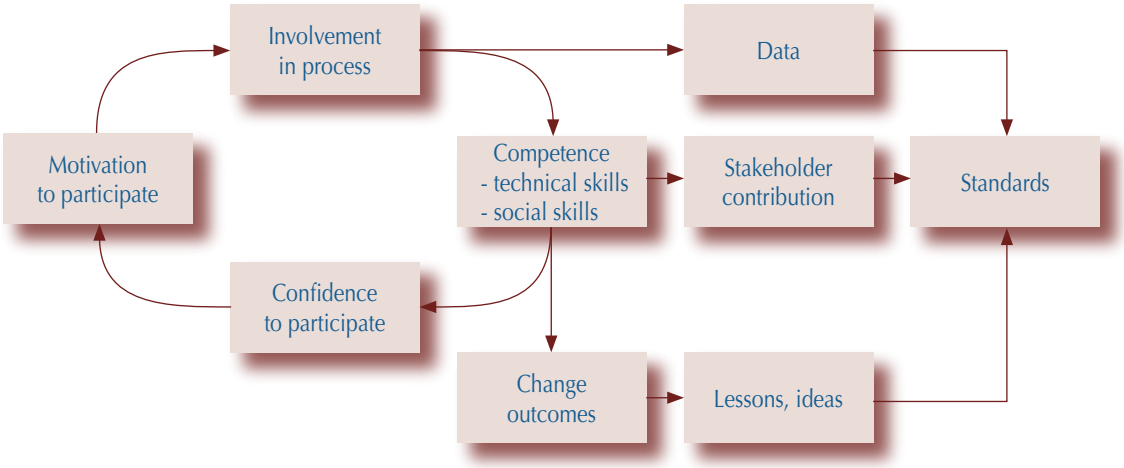
In such cases, some of the participants were also existing members of standards committees or had links with representatives on such committees. The standards process is complex and confusing. The ability of researchers and/or organisations to influence the standards process therefore depends upon an initial awareness and understanding of the process, resources in terms of time and finance to attend committees, and the ability to gain support from other committee members to support any proposals. These factors can present considerable hurdles to individuals and organisations and may indicate why so few cases were found where the outcome of participatory projects had influenced new or existing standards.

With reference to the earlier cycle of participation, some extra stages can be seen that enable participatory processes, and data from participation, to be integrated into the standards system. ■




PARTICIPATORY DESIGN OF WORK EQUIPMENT

# How end-user data can be integrated into the ISO and CEN systems

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## Introduction

In 1973, the International Ergonomics Association (IEA), which currently represents some 19,000 ergonomics scientists and practitioners world wide, proposed to the ISO to start standardization work in the field of ergonomics (Parsons & Shackel, 1995). The ISO established TC 159 "Ergonomics" to start this process in 1974, and published the first ergonomics standard in 1981 as ISO 6385:1981 *Ergonomics principles in the design of work systems.*

The pace of standards production increased rapidly thereafter, and now more than 150 ergonomics standards have been published by ISO and CEN on a variety of topics. The best-covered topics are machine safety, workplace and equipment design, and visual information and computer operation.

Most of these standards were developed by ergonomics scientists and professionals, and the large number of standards produced has helped to develop and bring into its own right the discipline of ergonomics over the past 30 years. The IEA can be pleased with that result.

## Users of ergonomics standards

This prompts the question, who are the users of ergonomics standards ? According to the definition of ergonomics, approved by the International Ergonomics Association, ergonomics deals with human-centred design of products and processes in order to **optimise human wellbeing AND system performance**.

Therefore, ergonomics has both a **social goal**, which is important for the users of products and processes (including work products and work processes which are important for the workers), as well as an **economic goal**, which is important for the management of an organization. This means that not only workers and other parties with interests in the social aspects, but also those with interests in the economic aspects of products and production processes, may have a

clear interest in ergonomics standards. Both groups can be considered as potential users.

The economic aspects of ergonomics are often underestimated. In management, a business process is usually described as a chain of value-adding activities. For example, the process of product creation and realization can be described by the chain : Research, Product Development, Process Development, Purchasing, Production, and Distribution. Product ergonomics can add value to the process of product creation (Research, Product Development) and production ergonomics to the process of product realization (Process Development, Purchasing, Production, and Distribution).

In **product creation**, management (e.g., the marketing manager) may opt for an ergonomic strategy, where a competitive advantage can be achieved by developing user-friendly products.

In **product realization**, management (e.g., the production manager) may also opt for an ergonomic strategy, where a human-friendly production system provides the labour force with acceptable working conditions, achieving higher productivity.

Both ergonomic strategies can be implemented by using an ergonomics innovation process in which product and process designers and ergonomists are involved. This should lead to ergonomic products and production processes for users such as consumers and workers.

This view of the place of ergonomics in an organization illustrates that there are many different parties who may have an interest in ergonomics : managers, designers, ergonomists and users. Consequently, these parties will also have an interest in ergonomics standards for the human-centred design of products and processes.

This list of interested parties squares well with the list of end-users mentioned in the revision of the first ergonomics standard on ergonomic principles in the design of work systems : managers, project managers, workers (and their representatives), professionals (such as ergonomists), and designers.

## User participation

However, these potential end-users of ergonomics standards, or organizations that represent their interests, such as employer organizations or trade unions, seem not to have been involved in their development : most of the 150 ISO and CEN ergonomics standards were chiefly framed by ergonomics experts. Other end-users or representing organizations had little involvement. This is a surprising finding, and goes against a basic ergonomics requirement that users should be involved in the design of systems.

To bring improvement to this situation, we would like to present a model that identifies key users or representing organizations (called stakeholders in the rest of this article) that should be involved in the development of ergonomics standards.

This model is based on a stakeholder model presented by Mitchell *et al.* (1997), that was originally developed for identifying key stakeholders in a business environment, from a manager's point of view. This model was recently applied by Willemse (2003) to identify stakeholders for standardization, and by Willemse *et al.* (2003) to identify stakeholders specifically for ergonomics standards.

The stakeholder model uses three basic variables :

- Power (P), which is the possibility for a stakeholder to influence the outcome, based on, for example, financial or knowledge resources.
- Legitimacy (L), which is the desire of other stakeholders that a specific stakeholder should be involved.
- Urgency (U), which indicates that the outcome is important for the stakeholder.

Based on these three variables, 7 groups of stakeholders can be distinguished. The first four groups of stakeholders have urgency : they are important users of the standard.

The **Definitive stakeholder** (PLU) has power, legitimacy and urgency. He can influence the outcome, others consider his involvement to be important, and the outcome is important to this stakeholder. This stakeholder should be involved in the standardization process. Examples are ergonomics consultants and big employers.

The **Dependent stakeholder** (UL) also has legitimacy and urgency, but possesses less power to influence the outcome. Involvement needs to be achieved for these stakeholders. Examples are trade unions, employer organizations, representatives of small companies, occupational health and safety services, and designers.

Involvement of **Dangerous stakeholders** (PU) is not desired by the other stakeholders, but they possess power and urgency to influence the outcome. For these stakeholders, a method of participation needs to be found that is accepted by the other stakeholders. This converts them into definitive stakeholders. An example is a powerful organization that can trigger negative publicity, if not properly involved.

The **Demanding Stakeholder** (U) has no power and legitimacy, but the standard is important for him. Stakeholders with power should represent this stakeholder.

The other three stakeholders are not users of the standard, but they can have an indirect relation to the standard.

The **Discretionary stakeholder** (L), is a stakeholder whose participation is desired by other stakeholders, for example, research institutes who have knowledge on the topic of the standard.

**Dominant stakeholders** (PL) have power and legitimacy, for example, a dominant manufacturer, while **Dormant stakeholders** (P) have power but no legitimacy or urgency, for example, consumer organizations.

In our view, at least the Definitive and Dependent stakeholders should always participate in the development of ergonomics standards. The specific topic of the standard will dictate which specific parties belong to these stakeholder groups. It may be expected that, for most ergonomics standards, ergonomics consultants, big employers, trade unions, employer organizations, representatives of small companies, occupational health and safety services, and designers are the most relevant stakeholders that should be involved in the process of standard development or revision.

Based on this stakeholder model, we propose the following approach for user involvement in ergonomics standardization :

- identify groups of stakeholders for specific ergonomics standards (not only ergonomists and worker representatives) ;
- involve at least the Definitive and Dependent stakeholders in the development or revision of ergonomics standards ;
- manage the process towards consensus.

We expect that the results of this approach will be rewarding. The standards will be better known to relevant stakeholders, will be accepted by more parties and will be used more in practice. Ultimately, this will result in better products and processes, both from the social and economic points of view.

## Research needs

In order to achieve these goals, there is a need to start an evaluation study for a selection of existing ergonomics standards, to find out who are the Definitive and Dependent stakeholders of these standards. It needs to be determined whether these stakeholders know the standard, and if so, whether the standard serves its purpose. Also, it should be identified whether the relevant stakeholders were involved in the development of the standard. Based on the results of such a study, recommendations can be made for user participation in future standards development and revision activities.

## Conclusions

Ergonomics has both social goals for workers and product users, and economic goals for managers.

Therefore, ergonomics standards have a variety of end-users. Many ergonomics standards are available, mostly developed by ergonomics specialists. The focus should shift from increasing the quantity of standards towards increasing the quality of standards, such that the standards are useful, desired and used by all relevant stakeholders. In order to achieve this, relevant stakeholders should be identified and should participate in the development or revision of a specific standard. ■

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