Transforming Industry in Slovakia through Participatory Ergonomics

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Abstract[1]

The paper is concerned on the problem of transforming industry in Slovakia through participatory ergonomics.

1. Introduction

The primary role of ergonomics in the current transformation process is to find appropriate ergonomics programs for Slovak enterprises that are based on scientific approaches to workplace improvements. A participatory approach in ergonomics means engaging all company employees, from representatives of top management to individual workers, in the process of workplace improvements in all operations of an enterprise. This is the subject of our recent research project number 019/2001, "Transforming Industry in Slovakia Through Participatory Ergonomics" [2]. This project is supported by the U.S. - Slovak Science and Technology Joint Fund at US and Slovak governments by APVT Bratislava, which was prolonged by APVT Bratislava until 2006.

This project focuses on adapting successful foreign experience in implementing participatory ergonomics programs to Slovak enterprises in order to bring about positive health effects and cost benefits. Enterprises that are proving to be competitive in the global marketplace are those that have high levels of involvement by a stable workforce and that devote a substantial portion of their resources to employee education and to health and safety measures. To be competitive economically and socially, Slovakia needs competitive ergonomics work practices related to worker safety and health.

The goals of this project, supported by the U.S. - Slovak Science and Technology Joint Fund are:

1. To implement participatory ergonomics in at least eight enterprises in the Slovak Republic – at least one in each region of Slovakia. The basis for this project has already been prepared through a series of workshops held in the departments of Occupational Preventive Medicine of all regional Public Health Institutes.
2. To study the relationship between body posture at work and the incidence of musculoskeletal injuries and illnesses in Slovak enterprises.
3. To determine the cost-benefits of implementing participatory ergonomics programs within Slovak industries and to develop specific methods for ergonomic program cost-benefit evaluations.
4. To provide examples of participatory ergonomics programs in the Slovak Republic that can serve as a model for other enterprises within Slovakia and for the neighboring countries of Central and Eastern Europe.

This project is built on eight years of successful cooperation with the Department of Occupational and Environmental Health in the College of Public Health at

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the University of Iowa, Iowa City, USA. This cooperation was begun in 1996 and has been made possible through a grant from the Fogarty International Center of the National Institutes of Health in the US to support a research and training program in occupational and environmental health in five countries in Central and Eastern Europe. The University of Iowa collaborators have many years of experience using participatory ergonomics in a variety of industries to reduce work-related injuries and illnesses and to improve economic competitiveness. This is an approach that is badly needed in the Slovak Republic.

Scientific goals of this project include:

- Assessment of the risk of musculoskeletal injuries and the use of epidemiologic and economic analysis techniques to evaluate the effectiveness of preventive measures.
- Development of new methods of evaluation of working conditions as the basis for developing specific ergonomic preventive measures.
- Expansion of the scientific basis for prevention of work-related musculoskeletal injuries in Slovak industries.

In our analysis of various risk factors for work-related musculoskeletal disorders and the effects of preventive measures, we will assume no effect. Using appropriate statistical analysis methods, we will confirm and accept this null hypothesis, or we will reject it and accept the alternative hypothesis about a significant effect. The overall hypothesis of our project is: Participatory ergonomics programs within Slovak enterprises will significantly improve the health and safety of workers while at the same time increasing economic competitiveness in the global marketplace, thus developing the national economy of Slovakia.

Data are collected in all enterprises that have agreed to participate in this project. We try to include at least one enterprise in each of the eight regions of Slovakia. These enterprises could vary in size but involve between 30 and 200 employees in the participatory ergonomics process. We have the capacity to initiate participatory ergonomics programs in three enterprises during every year.

2. Methods

In each of the enterprises involved, our project begins with a risk assessment in the form of a descriptive cross-sectional study. This study serves as the basis of material used for risk communication and as a baseline for future comparative studies. Our project is built on previous results and verified methods of earlier projects with our partners from the University of Iowa, USA. Occurrences of musculoskeletal problems in exposed workers serve as the main indicators of workplace shortcomings [3, 4]. Depending on the circumstances in each enterprise, we use combinations and modifications of the following data collection techniques:

1. Modified Nordic Questionnaire and subjective evaluation of working conditions.[6, 12].
2. "Gallup" questionnaires for gathering information regarding the relationships between workers and enterprise management.
3. Observation of operations focused on ergonomic risk factors for musculoskeletal disorders as defined by NIOSH and CDC recommendations.
4. Worker interviews focusing on the effect of observed ergonomic risk factors and alternative preventive measures.
5. Video and still images of workers and workstations to be used in the analysis phase of the ergonomic process and also for documentation and education and training purposes.
6. Anthropometry for ascertaining human body morphologic characteristics (lengths, widths, thickness, depths, and circumferences) [2].
7. Workplace dimension measurements using methods developed in the Ergonomics Department at the Institute of Preventive and Clinical Medicine [1].

Data obtained in the course of this project are entered into databases using the EPI-INFO epidemiological analysis system. All data are encoded and kept strictly confidential and all procedures have been approved by a recognized Ethics Committee.

The central feature of this project is to initiate a process to improve workplaces using group problem solving techniques. The groups or teams will consist of managers and workers and, possibly, engineers, consultants, health care providers, and other specialists according to specific problems being addressed at the time. This approach uses a cyclic process of problem identification, analysis, solution development, implementation, and evaluation to improve work methods, materials, tools, and other factors in the workplace (Fig. 1). This cyclical process continues until the working environment is improved and the problems are solved.

Indicators which are monitored to assess the problem and to determine improvements include:

- Occurrence of musculoskeletal complaints (reports of pain and/or numbness)
- Morbidity
- Injuries
- Turnover
- Missed work
- Worker's job and remuneration satisfaction

- Quality of work, e.g. defective work percentage, etc.

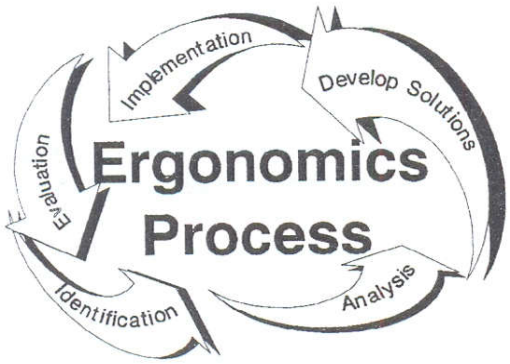

Figure 1. Ergonomics Process

3. Stages of Solution

In all the enterprises involved to this project, data collection and basic ergonomic evaluations will be conducted in three stages:

- 1st stage: data collection using worker questionnaires, and, in some situations, also interviews and measurements of workers' body parameters (ergonomic anthropology).
- 2nd stage: data analysis and development of alternative work methods on the basis of the results obtained from the data collected.
- 3rd stage: application and dissemination of data and project results to the Slovak Government, Slovak industry, and Bureaus of Public Health, and trade unions representatives.

Managers from participating enterprises will be expected to agree and participate in the following activities:

1. Provide information to workers and management about the goals, methods, effects, and personal data protection system that will be used in development and implementation of the participatory ergonomics programs.
2. Select and support the participants for the ergonomics program, establish enterprise ergonomic teams, and ergonomic working groups in selected operations.
3. Support data collection that is focused on recognition of risk factors and their effects, and help prioritize interventions on the basis of questionnaires, observations and worker interviews.
4. Support data analysis and preparation of specific education and training programs for working groups and ergonomic team members.
5. Support implementation of an ergonomics process as depicted in Fig. 1.
6. Support the annual evaluation of health effects and cost-benefit of workplace solutions and preventive measures.

4. Progress to Date

The first year of this project officially began in July, 2002, although we have been developing the foundation for cooperation from Slovak enterprises for several years through a series of workshops between 1997 and 2002.

The second year of this project officially began on July 1st 2003. Two enterprises that were involved in the project in the first year experienced a change of ownership. Although these reorganizations seriously affected the already-initiated ergonomics process, top management in both enterprises accepted the results of the ergonomics risk assessments performed in the first stage of project. We continue to be asked for help by top management representatives from several other enterprises where it is necessary to maintain a high level of quality and quantity of production in order to be competitive in the market place.

Because of new Slovak government legislative materials [9, 10, 11] requiring employers to conduct risk assessment and risk communication and to apply preventive measures against work-related injuries, we are asked by the institutions organizing education in the area of safety of work in Bratislava to take part in the education of state Health and Safety inspectors and Health and Safety technicians from all Slovak enterprises. This education included an explanation of the role of ergonomics in relation to Occupational Health and Safety systems in Slovakia. The majority of the inspectors taking part in these training courses expressed interest in being involved in our project.

We have already prepared our ergonomics risk assessment methods [5, 6] and appropriate evaluation programs in EPI INFO system. In cooperation with colleagues at Trnava Faculty, we are developing specific methods for ergonomic program cost-benefit evaluations based on principles similar to EMS cost benefit evaluation [7, 8]. These methods will be incorporated into this project final report.

We have involved to this project recently nine enterprises what represents altogether 1418 persons. In these enterprises health and safety technicians and human sources department professionals have expressed great interest in cooperating with us. Activities to date have included data collection using special worker questionnaires and real-time and video-based observations of work activities. These data provide:

1. descriptions of the groups involved in the study including such factors as age, gender exposure, body height, body weight, and indexes expressing body weight and body height relations;

2. evaluation of the prevalence of musculoskeletal problems, their severity, and body location;

3. information about job factors that employees consider to be causing musculoskeletal problems.

This information is used to prepare suggestions and recommendations for the managers of each enterprise involved to our project and for physicians taking care of the majority of employees in each enterprise.

In the next step of the ergonomics process, we will use these data as the focus of risk communication to the workers and as the basis of group problem solving exercises directed at workplace improvements. Additionally, these data will serve as baseline measures to evaluate the effectiveness of whatever preventive measures are developed and implemented. Concurrently, we will be performing cost-benefit analysis to examine the economic value of ergonomic interventions.

We will initiate a participatory ergonomics process in a minimum of three additional enterprises in Slovakia. Our experiences and the conditions of the transformation of industry have shown us that it is necessary to begin this process in as many factories as the resources of our department will allow. Unfortunately, some of the enterprises where we have already started the ergonomics process may be transformed is some way that will not allow us to complete our activities. In this case, it will be necessary to have additional enterprises. Because of the limited resources available for this project, it may be necessary to focus more on enterprises located closer to Trnava.

5. Conclusions

As the period of economic transformation continues, ergonomics is being increasingly recognized as an important independent science that can contribute greatly to both the health and safety of the population and to sustained economic development. The primary role of ergonomics in this transformation process is to find appropriate ergonomics programs for Slovak enterprises that are based on scientific approaches to workplace improvements. This process requires highly quality trained specialists in the area of ergonomics. Fortunately, the Department of Industrial Engineering and Management of STU, Faculty of Materials Science and Technology in Trnava has the experience, resources, and conditions to provide such specialists.

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