

## **Interactive research and HTO as an industry development model**

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**Abstract.** Meat cutting has since long shown high frequencies of work-related disorders and injuries. The meat cutting industry initiated an interactive research project to assist the companies in creating a better work environment considering also the profitability. After an initial diagnosis, a broad strategy was formed and four mixed groups focusing personal development, technological developments, work organization and work environment started working. The results from these further initiated focused studies that were performed in close interaction with the industry. During the four year project a continuous reduction of musculoskeletal disorder problems in the industry and other substantial effects were observed.

**Keywords.** Meat cutters, musculoskeletal disorders, change strategy, working conditions

### **1. Introduction**

The deboning and meat cutting industry is since long known for high frequencies of musculoskeletal disorders (MSD), accidents, problems related to working in cold environments and physically demanding jobs. In Sweden, meat cutters have been among those with highest accident risks (The Swedish Work Environment Authority, 2012). For many years there had been numerous contacts and disagreements between the meat industry, the different companies involved and the authorities. In 2006, the Swedish Work Environment Authority (AV) issued an injunction to the largest meat cutting companies to perform a number of actions in order to reduce occupational accidents and work related disorders among meat cutters. The companies were to meet the requirements until December 31, 2008. In 2007, representatives of the meat industry contacted the ergonomics research group at the Royal Institute of Technology (KTH) for a discussion of how to improve the physical working conditions for meat cutters in the Swedish meat industry. This discussion was enlarged and resulted in the formation of a four year industry intervention project, in which ergonomics, organizational development, and interactive research were integrated together with the Triple Helix concept involving industry, university and government in a collaborative innovation effort. An industry dominated steering group was created and a project plan was developed with the aim of reducing the health and safety problems in the industry and considering profitability at the same time. The aim with this paper is to outline the industry intervention and its main effects.

## 2. Theoretical framework

Much of the work environment improvement has taken place on an individual level, where e.g. Occupational Health Services (OHS) have made recommendations for improvements of individual workplaces (Kankaanpää, Suhonen, & Valtonen, 2008; Savinainen & Nyberg, 2012). In other situations, projects and interventions have focused the organizational level, something that is relatively often reported in literature (Karsh, Moro, & Smith, 2001; Silverstein & Clark, 2004). However, work environment improvements on an industry level are rare, despite the strong need of such interventions. There is consequently a need for intervention studies directed towards an industry or an occupation (Choi, 2012).

It is well-known that it is difficult to identify effects following interventions directed towards MSDs. Some of the reasons for this are the multifactorial nature of these disorders, the long latency times, vague diagnoses and difficulties to assess exposure. Also, interventions directed towards one factor seldom show effects, while broad interventions seem to be more effective in this respect (Karsh et al., 2001; Neumann, Eklund, Hansson, & Lindbeck, 2010; Westgaard & Winkel, 1997).

It is also well-known from the organization change literature that a large proportion of change projects do not succeed. It has been claimed that 70 % of such projects fail (Beer & Nohria, 2000). Most literature on change adopt a top-down perspective on change and the results of change are described at the organizational level e.g. Kotter (1995). If however, the perspective is shifted towards organizational change being the result of changed individual behaviors shaped by the work setting, the influence of the work setting characteristics must be focused (Porrás & Robertson, 1992). Moreover, it can be argued that all humans are different and it is thus the interaction between the human and the prescribed work offered by the organization and the technology used that shape the working conditions for the individual in the daily work activity (Daniellou & Rabardel, 2005). Integrating these aspects, the human-technology-organization interaction in daily work (HTO) has been regarded an interesting approach to analyze and understand interactions in work settings and the different results thereof (A. Karlton, Karlton, Eklund, & Berglund, 2014).

The concept of Triple Helix has been proposed as a model to emphasize the role of universities, industries and governmental organizations in innovation. It points to that collaboration between these three stakeholders is important in obtaining new ideas and innovative solutions in business development or in research. An underlying assumption is an interactive model for innovation rather than a linear model (Etzkowitz & Leydesdorff, 2000).

Interactive research is a development of action research, in which the research is performed in partnership with the practice system. The aim is to produce new and usable knowledge that is of high interest to both researchers and practitioners. Interactive research assumes participation and interaction in all stages of the research, from defining the issues at stake, the aim of the project, the data collection planning and the interpretation of the results to the knowledge dissemination. There is, however, a clear division of roles between researchers and practitioners in the collaboration (Ellström, Eklund, Kock, Lindström, & Melin, 1999; Svensson & Aagaard Nielsen, 2006).

## 3. Method

This paper is based on a retrospective description and analysis of the intervention

process using documentation, both published and unpublished. The published documents are reports, conference papers and papers published in journals. The unpublished documents are mainly notes from various meetings with steering committee and work groups as well as from interviews and observations. Regarding the primary data collection for the published documents it is referred to the referenced publications.

#### **4. Change process**

The injunction regarding the meat cutters' work environment can be seen as the starting point for the change process. The contacts with the university meant that the project was formed and preliminary defined. The Swedish Meat Industry Association (KCF) invested in the project in order to make an application for a research grant from AFA Insurance, owned by the Swedish labor market parties, possible. To lead the project a steering committee was formed with representatives for employers (3), union (3), researchers (1 ordinary, 2 adjunct) and led by the CEO of KCF. The steering committee had regular quarterly meetings where the project, the situation in the industry and the relation to the Swedish Work Environment Authority were discussed. These meetings were usually held at participating companies or other places of interest to learn together and to spread the results of the work during the process. The responsibilities for the steering committee were among others to take decisions regarding the progress of the project, to create and support contacts between companies/employees/stakeholders and the researchers. The interactive character of the project enabled the steering committee to adapt the project to the process of development and to adjust the focus when regarded to be advantageous.

The project work was planned to be performed in three phases, the first phase starting with a literature review regarding the meat industry and problems regarding MSD and accidents as well as an initial study of the current situation in the industry (J. Karlton, 2008; J. Karlton, Eklund, Engkvist, & Lindbeck, 2008; Lindbeck & Engkvist, 2008). The approach was inspired by a previous project for improving the work of Swedish postmen based on the HTO-view of work (A. Karlton, 2007). During the first phase, the application for a research grant was approved and the project was guaranteed for four years.

During the second phase the work was divided into four work groups, each led by an industry manager and including representatives from companies, union, and research. These four groups focused 1) personal development (H), 2) technological developments (T), 3) work organization (O) and 4) work environment improvements. In all about 25 people participated in these groups, which worked together for about two years, with shifting frequency but they all met between 5 and 10 times during this period. The groups served both as experience providers, triggers for investigations and settings for discussions. The scope of the groups were adapted to the HTO view complemented by the work environment group. Three of the groups produced a report on the national status of the focused area but the work environment group produced a collection of about 40 technical improvement solutions how to solve practical issues of importance to the work environment.

Overlapping the second phase was the third phase of in depth studies. The statistics regarding work-related sickleave due to accidents and MSD were carefully analyzed to obtain a better understanding of the problems in the industry. Evaluations of change efforts were done, the largest being the evaluation of a new work organization including a reduction in time using the knife, a rotation scheme and a program for personal development related to this (Vogel, Karlton, Eklund, & Engkvist, 2013). Other studies were related to more specific investigations regarding questions that couldn't be answered using

the existing literature. Such investigations were for example how the same meat cutters experienced working in different production systems where one system was highly controlled but less physically demanding while the other was basically the other way round (J. Karlton, Aili, & Vogel, 2011). Other studies were concentrated on the cutting task investigating temperature influence in cutting (Hägg, Vogel, Karlton, & McGorry, 2012) and whether the knife brand or the individual meat cutter had the major influence on how the sharpness of the knife was maintained during work (Bergstrand, 2011). A sharpness tester, Anago KST200e in which sharpness of knives could be measured, was introduced to the Swedish industry during these studies. Another study (forthcoming) was made comparing the traditional way of calculating profit from meat cutting with a way where the trade-off between speed and accuracy was considered.

In parallel to these phases, large efforts were put on information sharing and dissemination. The ten largest companies in the business were visited and informed about the project. They were also asked about problems and efforts made to improve the work situation for meat cutters. All but one were very interested and welcoming. Some of the suppliers of technical equipment and knives were visited and collaboration was established. International colleagues in research were also contacted and visited in order to find out what type of research was going on. Some of the international research results were translated and spread, while other results just were spread. Presentations were held at industry meetings where both the project and different findings were informed about. The magazine of the Swedish Meat Industry Association published articles about the project as did the union magazine. Companies in the industry could log into the website of the KCF and download every report written in the project as well as other information material of interest. An effort was also made to introduce a food industry information system on work environment for benchmarking and improvement efforts. The research leader in the project also participated in activities to improve the communication and contacts between the industry managers and AV which were frosty at the beginning of the project.

To summarize the structure of the project, it was performed as a three stage developing and deepening project, starting from overviews of the situation in the industry and available literature. The second stage focused the areas of HTO in a highly participative and interactive process of investigating and developing knowledge regarding these areas, involving industry personnel as well as researchers. The third stage then continued with focused research in selected areas where effects on the industry were believed to be as large as possible. In parallel, a multifaceted approach regarding information about the project, its topics and general achievements were launched.

## **5. Results**

During the period of the project the figures for work related injuries and disorders declined every year. The year after the project was finished, however, the figures increased again. This increase have recently been traced to a single large workplace and analysis is currently performed to find the reasons for this.

The frosty relations between AV and the industry were largely improved, from difficulties to meet and only communicating by letters to a situation when the responsible labor inspector participated in the steering committee meetings, either physically or via video conferencing, thereby reasoning in dialogue with the industry managers regarding the problems.

The project was also presented at a European conference for the Senior Labor Inspector Committee as an interesting example of how research can support in improving the work environment in an industry, based on the decreasing figures for work related

problems, labor inspector observations of large improvements at the different companies and the improved relations between AV and the industry.

Apart from the different publications, these citations from some of the main stakeholders in the business show opinions about the project:

*“We have reached a completely different collaborative climate and a constructiveness in the dialogue in these issues between the industry and AV compared to when the project started. This is very positive. The companies in the industry did spend a lot of resources in improving the work environment for the meat cutters, outgoing from the work in the project”* (CEO, Industry Association)

*“The project has created a unique collaboration in the industry regarding inventorying and finding better solutions for application in the daily work environment for the companies in the meat industry”* (CEO, Medium sized company)

*“The project has definitely been able to enlighten the work environment of the meat cutters from a perspective that did not exist earlier. Furthermore, it has contributed to a general increase in contacts between meat producers regarding work environment issues.”* (Member of the board of the union for meat cutters, chair of the local union in southern Sweden.)

The project furthermore has resulted in a second project regarding educating meat cutters on how to handle and maintain their knives and keeping them sharp. The reasons for this is that the skill of the individual worker regarding this ability to a large extent also determines the individual workload of the meat cutter given the same contextual conditions.

## **6. Discussion and conclusions**

Bringing change and work environment improvements for a whole industry is naturally very difficult and demanding. The possibility to show effects of such a project at a general level is uncertain. The combination of the issued injunction which put the industry in the position of having to do something, the research group with experiences of large intervention projects regarding the issues at hand and the interactive approach may well have been the main reasons behind the perceived success of the different stakeholders. The statistics developing in the right direction must be interpreted cautiously. A large amount of other factors did affect the industry during the project period, big changes in the industry structure, management turbulence, technical investments outside the scope of the project and labor conflicts just to mention a few but very influential factors.

The positive comments, the improved relations and the continued collaboration with research show however that even at an industry level, some effects seem to have been reached.

One conclusion by the authors is that the design of the interactive project which decreased the distance between researchers and practitioners, the HTO approach enabling the different work groups to keep focused on a specific issue, the multifaceted activities supporting improvements in different areas and the large efforts on creating participation and disseminating information explain the results on industry level of the project.

Another conclusion is that without the strong support from the chair of the steering group and some of the industry managers involved, the results had been very difficult to achieve, not the least regarding access to work places and information dissemination.

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