Applied Ergonomics 40 (2009) 826–832

Contents lists available at ScienceDirect

Applied Ergonomics

journal homepage: www.elsevier.com/locate/apergo

Spreading good ideas: A case study of the adoption of an innovation in the construction sector

Desre Kramer [a,b,*], Philip Bigelow [a,b], Peter Vi [c], Enzo Garritano [c], Niki Carlan [d], Richard Wells [a,b]

[a] Centre of Research Expertise for the Prevention of Musculoskeletal Disorders, Department of Kinesiology, University of Waterloo, Waterloo, ON, N2L 3G1, Canada
[b] Institute for Work & Health, 481 University Avenue, Suite 800, Toronto, ON, M5G 2E9, Canada
[c] Construction Safety Association of Ontario, 21 Voyager Court South, Etobicoke, ON, M9W 5M7, Canada
[d] Department of Sociology and Anthropology University of Windsor, 401 Sunset Ave., Windsor ON, N9B 3P4, Canada

ARTICLE INFO

Article history:
Received 20 September 2007
Accepted 2 September 2008

Keywords:
Diffusion of innovations
Prevention of musculoskeletal disorders
Workplace intervention research
Construction sector

ABSTRACT

A health and safety association collaborated with two research centres to examine the dissemination of knowledge of an ergonomic intervention by opinion leaders in the construction sector. The intervention was a hydraulic ladder lift that aided with loading and unloading of ladders off van roofs. Thirteen companies, with five to 900 employees, were involved. The van operators informed workmates not employed by their companies but who worked on the same site as them about the intervention. The opinion leaders informed decision makers within their companies which led to commitments to purchase similar units. They also gave presentations at prearranged health and safety meetings, where attendees indicated that they thought the intervention sounded like a good idea. In this way, knowledge of the innovation reached at least 32 more companies and potentially several thousand other employees. The study showed the potential for workplace change to be exponential.

1. Introduction

Construction workers are exposed to heavy manual material handling, repetitive movements, awkward postures, contact stress, vibration and forceful exertions. The physical demand is high and the control over product design and selection of materials is limited. The sector has one of the highest injury rates in Ontario, with musculoskeletal disorders (MSDs) representing 35% of all lost-time injuries in the rate group and over 30% of total direct WSIB costs.

Addressing health and safety issues and conducting research on health and safety in the construction sector is inherently more difficult than in a fixed industrial setting (De Jong and Vink, 2000; Schneider, 1995). The workplace is changing every day, the peripatetic workforce, and the complex project and organizational arrangements all mean that any health and safety intervention is difficult to implement or evaluate (Merlino et al., 2003; Moir et al., 2003; Van der Molen et al., 2005a). In addition, workers are constantly changing jobs, so the efficacy of interventions is difficult to gauge (Jensen and Friche, 2008; Schneider, 1995; Sorensen et al., 2006).

Despite these obvious issues, it has been shown that having safety initiatives in place does lead to better safety outcomes in this sector (Hoonakker et al., 2005), so ensuring that companies receive help with simple, inexpensive and efficient preventive measures (tools, processes, procedures) to reduce the risk of MSDs is essential in construction (Malchaire and Piette, 2002; Sexton et al., 2006). But how to communicate these measures is an issue. Practicing ergonomists and health and safety professionals find it difficult to communicate knowledge on MSD prevention (Mollo and Falzon, 2004) and even more so, to overcome the barriers to adopting new measures (Van der Molen et al., 2005b).

Acknowledging this as a problem, the Construction Safety Association of Ontario (CSAO), one of 14 sector-specific health and safety associations funded by Ontario's Workplace Safety and Insurance Board (WSIB), chose to collaborate with two research centres (the Centre for Research Expertise in the Prevention of Musculoskeletal Disorders and the Institute for Work & Health, that are also funded by the WSIB) to explore the potential for improving the introduction and adoption of ergonomic innovations in the construction sector, by using their expertise in knowledge transfer & exchange (KTE).

The two research centres use the concepts and techniques of KTE extensively with the goal of improving the effectiveness of transferring knowledge between communities (for example, ergonomists and workplaces; researchers and ergonomists) (Kramer and Wells, 2005). The model of KTE used by the two centres is based on a couple of theoretical foundations: the social interactionist model of knowledge transfer (Huberman, 1994; Lave

* Corresponding author. Tel.: +1 416 467 6272; fax: +1 519 886 5488.
E-mail address: dkramer@uwaterloo.ca (D. Kramer).

0003-6870/$ – see front matter © 2008 Elsevier Ltd. All rights reserved.
doi:10.1016/j.apergo.2008.09.006

and Wenger, 1988), and the diffusion of innovation theory (Rogers, 2003). The social interactionist model supports the idea that knowledge is essentially social and is created within a social context, and the more sustained and intense the interaction between researchers and potential "users" at multiple phases within the research study, the higher the potential for knowledge use. The concept of opinion leaders emerges out of diffusion of innovation theory (Rogers, 2003). Opinion leaders have multiple connections, are regarded as highly credible, and are influential in spreading new ideas.

How these conceptual frameworks are actualized as part of the research centres' activities, is that they invest in building strong relationships ("interactionist model") through regular contacts between their researchers and workplace decision-makers and involve these stakeholders throughout the research process (Thompson et al., 2006). Their stakeholders included potential users of research in the prevention of musculoskeletal disorders (MSDs) such as ergonomists, workplaces, organized labour, organizations and associations. This investment in relationship building has proven to be an effective KTE process (Kramer et al., 2004; Mitton et al., 2007) that in this research study led to the implementation of a change to reduce MSDs in construction.

Through this relationship-building, the CSAO collaborated with the research centres in initiating a more proactive dissemination of knowledge on the prevention of MSDs by using some of the principles of knowledge transfer and exchange, including using opinion leaders in the sector to promote new ideas, mining their existing network to hold discussions on MSD prevention, and creating focus groups with their member organizations to explore the major issues surrounding MSD prevention.

2. Background

2.1. Setting up a KTE case study

Using the networking ideas of KTE, the research group (made up of researchers from the two research centres and practitioners at CSAO), met with a number of trade-specific and labour-management health and safety sub-committees that CSAO operates at the provincial, regional, and trade/sector level. These committees are usually made up of 10 to 15 active members.

One of these groups, the Refrigeration/Air Conditioning committee identified a task they believed was a high risk for MSDs and falls, and identified an innovation that could potentially be very useful in reducing stress to the upper body and back. The task was taking ladders off and on the roofs of service vans. The innovation was a hydraulically operated, aluminium drop-down ladder rack.

The research process included: (1) holding a number of consultations with the CSAO sub-committees to identify companies that the sector believes are opinion leaders; (2) contacting the companies to gain their commitment to try out the ladder racks; (3) purchasing about 15 of the ladder lifts to distribute to the companies; (4) installing them on service vans; (5) giving the workers training on their use; (6) conducting interviews at staggered intervals with the workers to explore their perception of the benefits of the innovation; (7) conducting a biomechanical analysis of the innovation; (8) interviewing key people to profile the companies; (9) gaining the commitment from company representatives to talk at one of the CSAO committees about their experiences; and (10) evaluating the dissemination potential of this innovation.

2.2. Research questions

The research project was framed by the following research questions:

- Can opinion leaders help solicit construction workplaces to be involved in research?
- What are the barriers and facilitators to adopting ergonomic innovations in the construction sector?
- What are the characteristics of an innovation in construction that facilitates or retards its adoption in individual companies and its diffusion throughout the sector?
- What are the characteristics of "early adopter" companies in the construction sector?
- What are the challenges and facilitators in disseminating innovations in the construction sector?

3. Methods

3.1. Identifying the innovation

CSAO's Refrigerator and Air Conditioning Health and Safety Labour-Management Committee proposed that the repetitive lifting of ladders on and off vans puts maintenance workers at risk for injury and musculoskeletal disorders (MSDs) to the back and shoulders because of the weight of the ladder and the extended reach. There is also the risk of slips and falls because workers are stepping on and off the van bumper in order to remove the ladder from the roof.

The committee recommended a hydraulic aluminium drop-down ladder rack system, which allows workers to load or unload the ladder from the side of the vans. To raise or lower the ladder, the operator turns a control rod that allows a hydraulic cylinder to assist with raising or lowering the ladder rack (see Figs. 1 and 2 for pictures of the standard way of lifting a ladder, compared to the new hydraulic ladder lift).

Fig. 1. The old ladder lift.