



6th International Conference on Applied Human Factors and Ergonomics (AHFE 2015) and the
Affiliated Conferences, AHFE 2015

Critical success factors in the development and implementation of special purpose industrial tools: An ergonomic perspective

Francois Gauthier*, Denis Lagacé

Industrial Engineering Department, Université du Québec à Trois-Rivières, C.P. 500 Trois-Rivières (Quebec), CANADA G9A 5H7

Abstract

The variety of different manual tasks performed in industry is infinite. In many circumstances, these tasks are carried out under difficult conditions with ergonomic concerns about the postures, force or repetitions involved. These tasks are sometimes performed using a dedicated special purpose tool, often developed by the workers themselves. These special tools are generally task-oriented only, with very little consideration of basic ergonomics. Therefore, in many cases, the design of a new or improved special purpose tool is one of the solutions that could enhance the ergonomics of the performed task. However, developing and implementing a new or improved tool is not an easy assignment and the ergonomist could face many unexpected challenges and pitfalls. This paper discusses the pitfalls that could compromise these ergonomic interventions and the critical success factors that should be considered. The main difficulties that could arise during such a project include the poor understanding of the user's needs, the hidden constraints related to the requirements of the task to be performed, the construction and testing of the prototypes, and the users' resistance to change. Critical success factors related to worker participation, needs and constraints analysis, and the implementation of prototypes, are presented. Examples from industrial projects involving the development and implementation of special purpose tools are used to support the discussion. This paper should provide some guidance in this particular field of applied ergonomics.

© 2015 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Peer-review under responsibility of AHFE Conference

Keywords: Manual tools; Ergonomics; Design; Implementation; Pitfalls; Success factors

* Corresponding author. Tel.: 1-819-376-5011 (ext. 3959); Fax: 1-819-376-5152.
E-mail address: francois.gauthier@uqtr.ca

1. Introduction

The variety of different manual tasks performed in industry is infinite. In many circumstances, these tasks are carried out under difficult conditions, with ergonomic concerns about the postures, force or repetitions involved. In some cases, no special tool is used to accomplish the task. In other cases, the tasks are performed using a dedicated special purpose tool, often developed by the workers themselves. These “homemade” tools are generally task-oriented only, with very little consideration of basic ergonomics. Therefore, in many cases, the design of a new or improved special purpose tool is one of the solutions that could enhance the ergonomics of the performed task.

However, developing and implementing such a new or improved tool is not an easy assignment and the ergonomist could face many unexpected challenges. Based on past experience, the main difficulties that could arise during such a project are described in section 2. The critical success factors that should be considered during the main steps of the development and implementation of such tools are presented in section 3. Examples from industrial projects involving the development and implementation of special purpose tools are used to support the discussion.

2. Ergonomic problems and hand tool design: Challenges and pitfalls

2.1. Challenges and pitfalls related to the workers' support for the new tool development project

Even if workers are aware of the risks associated with their work technique or their actual tools, they often appreciate their simplicity and their effectiveness. In fact, “homemade” tools are often considered by workers as being very adapted to the task, despite their ergonomic deficiencies. Workers are therefore sometimes disinclined to change, particularly if this could have an impact on the simplicity or rapidity of task performance. An example of such a tool is presented in Figure 1. This tool, used for a residue cleaning task in an aluminum plant, consisted of a simple metal rod equipped with a handle. Despite the many musculoskeletal disorders of the back and elbows reported by workers using this tool, they were reluctant to change, considering its simplicity and its effectiveness.



Fig. 1. (a) Cleaning task (b) Simple tool used

Also, workers do not necessarily share the idea that the implementation of a new tool is the solution to an ergonomic problem. Sometimes, the task is particularly difficult and the workers want the task to be mechanized or eliminated. Yet the technical, organizational or financial constraints may be such that the company does not consider these alternatives. While the idea of a new tool can seem an interesting solution, the workers might not share this viewpoint and could be reluctant to support the project.

2.2. Challenges and pitfalls related to the workers' participation in the project

In a development project for a new more ergonomic work tool, the workers' active and direct participation is essential. Even when the workers support the project, obtaining their real participation in the project can sometimes

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات