



# Sustainable MSD prevention: Management for continuous improvement between prevention and production. Ergonomic intervention in two assembly line companies

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## ABSTRACT

To increase output and meet customers' needs, companies have turned to the development of production management systems: Kaizen, one piece flow, Kanban, etc. The aim of such systems is to accelerate decisions, react to environmental issues and manage various productions. In the main, this type of management system has led to the continuous improvement of production performance. Consequently, such production management systems can have unexpected negative effects on operators' health and safety. Conversely, regulation and control systems focusing on work-related risks have obliged firms to implement health and safety management systems such as OHSAS 18001. The purpose of this type of system, also based on continuous improvement, is to reduce risks, facilitate work-related activities and identify solutions in terms of equipment and tools. However, the prevention actions introduced through health and safety systems often result in other unexpected and unwanted effects on production. This paper shows how companies can improve the way they are run by taking into account both types of management system.

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## 1. Introduction

Musculoskeletal disorders (MSD) are today a major concern for companies. The social and economic consequences of this phenomenon have reached such a point that the concern is now being reflected in French public policy.

Scientific research, notably epidemiological, has pinpointed a relationship between MSD and work. The genesis of these pathologies is multi-causal: biomechanical factors caused by workers' movements (frequency, intensity, duration, posture, vibration, cold, etc.), psycho-social factors (stress, decision-making freedom, social support, psychological demand, interest in work, monotony, etc.), and organisational constraints (dependence, contradicting orders, etc.). These risk factors are all mixed together, as described in research in ergonomics and epidemiology. They are the result of workers being exposed to changes to products, production organisation modes, management systems, requirements relating to customer-supplier relations, etc.

Some ergonomists (Bourgeois et al., 2000; Coutarel, 2004; Douillet and Schweitzer, 2005) link MSD with a deficit in terms of how much room for manoeuvre workers have when executing the movements required for their jobs or with respect to the methods used to manage production and human resources. However, this approach has still not been widely developed in international literature or in daily corporate practice. One project, led by several research teams and social partners, called "Sustainable Prevention of MSD and Assessment of the Effectiveness of Actions" (Coutarel et al., 2006) has identified factors that either help or hinder prevention (Caroly et al., 2007). One aspect worth focusing on is the way companies deal with MSD through management based on a dual logic of safety and production.

What can be seen is that the prevention of MSD is rarely integrated in company management as information that could have an effect on work performance. Productivity coefficient calculations take into account the forecast operating rates and the actual operating rates of machines, as well as the resources available for production. But the correlation in terms of real people resources is not often made. Economic research, on the other hand, underlines the importance of taking this latter point into account. Workplace safety as a business objective adds value to the business bottom line.

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The link between Productivity–Quality–Costs–Safety appears like a sustained approach to competitive advantage. To get optimal benefit from implementing lean manufacturing techniques, companies must include a third variable in their lean manufacturing shibboleth—productivity, quality, and safety. (Maudgalya et al., 2008).

The issue relating to the hidden costs of MSD for a company (Fauconnier and Pépin, 2004; Geoffard, 2005) points to the difficulties involved in replacing staff, managing limited skills, absenteeism, workstation adaptation, etc. All of these factors have consequences: failure to reach productivity targets, drops in quality, time wasted recruiting temporary staff, training, etc. Overall production performance is therefore impacted by health and safety issues. Producing such data would therefore greatly contribute to decisions relating to change and to the coordination of improvement projects.

Prevention would be more efficient if health were incorporated in the tools and indicators used to run companies. Ergonomics considerations should be an integral part of the planning procedure when establishing new production systems and work places (Weestgaard, 2000). Most stakeholders do not realise that there is a link between health and production. Strong management commitment is often a condition for this multiple-logic approach (health, production, maintenance, hygiene, quality, etc.). The need for flexible, rapid and evidence-based preventive approach is underlined to create the possibility of integrating positive, preventive elements into industrial practices (Kuorinka, 1998).

The aim of this research paper is to analyse the conditions required for this safety/production logic approach to be integrated in the “continuous improvement” systems of French industry. Incorporating organisational level into occupational health research is an international question which could help industries to improve production/safety and preserve worker health (MacDonald et al., 2008).

## 2. Continuous improvement

Implementing continuous improvement in a company creates an opportunity to link production management with prevention management.

### 2.1. Continuous improvement in production management

In order to increase production, companies use production management systems: Kaizen, one piece flow, automation islands, Kanban, 5S, etc. Such approaches are rolled out in mass production organisations having to face high competition and demanding customer requirements (short lead times, product quality, flexible uses, etc.). The continuous improvement process aims to optimise information, physical flows and products in order to control production costs and quality.

Continuous improvement is based on developing methods, considered to be “original” by managers, where the aim is to have team discussions about the installation of new machines in small spaces; to encourage rapid feedback about operational problems; to facilitate line optimisation using the same resources; to improve responsiveness in relation to customer requests, etc.

With constant raw material and labour price values, optimisation solutions mainly focus on reducing production costs (e.g. number of movements required to assemble a product) by eliminating certain “non-value added” aspects in the production process (processing of useless information, use of ill-suited tools, etc.).

Continuous improvement based on PDCA (plan, do, check and act) cycle logic (Deming, quoted by Kanji, 1996) makes it possible to draw up specifications about the product, to test it in situ and then

to re-design it. Improvements are sought by focusing on a so-called normal cycle, but do not take into account product variability and operator fatigue. These production management systems have a limited vision of performance. Indeed, setting up a Kaizen system (e.g. focusing on achieving results while cutting down on resources in terms of time, space and operators) does not take into account effectiveness, efficiency (Bescos et al., 1997) and relevance (Hubault, 1998), i.e. the relations between the available resources and the objectives to be reached.

Consequently, the effects of production management on the health and safety of operators are not always included as part of the objectives of continuous improvement. There are only a few exceptions where employee well-being is explicitly said to have a positive influence on the results of a company (Toulouse et al., 2005). Objectives relating to the development of human resources and management of skills are rarely included in these approaches. These are considered more often as factors that are “external” to these management systems (Du Tertre, 2005).

### 2.2. Continuous improvement in safety management

In terms of regulatory systems for assessing and preventing professional risks, there are safety management approaches (OSHAS 18001, ILO-OSH 2001, etc), based on continuously improving health and safety issues. Furthermore, the traditional OHS specialist's role is increasingly incompatible with the speed of change in today's industry (Kuorinka, 1998).

According to the Deming wheel, the first step when setting up a safety management system consists in drawing up a single document listing all the risks present in a company. However, this standardised methodology, which is used to produce this type of document, fails to take into account suitable indicators relating to work activities and tends to underestimate the variability of work situations. Risk prevention and management systems should also take into account the diversity of populations, in terms of their age and time spent in the company, as well as their state of health. Implementing a risk assessment approach should also involve operator participation. Indeed, the solutions available for eliminating risk factors are often thought up by health, safety and environment experts without consulting the workers.

The safety management system tends to underestimate the effects of decisions about production operation. Because such a system focuses on occupational health and safety issues, the objective pursued is to provide workers with greater comfort and adapted workstations. This approach to safety often leads to transformations that actually disturb workers' activities and make strategies focusing on production and quality difficult to implement. This leads to equipment and new procedures being under-used and opposes logic based on safety and that based on production.

### 2.3. An innovation challenge: combining production management and prevention management

Research on innovation shows that the innovation process should combine these different forms of logic. For example, a technological approach should be considered at the same time as a social approach to work. Designing work situations and/or a future work organisation should include the building of compromises, notably between the political wishes of the project owner and the technical feasibility defined by the project manager (Martin, 1998). It should also be mindful of the confrontation between heterogeneous forms of logic (Daniellou, 1992), and efficient forms of collaboration between professionals.

In his work on the integration of Occupational Health and Safety in quality management and production management (using Kaizen

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