least of which being the desire to lower costs associated with lost time accidents. Many other employers are concerned with increasing efficiency and yet some others approach it as a moral issue or even a legislative diligence issue. It is interesting that in many cases the approach to ergonomics is largely dictated by the primary motivation of the organization. While this increasing attention to human factors is encouraging it is not without its drawbacks and, in fact, some negative experiences with 'ergonomics' have actually marginalized or largely driven these programs from some companies.

One of the questions that consistently arises is: How effective is this program? Consider the following example:

A consultant is hired to examine the difficulties associated with a particular manufacturing process in a large high tech manufacturing plant. In the month that the company decides to engage the consultant the lost time injuries in this area of the plant are at eighteen instances. The consultant then spends a large amount of time working with the employees in this area, gathering information and engaging in dialogue with the operators. Small and easy changes are made in co-operation with the Process Engineers, the major changes are in the planning stages and the operators are regularly apprised of the progress. During this time the

number of incidents per month drops almost immediately to zero and stays that way for five months (Personal Communication, 1991).

Was that an effective intervention? It depends how the outcome is measured. If the desired outcome was to reduce incidents of lost time it appears to be very successful. The troubling finding is that the major physical contributing factors to injury have remained relatively unchanged. Another very similar high tech manufacturing plant hired an outside 'ergonomist' and then embarked on the purchase of over two million dollars of equipment to improve the physical aspects of the work stations only to have the rate and severity of injury rise by 20% (Personal Communication, 1994).

Finally, a major city's refuse collection workers are demonstrating high levels of lost time due to work related injury. This is true for each of the bases of operation in the city (there are four in total) except one. This one reports no injuries. This particular operation has the heaviest collection routes on average in the city, uses the same equipment, works the same hours, has a similar employee population and does the same type of work as all the others (Personal Communication, 1995). Should this division be rewarded for their brilliant outcomes and then model them for the other divisions?



BACKGROUND

What is Effectiveness?

Simply spoken, effectiveness is a high level of commitment to the correct principles (Covey, 1990). There are many examples of people and organizations who are very committed, but to an incorrect process, system or philosophy. There are also many examples of the alternative with low commitment to correct ideas.

The Systems Orientation

It is largely accepted that complex systems demonstrate complex and interdependent behaviors that move in a substantially non-linear fashion (Senge, 1990). This method of approaching issues is referred to as 'Systems Thinking' and is focused on understanding the entire concept rather than focusing on momentary symptoms or outcomes. The examples cited in the introduction could certainly generate different conclusions about effectiveness depending on whether or not you chose to approach them with a systems view. In the realm of human factors this approach is sometimes known as macroergonomics (Hendrick, 1995). There are so many factors that limit or enhance effectiveness in the practice of ergonomics it is critical to identify as many of them as possible to maximize results.

Principles and Foundations

Dr. Stephen R. Covey, among others, has become very popular in recent years for the simple advocacy of basing both individual activity and organizational activity (which is, after all, just a group of individuals) on external validated principle rather than on less stable elements such as enemy, money or self (Covey, 1988). The essence of this way of thinking is that if the activities of the organization are aligned with principle, the correct outcomes will manifest themselves.

For instance, if an ergonomics program is designed to save money, then all steps will be taken to meet that goal whether or not they are correct. The ultimate danger is that if the program is centered on saving money and it is not showing those savings, it will be interpreted as failing. When you consider this within the context of the larger trend of money/profit centeredness that views the human resource (employees) as an expense or drain on resources (Kiernan, 1995), it is even more instructive.

Evidence of this can be seen in organizations that viewed the human resource in this fashion through the

aggressive downsizing over the last decade. It has been widely reported in the business press that in nearly 80% of the cases cited, the downsizing did not improve corporate profitability significantly, if at all. Many organizations saw erosion of market share and those that did improve profits did so in most cases due to other unrelated factors (Kiernan, 1995). All this occurred while such organizations as Hewlett Packard and 3M invested in their human resource and leveraged large increases in profitability, innovation and market share (Kiernan, 1995).

It would be overwhelming to list in this presentation all the principles and laws that play a role in ergonomics. What is important to understand is that alignment, or the lack thereof, with these laws produces consequences over which there is little control once they are invoked. The properly aligned ones are assumed to produce desirable consequences. The lesson is to consider those things before they become consequences, the basis of true proactivity.

Some will argue that many principles are faith based rather than science based. To simply consider operating in opposition to these principles through unfairness, deceitfulness and with no regard for human dignity makes these less a matter of faith a more a case of clinical self evidence. We are scientifically aware of the consequences of violating physical principles such as gravity when we roll off the bed and thermodynamics when we go for a swim in cold water.

Within the field of ergonomics, system theories and laws are developing. A profound example of this is the work of Valery and Yuri Venda in advocating what they refer to as 'ergodynamics'. They have proposed the three foundational laws of: mutual adaptation, plurality of work functional structures and transformations (Venda, 1995). Venda was propelled forward in his research by the obvious limitations of the monotonic and exponential models of ergonomics when the experience was loudly suggesting that it was much more complex and dynamic. The laws that Venda advocates and the basic organizational system structures advocated by Senge and others are very similar on examination, with Venda's being more applied to one concept.

The Human Context

Essentially ergonomics should be about maintaining alignment with the human context in the work place and elsewhere for that matter. In many ways this concept almost forms a 'macroprinciple' where people are



concerned. Within this context are the subsets of the physical, social/emotional, mental and spiritual domains. According to many authors these domains are reflected in human activity through the need to live, love, learn and to leave a legacy (Covey, 1988). If we examine some of the most serious difficulties facing society, we will find evidence of this and of the reinforcing systems that perpetuate them (Senge, 1990). Addiction behavior is a classic example of this as is the treatment of Carpal Tunnel Syndrome with wrist splints or the treatment of tendinitis with cortisone injections (Figure 1).

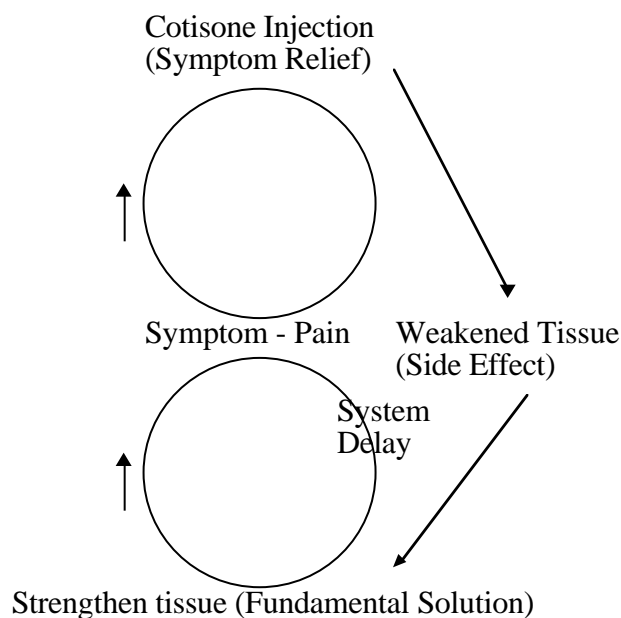


Figure 1. The effects of shifting the burden in relieving tendinitis.

When considering the fact that the human species is now changing its behavior at a rate that is significantly outstripping the rate of organic evolution we see a logical reasoning of these issues emerging. In the physical domain, it is clear that the structure of the human organism is not well evolved to meet the challenges of sitting, yet the behaviors in which we engage at work and in leisure encourage this posture. It is also self evident that the human species is not well adapted to inactivity, evidenced by the severe maladaptations that ravage the body when this happens. This in combination with inappropriate postures, technologically supported passivity and a culture of low effort create an enormous downward spiral that is fueled by this misalignment with the human context.

Many of the behaviors found in modern work, especially repetitive work, are also in clear disagreement with the

social/emotional, mental and spiritual aspirations of human beings. As a result of this, there is increasing pressure on organizations to adopt different values that are more aligned with human aspirations. This trend has been widely reported in both the popular and academic literature during the last fifteen years.

The Participative Model

The participative model of macroergonomics has become an issue of growing interest in the last decade and experiments with it are widely reported in the literature (Hendrick, 1995). Participation is well aligned with the human context as it is with concepts of worker empowerment or personal mastery (Covey, 1988, 1990, Senge, 1990). There seem to be some emerging preconditions to the complete success of this concept. Failure to meet any of these conditions will prevent optimal operation of the model.

The first is that the roles of the participants must be aligned with the competencies of the participant. Many ergonomics programs, that this author has both witnessed and read about, endeavor as a first step or second step to turn a group of people into 'junior ergonomists' through some form of training and/or co-education. These activities typically involve discussions of human anatomy/function, risk factors, tools for analysis and other factors. These courses can be offered to a wide variety of individuals within an organization ranging from the front line operators through to engineers and up to the executive level. There is an expectation that these activities will improve competence and allow them to expand their roles, but the evidence seems to suggest that it rarely happens and that it may even produce significant conflict for the individuals through poorly aligned expectations. In one study, when asked if the participants felt more confident in participating in ergonomic change work in their work area, the mean response was only half way between Not At All and Full Agreement, yet they expressed high levels of desire to participate in change and that there was a continued need for change (Garmer et al, 1995).

The second condition is the need for participation based on a shared value rather than an imposed value. Even when the value is the same, the acceptance and commitment to it are higher when it is developed in a shared fashion (Covey, 1990). The implication is that the value must be developed with all stakeholders from the beginning. It is this author's direct experience, that in the development of Bona Fide Occupational Requirement testing for preplacement of workers and ongoing



maintenance of standards, that the process has no chance of success with a labor union or any group of employees if they are not involved in developing it. This is true even when they agree with the principle of the idea. Whereas, when they are initially involved it progresses to implementation in every occasion thus far.

The third condition is that the democratic right of participation within the group or team is limited to input only. There must be a commitment within the group to adhering to principle. Very often people may 'vote' for a change out of a perception of comfort, but may be placing themselves in risk positions down the proverbial road. An example of this is commonly encountered in the purchase of chairs. Many people will select the chair that feels most comfortable, often because of a soft seat pan. Of course, based on principle, we know that the chronic consequence of that decision would be increased discomfort. This also underlines the importance of expert support in the group. Eason (1995) shows examples of this in his paper on whether ergonomics should be by users or for users.

It is the responsibility of each individual to carry out this personal discipline, but it is the responsibility of the group leader to ensure that this is the case for the ultimate decision. Covey explains this point generically by asking people in attendance at a work shop to point north. Consistently there are a wide variety of opinions. He then asks only the people who are very sure they are right to point and again there are conflicting ideas. Even if a majority voted that north was in a particular direction that would not change the fact that north is where it is, whether they happened to be right or not (Covey, 1988). It is a kind of a play on the old admonition of "if Johnny jumped off the Empire State Building, would you too?"

If the team has been well developed, the level of personal integrity and leadership will likely avoid many votes. The last condition is open and clear access to an expert support, whether that be a human movement specialist, process engineer, industrial hygienist or someone else. This is critical to the effective functioning of these participative processes and is somewhat related to the issue of competency. Garmer et al (1995), in their survey found a strong need from both operators and engineers to access the expert resources.

The Learning Organization

Global competitiveness pressures have focused business on the commodities through which they gain competitive advantage. They have in the past included

corporate size (economies of scale), pricing, distribution and most recently quality. Increasingly, the playing field is leveling where all of these commodities are concerned, including quality. Some of the old advantages have become distinct disadvantages in the rapidly accelerating first phase of the information age (Kiernan, 1995). This would be especially true for corporate size, as it is much harder to turn an oil tanker than a speed boat.

The ability to learn, to innovate, adapt, be proactive and see the future are the keys to competitive advantage in the next century (Senge, 1990, Kiernan, 1995). Ergonomics must play a large role in this process and the process of learning must play a large role in the process of ergonomics. Organizations should make every effort to create team learning and individual learning experiences to improve competence in a number of areas. A very important piece of this learning puzzle would include the education of the body, mind and spirit and its relationship to work, helping to illuminate the relationship between behavior and the human context.

Peter Senge emphasizes in his definitive work on learning organizations, *Fifth Discipline*, that a learning organization is not something to be achieved, but an ongoing process or journey - the expression of a cherished organizational value (Senge, 1990). It is also a state of existence that is not quickly achieved and that there needs to be much perseverance and patience for the process.

DEVELOPING A MATRIX

Characteristics of an Effective Program

In accounting for the principles, systems and learning processes that are described in the preceding, it is possible to understand a number of characteristics that the program must possess:

- Principle Centered - the matrix is governed by agreed upon and committed to external principles whether they be universal such as human dignity or physically specific like leverage. Democracy and participation must exist within the context of the principles, as democracy cannot be correctly anchored by its own weight.
- Aligned - the systems and structures of the organization must be obviously aligned with the value that this process is driven by. Failure in this regard generates septic cynicism throughout the organization.



- Proactive - truly so, in the sense that the full understanding of the systems and the archetypes operating within it allows truly high leverage preventative work to occur. This ensures only the desired consequences are endured.
- Dynamic - that it is able to lead change and respond to stimuli to maintain effectiveness.
- Participative - at all levels to encourage the highest level of commitment and generate the most honest and complete portrait of the state of both reality and vision at all times.
- Accountable - at all levels of an organization and that the accountability is evenly shared based on role and appropriately consequenced (positive and negative) to further encourage accountability.
- Interdependent - barriers between information and action sources cannot exist and a firm understanding supported by actions that the organization is an indivisible whole.
- Competent - the roles must be clearly within the realistic realms of limitation that are present at any time. Individuals at any role position should have opportunity to improve competencies without being burdened with accountability that outstrips present competence.
- Expert - appropriately resourced to ensure the highest quality of process possible.
- Self Aware - always striving to take information from all stakeholders either formally or informally to reassess current realities and relative position to desired vision.
- Inclusive - all aspects of employee health and well being are included in the scope of the program as are all the factors that inter-relate with them. Essentially, it is a matrix that underpins the entire organization for the life of the employee.
- Free of Political Bias - the matrix must be seen by all only to serve the principles of the program and not management or labor or some other special interest.
- Interdisciplinary - establishment of core competencies that need to be reflected in the core team and then the development of a virtual team around it through which members synergistically produce ideas, concepts and solutions.

- Integrity - the matrix must be true to its principles always, not just when it is convenient or expedient. Any accidental violations of this characteristic should be admitted and explained to maintain integrity.

An Organic View

When considering many of the preceding characteristics it is obvious that the matrix in many ways is representative of independent life. It is a dynamic, responsive, living and breathing entity that takes into account the environment in which it must co-exist and how it must act on that environment.

Hendrick (1995) wrote indirectly about this as did Trist and Bamforth (1951) as long ago as 1951 in their studies with coal extraction industry. More recently Reichelt and Conrad wrote a review of Musculoskeletal Injury in Firefighters and advocated an organic approach, by developing an ecological model of injury prevention that understands personal factors, work place factors and external environment factors. By understanding the feedback loops that operate between the components in a system, we are better prepared to exert influence over them through the development of solution systems that are aligned with those realities.

Evolving Ergonomics

The traditional role of ergonomics as a technology based concept that is focused on micro changes only has been proven largely unsuccessful (Hendrick, 1995). Even in the enlightened discussions of macroergonomics and human centered concepts there is an alarming tendency towards only 'fitting the task to the person' and an idea that ergonomics can still control behavior. If there is a simple truth reflected in experience and literature throughout the centuries, it is certainly that people cannot be controlled in the sense that you cannot control what decisions and choices they will make (Covey, 1988).

Fitting the person to the task must also be considered when discussing ergonomics. In the obvious examples of firefighting and police work, there is limited control over work place factors and virtually no control over external environment factors. The only point of leverage lies in the domain of personal factors. Improvements in conditioning, skills mastery, awareness, personal discipline, commitment to team, problem solving (avoiding) and other competencies will be the point of greatest influence. This is also true in less obvious situations such as clerical work where the external



environment is fairly predictable and the work place factors can be largely improved. Considerable research has demonstrated that these microergonomic changes do not necessarily predict rate or severity of injury. Some of these findings are summarized by Hendrick (1995).

Attention to personal factors of the exact same kind identified in the earlier firefighting example is a point of significant leverage for the clerical worker. As an example, improvements in physical condition would allow for the easier maintenance of mechanically correct postures and more likely avoidance of the trauma associated with them. It is possible to provide the perfect work station (within reason) and still have individuals become injured while working there.

As Hendrick (1995) clearly points out, these failures of microergonomics are largely due to a technology centered approach that does not take into account many of the psycho-social factors of work. I would contend that it is true for all aspects of the personal domains it is a place we have historically expended little energy. This is a bias that, in my opinion, must change.

In ten companies that this author randomly surveyed, the ergonomics program existed in near complete functional isolation from the wellness/fitness activities (if present at all) and the concepts of disability management. Yet, some respondents indicated dissatisfaction with both the microergonomics success and the wellness initiatives. Based on the organic, human centered view it is easy to see how the programs are not successful. Ergonomics can not function effectively without the feedback of injury management processes or the participation of programs targeted at personal factors (i.e. Wellness). Likewise, disability management cannot work effectively without a close relationship to the ergonomic processes and the personal preventative activities. Should the word ergonomics, or more specifically, macroergonomics evolve to include these other areas?

Ergonomics is a massive field with a massive variety of expert knowledge bases. The benefit of this diversity is its enormous potential as a change agent (Hendrick, 1995, Moray, 1995). The challenge of this diversity is to effectively implement and manage it with optimal results. I find it personally fascinating, the amount of energy and time being expended in defining the field of ergonomics and who should be referred to as an 'ergonomist'. Being an ergonomist is in many ways a paradox. Is it actually possible for one individual to be an expert in the area of ergonomics? And what does the presence of this person do to the roles of other team members and the very individuals that make up the organization?

In my view, the ergonomist is not a person, but a group of people exerting a well coordinated and synergistic interdisciplinary body of expert knowledge over the issues encountered. As previously mentioned, it should be composed of a core team and a virtual secondary team of members that can be periodically integrated with the core team. The core team is typically going to involve several front line operators, process/design engineering, human movement specialist, safety specialist, operations supervisor, human resources specialist and usually the company medical consultant(s) and disability case manager. The virtual aspect of the team may include an industrial hygiene specialist, executive management, a medical specialist, a cognitive specialist, industrial relations specialist and many others.

The vast majority of issues and situations could be resolved with predominantly the expertise represented in the core team. The leader of this team, while it may be beneficial for them to have background in ergonomic expertise of some variety, need not have it. The critical role that they must play is to lead the team and help keep it clear of bias. They must reinforce the guiding principles and facilitate optimal team behavior. The only competencies of paramount importance to this individual are effective leadership habits and skills and a strong commitment to the value of ergonomics and health that is shared by the rest of the team.

One of the regular concerns with respect to ergonomics is whether the expert support is internal or external to the organization (Garmer et al, 1995). There are certain advantages to both situations and the size of the organization should be a significant factor in this decision. As stated earlier, expert knowledge must be seen to be clear of political bias, and this may not be possible in an organization where such an expert is labeled as either part of management or part of labor. An external consultant is usually better positioned in this sense, but in order to be effective the client organization must have a very enlightened view of the synergistic relationship the consultant must have with the company. These relationships are becoming more popular in recent years, generally speaking (Kiernan, 1995).

One place that may allow the proper emergence of the ergonomist is in the realm of macroergonomics. This could become a specific field all unto itself - change agents of society with an interdisciplinary, systems based and interdependent view of issues. This also demonstrates the power of ergonomics in effecting change. In my opinion, the role of injury prevention and rehabilitation and the optimization of person-work relationships is the point of highest leverage in an



organization and should be happily exploited to create spillover benefits into other areas of the organizational flow.

IMPLEMENTING THE MATRIX

In considering the implementation of the following matrix it is important to remember that the processes should be well aligned with the organization and that as a precondition there must be complete support from the very highest level of the organization. This support cannot be qualified or dependent, but complete. This is important because the changes will likely occur slowly over many years, especially with personal factors, and there must be courageous leadership to adhere to the program as it matures. Things that generate apparent results quickly, are often belying a significant other system that may conspire to chronically defeat effectiveness of further entrench the fundamental problems as previously illustrated in Figure 1.

(1) Meeting with Executive of the Organization

This is critical to getting commitment for the program to be implemented. It is the first step, because without this support, the project may be ultimately destined for failure or at least sub-optimal behavior. This consultation process should lay out the entire concept so that they are fully aware of their responsibilities and are comfortable with the mission and its guiding principles. This is the first introduction of the 'constitution', to which after their input they are willing to become signatories and uphold its content.

This process may involve a preliminary discussion of the concept followed a by a full day session of self discovery and team learning to entrench it. It may also involve the executive of labor representation. This is critical in a union environment as it has been my experience that labor unions are generally very supportive as long as they are involved from the beginning - it works to establish trust.

(2) Involving the Stakeholders

The stakeholders are everybody in the organization and increasingly it may even include certain suppliers or even customers. The stakeholders must be correctly inventoried and then identified according to current and envisioned roles.

At this point the general concept, vision and the underlying principles should be highlighted to the entire

organization through, ideally, personal presentation and a brief written description. These presentations should accurately outline the opportunities, processes, resources, consequences (good and bad) and the unequivocal support of the executive of the organization. A call for stakeholder input should immediately be made to set the tone and help gather information about the current realities at work in the personal, work place and external environment domains.

A brief sketch of timelines and requirements should be illuminated at this time as well as the timeline for reconsultation.

(3) Recruiting the Team

This is a critical step as the effectiveness of the members of the team will be a significant determinant of success in such a human centered process.

Initially, the core members of the team need to be identified. Once they are identified and it is clear that the work place structure fully supports their involvement and they have a general idea of their required commitment they can be brought together to develop a team relationship. They must engage in an intensive discussion of mission, principles and process to develop shared values for the project. This will hatch the first version of the constitution, which will becoming the evolving document that reflects the underlying principles and serves as a stable external reference for the matrix.

Roles and expectations should then be clarified and the development of personal vision for role development completed. This should then be solidified with a performance agreement (Covey, 1990) that is drawn up and signed by each team member in consultation with the team.

(4) Check for Structural Alignment

At this stage a quick evaluation of continued commitment should be made. It is also wise that stakeholders be asked if the progress so far is meeting expectations or more specifically documented requirements.

It is also prudent to ensure direct team members process of career review is adjusted to appropriately effect their slightly shifting roles.



(5) Collecting Information - The Reality Check

Now that an infrastructure has been established it is crucial to fully understand the systems, variables, forces and other factors that are bearing on the organization in the areas of personal, work place and external environment domains. This will certainly involve significant stakeholder input, statistical analysis of injury rates, types or product output for example. It will also involve analysis of many psycho-social factors. A key component of this process will be the ergonomic audit of the organization's operations in a general sense. It may be a good time to involve a virtual team member like industrial hygiene to deliver an audit.

It is also a good time to initiate a low level process of training in human factors to the team members so that they can learn in an applied sense during the period of information collection. This will be the first step in maintaining competency.

(6) Visioning and Outcomes

Once you know where you are it is possible to set your sights on a vision to be achieved. This engages the 'creative tension' that Senge (1990) identifies as being critical to progress and positive change. Goals and actionable objectives can be realistically determined by the core team and then disseminated to all stakeholders for input and to contribute to a sense of shared value.

A very important step to cover here is the identification of correct and mutually agreeable outcomes, a kind of performance agreement for the entire matrix with the organization.

At this time the roles of the front line operators will largely be seen as a conduit of information between the work site and the rest of the team. They will carry information, opinions and suggestions back and forth.

(7) Process and Renewal

The organization then embarks on its pursuit of the identified vision, guided by its constitution and evaluated against its goals through the predetermined measurement system.

The roles of the team members and the competencies of all individuals in the organization are slowly guided forward being careful not to lose alignment. Frequent and effortless communication of information from and to stakeholders is a critical requirement. It allows for the

ongoing evaluation and adjustment of reality to maintain optimal creative tension.

The constitution should also be regularly revisited to maintain a sense of shared value.

CASE STUDY

A program of this kind was implemented in a manufacturing plant over several years in the early 1990's and established tremendous statistical and perceived success throughout the organization until there was a significant turnover in executive management. This resulted in a substantial lack of commitment to the matrix on their behalf. In addition, they fostered a process of exclusion, disabling the interdependent relationships between ergonomics and all other factors. There was an increased pressure on front line team members to take on expert roles which generated failure and significant frustration (save money). Because there was also a naive assumption that everything was under control, financial resources were eliminated even though the project was demonstrating cost effectiveness in the millions of dollars.

A classic case of starving the goose that laid the golden egg or as Covey illustrates, the imbalance of the attention to the product and the production capacity (Covey 1988, 1990). A sampling of the program results are found in Figure 3.

Although the negative turnaround of this case is disappointing, there is a silver lining. In identifying the reasons for collapse they go to reinforce the reasons for its early success and give us fuel to avoid similar mistakes in other implementations.

CONCLUSIONS

It is becoming clear that traditional approaches to ergonomics are not working very effectively, but that macroergonomic interventions are demonstrating tremendous benefit (up to 90% improvement) in recently reported cases (Hendrick, 1995). This is encouraging as these approaches typically utilize a systems approach and are more based on known principle than on unstable concepts.

The matrix developed and outlined in this presentation demonstrates a concept that applies all the time in an organization and that is inextricably linked to all other aspects of organizational effectiveness. It is based on an organic or ecological model that is dynamic and focused on full system understanding. It leverages the



competencies of individuals within an organization to maximum effect by making them accountable for reasonable expectations and compensating them appropriately (fiscal, psychic, responsibility, etc.). It reflects the realities of the human context and seeks to help others to become more aligned.

The bottom line in ergonomics, as in other aspects of life, is that everyone is responsible. Ergonomics is not somebody's department or job, it is everybody's department and job. The role of the interdisciplinary team is to reinforce and empower this capability through competent leadership and stewardship.

This is not to minimize the role of microergonomics, which if ineffective, will severely compromise the outcomes in the larger system (Hendrick, 1995). Microergonomics must also become more focused on the human participation in technology and consider creating compromise between people and their work by decreasing resistance in both the person and the work place. If we look to changing work to control people we will never reach our potential. We must embark on the mission of fostering the increase in personal competency and awareness within the work force.

We must do this by recognizing the deeply seated requirements of the human context and dedicate ourselves to facilitating better alignment with them. If we can strive to achieve this, I believe that, then we will see truly astounding improvements in all facets of organizations.

Lost Time decreased 87%
Lost Time Claims declined 91%
Claim Costs declined by 87%
Lost Availability for work declined by 88%

Figure 2. Statistical improvements with ergonomics

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