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The safety of work equipment
User-oriented strategies for improving technical standards

TUTB-SALTSA conference

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Editorial

In 2001, the TUTB set up a partnership research project with the Swedish SALTSA Programme. It had three main aims :

One was to bring the practices of trade union participation in standardization into the public arena ; two reports on the situation in Sweden and Germany have been posted on the TUTB website. Our *Newsletter* carries a summary.

Another was to look closely at where the globalization of technical standards might lead us, and particularly, what effects might flow from the agreement between CEN and ISO on European standards, especially those mandated under European directives. We published the findings of that analysis at the end of 2002 as *Globalizing technical standards. Impact and challenges for occupational health and safety.*

The third is to promote and put a focus on participatory approaches to equipment design. It shows what lessons not just standard developers, but also the European public authorities responsible for framing design rules and policing the work equipment market, can learn from it.

The outcomes of the different stages of the project were presented to the joint TUTB / SALTSA seminar held in June 2003, the centrepiece of which was the draft consolidated report bringing together and analysing nearly forty case studies on worker input into the design of their own work equipment. The consolidated report has just been published as *Developing a participatory approach to the design of work equipment. Assimilating lessons of workers' experience.*

These practices were garnered in a multi-stage process which produced thirty-eight case studies from seven EU countries, two-thirds of them previously unpublished.

Above all, what this enterprise does is to provide a showcase for the extensive but unseen knowledge base that final users possess on the processes and equipment that they work with. Knowledge that can be leveraged both in and outside the workplace to improve technical standards. The mine of information gathered from users can be used not just in devising technical solutions, but also putting them to work.

Workers and trade unions must be actively involved in systematically collecting information at the workface, and in transferring and securing legitimacy for their knowledge in arenas outside the workplace.

The seminar was an opportunity for a more detailed examination of ways and means for feeding user information back to designers through an analysis of the role of different actors : user groups, national authorities and trade union industry federations. The scientific community's potential input into working out a common approach that is recognized at European level, as well as research needs and resources, were identified.

Taken as a whole, the project outcomes show that there is an urgent need to put in place European-level information resources that incorporate data from final users, as well as procedures so that CEN technical committees, especially when operating under the Vienna Agreements with the ISO, can initiate their own information collection so as to be certain, for instance, that risk assessments stand up in practice.

Marc Sapir,
Director of the TUTB

IN THIS ISSUE

Globalizing technical standards : impact and challenges for occupational health and safety

Jean-Paul Lacore
Engineer, former chargé de mission for standardization at INRS, Paris. He has been deeply involved in the activity of CEN/TC 114 "Safety of Machinery" since 1985.

The development, over the last 20 years, of technical standards relevant to occupational health and safety

Before the New Approach

To understand properly the current situation, it is vital to look back over the last two decades at the various forms taken by technical standards relevant to occupational health and safety.

Twenty years ago, the body of existing standards of this type was made up almost exclusively of a few (fairly disparate) national standards, and a few international standards (ISO/IEC), dealing with scientific disciplines of importance to the health and safety of individuals (in particular ergonomics, acoustics, vibrations, etc.). They often dealt with methods of measurement. European standards still played an extremely minor role. There was practically no link made between standardization and regulation. Such standards, updated regularly, now represent an invaluable source of scientific data for those involved in the prevention of occupational accidents and illnesses.

New elements introduced in the New Approach

These scientific standards were completely apolitical in nature and drawn up by specialists in each area. In parallel, the European *New Approach to technical harmonization and standardization*, launched in 1985, established and developed a type of standardization which was closely linked to the European directives on the design of products[1] with an impact on health and safety. The New Approach closely combines a social objective – *ensuring a high level of individual protection* – and an economic objective – *abolishing technical barriers to trade* – thus encouraging the joint involvement of economic players and the social partners.

A new type of standardization, it brings together three sets of *interested parties* : manufacturers of the products in question, users of these products and "prevention agencies" (the public authorities or other bodies responsible for the prevention of accidents and occupational diseases). It stimulated, especially during the first ten years, unprecedented involvement of European experts representing all interested parties, and so led to an intensive cross-fertilisation of ideas, with benefits clear to all.

Reasons for the gradual "shift" to the international scene of European standards on safe product design

In the 1980s, ISO had launched the memorable slogan : "Do it once! Do it internationally!". Around 1990, ISO technical committee 72 (in which European countries played a predominant role) was drafting simultaneously for CEN and for ISO a standard on textile machinery, and realised how valuable it would be if international standards could refer to provisions in the "horizontal" CEN standards. To this end, in November 1991 ISO technical committee 199 "Safety of Machinery" was set up, as an international response to CEN technical committee 114.

The first work based on European standards

Taking a pragmatic approach, ISO/TC 199 then decided to take full advantage of work being done in Europe and to submit to the international community the standards and draft standards drawn up by CEN/TC 114[2], with a view to turning them into international standards.

The will to succeed was so strong that the European and international standardization bodies were quick to develop new procedures. For example, when CEN and ISO decided to work together, under the Vienna Agreement, on the revision of EN 292:1991 (the basic standard, underlying all the European "machinery" standards), the task was entrusted to a special working group of CEN technical committee 114, made up of experts designated by the member committees of CEN, CENELEC, ISO and IEC. That revision of EN 292: 1991 was launched in 1995, and will culminate this year, 2003, in the adoption of EN ISO 12100. The process will have shown the difficulties inherent in starting from a European standard, and trying to convert it into an international standard which still meets European requirements. This task is especially problematic when the standard in question contains certain elements which are viewed in differing ways by countries with different cultures and different ways of organising society.

Such difficulties, however, have not always arisen. A fair number of European "horizontal" standards concerning safe machinery design have become international standards, following a public enquiry and vote by the member Committees, without any change being made to their technical content.

This presentation was based on *Globalizing technical standards : impact and challenges for occupational health and safety*, published at the end of 2002 by the TUTB as part of the joint TUTB-SALTSA programme.

[1] Essentially machinery and personal protective equipment.
[2] ISO/TC 199 has also started an original project, i.e. not based on European work : the development of a standard on hygiene requirements for equipment used in the agri-food sector.

Success factors and difficulties inherent in the European New Approach

Success factors, in particular from the point of view of prevention

Eighteen countries[3] have succeeded, over fifteen or so years, in drawing up and adopting a vast, logically structured body of standards to support the "machinery" and "personal protective equipment" directives. Today, even those who began to lose patience during the process must admit that this is a pretty impressive record. We must realise, though, that the circumstances surrounding this project, launched in 1985, were propitious.

Firstly, the countries involved in the undertaking are countries with a similar (or not too strikingly dissimilar) level of technological and regulatory development. Then, the relatively small size of Europe means that it is particularly easy for experts to meet. Finally, it is worth remembering the positive impact of the "ground rules" set by the European institutions :

- a single legislative framework provided by the European directives, and incorporated into the legislation of each State ;
- essential requirements in the directives providing a strict frame of reference for the development of standards, and so avoiding a situation whereby the standardization group would reach consensus on too low a level of requirements (the "levelling down" which would inevitably occur without constant reminders of the obligation to ensure "a high level of individual protection") ;
- the requirement on all member countries of CEN and CENELEC to incorporate into their national set of standards any standard adopted by these bodies.

One example given by Friedhelm Nachreiner and Lennart Levi, in their articles on standards dealing with the mental workload, shows clearly how the political and social importance of the European standards tends to awaken the critical spirit of representatives of the various interested parties. The same draft standard on design principles for work systems, focusing on the mental workload, went through the ISO public enquiry unopposed, but gave rise to many objections and comments during the CEN enquiry to which it was submitted "in parallel". The reason for these differing attitudes, beneficial in terms of prevention, becomes clear when one realises that mental workload is covered in three European directives, including the Machinery directive.

Difficulties, weak points

The public authorities in each State have, for a great many years now, been responsible for drawing up, interpreting and enforcing laws and regulations concerning occupational health and safety. Standards, on the other hand, are drafted in bodies where these authorities are only one of several interested parties, and have to deal with others representing private interests (equipment manufacturers and users), and non-State prevention agencies. It is understandable if representatives of the public authorities sometimes find it hard to accept the idea of practical interpretation of the law being partially in the hands of private interests. Moreover, most standardization bodies use a working method geared towards consensus, a method which leads them to evade the main points of disagreement, often the result of practical difficulties encountered during the application of certain essential requirements in the directives. This does not make the task of the public authority representatives any easier.

Another weak point is the *conditions of access to standards*. While laws and regulations are texts in the public domain, to which all citizens should – and indeed do – have cheap and easy access, standards are covered by *copyright* and are sold (at quite a high price !) by the national standardization bodies.

The system of laws and standards developed under the European New Approach is complex and voluminous, not easily accessible. For this reason, various initiatives have been launched in certain countries to bring about a situation where European standards would be used as a broad basis for the teaching of machinery design[4]. Results so far are encouraging, but it is regrettable that the European Commission has not, as of yet, supported these moves. It is not too late for it to decide to do so !

Finally, the people most directly affected by the equipment covered by the standards – workers in industry and consumers – are not yet sufficiently able to feed into the standard-drafting and revision process the benefits of their unique practical experience. We must welcome and encourage any initiative – such as the TUTB-SALTSA programme – which aims to make full and overdue use of this experience.

European achievements

A tried and tested philosophy and methodology

The European New Approach gave a proper status to *the principle of safety integration* in machinery design. This principle is based on the idea – not accepted to the same degree in every part of the world – that the best form of prevention is obtained when the designer of a piece of equipment reduces the risk as far as he possibly can, given the state of the art, thus minimizing the number of preventive measures which will need to be taken by the user.

[3] Eighteen at the outset, nineteen after the accession to CEN and CENELEC of the Czech Republic.

[4] The introduction to both EN 292: 1991 and its revised version (EN ISO 12100:2003), states : "It is recommended that this standard be incorporated in training courses and manuals to convey basic terminology and general design methods to designers".

Thanks, in particular, to basic standards EN 292 and EN 1050, the New Approach created a formal method of *adequate risk reduction*, based on a series of steps of *risk assessment* and *risk reduction*, whose outcome is evaluated not only in terms of the risk reduction obtained, but also in the light of other factors, such as the non-creation of new risks, ability of the machinery still to do its job, preservation of working conditions for the operator and others involved in the process.

The procedure to be followed by the designer for risk reduction is based on the so-called "three stage method": *inherent design measures - safeguarding - information for use*. When applied systematically, this method gives the designer the best chance of avoiding serious oversights, and leads to the most effective and "elegant" results.

Considerable efforts to harmonize technology

CEN/TC 114, responsible for drawing up the main horizontal standards on the safety of machinery, has taken it upon itself to define the most important concepts used in this work, and to create, in the languages of the member countries of CEN/CENELEC, a consistent body of terminology, important not only to help people understand the standards, but also to provide a clear basis for future discussions.

Considering all possible risks

The European New Approach should also be credited with having finally given due importance, in the design of safe machinery, to *ergonomics* and *emissions* (noise, vibrations, radiation and / hazardous substances). For many years, prevention in this area had been confined almost exclusively to risks of mechanical and electrical origin.

Conditions and future prospects for the globalization of technical standards

"Flexibility" needed from European partners...

Europeans would be seriously mistaken to believe that the system of standards developed under the New Approach is the best possible system, and so to insist on transposing it "lock, stock and barrel" to an international level.

Firstly, we must not forget that these standards depend to a great extent on European directives, which have no international equivalent. The idea, put forward by some, of developing equivalents of the New Approach type directives for the whole world would, though maybe not entirely unrealistic, provide no short-term solution.

Moreover, what standardization attempts to do is to overcome the disadvantages of diversity and to make full use of its advantages. The main asset of the New Approach has been the diversity of the European input. It would be a real shame, when expanding the process to the rest of the world, not to fully benefit from all the original ideas which would be bound to come from the new participants.

...but also the need to preserve what we have already achieved in Europe

How better to express this than to quote directly from Ian Fraser in his article *From CEN to ISO and back...* : "European safety experts should approach the transfer of standards from CEN to ISO with an open mind. Given the advantages of having a global standard, we should strive within ISO to reach agreement on a standard that is both internationally acceptable and in line with the essential requirements laid down by European regulations. This will obviously involve taking into account the different approaches to design and use of machinery existing in different parts of the world. That such agreement is possible has already been shown by progress on global methodological machinery standards."

Ian Fraser is referring here to the fascinating experience of revising EN 292, a process which began at the end of 1995 and which will come to an end this year with the adoption of an international standard – EN ISO 12100 – complying with European requirements.

Greater difficulties in organising the "input of information" from the field

We have already seen, taking stock of fifteen years of European standardization, that one of the main causes for concern is the fact that, up to now, far too little use has been made, to improve the standards, of the experience of "workplace users", the very people most affected by the safety level of machinery and personal protective equipment. Using this experience for international standards will be far more difficult than for European standards, since experts are scattered far and wide. The only glimmer of hope is the possibility of working through international, internet-based networks, such as the network – EUROSHNET – which European prevention agencies are now beginning to use.

Incompatibility of certain international standards with European requirements

What happens when the compatibility of an ISO or IEC standard is checked against European requirements ? There are many examples of international standards which "do not fit" into the European New Approach system, either because they are addressed indiscriminately to designers and users (one example being an ISO standard on automatic production systems), or because their scope is far wider than those covered in the European system (Maurizio D'Erme refers in his article to the many difficulties encountered in the area of machine control systems).

Admittedly, though, for some purely technical subjects it has sometimes been very useful, and unproblematic, to refer to international standards in certain European

standards, at a stage before these have been turned into international standards. For example, IEC standards on "safety" components now provide a useful addition to the European standards (adopted in ISO) on emergency stop systems and interlocking devices.

Future prospects

One of the most important achievements of the European system is to draw a strict distinction between the obligations applying to designers and those applying to users. In many non-European countries, however, there is considerable vagueness as to these obligations themselves and as to how they are split between designers and users. It is true that the European New Approach standards can only be addressed to designers ; but nothing would prevent an international standard, whose design provisions were entirely in line with the essential requirements of the directive in question, from also including provisions for users, as long as, of course, the latter were clearly distinguished from the former.

The international answer, mentioned earlier, to the New Approach (international agreements replacing the "regional" European legislation), is arousing interest, it is said, more or less throughout the world (in particular among certain European manufacturers who export all over the globe). Be that as it may, Europeans should take care that the strong points of the New Approach are not left by the wayside.

Apart from the system of "regional exemption clauses", which should be ruled out, as it runs more or less counter to the desired goal, every effort should be made to develop international standards which meet the European requirements. The imminent success of the revision of EN 292 – a success which, it is worth remembering, was far from a foregone conclusion ! – gives grounds for optimism as to the future prospects of this approach, in most cases. However, if it is unsuccessful, we will have to resign ourselves to living a little while longer with separate international and European standards. ■

International standards for the elimination of barriers to trade :
an analysis of the agreements and discussion on standardization policy
Dr. Josef Falke, Universität Bremen (ZERP)

KAN report No. 29, 2002, 46 pages

Mr. Corrado Mattiuzzo, KAN technical officer, gave a presentation on the KAN report to the Conference. The document can be viewed on the website : http://tutb.etuc.org/uk/newsevents/files/mattiuzzo.pdf

A GLOBALIZED STANDARDIZATION PROCESS

Ten years of Swedish trade union activity in the national and European standardization process

Sven Bergström
LO - Swedish Trade Union Confederation

This is a summary of a fuller report written by Sven Bergström in collaboration with the joint LO standardization group ASTA and its former chairman Bo Tengberg. English translation by Erica Stempa. Available in English on the TUTB website : http://tutb.etuc.org/uk/dossiers/files/tu-report-sweden.pdf.

Introduction

The overall objective of trade union participation in standardization work is to put trade union experience and knowledge to use to contribute to better standards and thus reduce the risk of occupational diseases and accidents for workers in Sweden and Europe. Good standards should help to create satisfactory working conditions and therefore "better jobs".

Technical developments constantly give birth to new products, methods and organisation that may bring new risks. Experiences of products such as asbestos and solvents show that trade union vigilance in needed to protect workers' health.

Swedish authorities and social partners have traditionally cooperated in drawing up work environment regulations on a tripartite basis, so the Swedish Trade Union Confederation, LO, was involved in this area of work long before Sweden joined the EU.

Following the Council of Ministers of the European Communities decision in 1985 to launch a New Approach to harmonising national rules, the Swedish *Riksdag* (parliament) agreed that Sweden should deepen cooperation with its European neighbours, even though it was outside the EC. Sweden was able to influence the common rules even though it could not help to frame directives, and thus the forum for trade unions to exercise influence moved from national tripartite collaboration to European cooperation.

LO set up a working group that, in 1988, called on the government to launch a study of the increasing

importance of standardization. In its response to the government's report, LO declared its support for harmonisation of rules and safety regulations in Sweden and the rest of Europe, and noted that standards in Sweden were relatively good, although more needed to be done. It also added :
"It is a clear objective for the EC's integration work that no member state should need to reduce its standards…
LO considers that it is a basic requisite for the work of harmonisation that work environment questions are determined in collaboration with the trade union organisations…
Sweden has come relatively far in matters concerning our external environment. We also act as a driver nation in this field…
LO considers that education and remuneration, particularly for international work, is a necessary prerequisite to enable the trade unions to provide an effective contribution to the standardization process…
LO considers that the trade union should be able to act on the basis of its own priorities, and therefore funds for education and other standardization work must be provided to the trade union organisations directly."

The Swedish Standards Institute (SIS) was built up by industry and consisted by and large exclusively of paying stakeholders from industry with a small proportion of representatives from government bodies. Since the relevant interest groups financed each standardization project, it was difficult for SIS to carry out work on wider safety rules of general benefit.

In its letter of instruction to SIS in 1990, the government introduced a target-related subsidy for standardization projects relating to safety, the work environment, consumer and environmental protection, which contribute to developing western European harmonisation. Thanks to trade union pressure, tripartite consumer and work environment councils were set up, with responsibility for distributing funds to the Swedish technical committees for work on harmonising standards. The government put aside 5 million Swedish kronor for trade union activity in European standardization, including information and education.

What difficulties do trade unions face in participating in standardization work ?

Trade union influence in European standardization work requires major resources, both financial and human : funds for travel, hotels and charges to the national standardization organisations, as well as people with the required knowledge of technical standardization English and the regulatory codes that are applied within CEN.

Opportunities for LO to participate – thanks to special government funds for travel and educational activities – have been relatively good since the launch of the LO's ASTA network in 1990, compared with the situation for trade union colleagues in the EU and European Economic Area (EEA). But even if the Swedish trade union movement has a relatively large number of people who are knowledgeable in the work environment field, their availability to participate in this work is limited, since other competing duties must often be given priority.

Other difficulties include the accessibility of completed standards. The cost of buying a completed standard and the frequent lack of a Swedish translation means that general awareness of the requirements in standards is too poor.

One of the most severe problems in Sweden is cooperation with the private-law standardization organisations, which has caused problems right from the start. Initially, in 1988, LO was invited to participate in the standardization activities within the ergonomics field at a cost of SEK 100,000/year. When the SIS work environment council was set up in 1990, pressure for the trade union organisations to pay decreased. It was thought that the state funding for the areas of priority could cover the trade union organisations' participation.

However, in 1994 the Swedish Agency for Administrative Development's committee of inquiry[1] criticised the activities of the work environment and consumer councils and proposed their abolition. It also recommended that the grants to SIS for work environment-related and consumer-related standardization projects should be abolished, and that all participants in the work of standardization should contribute to covering the administrative costs.

In its budget proposals for 1995/96 the government also adopted some of these proposals, and the SIS work environment council disappeared, although the SIS consumer council remained. SEK 4.5 million was set aside for SIS work environment projects, but this was to be allocated to the authorities responsible for different areas, in line with their efforts in standardization work.

A Federation of Swedish Industries inquiry in 1993 (*Improving the efficiency of the organisation of standardization in Sweden*), also led to decentralisation of activities. As a result, pressure for the trade unions to help fund the technical committees increased considerably, and some trade union members were excluded from participating.

Taking the view that the government was making it more difficult for trade unions to participate in national technical committees, LO was very critical of the National Board of Trade's inquiry concerning the EU evaluation. It declared :

[1] Standardization and the State – consequences of the new standardization organisation.

"The New Approach model has failed as regards trade union participation in development of common safety rules in Europe. Nor have the national standardization bodies been able to shoulder the wider responsibility this has implied. The fact is that many product standards are more or less developed by the manufacturers themselves – without the users of the products being represented. The consequence is that the quality of the harmonising European standards will not be what it could have been if the stakeholders concerned had had the opportunity to participate.

LO believes that if the intentions concerning trade union participation in standardization are to be realised the financial conditions must be changed. It is not reasonable that trade union organisations in Europe should have to pay for the work of harmonisation via membership dues that are already taxed."

Government investigates subsidies to standardization

At the beginning of 1997 the Swedish National Audit Office presented its report on *More effective support for standardization*. The assignment was to evaluate the use of the government grant and its appropriateness. The report, which does not deal with trade union participation, proposed that the government should participate more actively and thus have a say in standardization. It recommended that general subsidies to SIS should be abolished and that government authorities should participate to a greater extent in the standardization work.

The positive part of the report was the proposal that the government should support and exercise influence over standardization work involving protection of life, health, the environment etc. It suggested standards that play a legal role should be supplied free, via the Internet, and that translation to Swedish should be made faster.

The LO Congress in 2000

The LO Congress in 2000 approved a motion calling for :

- An increase in funding for participation in the work of standardization
- Economic support to educate the participants

LO pointed out that standardization was increasingly moving towards international criteria, with strong pressure for Europe to adopt similar safety rules as the USA. Education and exchange of experience were vital. LO criticised the growing pressure on trade unions to help finance the technical committees.

Since the late 1980s, the state investment in standardization projects fell from 60% more than the stakeholders to 10-15% more. Demand for an overhaul of the system led to changes to make Swedish standardization organisation more effective in 2001, with the amalgamation of seven different industry standardization bodies into one organisation controlled by the stakeholders, the SIS. The Swedish Standards Council (SSR) was set up, representing government, local authorities, trade, industry and banking.

Government funds for participating in Swedish technical committees

The state subsidy to standardization activities in 2002 included SEK 1 million allocated to SSR for promoting the users' interests. The money was aimed at non-profit consumer, employee and environmental organisations to cover fees for participation in Swedish standardization work.

LO's standardization group, which has been trying to solve the problem of the fees to the Swedish technical committees for many years, is now looking forward to improved cooperation with the standardization organisations. Thanks to the government funds trade union members can also expect to be important stakeholders in standardization.

Examples of successful trade union influence in improving standards

Broad experience has shown that trade union participation is necessary to safeguard the members' health and safety. Although trade union representatives can feel something of an oddity in these circles, it is often clear that none of the other participants have practical experience of the equipment in question. Experts in the working groups frequently come from manufacturing companies or testing institutes oriented towards the products in question. Far too often there is no one to speak for users' experiences and wishes.

By and large, all trade union participation is always positive, since trade union influence in the working groups often leads to better standards. Below are some positive examples :

- CEN/TC 122 Ergonomics

The standard deals with ergonomic principles for designing machines and working equipment. Already at the first meeting in 1988, the matter of musculoskeletal injuries, which is important for LO, was brought up. The trade union objective has been to make designers avoid building machinery that necessitates short-cycled repetitive movements. This led to a new standard called EN 614-2.

Another demand the trade unions have pursued vigorously is that machines and equipment should be designed for both women and men. Within the working group, strong voices have pressed for separate specifications for women and men. Despite this, the standard EN 614-1 means that designers do not have to make "pink" and "blue" machines.

■ CEN/TC 160 Safety belts and lines

Trade unions have taken part in five working groups to protect people working at heights. Different working methods in the Nordic countries and the rest of Europe have led, with the help of trade union involvement, to the framing of a standard for long connecting lines.

■ CEN/TC 128 Roof covering products

Swedish trade unions have aimed at removing products containing asbestos from product standards, and worked in cooperation with the EFBWW (European Federation of Building and Wood Workers) and the TUTB (Trade Union Technical Bureau).

■ CEN/TC 128 SC 9 Anchorage devices for roofing

A proposal for the standardization of anchorage devices for safety lines on buildings, already sent out for comment and approved as a preliminary European standard, was so deficient from a Swedish trade union point of view that it would have led to a considerable deterioration in safety. Through trade union action in cooperation with other Nordic countries, the proposal was sent back to the working group for revision.

■ CEN/TC 161 Foot and leg protectors

Swedish trade union participation has mainly contributed to improving slip protection, through acceptance by the working group of Swedish testing methods.

■ CEN/TC 53 WG 1 Scaffolding

Swedish scaffolds are broad enough to allow two people to pass each other, while other European scaffolds are usually considerably narrower. On the instigation of Swedish trade unionists, Sweden, Norway, Denmark and Finland have supported a resolution demanding a debate on scaffolding width of 1.8 to 2.4 metres.

■ CEN/TC 158 Head protection

On the initiative of the Swedish trade unions, testing of safety helmets' heat resistance has been carried out in cooperation with the Danes. The trade union contribution has meant that Swedish firemen do not risk getting worse head protection because of harmonisation.

■ CEN/TC 239 Ambulance medical care

Swedish trade union efforts have contributed to the lift height for stretchers being reduced, so that it is not necessary to bend the arms when putting stretchers into a vehicle.

■ CEN/TC 144 Tractors and machinery for agriculture and forestry

The working group deals with such things as the highest allowed force when driving agricultural and forestry machines. Swedish trade union have called for the values to be reduced, since the present levels in practice mean that women are excluded from this type of work.

■ CEN/TC 143 Machine tools - safety

Because there are many accidents in this area, many of the working groups include Swedish trade union participants, who have used their experience to argue for improvements.

■ CEN/TC 98 Lifting platforms

In WG 4, the design of the emergency shutdown has been a controversial question. Swedish trade unions have demanded that the emergency shutdown should stop the entire platform and not just the lifting device in question, and should be in the form of a button, not a switch. Other demands have been that the instructions should be in the form of pictures instead of text.

■ CENELEC/TC 112 High-tension switch gear

Trade union participation has secured reference to "short disconnection times" and requirements concerning the longest time allowed for disconnection of switchgear.

Strategies, methods, and cooperation with other institutions

LO's overall strategy is based on the premise that good, harmonising European standards are in the public interest, and that trade unions contribute to raising their quality and helping the state to reduce costs by cutting the risk of occupational injuries. The state should therefore make a financial contribution to trade union participation. State funding towards the costs of travel and hotels, and for education and information has been a basic condition for the Swedish involvement.

Tasks are allocated and coordinated by LO's joint union working group, ASTA, set up in November 1990. The group, which is still active, met regularly every fortnight during the 1990s, reflecting the interest and enthusiasm of members from affiliate organisations and the need for inter-union discussion on standardization strategy. In all, the group has held about 160 meetings. It has also run regular courses for union officers on standardization questions and technical English. Union representatives are appointed according to who has most experience and knowledge in the area in question, and their aim is to achieve the best possible standard from the broad LO perspective, not only with regard to individual union interests.

The works covers :

- allocating monitoring areas among affiliates ;
- drawing up education programmes ;
- acting as a reference group for the SIS work environment council ;
- developing cooperation with authorities and organisations in the field, both nationally and internationally ;
- helping to ensure that harmonised standards reflect members' interests.

In order to make the best use of resources, LO has set priorities for its activities :

1. direct participation in the European standardization group, especially on projects mandated by the machinery and personal protective equipment directives ;
2. participation in the Swedish "mirror" groups ;
3. following preparation of standards through contacts with official representatives.

Government funding reflects the increased cost of participation in European-level standardization work. It goes to four main areas : participation (travel etc), education, language (technical English) teaching, and coordination and administration.

The figure shows that the cost of LO's participation went down in the 1990s. The reason for this was not a direct shortage of funds, but rather the retirement of active members and lack of new blood.

However, many new people indicated their interest in 2002, so this trend is likely to be reversed.

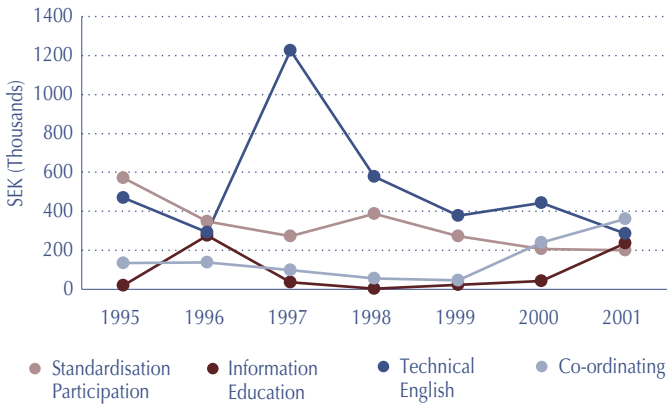
Information and education

LO and its affiliates have published and distributed several publications on European standardization. In 1991, 1993, 1996 and 2000, training was organised, in cooperation with the TCO, on rules and systems in the standardization process, which helped to recruit new participants. Further courses have taken place in Brussels in cooperation with the TUTB, the European Commission and local offices of the LO/TCO and Swedish EU delegation.

In recent years, TCO has not taken part in coordinating standardization activities or applying for government funding for participation.

The first trial study course on technical standardization English was held in 1991, followed by a series of residential sessions that covered 248-person weeks between 1992 and 2001. Residential weeks also took place in Lancaster, UK, in 1992 and 1993, attended by trade unionists from 13 different LO affiliates. January 1997 saw the launch of a new two-year programme aimed at recruiting new experts to replace those who had left or retired, and language training continues in the UK and Sweden.

Use of the ASTA group's standardisation funds 1995-2001



Cooperation

Extensive cooperation in preparing standards takes place with the Work Environment Authority, especially in the framework of the Swedish mirror committees. In specific cases, such as scaffolding and ladders, common Nordic strategies are devised. The Nordic Council has set up a working group, and there is also cooperation in various industry sectors.

Sweden has participated actively in the TUTB's European network for standardization since 1990, and the LO hosted its meeting in Stockholm in autumn 2001.

Cooperation with standardization bodies, apart from the problems of fees to the technical committees, has functioned well. As well as participation in the SIS work environment council, trade unions were involved in two of the earlier standardization organisations, BST (the Swedish Building Standards Institution) and IKH (the Swedish Crane Standards Commission).

In cooperation with the former General Standardization Group, STG, the Swedish LO acted as host when TC 122 Ergonomics met in Stockholm in 1989, coupled with several working group meetings. Trade union hosting of a meeting at TC level in European standardization was seen then as unique and attracted some attention. ■

The role of German trade unions in the national and European standardization process

Ulrich Bamberg
KAN - Commission for Occupational Health and Safety and Standardization

KAN

DGB

What prevents unions from participating effectively in standardization ?

Employees have an interest in a safe and healthy working environment ; they expect machinery and tools, working materials and the working environment, work procedures and the work activity itself not only not to be dangerous to them, but to actually promote their interests in the positive (or preventive) sense, i.e., to be humane. Their interest is addressed in many ways by standardization, as standards first and foremost specify the characteristics of products. The content or failings of individual standardization projects or areas of standardization activity are therefore of great consequence for the interests of employees.

The fact that the standardization procedures do not facilitate the articulation of employee interests is therefore a focus of constant criticism by the unions.

Employee involvement in standardization

Demands have been made since the 1975 DGB[1] federal congress for private standards development to be made democratic[2]. This demand is as much a live issue as ever, because some major progress notwithstanding, it has still not been met.

It is a basic requirement that employees' views be taken into account by standards developers and that they have an opportunity to voice those views. As a result, instruments have been set up at the European level (TUTB) and the national level in Germany (KAN) by which for the unions to voice employees' interests and feed them into the standardization process.

The DGB, however, demanded the right to have a "reasonable" influence on standardization which reflected the importance to and impact upon society. This is not delivered by the existing procedures and established interest structures.

The dominance of manufacturers' interests in product-related standardization

Standards are drafted by private standards organizations which are influenced to a large extent by manufacturing sector interests. Adequate occupational health and safety, and consideration for the interests of employees, are not assured from the outset in European standards. DIN has, however, created a veto for minorities.

Short deadlines for comments

There is, of course, a procedure for objecting to draft standards. But it is highly unsatisfactory for weaker parties in the economy. Aside from the fact that the standards developers, i.e., the committee which drafted the standard, have the final say on such objections, the deadlines set are a major obstacle. According to the ISO, a standard may take on average over seven years to draft, but the deadline set when the draft is finally published is very short. Outsiders unfamiliar with the background to the standard and not party to its development are then expected to present substantiated objections within five months or less. Five months might seem an adequate length of time, but the clock begins ticking when the draft leaves the committee. By the time the document reaches the union, an expert employee representative has been found, and the document has been translated, for instance, valuable time has been lost.

Time and cost requirement of standardization work

Interests can be represented directly when employee or OSH representatives are present on the committees themselves, i.e., are involved in the standardization activity from the outset.

The standards bodies also emphasize that standardization work is, of course, open to all "interested parties". But, this is an opportunity which not all can afford to take up. Theoretically, any individual or organization can take part in the framing of standards. Practical experience shows, however, that most of the experts, who work on a voluntary basis, are seconded by industry, for whose development standardization clearly represents an indispensable investment[3], as stated in a paper published by the European Commission.

Financial support is needed if the opportunities for participation are to be taken up. In purely quantitative terms, participation in hundreds of standards committees of relevance to employees would be an enormous undertaking. But employee representative bodies lack the financial resources to join the other "interested parties" as the costs - estimated at € 15,000 to 20,000 per year for each individual participant in standardization - must be borne by the participants themselves, or their sending institutions. Involvement in even a small selection of the more than 4,000 German and 2,000 European standards committees and working groups would be beyond the financial means of the unions themselves and their OSH experts.

This paper is based on a more extended report written by Ulrich Bamberg. The full report is available, in English, on the TUTB website at : http://tutb.etuc.org/uk/dossiers/files/TU-report-germany.pdf.

[1] DGB : Deutscher Gewerkschaftsbund (German Trade Union Federation).
[2] At its 10th National Congress in 1975, the DGB adopted a comprehensive motion by IG Metall, the metalworkers' union, concerning „occupational and in-plant health protection". The motion focussed upon humane working arrangements and demanded that the national legislature adopt measures to democratize the drafting of regulatory provisions by private standards bodies.
[3] Florence Nicolas, with the cooperation of Jacques Repussard, *Common standards for enterprises*, Luxembourg, European Commission, 1995, p. 26.

Priority of international and European standards over national standards

To avoid duplication, an agreement was reached between ISO and CEN in the Vienna Agreement, and between IEC and CENELEC in the Dresden Agreement, to co-operate in the drafting of standards with the aim of confining standardization work to a single context and deriving identical international and European standards from the results (parallel voting procedure).

These agreements, though understandable, give rise to considerable problems :

- international standardization entails high travel and conferencing costs ;
- it is not easy to put over trade union interests in such a context, especially where interests outside Europe are involved ;
- if ISO standards are not simply adopted, but are to be adapted as European Standards in order for them to comply with the European legislative framework, the process is made more difficult by the fact that the agreements involved are frequently reached under time pressure.

Costs and content of standards

One stock union demand is that standards should be more accessible to employees. The price of standards in particular is an obstacle to wide dissemination. If the standards bodies are interested not only in sales, but also in broad application of the standards, more transparent channels of distribution must be found, for example involving electronic technology. This applies not only to completed standards. Draft standards are equally expensive. This raises the question for unions as to whether they can keep pace. The cost of draft standards represents an obstacle to the involvement of parties who may not have had a hand in framing a standard but wish to comment upon the draft.

Factors which by definition are inherent to the value of a standard are transparency and public access to the documents on reasonable terms. Furthermore, it is often said that the only useful standard is one which is used. Conditions must be improved considerably in this respect.

Finally, there is the vexed issue of finding that a purchased standard fails to meet expectations. As standards cannot be inspected in a bookshop, but only at some 60 sites (in Germany), they have to be selected on the basis of title, abstract, or key words in the PERINORM database. Only after purchase may the user discover that the content is of no use.

Blanket involvement of employee representatives in standardization activity is unaffordable. If the structural discrimination against the weaker side of industry is to be eliminated, however, procedures must be created and resources made available which open up this form of representation to the unions.

Examples of successful influence on the development and content of standards

Protection of minorities in DIN

One objective of the standardization process is to achieve consensus results. The idea is to frame standards which have the support of all interest groups. The content of a standard is to be drawn up by mutual agreement with the aim of achieving a common position. This principle has been further safeguarded within DIN by the provision that an interest group which has voted unanimously cannot be voted down. Should, for example, the DGB or the OSH group unanimously take a view different to that of the majority of the standards committee, DIN must abstain during further consideration of the subject at European level.

The decision in question, taken by the DIN management committee in October 1996 (cf. DIN Announcements 1/1997, p. 5), is as follows : "Should, in exceptional cases, a decision need to be put to a vote in a technical committee, no decision may be taken contrary to the unanimous vote of a group with a substantial interest in standardization."

Financial support to participation by union representatives in standardization activities

A further agreement between DIN and DGB has eliminated an obstacle which cost-sharing in standardization would otherwise represent for employees. DIN normally assumes that parties involved in standardization activity are representing their own interests, entailing both benefit and cost for the seconding party. All interested parties are therefore involved in financing standardization activity through membership subscriptions, subsidies, or contributions to costs. Any party wishing to participate in a standards committee must therefore pay what is essentially an annual front end charge of 750 euro to DIN, merely to be present – to cover session, publication materials, and similar costs incurred by the secretariat. DGB, however, is one of the organizations whose experts are exempted from this upfront cost contribution.

Travel costs are not affected. They must be paid by the individual (or seconding institution) and are one reason why more employees are not seconded for work on standardization activity.

Individual standards/topics

Since 1995, OSH bodies in Germany, including the unions, have been able to argue their case in standardization through KAN. KAN sends comments on fundamental standards policy to the relevant political bodies (federal government, European Commission, advisory committees, SOGS, etc.). Some 3,000 comments on proposed specific standards have been made directly to DIN and its standards committees since 1995.

Selected examples of particular interest to the unions are described below.

Participation in standardization : a few figures

The paradox of "huge minorities" can be observed in standardization. Conceivably the two largest affected groups (370 million consumers, including 165 million employees, within the EU) are minorities within the standards committees, if indeed they are represented at all.

DIN, the Deutsches Institut für Normung, has 84 standards committees with 4,100 working groups, producing (or supporting) some 2,000 new standards and 9,000 draft standards each year, adding up to a body of 27,000 DIN standards in all.

These hundreds of standards committees involve over 26,000 experts representing the interested parties. Traditionally, these experts have primarily been manufacturers' representatives. The number of union representatives involved in recent years has been 20 to 30 – a mere 0.1 percent of the total.

There have however been co-operations, in numerous cases, with OSH experts from the accident insurance institutions (*Berufsgenossenschaften* - BGs), who play an important part in standardization. Some 180 OSH experts from the BGs and their expert committees are currently active in European standardization on around 380 committees.

■ OSH management systems

The German unions regard OSH management systems as a useful way to get occupational health and safety integrated into company organization at all levels, compliance and performance formalized in day-to-day company operations, and work-related health hazards reduced as a result.

The unions share the view of employers and other parties in KAN that it must be possible for OSH management systems to be introduced without costly certification. For this reason, the German OSH institutions have opposed all standardization plans in this area, because the chief beneficiaries of standards, as ISO 9000 has shown, are the certification bodies. Companies face the additional expense of auditing and certification, with no corresponding assurance of improvements in the health and safety of workers at work.

Following a DGB initiative, KAN developed a German position for negotiations in the International Organization for Standardization (ISO), which was used to defeat initiatives for the standardization of OSH management systems in 1996 and 1999. Instead, political concepts for OSH management systems were developed with the active involvement of the unions. Following two national policy documents (published in the *Federal Gazette* 9/97 and 2/99), international guidelines for OSH management systems were made available in mid-2001 which were drawn up in the proven tripartite structure (governments, employers, unions) of the International Labour Organization (ILO). The guidelines are to leave the competent national authorities sufficient scope to structure occupational health and safety according to national needs, and to make standardization in this area superfluous.

■ Psychological strain

The adoption of international standard ISO 10075-2 *Ergonomic principles related to mental workload – Part 2: Design principles* as a European Standard (EN) was greeted by criticism and doubts from by employers' representatives about the need for such a standard.

Mental stress may arise at work, for example, as a result of time pressure, poor working climate, unfair division of labour, and either overwork or insufficient challenge. While Part 1 of the series of standards, which describes these relationships and contains definitions, was accepted, concerns were voiced that the provisions of Part 2 Design principles for the avoidance of fatigue, monotony and reduced attention at work would incur unreasonable costs on companies for hazard assessments, up to and including the employment of additional specialist personnel.

Unlike the employers, the unions voted for adoption of the draft as a European and German standard on the grounds that – issues with certain details aside – it was an important component of the series of standards, and it was clear that it would otherwise be difficult to reach agreement on the content with employers in Germany.

As the unions and employers' representatives remained firmly at odds in the German standards committee, and appealed to both the protection of minorities and unanimous interested party vote provisions, DIN abstained during the European voting. Most CEN members voted in favour of the draft standard, however, with the result that the ISO standard took effect as an EN in March 2000 and was adopted unchanged as a DIN EN in June 2000.

Greater efficiency through transparency

When examining ways of improving the efficiency of European standardization, the European Commission[4] established a close link between efficient standardization and transparent standardization procedures. According to the obligations for standardization laid down by the New Approach, including involvement of all interested parties in the standardization process, improved efficiency expressly includes, in the European Commission's view :

- transparency in standardization procedures ; and
- a wider opening up of CEN and CENELEC to European interest groups.

In the European Parliament's view, the time taken to process a standard is just one of number of factors by which the efficiency of standardization can be assessed. In its resolution on the European Commission's report, Parliament also considers the quality of standardization activity, which is based upon adequate consideration being given to all affected parties (in particular employers and employees, consumers, environmental groups, SMEs) and the public, as a substantial factor.

KAN has given input to this discussion with a number of position statements, directed in particular at the Council Group responsible for economic issues/standardization, with the objective of speeding up standardization under New Approach directives at no detriment to the quality of standards. In support of this position, it has formulated quality criteria (including involvement of all affected parties in the standardization process, and ease of use for small and medium-sized enterprises) and has supported the European Commission's call for interested parties to be given fuller information about standardization projects. The positions formulated by KAN contributed to a number of substantial OSH positions being considered in the Council Decision.

Strategies, methods and co-operation with other institutions

KAN – a success story

The Commission for Occupational Health and Safety and Standardization (KAN) provides the unions with an institutionalized means for exerting an influence on standardization. They are represented in the Commission with five of the 17 seats, and have a secretariat of their own within that of the Commission.

[4] "Efficiency and accountability of standardization under the new approach", Report to the Council and the European Parliament (cf. europa.eu.int/comm/dg03/public.htm).

KAN was set up in 1994. Its function is to concentrate the formulation of national positions on OSH issues and bring them to bear in standardization. KAN is the first national body in which all major OSH bodies are represented in a forum for views on standardization. A tripartite core structure (five representatives each of employees, employers and the state) was selected for the **organization** ; one representative each from the BGs (HVBG) and standardization (DIN) were also added to the membership. Beside the state, the BGs represent the second pillar of occupational health and safety in Germany, and have already been concerned with European standardization for some time. DIN acts as the voice of German interests, including OSH interests, in the arena of European standardization.

KAN's activities are supported by a **secretariat**, which also carries out its decisions. One particular feature of the Secretariat is that it hosts an **office** for employers' representatives and a corresponding office for employees' representatives. These offices particularly reflect the demand for the two sides of industry to be given greater influence in standardization. Co-operation with their respective members within KAN is one of the chief functions of these two offices. They also maintain contacts with various institutions and associations, in particular experts representing employers and unions. Unions and works councils make substantial use of the "employees' office" as a source of information and advice, for example. In the view of the employers' and employees' bodies represented in KAN, permanent offices within the KAN Secretariat have proved their worth, enabling them to introduce sociopolitical OSH interests into standardization activity in an effective and timely manner.

KAN and its secretariat are **financed** by the German Ministry for Labour and Social Affairs (BMA) and the BGs for the industrial sector, who bear 49% and 51% of the cost respectively.

KAN systematically presents the German consensus on OSH to the private standardization community. This function encompasses all stages of the standardization process, from the EU's mandates and programmes, through the influencing of current or planned standardization projects, to review of the existing bodies of standards, at national, European and increasingly also international level (DIN, CEN and ISO respectively). KAN monitors standardization activity, points out deficiencies from the occupational health and safety angle, and proposes ways of rectifying them. It also establishes the need for future standardization in the field of occupational health and safety. This includes the review of European Commission mandates and draft mandates.

KAN acts as a national advisory committee for Germany. Equivalent bodies that might influence standardization, which is increasingly done at European level, do not yet exist in most other Member States, however[5].

Consolidation of national co-operation

Trade union opinion-forming on standardization issues takes place within the DGB committee of full-time union secretaries responsible for occupational health and safety. The employee representatives in KAN are also represented on this committee. The employee representatives themselves meet separately for "party meetings" of their own in order to deal with topical standardization issues.

There is no systematic and organized feedback from users to manufacturers and standards bodies. This failing can be addressed, albeit with limitations, with the aid of KAN. The monitoring of standardization activity has now been placed on a systematic footing. Furthermore, from an occupational health and safety perspective, KAN's position statements reflect at least the experience of experts who deal routinely and in a professional capacity with OSH issues. In this respect, the position statements also reflect practical experience, albeit more from the perspective of the OSH inspectorate than from the immediate perspective of employees.

Co-operation within Europe

Together with KAN's employee office, several representatives of German unions are involved, under DGB co-ordination, in the network for European standardization maintained by the Trade Union Technical Bureau for Health and Safety in Brussels.

A number of individual German unions (those responsible for the metal, chemicals, construction and wood industries, etc.) are involved through their European umbrella organizations in opinion-forming at European level in the technical areas which specifically concern them.

Furthermore, German unions also have opportunities through KAN to forge co-operative links with bodies in other European countries. KAN seeks and maintains such European contacts, which are important particularly in the preliminary phase of European agreement on specific standardization projects. Based upon an exchange of experience between the European institutions registered with the Advisory Committee on Safety and Health Protection at Work, bilateral relations were first established, for example with EUROGIP and INRS in France, HSE in Great Britain and FIOH in Finland.

KAN also supported the launch of a European occupational health and safety network[6], the objective of which is to co-ordinate positions at European level and to represent common positions in the arena of standardization. OSH experts from nine Member States of the European Union (Denmark, Germany, Finland, France, Greece, the United Kingdom, Italy, Norway and Sweden) and participants from five accession countries (Lithuania, the Slovak Republic, Slovenia, the Czech Republic and Hungary) have since announced their active involvement in the network. ■

[5] KAN is unique within the EU. Thirteen years after adoption of the Machinery Directive, the task of providing employers' and employees' representatives with greater participation in standardization has been fulfilled either by completely different means, or not at all by other Member States.

[6] EUROSHNET (EURopean Occupational Safety and Health NETwork) : www.euroshnet.org.

European directives, standards and procedures in the international context

Stefano Boy
TUTB researcher

Going international : where do we move from ?

Since first being set up, the TUTB has worked to gain a better grasp of the decision-making mechanisms of both Community institutions and standard-making bodies, in order to increase the trade union influence on both legislation and technical work that affect the health and safety of workers.

As part of that, the TUTB has over the years kept under review two main elements of the European health and safety regulatory context : one is the balance between the essential requirements that products have to meet under the New Approach directives to be regarded as safe, and the voluntary standards that translate them into technical specifications ; the other is the balance between the two distinct legislative frameworks dealing with the working environment and products moving within the internal market.

The TUTB keeps track of both things in terms of the interlock between them : on the one hand, an effective squaring away of standards and legal requirements, and on the other hand, two legal spheres that regulate work equipment that is fully integrated into the workplace. Inevitably, this approach leads the TUTB to look at the balance between market demands and the protection of workers' health and safety.

The New Approach to technical harmonisation

In Europe today, free movement of goods is regulated by a legislative system characterized by a number of distinctive aspects : detailed Essential Health and Safety Requirements (EHSRs) are laid down in directives with obligations placed on manufacturers ; "mandates" are issued by the European Commission, requesting standardization bodies to draw up *harmonised* standards as an aid to interpretation of the legislative provisions ; draft versions of these standards are made available at national level for public comment before approval ; assessments are carried out by "consultants" in charge of checking the compliance of draft standards with the mandates issued by the European Commission ; a facility exists for objecting to draft standards that are thought not to deliver the EHSRs, and a safeguard clause exists to address failings identified at a later stage. The European legislature maintains control of the final outcomes, as the references of these standards must be published in the *Official Journal* for them to have legal effect (presumption of conformity). Finally, a policy for the revision of standards is in place to maintain their quality over time.

In other words, Europe has mechanisms for ensuring the quality of technical work that affects the working environment. Additionally, the legislative context includes Directives that oblige Member States to take measures to enable both sides of industry to have an input – at national level – into the process of preparing and monitoring health and safety standards. Admittedly, participation of societal stakeholders is only specifically mentioned in the Machinery Directive[1]. This provision reflects the fundamental principle that health and safety are central to workers' rights : the TUTB has over the years fought to get this principle written into the European legislative framework and the supporting voluntary standardization programme.

In connection with this, the TUTB handles two different communication flows : information gleaned from our observation of European standardization work on health and safety matters is channelled through to our affiliates in order to identify priorities and develop technical proposals, while information collected on workplaces is filtered and ultimately passed on to EU institutions in order to improve the quality of their health and safety-related activities.

The issue here is that the work equipment market is a global fact : this raises the question of what might happen to the European model, its dynamics and trade union involvement when moving up to the international scale.

Going international : where do we move to ?

The international dimension of standardization is central to the current debate within the trade union movement. As global trade increases, so does the use of international standards to enhance market access and facilitate trade. The fact of the matter is that the world of standardization is a patchwork quilt, a mixed bag of organisations with different structures and vocations and methods of standards development. Much remains to be done to achieve a coherent system.

[1] Article 5(3).

The TUTB is very alert to the growing focus on the WTO Agreement on Technical Barriers to Trade (the TBT Agreement as it is known), and the ways in which Member States and EU institutional actors consider themselves bound to observe the provisions of WTO agreements. A complex set of issues are being raised as to how the policy- and law-making process in the European Union is affected by the EU's membership of the WTO.

One major complication is that the TBT Agreement requires Member States to use *international standards* as a basis for their regulation, but neither defines what standards are nor lays down any concrete obligation as to how standards should be used in technical regulation.

The question arises as what scope this leaves the New Approach for further development. The TUTB – and it is not the only one – believes this bears close scrutiny, and is closely monitoring the ongoing discussions on the role of the New Approach within the enlarged Europe and beyond, as well as the scope for extending the *essential requirements* concept to the global level. The essence of the New Approach - combining the flexibility of a voluntary method of consensus-based agreements with the certainty of legislative control - is not, in principle, up for discussion.

What remains controversial is not only what organisation might assume the task of framing international essential requirements (i.e., identifying common regulatory objectives to align legal requirements in countries with different fundamental cultural and societal concerns), how, and using what instruments ? Questions also arise about how international voluntary standards might recognize and support the essential requirements, and what international forum would monitor the interaction between them.

The chances of getting in the international sphere what has been achieved in Europe by trade unions' continuous struggle for an "ideal" standardization model which supports work equipment regulation (cooperation between industry, workers, consumers and authorities with a delicate balance of interests between all the actors involved, producing a consensus that gives credibility to the results) probably remain slim.

The TUTB has repeatedly voiced concerns about what "consensus" means in the European standardisation model: more specifically, a fundamental issue is whether the "national consensus" brought into the CEN system reflects a "balanced" representation of all interests concerned in the standardisation process. In fact, as each national standardisation organisation can only take a uniform national position in the voting, societal stakeholders strive to exercise their influence through the national standardisation work and as members of the national "mirror committees".

As improving European societal stakeholders' involvement in the standardisation process is arguably a precondition for its "accountability", the TUTB will keep the debate alive on whether the WTO accepted principles supporting international standards (Transparency, Openness, Impartiality and Consensus, Effectiveness and Relevance, Coherence, Development dimension) will ultimately deliver an adequate representation of societal interests. Regrettably, in many countries outside the EU, the formal rights of social groups to participate differ profoundly, while in many others they are non-existent.

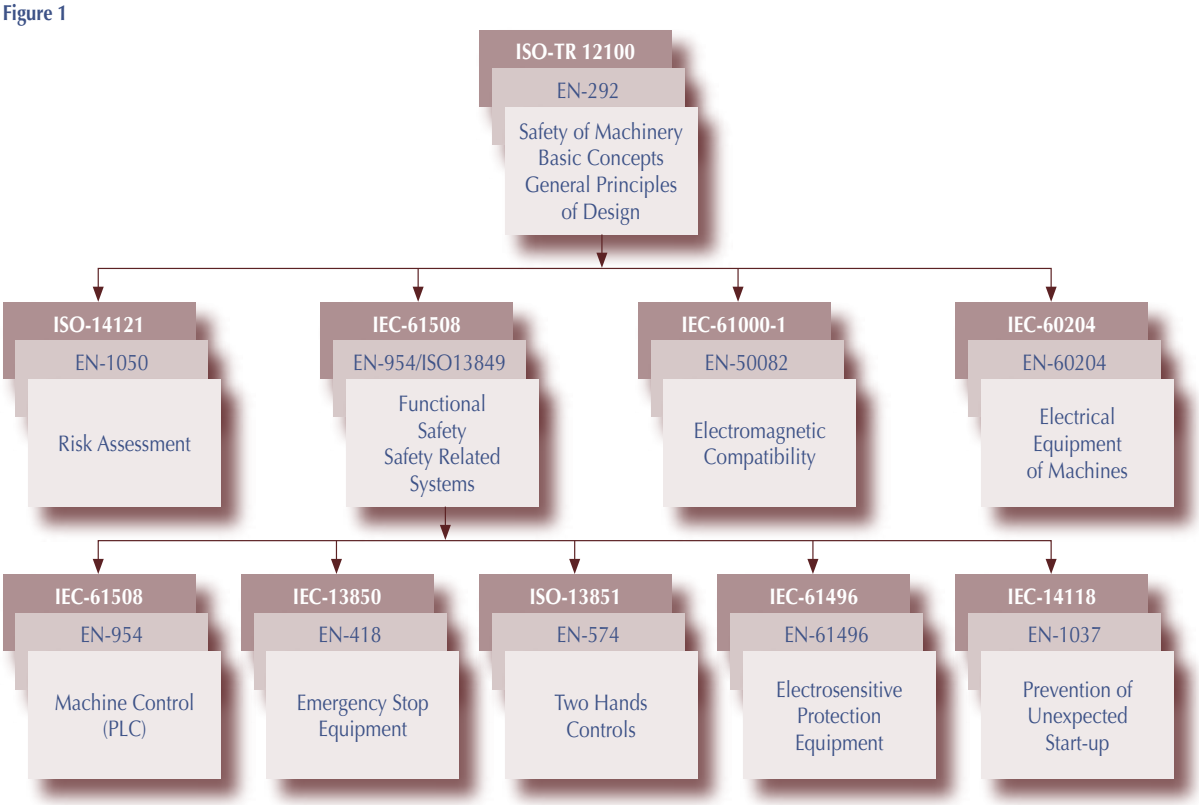
The interplay between CEN and ISO

As global distribution of products becomes the norm, work equipment manufacturers and end-users increasingly look to global machinery safety requirements when designing equipment. Unlike the electrotechnical sector, the interplay between European and international standardisation has been less developed in the mechanical engineering sector.

The Agreement on technical cooperation between ISO and CEN (Vienna Agreement), formally approved in 1991, was one result of the pressures to integrate the Single European Market into the emerging global marketplace. To avoid duplication or divergence of activities, and to promote the use of international results whenever possible, CEN and ISO agreed to work on developing and adopting identical ISO and CEN standards, with the drafting work done once only within one organisation, and a parallel approval procedure for drafts in both organisations. The Agreement recognizes the singular needs of the "mandated" standardisation work supporting European legislation : in particular, for standards mandated under European Directives (under the New Approach), CEN may be assigned "leadership" in drafting them. However, the Vienna Agreement does not rule out giving "leadership" of mandated work to ISO : in this case, as Consultants are still required to assess draft standards, a negative assessment of the ISO work may ultimately lead to a joint decision to withdraw the project from the Vienna Agreement so as to allow ISO and CEN to finalize separate standards (see figure 1, p. 18).

To give an idea of the figures, under the Agreement between ISO and CEN, 2362 ISO standards have been adopted by CEN (at June 2003) of which 910 were developed under ISO's and 222 under CEN's leadership, while 1230 were the product of ex post adoption of existing ISO standards. It is worth mentioning that the ISO standards adopted by CEN are then adopted by all the CEN member countries as their own national standards, with concurrent cancellation of any previously existing national standards that are found to be in conflict.

Figure 1



Source : From *New Global Regulatory Process For Machinery Safety* – Frost Controls Inc.

Interestingly, the CEN Technical Board has recently decided to assign the ISO leadership of all future work on revisions and amendments of ISO/CEN-developed standards : this decision – although consistent with the recognized primacy of international standardisation enshrined in the Vienna Agreement and confirmed by the WTO in the Code of Good Practice – brings new challenges to the complex relation between standards and legislation. And the TUTB's experience in the CEN and ISO arena so far bears out the level of that complexity.

Diverging views on "designing for safety"

Over the past three years, the TUTB has monitored the revision of three fundamental safety standards : EN 292:1991[2] *Safety of machinery – Basic concepts, general principles for design – Part 1: basic terminology, methodology – Part 2 : technical principles and specifications* ; EN 1050:1996 *Safety of machinery – Principles for risk assessment* ; and EN 954:1996 *Safety-related parts of control systems – Part 1: General principles for design*. As these standards lay down basic safety concepts to be used across a wide range of work equipment, their revision has provided the TUTB with valuable insights into the complex process of reaching international consensus on core principles of machinery safety in an increasingly global market.

The CEN and ISO cooperation brings together a large number of technical experts from all over the world to (endeavour to) agree common technical solutions to identified problems. This process reveals widely differing conceptions of work equipment safety, which are the product of diverse historical national approaches to health and safety regulation. Different safety philosophies have therefore emerged over the years, and crucial elements like risk perception, risk–damage causality, state of the art, human-technology interaction among others all remain sticking points where different views confront one another.

The divergences between those who espouse the view that machinery users must be protected against their own mistakes, and those who contend that priority must be given to worker education and training to address contingencies during machinery use, have inevitably shaped the debate around the *reasonably foreseeable misuse* issue.

Admittedly, there is no unanimity in CEN and ISO about how safety standards should deal with foreseeable misuse. If reasonably foreseeable misuse must be taken into account[3], a decision must be taken on whether and to what extent this should be done at the product design stage or whether other protective measures are needed, or whether safety information should suffice. Some experts argue that it would be very difficult to detail reasonably foreseeable misuses and prohibited applications in C-type standards, and

[2] The new standard was adopted at the end of 2003 as EN ISO 12100-1:2003.
[3] As required by EN 292-1:1991, 3.12 (now EN ISO 12100-1:2003).

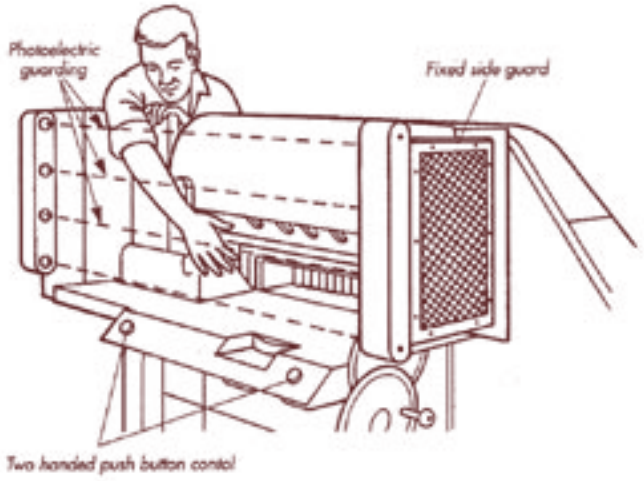
fundamental questions remain about how far the standard should go in illustrating potential risk uses. Others experts contend that manufacturers may fight shy of specifying foreseeable misuses for fear of limiting the use of their equipment.

Machinery misuse may be attributable to designers' failure to anticipate the design's vulnerability to operators knowingly taking a risk-benefit gamble : a case in point is one of the most common operator "errors" - interventions on machines which are running (see figure 2). A range of incidents may occur during machine operation : as manufacturing systems are increasingly under the pressure of productivity, operators may feel impelled to take action themselves in cases of equipment/process malfunction. When facing such dilemmas, operators are aware of the trade-offs between production and repair/maintenance requirements. A barrier – fitted to prevent (part of) the operator's body intruding into a hazard area – may be by-passed to gain in productivity and/or quality, as the operator may prefer to "watch" inside the machine to check the material quality and/or prevent overload and jamming. So, operators may see lessening the consequences of a production stoppage as overriding the risk to their own health. This problem is particularly acute whenever "barriers" protecting operators are included in the final stage of design rather than as the result of an inherently safe design approach, because safety "add-ons" very often hinder performance and functionality.

Machinery misuse may also be due to designers' failure to anticipate that the design may be capable of being used in unintended ways : a case in point is where flawed design of the working area of refuse collection vehicles results in recesses or projections that operators may find usable as foot- or hand-holds, thus assuming hazardous postures that may bring them into contact with compaction mechanisms.

CEN and ISO experts have at times voiced concerns about the difficulty of dealing with foreseeable misuse in C-type standards covering *families* of machines : one such is earth-moving machinery standards that cover equipment with a wide range of functions and characteristics, making it nigh-impossible to illustrate all misuses to be avoided. On the other hand, where the misuse is well-known to the industry, there is general agreement on the need for a redesign. Here, manufacturers' role in standard work is crucial : they have an intimate knowledge of their equipment to feed into standards, but if they are unaware of the real conditions in which machinery operates, incidences of misuse will be beyond their ken and will never appear in safety standards. The recent TUTB Machinery Project has shown that surprisingly many designers are quite out of touch with workplaces, and left to their own devices, may have little idea of the realities of the environment in which their machines are used. By contrast, diligent manufacturers follow-up their

Figure 2



Source : *A Guide to Practical Machine Guarding,* Queensland Government, Australia

equipment through direct contact with customers, or sales and after-sales service networks.

In conclusion, it is clear that not all irrational uses should be taken into account when framing standards, but a decision is still needed on how much foresight is required of the manufacturer and where the limits of legitimate users' expectations lie. And that involves a difficult compromise between hazard avoidance, technical possibilities and economic constraints.

There has been robust debate among CEN and ISO experts around a number of basic machinery design aspects, including the relationship between hazard, hazard situation, hazardous event and injury or damage to health, safety functions, fail-safe condition, risk assessment and reduction, and inherent design measures. Discussions on the meaning of the so-called "3-step method" by which designers will make the best possible use of, successively, *inherent design* measures, then *safeguarding* measures, and finally *information for use* (see figure 3), have been complemented by different views expressed on what *inherent design measures* mean when applied to control systems. In this connection also, the concept of *machine* has been revisited, in particular as regards the traditional schematic demarcation between the *control system* and the *operative part.*

Indeed, the relationship between the operator, the equipment with which he works and the physical environment in which this "man-machine system" operates has dramatically evolved in the last two decades. Not only the operator-machine interface, but also the allocation of function is increasingly changing: as automation processes proceed more smoothly, manning levels can be reduced, sometimes drastically, and therefore costs can be contained and productivity increased.

However, automation brings a number of problems with it that are perceived in different ways by designers around the world. Among them, *task allocation* :

Figure 3 : Protective measures taken by the designer

Step 1 : Inherent design measures
Step 2 : Safeguarding and complementary protective measures
Step 3 : Information for use ■ at the machine - *warning signs, signals* - *warning devices* ■ in the instruction book

Source : EN 292:1991 Safety of machinery – Basic concepts, general principles for design – Part 1: basic terminology methodology – Part 2 : technical principles and specifications

the human operator is often required to monitor the performance of largely automated systems, initiate and coordinate key stages of system operation and respond to any malfunctions that cannot be handled automatically. This may result in problems when things go wrong and the operator has to intervene : by moving the operator from active control to passive monitoring he will invariably start to run behind the process. And if, for whatever reason, human intervention is required, the speed and quality of that intervention will almost certainly be poor.

These comments on automation cannot be dissociated from reflections about the increasing use of programmable electronic (PE) technology to improve safety and increase productivity. Although PE provides many benefits, accident data show that it adds a level of complexity that, if not properly taken on board, may jeopardize workers' safety. Experts agree that it is no longer conceivable to design work equipment without asking the following question : what will happen if safety control systems and components fail ? This question is crucial when integrating PE technology in work equipment, as it shows unique failure modes that are different from mechanical systems or hard-wired electronic systems traditionally used in machinery design. On computer-controlled machines, visible and identifiable malfunctions in traditional electromechanical components are now being replaced by a new category of "intangible" faults in electronic modules and systems resulting from software errors, bus connection failure, sensing device malfunctions. Here, CEN and ISO machinery experts take different approaches to integrating microprocessors, embedded controllers, programmable logic controllers (PLCs), and associated software in machinery. In particular, differences of opinion remain on how to validate the designer choices : validation involves defining a list of faults which will be "injected" directly into the equipment to be tested, or used as a basis for failure mode and effect analysis (FMEA). Such a list represents a benchmark to help designers in the choice of technical solutions "resistant" to those faults. Now, a list of faults is straightforward for simple components like transistors, but not for complex components like microprocessors made up of millions of "gates" : all failure modes may simply not be known. The conclusion is straightforward : where the hardwired technology is replaced by another more complex, less mature and entrenched technology, the question arises whether the same level of safety will be achieved or not.

These reflections on the complexities of dealing with the safety of work equipment surround the TUTB's conviction that more opportunities must be explored for collaborative work between engineers, employers, workers, manufacturers, researchers and governments who can contribute to better health and safety through consideration of design issues. In particular, designers typically enjoy few opportunities to experience operations at first hand, and only a minority of operators spend the time in a design office that can help them understand how a design embodies a designer's intentions. Participatory design seems to us a valuable example of cooperative work.

Participatory design : the way ahead ?

Against this complex background stands the TUTB's commitment to exploring new pathways to deliver the aim of putting workers' knowledge to best use in improving the working environment. In particular, what information can be extracted from the working environment to help improve the design of work equipment ? A second related question is the use of this information to improve harmonised standards : the TUTB is thinking around developing a *tool* that incorporates end-user data and makes it readily understandable by standard makers, public bodies, and all interested stakeholders.

The TUTB-SALTSA Conference has shown that participatory design – supported by appropriate research efforts – could be a methodological delivery system for this data and to formally organize the tool, which could in turn be part of the knowledge base that guides standard revision work, market surveillance initiatives, and Community initiatives to strengthen the legislative framework.

Participatory design is an innovative field and a method for involving workers in analysing and redesigning their own job. Participation is thought to legitimize the ideas and experiences that workers have accumulated in doing their jobs, which they can draw on to suggest their own solutions to work-related safety problems.

What participatory design sets out to do is to provide a context in which design experts can gain the practical understanding they need for successful design : end-users possess this knowledge but lack the insights designers and manufacturers have into new technical possibilities : bringing designers and end-users together is the first step towards that goal. By involving end-users in developing and implementing technology at the workplace, a more intensive and creative use of their knowledge and experience can ultimately make the difference between a safety and health proactive, rather than entirely market driven, design.

A participatory approach to re-design can take many forms, there is no single model. Participatory design may be structured around a team or task-force, mostly consisting of worker and management representatives provided with ergonomic inputs and training.

As participatory design supports an integrated interplay between technological, organisational

and worker-related factors in the design process, it can be a promising means of easing the tensions between the two dominating policy objectives : regulating free movement of equipment and the working environment. The dual dimension of essential requirements laid down by Community legislation and national occupational safety and health requirements in fact form the specific backcloth to the CEN and ISO's initiatives on work equipment health and safety matters. The TUTB argues that these two regulatory elements can be reconciled by identifying and implementing mechanisms to feed back information on the use of work equipment to design and manufacturers : it remains to be seen which procedure in the CEN & ISO system would better promote participatory design experiences, with the aim of integrating *safety* and *design* into a coherent *safe design* culture. ■

International standards and occupational safety

New links between regulatory requirements and voluntary standards

In the past 20 years, two major developments in the area of harmonization of technical regulations and facilitation of trade have introduced new links between regulations and voluntary standards : the Agreement on Technical Barriers to Trade, now signed by some 147 countries in the context of the World Trade Organization, and, in Europe, the New Approach to harmonization of technical regulations. Both have given a new impetus to international standardization, particularly in the area of safety standards. The "Vienna Agreement" between ISO and CEN, in force for some twelve years now, has enabled a good synergy between the regional and international levels, and helped ensure that the construction of the EU internal market does not result in the building of a so-called "Fortress Europe".

Indeed, technical obstacles to trade often relate to diverging regulatory requirements. The level of safety that consumers and workers are entitled to expect must not be lowered in order to overcome these obstacles. Standardizers must ensure that this does not happen when regulators refer to their standards so as to facilitate international trade. They have therefore paid growing attention to associating all stakeholders with their work, operating transparent consensus-building procedures and designing both product and generic standards and guides to incorporate safety requirements.

The longstanding involvement of ISO in safety at work and ergonomics

ISO has a long record of involvement in ergonomics and safety of industrial machinery and protective equipment : ISO/TC 159 *Ergonomics* has published some 50 International Standards, from basic methodology for designing safe machines through carrying out risk assessment, to standards dealing with particular aspects of machine safety. Recent developments of particular interest have been the revision of ISO 6385 *Ergonomics in the design of work systems*, the extension of ISO 10075 to all aspects of ergonomic principles related to mental workload, and new standards related to the *human-system interaction in the IT field* interface. ISO/TC 94 *Personal safety – Protective clothing and equipment*, ISO/TC 199 *Safety of machinery*, as well as ISO/TC 23 *Tractors and machinery for agriculture and forestry* and ISO/TC 127 *Earth-moving machinery* are all deeply involved in safety related standards, often collaborating with CEN in the context of the Vienna Agreement.

Taking user experience into account in standards development and implementation

The experience of users is paramount when developing safety standards to ensure the efficient incorporation of safety principles in the design of equipment and the workplace, all the more so as the tendency nowadays is to prefer performance over design standards, if only not to hinder innovation.

This can be done in various ways :

- by ensuring the participation of representatives of workers' organizations as well as of research and technical institutes involved in safety at work, at least in the activities of the ISO national mirror committees and whenever possible at the international level ;
- by developing general guidelines on the incorporation of safety elements in standards, as illustrated above in relation to the work of ISO/TC 159 ;
- by encouraging the participation of workers' expertise at the conformity assessment level, where the actual implementation and interpretation of standards may be tested, validated and improved.

International standards : reconciling adequate safety and international trade

Owing to their global reach and acceptance, and because they are based on a consensus involving all stakeholders, International Standards are the modern way to address the complexity of today's technologies, as well as to reconcile the quest for adequate safety and the facilitation of international trade. ISO has recently launched a broad consultation through its national members and main international partners to capture expectations in regard to ISO for the coming decade. Involvement of stakeholders is one of the central issues, and participants in this workshop are invited to actively take part in this consultation through their national ISO member. ■

Alan Bryden
ISO Secretary General

This paper is based on the presentation given by Alan Bryden, Secretary General of ISO, at the Conference panel discussion.

Participatory design of work equipment : lessons learned and suggestions for future actions

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Introduction

As part of a TUTB-SALTSA joint project on integrating users' experiences into the standardisation process, a particular project examined case studies on end-user participation in development of work equipment.

The aims were :

1. To justify the need to apply participatory methods when designing equipment and demonstrate the added value of incorporating end-users' experiences from the workplace.
2. To suggest ways and systematic models for collecting end-user data from different sources across Europe.
3. To suggest changes in the formal procedures, either via current legislation or the standardisation process to provide opportunities for end-user data to be incorporated into future standards.
4. To review the reported methods of participatory ergonomics projects within Europe to develop the level of understanding of participatory ergonomics approaches and consider whether a European guidance document would be needed.

This project examined 38 case studies drawn from seven countries (Finland, France, Germany, Portugal, Sweden, The Netherlands, United Kingdom), supplied by a number of national authors. Lessons from these case studies, and from the literature on participatory design and participatory ergonomics in general, have been integrated into an overall report.

Participation can have a number of levels, from one-off design interventions in the workplace or for equipment, through a series of multiple interventions (at its best a process of continuous improvement), to a full participatory management programme. Also, certain aspects of training and job support can be regarded as part of participation.

In fact participatory design has been defined as : "The involvement of people in planning and controlling a significant amount of their own work activities, with sufficient knowledge and power to influence both processes and outcomes in order to achieve desirable goals" (Haines and Wilson, 1998).

Participatory design

There has been considerable growth in participatory design since the 1980s, partly because of regulatory requirements, and partly because it matches newer management philosophy and workforce and trade union expectations. In some national economies, it is also regarded as the right way to go about things in industry or at work, as well as being an effective way of achieving design, implementation and organisation. The various reasons for applying it might be summarised as need, greed or vision, with it matching industrial democracy and social democracy in Scandinavia, a philosophical approach and reflective practice in France, a pragmatic solution-driven approach in The Netherlands and Germany, and having an economic basis in terms of reduced costs in the UK.

The potential gains for participation have long been explained, and may be summarised as direct gains and systemic or more indirect gains. Briefly, these comprise:

- Direct gains
  - solution ownership
  - commitment to change
  - better design process
  - earlier learning/training
- Systemic gains
  - devolved skills
  - people involvement
  - spread of interest

A substantial body of opinion in the ergonomics and related literature suggests that participation by end-users in the design of work equipment and workplaces will lead to better design, as these solutions are developed using their expertise and practical experience (St Vincent *et al.*, 1997 ; De Looze *et al.*, 2000). At the workshop as part of this project it was noted that there is a need to clarify what is meant by better design ; depending upon the product, the context or the participants this can mean different things. For example, a better design may mean one that is safer, is healthier to use, is more usable, is better at the task for which it is required, is more acceptable to use, is more obvious as to what is should be used for or that may be used by more people.

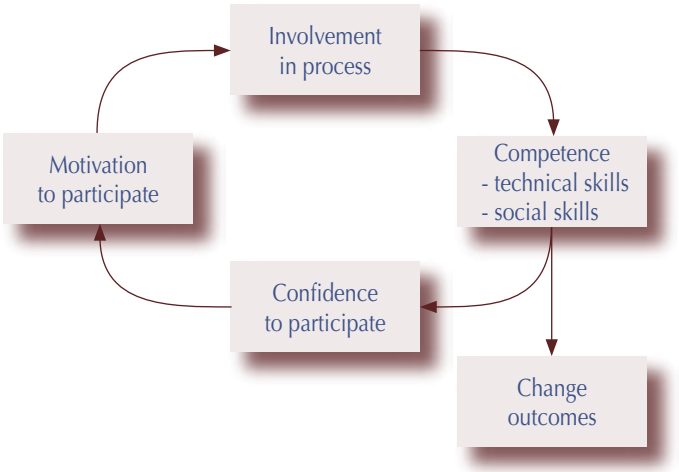
As well as a "better" solution, the second main advantage of participatory processes is said to be the greater acceptability of these solutions for the stakeholders (Van der Molen *et al.*, 1997 ; De Jong & Vink, 2000). The reasoning is that if people (or their peers) have been involved in generating a solution or a change then they are likely to be more committed to making the change work, to be less resistant to change and to be more satisfied as a result. If all this is so, and given that we expect a better-designed

The full text of the **national reports** on case studies collected by the national authors can be viewed on-line at http://tutb.etuc.org/uk/dossiers/dossier.asp?dos_pk=2. (Reports from : Finland, France, Germany, the Netherlands, Sweden and the United Kingdom.)

solution also, more fit for purpose, then the implementation of change should be more effective and of higher quality.

Other benefits from the use of participatory ergonomics in workplace design have been improved industrial relationships (Lanoie & Tavenas, 1996), improved productivity (Brown, 1994 ; De Looze *et al.*, 2000) and a reduction in the reporting of accidents and musculoskeletal discomfort due to work activities (Kuorinka *et al.*, 1997 ; Nygaard *et al.*, 1997).

Some of the possible gains for participation can be summed up in the participation cycle shown in the diagram.



As people get involved in the process they develop greater competencies – technical and social – that not only lead to a beneficial change but give them more confidence and thus motivation to participate in future.

At the same time, we must be aware of the problems and disadvantages for participation, in order to address them in any general advice or in particular cases.

These might be summarised as :
- Seen as a "threat"
- Seen as too slow
- Participants not (perceived as) competent or motivated
- Insufficient support or resources
- No buy-in from peers
- Possible poorer designs

Lessons from earlier cases

Bearing in mind these potential problems, but also the advantages, cases carried out up to the time of the current project taught us a number of lessons about the ability of participatory design to resolve differences and generate solutions, particularly if there are agreed parameters (including budget) at the outset. There is also a definite sense of transfer of ownership, but this can be difficult when the change agent departs. The best cases show continual improvements, a broadening of the effort and actual embedding of participation within the company. On the other hand, even in organisations with good will, there are often blocks - of time and personnel, even more than money - on participatory processes being properly maintained. Also previous experience shows that real evaluation is difficult.

Lessons from TUTB / SALTSA project cases

We identified a number of lessons from the 38 cases collected by the TUTB / SALTSA project. At a top level, there are a number of apparently favourable outcomes from the cases but the evidence is not particularly convincing in terms of good science and good research. It could well be that there is a selection bias in both reporting cases (only the successes get reported) and even earlier than that in the selection of problem focus. It is quite possible that participatory processes are only implemented where it is known that the situation has a good chance of being addressed and problems solved through participation.

Table 1 : Key factors for the success of participatory projects

Commitment
■ A champion to support and or facilitate the process
■ A sense of urgency - reason why
■ Clear definition of actors and their role - who will be involved
■ Structures to support the process - how will the participation be managed
■ Appropriate levels of knowledge for all participants
■ Previous good experience
■ Trade union involvement
■ Involve end-users in all stages of equipment design
■ Preferably involve manufacturers from the beginning of the process
■ Keep the project simple - well-defined and well-targeted
■ Keep the client's needs in focus

It is certainly true that there are many more published cases on participation applied to workspace design than to equipment design, probably because this is more amenable for people to make decisions and choices on, and for them to be able to visualise and coherently come up with new ideas. It is a more concrete aspect of work than even the equipment people use, and certainly than the jobs and roles they fill. Also, we found limited connections between the cases and the production of standards, but this does not mean to say that this linkage is not possible.

In looking through all the cases, a number of success factors common across them have been identified and these can be defined under the headings Involvement, Commitment, Climate, Management and Resources.

Table 2 : Success factors in participation cases

Involvement	■ Partnerships of stakeholders – especially for standards ■ Manufacturer involvement ■ TU involvement ■ User and user-company needs-driven ■ Multi-disciplinary ■ Participants at all design stages
Commitment	■ Commitment of all stakeholders ■ Real support from senior management ■ A champion with change agent skills ■ Clear perceived need ■ Urgency
Climate	■ Appropriate knowledge levels amongst the stakeholders and whole company ■ Previous good experiences of related initiatives ■ Acceptable industrial relations ■ Open, communicative organisation
Management	■ Clearly defined actors and roles ■ Structured process which matches organisation structures ■ Clear, single, simple, well-defined project
Resources	■ Clear identification of availability of resources : time, money, people, equipment etc. ■ "Rich" information from "real" users

New research

A number of potential new research directions were identified, and these were divided into those to do with participatory process, those to do with participation methods and those to do with the transfer of participation into standards.

For the process, research should be :

- A deep examination of the cultural influences (national, organisational, industry, history etc.) on the readiness for participatory processes and on the success of their outcomes.
- A study of a number of different cases to examine the real gains to be made. The efficiency of the process, the quality of the solution and the degree of acceptance of the solution in the real organisation should all be examined.
- Guidelines should be developed for the use of participatory approaches and how to promote these with trade union officials and support staff, to train in the application of participatory approaches in the workplace.
- Build and develop the network of people who use participatory approaches within their area of work, to allow the ongoing collection of case studies and the development of appropriate guidance to organisations.

For the methods, research should be :

- A study of the participatory session processes to examine what methods are used and whether some appear to be of more value than others. Methods need to be appropriate for the context of the work and some methods may be easier to adapt than others.
- Study of the use of visualisation and virtual reality tools to support participatory design.
- Study of effectiveness of participation when carried out by distributed or virtual groups. Possible tools are a web-based forum, collaborative virtual environments or a variety of virtual team information and communication technologies.
- Development, and study into the use, of personal digital assistants and other wearable or mobile technologies to gather use data and user opinions of existing equipment and personal protective devices.

For incorporation into standards, research should be :

- Structured study of the production of standards with and without participatory processes, across three or more European countries.
- Review of the requirement to collect and utilise end-user data as part of the ongoing process of updates to standards for equipment and machinery.
- Review of the format of standards to review whether the end-user is able to understand and interpret the information they contain.
- Pilot studies to include end-user perspectives on research that is undertaken to support the standardisation process and report on the effectiveness of such an approach.

Conclusions

The conclusions of this project are that there is a growth of participatory design across Europe, but that the cases we have found and the programmes are to some extent both context-specific and also embedded in different national, regional, industrial and historical cultures. There is far more participatory design on the workplace than on work equipment, but there have been very successful cases of participatory equipment design. In general, favourable outcomes are reported in the general and professional press, especially where there is high acceptability by participants, but the evidence in the scientific literature at least is quite limited. Better, well-thought-out evaluations are needed. There is a need to develop participatory processes and guidance at a macro or organisational level as well as at a micro or case study, one-off level. This guidance should include better understanding, together with frameworks and method advice.

As regards feed-in to standards, there is considerable potential, but reports of changes to standards as a result of the case studies were hard to find. Those case studies that had been able to make a difference to standards were those that involved a large number of different participants (authorities, organisations, trade unions, researchers etc).

Developing a participatory approach to the design of work equipment.
Assimilating lessons from workers' experience
Wendy Morris, Prof. John Wilson and Theoni Koukoulaki

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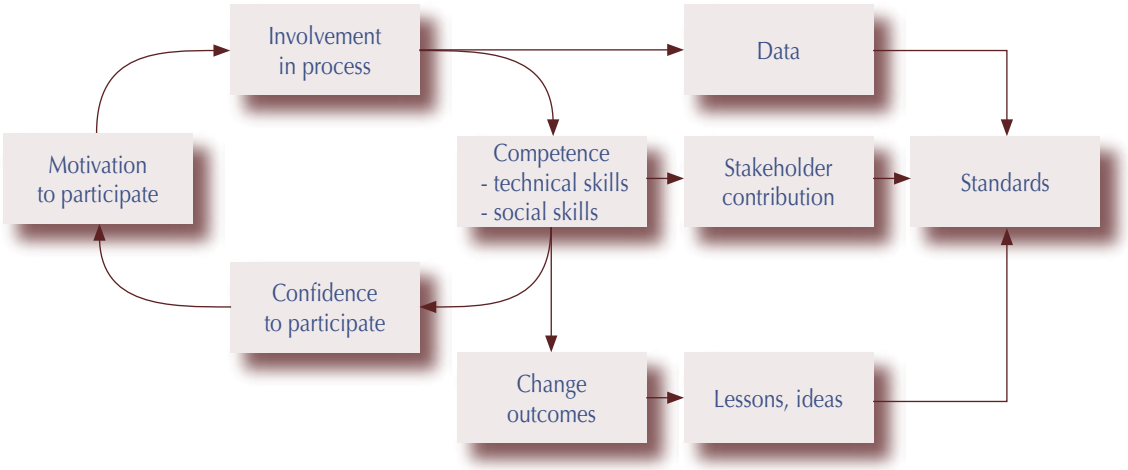
In such cases, some of the participants were also existing members of standards committees or had links with representatives on such committees. The standards process is complex and confusing. The ability of researchers and/or organisations to influence the standards process therefore depends upon an 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

Jan Dul, Harmen Willemse and Henk de Vries

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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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Occupational health and safety – Contribution of European standardization

The current and future role of European health and safety standards is at the top of CEN's priorities. Occupational Health and Safety (OHS) is a cross-sectoral activity connected to product safety and related sectors where health and safety are involved, including work equipment, as well as CEN's general policy on improving safety and work conditions through standardization. Information to users has emerged as a priority issue for the sector.

The New Approach, product safety and related sectors

Health and safety has been a main focus of modern standardization since it was introduced. Standards bodies around the world have not only always kept that focus, but have transmitted it into the regional and global standardization organisations that they created. This explains the huge growth of activity in CEN in the late Eighties, when the New Approach was developed to abolish technical barriers to trade whilst safeguarding health and safety at high levels, in support of the single market. In the New Approach, the European Directives, contain the headline goals for health, safety and environmental protection in the form of essential requirements and refer to "Harmonized Technical Specifications", which are defined to be European Standards, worked out by CEN, CENELEC or ETSI.

CEN has been able to draw up more than 8,900 standards. Safe product design applies across a wide range of standardization fields, such as machinery, pressure equipment, personal protective equipment (PPE), construction products, transport and many more. Furthermore, CEN now produces some 1,000 normative documents a year. European Standards are drawn up with industry participation and support from – consumer organizations and trade unions, amongst others - in excess of 60,000 professionals in all. These standards deliver extremely high levels of safety, and are anything but a compromise or average. What all this means is that products that are CE-marked – certifying that they meet the essential safety requirements of the directives and are in conformity with the harmonized standards - are as safe as can be, and so help to bring the work accident figures down, as reported by the occupational health and safety agency in Bilbao.

OHS Institutions, Notified Bodies and health and safety experts (i.e., consultants…) are key partners of CEN. They take part in CEN Technical Committees and CEN Sector Fora established in 1998 for the main areas of New Approach standardization. Technical guidance – the documents provided by the Notified Bodies on standards to the Technical Committees - helps in identifying inconsistencies in standards, and constitutes a useful basis for the revision of standards, and when safeguard clauses are invoked. The CEN Management Centre also participates in meetings of Notified Bodies at EU level for all New Approach sectors (PPE, Machinery, Toys, Lifts, Gas, Recreational craft, CPD, Medical…), and satisfactory cooperation is now in place.

OHS sectoral activities – Information to users

As well as standardization in support of the New Approach, there is also a more voluntary side to what we do. This is CEN's sectoral activity on occupational health and safety (OHS), where a horizontal-type OHS Sector Forum addresses health and safety aspects in product standards, but also end-user information, hot surfaces, ergonomics (CEN/TC 122) and the analysis of chemical agents in workplace air (CEN/TC 137)… This horizontal activity is fully supported not just by CEN, but also by key stakeholders like the European Commission (DG Enterprise, DG Employment), EFTA, the European Agency for Safety and Health at Work (Bilbao Agency), CEN National Members, the Machinery Sector, UNICE, ESF (European Safety Federation), TUTB and KAN. An OHS Task Force has already identified 24% of the CEN Technical Committees concerned with OHS issues, including approximately 200 work items and European standards (eg, ergonomics, vibration, acoustics, biotechnology, work place atmosphere…) (BT N 6142 /BTC 112/2000). Information to users has emerged as a priority issue for the sector.

The OHS sector organized a seminar on Information to users on 18th October 2002 with the participation of standards bodies, sectors, the European Commission, industry, consumer organizations, trade unions and public authorities. The need for adequate information to users is already recognized in various European directives (eg, the General Product Safety, Personal Protective Equipment, and Machinery Directives). Speakers from CEN sectors, consumer associations, trade unions and public authorities focused on the contribution made by standards for machinery, personal protective equipment, guides, horizontal guidance on product information on goods and services relevant to users, and training. Product information can be found in purchase information, instructions for use and after-sales information. The use of pictograms emerged as a crucial issue directly related to information to users, which might be subject of a guide at European level. The seminar on information to users was seen as a starting point for further discussions in order to bring some coherence to the different fields of standardization. Two Working Groups of the CEN Technical Board - BT/WG 124 "Product Information" and BT/WG 154 "Product identification" - are concentrating on this issue. A CEN Guide on product information has already been finalized and will have an impact on information to users and consumers.

CEN general policy on OHS – BT/WG 156 "Health and Safety at Work"

The CEN Technical Board saw a need for a general policy on OHS and set up a CEN strategic group in order to review the focus and strategy of the OHS sector, considering European needs in light of international development and activities. BT/WG 156 "Health and Safety at Work" has already begun reviewing many big issues for the OHS sector, including : development of guides, information to users, OHS management systems, corporate social responsibility, ergonomics and risk assessment. By the end of 2003, BT/WG 156 will bring forward a global strategy on OHS, including a framework organization, and an action plan for 2004.

To conclude, CEN continues to be supportive to health and safety issues, and to European initiatives like this TUTB Conference working towards a proposed methodology for incorporating end-user information in the standardization process. In so doing, CEN demonstrates its commitment to making Europe an ever safer place for people to work in, and is thereby taking forward an important contribution to society which started at the beginning of the last century at national level in many European countries. ■

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Secretary General of CEN

This paper is based on the presentation given by Georg Hongler, Secretary General of CEN, at the Conference panel discussion.

The market as a driving force : the role of user groups

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Introduction

This article draws on experience gained in two major development projects with significant trade union involvement. The case studies described centre on developments in safety and health in the Swedish metal manufacturing industry.

With support from government funding for the now-defunct Swedish Working Life Fund, companies, tool manufacturers, unions, end-users, designers and researchers pooled their efforts to develop new products and practises relating to the use of hand tools. The projects were major undertakings in which the best-available national expertise was recruited and firm industrial commitment was achieved. There was a participatory aspect to both projects, involving end-users as well as union representatives.

The projects differed sharply in focus and design, reflecting the particular conditions met in the product areas addressed. The basic philosophy could be summarised as follows :

- A large share of the work-related injuries and diseases in manufacturing industry may be attributable to the use of hand tools.
- If major Swedish companies were to present united demands for better hand tools to be available, this would be an incentive to manufacturers and dealers.
- Benchmarking between companies with respect to choice, problem-solving, and use of hand tools could be much more efficient.
- Participation of end-users in the project would help to articulate demands in user terms, and facilitate the development of more efficient and user-friendly tools, as well as acceptance of new, improved tools as they become available.

It could be said that the participatory approach taken in the projects implied recognition of the operator as the expert on his or her work.

Case Study 1 : The Swedish Hand Tool Project

Background

The focus of the first case study project was "to turn the ten most frequent problem tools in Swedish manufacturing industry into new products, ergonomically well-designed and commercially available". Six major companies united in an orchestrated effort : ABB, Saab Automobile, Samhall, Scania, Volvo Trucks and Volvo Cars.

As noted by Kardborn (1998), there were three fundamental ideas forming the basis of the Swedish Hand Tool Project :

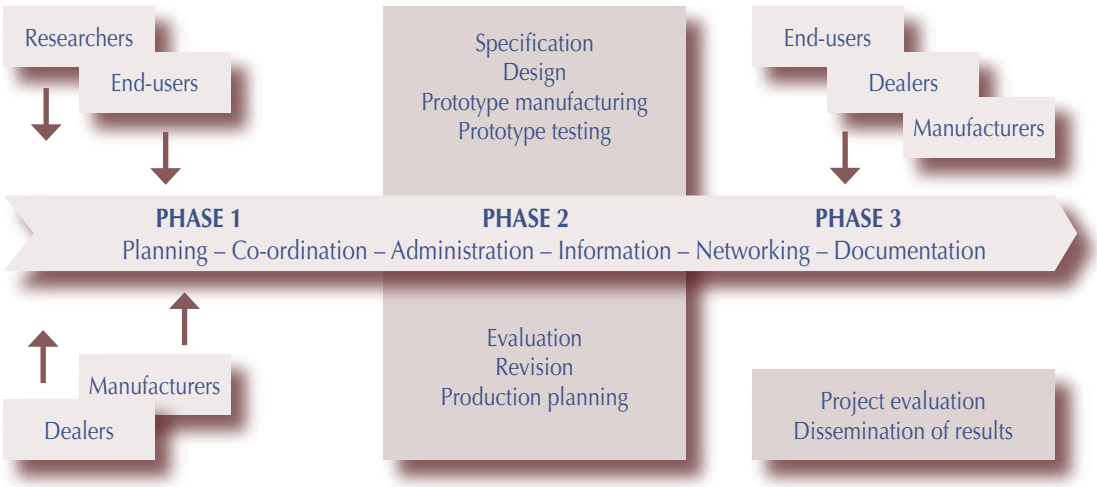
- There was a user-centred approach, facilitating inputs from end-users of hand tools.
- Increasing the knowledge base within the companies was essential in order to create acceptance and understanding of the qualities of the new products.
- It was necessary to create a project organisation that supported simultaneous activities in and information flow between the different groups.

Project design

A steering group was formed for the project, consisting of :

- the working group chairs ;
- representatives of the participating companies (the project owners) ;
- a representative of the financing agency ;
- a representative of the Swedish Metal Workers Union ;

Figure 1 : The Swedish Hand Tool Project (adapted from Kardborn, 1998)
Marketing, information and training activities were carried out throughout the project.



- a representative of the Swedish Association of Engineering Industries.

The project design is illustrated in Figure 1. Four different working groups were formed :
- end-users (the participating companies) ;
- Swedish tool manufacturers ;
- tool dealers (wholesale companies and representatives of foreign tool manufacturers) ;
- researchers (engineers, ergonomists, designers, physiologists).

A main responsibility of the **User group** was to identify the problem tools. It would also support evaluation of prototypes and participate in educational and information activities.

The **Tool manufacturer group** would consider the list of problem tools, identify suitable actors and contact designers. It would support the development of prototypes, and make them available for testing against the requirements and for comparison with existing standard tools. Finally, the new tools would be made available to users and marketed.

The **Dealer group** would scan the market for existing good products that may not have achieved general acceptance. They would also participate in educational activities. When new project tools were developed by manufacturers, this group would give support to making the ergonomically improved products available to end-users.

The role of the **Research group** was to :
- make scientific knowledge relevant to hand tool design available to the project consortium ;
- develop methods for inventorizing and prioritising problem tools, and collecting user demands ;
- develop ergonomic specifications for the project tools ;
- apply science-based methods for the evaluation of tools and prototypes ;
- document the project results and report to the scientific community.

Material, methods and results

Identification of problem tools

In order to obtain a list of problem tools, a report form was distributed to end-users from within the six participating companies. About 400 reports were received back to the project management group. In prioritising project tools, a number of aspects were considered.

In order to evaluate these reports against the project intentions, a list with weighting factors was developed, assigning different levels of importance to different types of problems reported.

Tools were required to :
- be assigned a high problem weighting ;
- feature in more than one report ;
- be of concern to many end-users ;
- feature in official statistics of causes of reported occupational accidents and injuries ;
- be strategically chosen (represent a range of tools) ;
- be a standard item in an ordinary tool-box ;
- not have been the focus of recent ergonomic development projects ;
- be able to be reasonably developed within the project framework ;
- have the potential to be manufactured in Sweden (not mandatory).

The complicated process of project tool selection resulted at the end of Project Phase 1 in ten project tools, for each of which a development project was launched.

Specifications

Once the project tools had been identified, the specification project started, applying a consumer technology approach. The "yellow sticker method" was applied as a validated way to arrive at identification and articulation of user demands. This method was applied in local groups in the participating companies. A group would ideally consist of 3-6 end-users, a supervisor, an expert from the health care services (an ergonomist, a nurse, a safety engineer or a doctor), an engineer from the technical support services, and a member of the purchasing department. Each participant was given a set of yellow self-adhesive stickers, and was asked to write down any type of demands that a tool of the category should fulfil, one demand on each sticker. After a few minutes, the stickers were collected in by the local convenor and a session followed where they were posted on a whiteboard, in groups of stickers addressing related types of demands. Each demand group was then discussed by the participants, and the views noted by the convenor.

The yellow sticker method served essential purposes in the tool specification process. In the identification of demands, operators were given the same opportunities as the supervisor or the expert to express views – irrespective of hierarchies. The session also contributed to a common understanding of the problems associated with an existing tool. The end-users were given a clear role in the process, and their experience was acknowledged.

Following the inventory of user demands, the research group developed an ergonomic requirements dossier containing specifications for each project tool in the form of :
- a definition of the tool ;
- a list of user-specified demands ;
- a list of ergonomic demands ;
- a list of technical demands ;
- a checklist relevant to all kinds of hand-held tools and machines ;
- references to existing standards and authoritative publications.

These specifications were used subsequently as a starting point for the testing of tool prototypes developed in the project.

■ The tool development projects

Tool manufacturers joined with designers appointed by the project to develop functional prototypes. Tests were carried out by experienced users called in for the purpose. The tests included (a) comparison checking of prototype tool characteristics with the tool specifications, and (b) comparative testing using a standard tool as reference.

The choice of methods for testing was based on previous research on evaluation of hand tools (e.g., Kilbom *et al.*, 1993). Users were interviewed about the tool characteristics with reference to the user demands articulated in the tool specification.

To facilitate evaluation of new tools and prototypes, and the choice between existing tools, a guide, *A Good Hand Tool – Check yourself !* was applied. The guide was essentially a checklist which users could use to assess tool performance against a number of properties considered important in terms of ergonomics and productivity.

What were the project outcomes ? The development of new tools for the market is summarised in the table below, which shows that new versions of most project tools were made available in the project.

Project tool status

Tool	Status
Engineer's hammer	Marketed
Knife	Marketed
Crimping tool	Marketed
Ratchet	Marketed
Hex key	Marketed
Wire brush	Marketed
Plate shears	In process
Cable stripper	In process
Band cutter	Not adopted
Spanner	Not adopted

Source : Sperling *et al.*, 1997 ; Kardborn 1998

Concluding remarks

It was concluded by Sperling *et al.* (1997) that, "The Swedish Hand Tool Project became an arena of a network of actors. The large scale project drew attention in industry and made the importance of ergonomic hand tools obvious. Interaction between research and practice, on basis of user requirements, was found to be a fruitful model in product development. Ergonomically improved non-powered hand tools were developed, and improved work with powered hand tools was made the goal of a subsequent project. Methods for comparative evaluation of hand tools were tried and improved in subsequent projects."

Kardborn (1998) in his project evaluation, concluded : "The user-centred approach was basic to the Swedish Hand Tool Project. User participation of two kinds, representatives for end-users as well as actual end-users, was an effective method that provided important information for the specification, design and evaluation of improved hand tools. As shown by the Swedish Hand Tool Project, the mixed strategy of design *for* users, *with* users, is successful."

Case Study 2 : The Powered Hand Tool Project

Background

A group of major Swedish manufacturing companies decided to launch a joint project based on needs and experiences with respect to the use of powered hand tools, and on the results of Case Study 1. It was realised that the problems concerning powered hand tools differed from those encountered in the use of non-powered hand tools :

- the tools are generally heavier ;
- precision grips are less common ;
- actuators need to be operated ;
- cords (electric or pneumatic) or batteries add to the handling strain ;
- shocks and vibrations are common ;
- powered tools are generally more expensive and often system-dependent (i.e., pneumatic tools require compressed air supply).

It was realised that the risks involved in the use of powered hand tools could only be addressed to a limited extent by modified tool designs, and that other factors, like workplace design and work organisation, might be equally important. It was also thought that there were administrative obstacles to acquisition of the best possible tool on the market for a certain application, involving economic constraints, conservatism, and hidden agreements between purchasers and suppliers.

The project aims were formulated as follows : "The main intention was to reduce injuries caused by hand held powered tools, by demonstrating how to be able to decrease exposure to work with such tools, and to show how machines can be improved in order to make possible safe use for all of operators."

Operative goals included :

- To influence powered tool manufacturers in order to bring about development and marketing of ergonomically optimised tools. So-called "concept machines" would be developed within the project in order to demonstrate ergonomic solutions and increase awareness among manufacturers, end-users, and purchasers of tools.

- To show how the production situation could be changed in order to reduce the risk in working with hand-held powered tools.
- To demonstrate how better product design could reduce the use of powered tools in production, and to explore how production experience may be fed back more efficiently to product designers.
- To disseminate within the project companies information on successful interventions where medical, technical and organisational measures had resulted in good working conditions for employees sick-listed due to working with hand held powered tools.

Another stated goal was to inform other companies and actors about the project outcomes.

Project design

A consortium of seven major tool user companies - Asea Brown Bovery (ABB Support), Electrolux, Saab Automobile, Saab Scania, Samhall, Volvo Cars, Volvo Trucks (associated), VME Excavators - was formed to formulate and run the project. Figure 2 illustrates the organisational structure of the project.

A steering group was formed to oversee the project and to facilitate the dissemination of results. It comprised representatives of :

- the seven project-owning companies ;
- the Association of Swedish Engineering Industries ;
- the Swedish Metal Workers Union ;
- the Swedish Institute of Production Engineering Research ;
- the Swedish Working Life Foundation (financing body).

The project was subdivided into the following activities :

1. Identification of problem tools.
2. Development of prototypes showing the potential for alternative, ergonomic tool design.
3. Documentation of technical and organisational solutions developed in industry, and dissemination in a benchmarking effort.
4. Development of reference workplaces in industry.
5. Development of models for ergonomic feedback from users and production engineers to product designers.
6. Development of educational material.
7. Development of a checklist to be used in tool acquisition and a model for ergonomic evaluation of work with powered hand tools.
8. Documentation of good practices in rehabilitation of users of powered tools.

For each project tool, a task force group of industrial designers was established and instructed to work with "the problem owners" among the companies to develop and test out prototype tools. The design process was user-oriented. For instance, end-users in the participating companies were asked to keep diaries of the use of the particular tool and provide a commentary to the designers.

Material, methods and results

The project tools

Problem tools were identified through questionnaires filled in by users, scientific evidence, and the informed opinion of responsible company personnel.

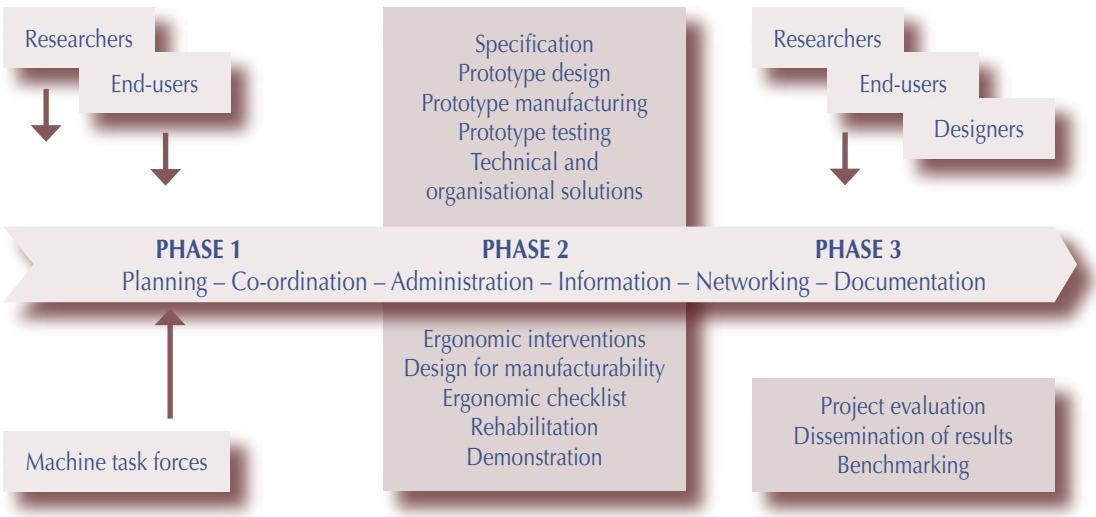
The following types of tools were prioritised :

- battery-powered screwdriver ;
- stapler ;
- pop riveter ;
- cutting device for electronic assembly ;
- angle grinder.

Reaching out to the end user : the hand ergonomics training kit

One of the major endeavours in the Powered Hand Tool Project was to find ways to make end-users aware of ergonomics factors of importance in the selection and purchasing of tools. In accordance with

Figure 2 : The Powered Hand Tool Project
Marketing, information and training activities were carried out throughout the project.



the consumer-oriented approach, it was decided to develop a "hands on" training kit for practitioners "to support awareness and critical thinking" (Garmer *et al.*, 2002).

The training kit was housed in a wooden box, designed for easy transport. It contained a booklet introducing the essential hand ergonomics issues and a laboratory manual, as well as overhead originals that could be used to introduce a session with practitioners.

The box contained the following ingredients :
- a slide-rule for measuring hand size ;
- a grip cone for measuring grip diameter ;
- a hand-grip force measuring device ;
- a device for measuring screwdriver torque ;
- a bolt for trying out wrenches ;
- a structure for trying out hammers ;
- a number of tools of different makes (screwdrivers, pliers, hammers, wrenches).

The training kit was intended for use on the company shop floor, where end-users together with supervisors, purchasers and technical support would unite in a discussion of the pros and cons of different tools.

- Project results

It should be emphasised that the development of tool prototypes was only one of several subprojects carried out in the Powered Hand Tool Project. The following list shows that the stated operative goals were reached :
- five functional prototype tools were developed ;
- technical and organisational solutions were documented, including 120 good solutions from the participating companies, and the Powered Tool Centre as a facility to support quality and ergonomics in car assembly ;
- six reference workplaces were developed ;
- models were developed for ergonomic feedback from users and production engineers to product designers, particularly with respect to manual welding ;
- educational materials were developed, including a training kit for increasing awareness among end-users ;
- a checklist was developed to be used in tool acquisition and a model for ergonomic evaluation of work with powered hand tools ;
- good practices in rehabilitation of powered tool users were documented.

The outcomes of this part of the project thus included five new functional prototypes of powered tools, all of which represented significant advances over currently available devices. However, due to the short timeline allotted to the Powered Hand Tool Project by the financing body, negotiations with tool manufacturers could only be initiated, and had to continue after completion of the main project. The responsibility for pursuing this work was given to the designers.

In an evaluation study of the effect of using the hand tool training kit in one of the participating companies, Garmer *et al.* (2002) found positive outcomes.

Concluding remarks

The Powered Hand Tool Project drew on the experiences of the Swedish Hand Tool Project. However, mainly due to extreme time constraints, there was a somewhat less clear end-user focus in the new project. Arguably, it was run much like an industrial project, carried out under severe time pressure and with heavy focus on operational goals. Nevertheless, the project was organised as a participatory effort, where workers' needs and experiences could be noted and acted upon, and where technical and organisational solutions could be worked out locally, as closely as possible with the end-users.

The project outcomes were considered relevant and in principle, highly useful, by the companies. However, our observations suggest that the project did not manage to significantly change broader attitudes or practice in the project companies. It may be said that the project aims to change basic values and ways in the company's approach to work with hand-held powered tools were unrealistic. Undoubtedly, changes did take place within the companies, but it was not possible to trace these back specifically to the Powered Hand Tool Project outcomes. It can be assumed that a one-year effort devoted solely to information at the end of the project, and engaging the researchers as well as company production staff, would have been most beneficial to the impact of the project.

Summary and conclusion

The Metal Workers Union was very active on the Steering Committee in both projects. The representatives were appointed at the national level. An important role in the project formulation stage was to approach individual companies and discuss the prospective project with local employers and unions.

The user-oriented approach in the projects was chosen for a number of reasons including :
- to increase the relevance of the project ;
- to ascertain that good ergonomic solutions were developed ; and
- to support acceptance of ergonomically sound tools as they become available.

End-users played an essential role in both projects, in particular in Case Study 1, in terms of a truly participatory process. Studies on the effectiveness of change strategies (Ingelgård and Norrgren, 1997) have demonstrated that programmatic change strategies, i.e., attempts to bring about change through predesigned, expert-designed and narrowly-focussed interventions, are generally less effective than a learning strategy, based on a broad, participatory working through of structure and technology, as well as the processes by which experience and new

information are transformed into action. Relating the present projects to these definitions, it appears that Case Study 2 was mostly of a programmatic nature. Thus, the relatively minor impact on learning that the results indicate, could have been anticipated.

There was no standardisation focus in these projects. However, in the formulation of technical and user demands, standardisation documents, including some under development, were referred to. For instance, for the ergonomic specification of the engineer's hammer, reference was made to the ISO standard document on hammers, and to relevant ergonomics documents forming part of the CEN standardisation process.

In conclusion, the two projects represented major undertakings by industry, research organisations and financing bodies. The cases demonstrate both the potential and the difficulties of trying to apply user-driven development of machinery for industry. It is evident that in order to have a substantial influence on machinery manufacturers, a group of user companies needs to be formed, representing a large number of prospective customers. End-users, if given the opportunity, may provide unique insight that is highly relevant in formulation of functional requirements to be included in the machinery specifications. An end user approach enhances the quality of the project, and manufacturers should see this as an asset. Articulations of user demands may also feed into the standardisation process leading to user-centred design.

It is interesting to note that Henriksson *et al.* (1996) in a study of attitudes among actors having a potential influence of the development of hand tools in the two projects, found that whereas all actors agree that it is the end-users who are the most knowledgeable with respect to characteristics of hand tools, there is a difference with respect to the appreciation of influence. The end-users themselves think that they have little power to bring about any changes, but all other actors believe that end-users have significant influence on the development.

Ultimately, manufacturers are profit-driven. Unions should ally with other forces to increase awareness of the importance of ergonomic issues, health and safety in the use of machinery, thereby creating a market for good products, which would give manufacturers of such products a competitive edge. This is a possible way forward for European trade unions. The case studies included in the present report point to project models that could be applied in such an extended context. ■

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Market surveillance and work equipment standards : the role of the national authorities

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Introduction

I see the TUTB's invitation to a French Ministry for Work representative to take part in this conference as being a significant move directly in line with more recent actions. Without delving back into the mists of time (I am thinking of the TUTB's first conference on the trade union role in standardization over 10 years ago, which the French Ministry for Work was also invited to attend), let me just mention :

- The French government's 1998 memorandum on the role of the public authorities in the standardization process.
- The market surveillance conference held under the French Presidency in Paris in December 2000, where the TUTB representative stressed the importance of setting up a Community information system on the matter.
- The conference on safe products through market surveillance held in Berlin in October 2002, where the organizers (including the French Ministry for Work) stressed the importance of the debate with all interested parties, stating that : "In the interests of all market participants and groups with a stake in an effective market surveillance system, appropriate national and European forms of organization need to be created to allow long-term collaboration between the market surveillance authorities and market actors. For example, a Market Surveillance Forum, which would be convened on a regular basis, should be created (at the national and European level). The purpose of this Forum would be to bring together the different interests so that information could be exchanged and joint strategies developed" (Point 4 of the Conference Final Declaration).

It seems to me that this meeting shares that concern.

In line with that declaration, I should like to spell out how we see the feedback of market surveillance experiences taking place, illustrated by a few examples of market surveillance actions that impact standards development, and concluding with a look at how the future may play out.

Market surveillance, standardization, experience feedback

The first thing to say is that, by "standardization", I mean the process of framing harmonized standards in support of New Approach Directives (chiefly machinery and personal protective equipment as far as my Ministry's work is concerned).

Market surveillance is an obligation which the Member States have under all the New Approach Directives. It aims to ensure that products meet the essential health and safety requirements that are given effect to an extent which needs to be precisely determined in the standards.

Market surveillance in France encompasses a feedback of experience from many sources based on an analysis of work-related injuries involving machinery, technical and ergonomic studies, checks at trade fairs and exhibitions, and a Ministry for Work database (known as "Madeira") set up for the systematic tracking of incidences of non-conformity found in workplaces.

The feedback of experience we have developed is a means of keeping under review the quality of work done by the "notified bodies", how well the Directive itself and its essential health and safety requirements are working, issues around equipment design by manufacturers, the recommendations to be followed by users, and the quality of standards. It is this latter point that I wish to expand on, although I also hope to show that action on technical standards and the other aspects of prevention activity are fairly seamless.

Our agenda for this activity is ergonomic work analysis, an approach which argues that the way in which machines are to be used differs according to the nature of their design, because *the operator's use of them* is constrained by time, social, economic and other factors. So the feedback of experience stems from a problem approach. This factor must be taken into account in data collection. This is one reason for the diversity of sources used in our market surveillance activity, and informs the issues that we look into.

In this connection, I should like to offer up a question for discussion : is the idea to develop the maximum possible "ergonomic design standards" or rather - as we believe - to work out technical standards that incorporate as far as possible ergonomic work analysis, which is a problem-oriented, bottom-up approach ?

The Ministry's input to standards development also varies according to the scale of the hazard created by the machinery concerned. It may range from

ordinary technical proposals to formal objection to the standard.

We use the information collected to :
- suggest improvements to standards in the works ;
- inform debates set rolling by standards institutions, the Commission, or the Member States within the Machinery or Personal Protective Equipment Directive monitoring committees ;
- lodge formal objections to what are patently deficient standards.

Selected examples of experience feedback

Action taken on a wide range of machinery and personal protective equipment could be cited to illustrate this, like portable tools, self-propelled trucks, refuse collection vehicles, mechanical presses, press brakes, woodworking machinery (moulding machines), gloves, protective masks, and so on.

I shall consider three : press brakes, fork-lift trucks, and refuse collection vehicles.

■ Press brakes and the framing of standard EN 12622

We did a qualitative analysis of all work injuries reported to us as involving press brakes, and visited trade fairs to get an idea of technological developments susceptible of being incorporated into Press Brakes Standard EN 12622.

As a result of our findings on the rate of work injuries involving these machines, we issued a national instruction to improve operator protection, particularly at the front faces of press brakes in service. The instruction covers various aspects relating to operator training and organizational measures, as well as proposals on protection devices, particularly for controls, to improve prevention of serious work injury risks.

Based on what we found at trade fairs, we went to the standardization groups in which our experts took part with proposals that safety devices like "multi-beam lasers" and "intrinsically safe programmable controllers" should be included (through an amendment to be published) in standard EN 12622 to improve the safety protection of press brake operators.

■ Self-propelled extendible reach trucks and standard EN 1459

We found that self-propelled variable reach trucks were becoming much more common on building and civil engineering sites due to their versatility. They are equally useful for handling and lifting non-suspended and suspended loads alike in similar conditions to travelling articulated jib cranes.

Given the development of the field-installed base of these machines and this form of use, we also noted an upsurge in overloading and forward tip-over accidents with these fork-lift trucks which, although relatively new on the market, have no safety device to prevent the overturning moment being exceeded, even though required by the Machinery Directive in point 4.2.1.4. of Annex I, "Loading control".

But while standard EN 1459 of December 1999 - *Safety of industrial trucks - self-propelled variable reach trucks* - requires a safety device to **warn** operators nearing the overturning limit, it does not require a device to **stop** movement where that limit is exceeded.

It must be stressed that, while the standard was being framed, the French authorities and prevention bodies argued that self-propelled extendible reach trucks should be fitted with devices to prevent the overturning moment being exceeded on the grounds, among others, that this was already the practice among some manufacturers. But most of those involved in developing the standard were against fitting limiters, arguing that they could not address all overturning risks.

As a result of the German authorities' invoking of a safeguard clause against EN 1459 *Safety of industrial trucks - self-propelled variable reach trucks*, the European Commission mandated CEN to carry out a complete revision before 30 November 2001 of the standards concerned to accommodate the risks arising out of a foreseeable misuse of the trucks and truck roll-over/tip-over risks.

The French authorities discovered that CEN had not carried out its mandate by the deadline set, and again made representations to the European Commission to get the standard revision process going again.

■ Refuse collection vehicles and standard EN 1501-1

European harmonized standard EN 1501-1 adopted in 1998 set rules for the construction of refuse collection vehicles (RCVs). The standard prescribes two safety devices in particular : one preventing reversing, the other limiting the speed of RCVs to 30 kph with a person riding on one of the rear steps, to protect crew members working behind the RCV against the risks of ejection from the compaction mechanism while the vehicle is moving or the risks of being crushed against a stationary object by a manoeuvring RCV. But these safety devices were challenged, in particular after an incident which highlighted the risk created by unintended activation of the safety device. Amendments to the standard to address these issues were then proposed by the standards body.

The discussions on the changes to be made to the standard highlighted the problems with assessing the real impact of the standard's recommended safety devices on crew members' safety and working conditions.

The Ministry for Social Affairs, Work and Solidarity therefore saw a need to have a multidisciplinary study done by practitioners from different disciplines

(ergonomist, occupational health doctor, engineer, sociologist) on the real-life work use of RCVs to pick out areas or progress and failings in the standard based on the problems actually met by operators (drivers, crew members, maintenance staff…) in their work and the preventive strategies they deploy, and to come up with recommendations for ways of improving the standard.

This study was commissioned from a consultant, and was based on identified accidents, observations of actual work situations (in four refuse collection firms) and interviews with a leading equipment manufacturer and an independent operator that manufactures its own RCVs. It found :

- That the safety devices prescribed by the standard interfere with the way in which crews manage and organize their pace of work, **and do not always avoid potential risk situations when reversing**.
- That safety system reliability had to be improved in light of users' practices and constraints.
- That the design of RCVs had to be revisited, with a bigger focus on the activity of crew members and the need for better crew member-driver communication. The study concluded that a real work station needed designing for crew members to prevent the aspects that made their jobs most strenuous : this would include the size and positioning of grab bars and rear steps, the location of the work station, and weather and noise protection, because some recent technical developments completely overlook this aspect.

Proposals will be made in the standardization groups, sponsored by the French authorities and prevention experts.

The future

Right from the start, we tried to enforce the Machinery and PPE Directives through a far-reaching system of controls based on information from the places in which work equipment is used. For equipment intended for use in firms, the Ministry for Work has set up a reporting system for non-compliant equipment, most of which are reported by labour inspectors.

From experience, we can pick out a number of issues that require further exploration :

- The methods and procedures of data collection and analysis for a more detailed examination of what the non-conformities consist of, so as to come up with something of real relevance for users.
- The geographical scope of such a set-up, because the European picture is a mixed one : only a minority of Member States carry out checks. Maintaining purely national surveillance arrangements in what is already a single market is an open door to abuse.
- The long-term future of such a set-up in France and other Member States given the budgetary constraints and priorities set for the reform of the State.

The situation could be improved by a clearer definition at Community level of Member States' responsibilities, and developing cooperation between each Member State's market surveillance authorities and the European Commission, as well as initiatives to establish a **European database of instances of non-conformity discovered by the public market surveillance authorities, expert bodies, representatives of users, etc**. Proposals to this effect are coming out of the recent Commission Communication on the assessment of the New Approach Directives.

As to standardization, there still remains a long way to go because it is clear in our own case that our inspection staff have not yet developed the reflex of looking to see where standards are failing as part of their normal checks. But while standards have assimilated some of what experience can tell us, they can also fall short in real-life use. **More field surveys by the labour inspectorate geared to feedback of experience with standardization through appropriate means - training, survey guidance, etc. - could help improve matters here**.

But might it not also be possible at European level to carry out experimental **analyses of accidents involving the use of a machine or type of machine to see how that can usefully inform standards development**, and give collective thought to the most relevant methodology for data collection ? Is this not something the European Agency for Safety and Health at Work could do ? Our experience shows that accident analysis is a key way to improve both manufacturers' application of safety requirements and the quality of standards.

I hope these few proposals can help inform the debate and chart possible ways forward for a common discussion. ■

Trade unions : strategic participants – the role of industry federations

This paper is being presented to help identify the role that industry federations can have in standards development ; the opportunities and challenges that exist for trade unions to have a strategic partnership with industry federations to develop participatory design ; and some ideas to promote discussion on how to develop the opportunities in the future.

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Ensuring the health and safety at work of employees is a key legal and moral duty for all employers across the European Union. With the enlargement of the Union, it is critical that common standards of prevention and protection should apply consistently across all Member States. The protection of workers is a key issue for trade unions and it is an issue for many industry federations.

Within standards development, it is recognised that involving users in the design of equipment can assist in improving the safety features and efficiency of new equipment. As the work done within the TUTB – SALTSA participatory design project has shown several examples of this, there needs to be consideration of how trade unions can more directly influence the design of new equipment.

The following are the key reasons why businesses need to have good managerial controls on health and safety at work standards :

- Employer insurance premiums are likely to increase in the short- to medium-term.
- Damage to corporate identity in the event of a publicised or prosecuted health and safety failure.
- Changes in health and safety legislation, coupled to enforcing authority activity and criminal prosecution.
- Future developments around corporate manslaughter.
- Employee expectation.
- Trade union pressure.
- Pressure groups.
- Standards developments.
- Ethical trading standards.
- Tighter health and safety requirements related to the use of contractor's lists, particularly in construction.

While these pressures are facing many employers across Member States, various organisations involved with health and safety at work are looking more critically at reducing accidents and ill-health. Industry federations are often in a position to be able to co-ordinate the activity of industries at a national and European level, and some will also operate at international level.

It is not simply accidents that employers are looking at. Issues such as stress, hours of work and violence to staff are becoming increasingly important issues to address. With the changes in employment patterns, some employers and employer organisations are becoming more sympathetic to getting more involved in the design process. While the TUTB – SALTSA report identifies different ways that organisations have influenced the design process – bringing users more directly into influencing new designs – this paper sets out to identify what role trade unions can have with employer industry federations to exercise an influence on new design.

Employer industry federations

The key roles that many industry federations have can be summarised as :

- Promoting the interests of their particular sector to political bodies, media, the public, and within the business world.
- Lobbying on behalf of their member companies to seek improvements or resist developments that may - in their view - harm the sector.
- Providing information and services to member companies that assist them in running their business.

Many Industry Federations may also have industrial relations agreements with trade unions and be a "regulating" influence on wages and conditions. While the extent of services provided by Industry Federations may vary, many will get involved in health and safety issues. The key reasons are :

- Providing a consistent approach so that all member companies - and the sector as a whole - operate to the same standards.
- For several industries, a poor health and safety record could seriously damage their public profile. Examples would include the chemical industry and the public transport companies. So, setting health and safety standards is an important issue for them.
- To provide a mechanism for the industry to influence health and safety standards with organisations, such as CEN or the enforcing authorities.

Again, individual employer federations may be involved to a greater or lesser degree depending

on how important health and safety issues are to the respective industries. The key point in looking at how such federations can assist trade unions in influencing designs is how influential the industry federations are in themselves. Some, like those that cover the farming industry, are powerful lobbyists. However, the health and safety of agricultural workers may be poor.

The chemical industry is a powerful lobbyist in Europe and is very influential in developing a variety of standards. Trade unions can have a significant influence with the federation. Yet there will be differences between what the employers' organisation may identify as an acceptable standard and what the trade unions think is an acceptable standard. However, between the trade unions in an industry and the companies, there is a vast amount of practical knowledge about problem-solving. It is identifying this knowledge ; communicating it within industries ; and directing it into the design process that provides both an opportunity and a challenge for the future.

To look at the potential, one of the examples is taken from the TUTB – SALTSA report. This case study is summarised and then the ways that end-users can influence new design is discussed.

Case study : needle guards

The project

In 1996, William Baird – a major clothing manufacturer in the UK – set up a project in one of their factories that had a high number of needle-in-finger injuries. A team of GMB machinists, an engineer and supervisor were given the task of trying to design an effective guard. After a few months of trying different designs, a Perspex encapsulating guard proved the most successful. This was put on a number of machines and offered significantly improved protection over the traditional guard.

William Baird then contracted an engineering company to manufacture the guard, which was designed to be used on specific types of sewing machine. Since then, adaptations to the original guard design mean that it can be used on most of the commonly-used sewing machines in the sector. Where the guards have been fitted, needle-in-finger injuries have virtually been eliminated.

The results

In 1998, the GMB launched its "Stitchy Finger" campaign to draw attention to the guard and support its use. However, machinery manufacturers did not want to incorporate the new design into new machines unless it was required by standard. The GMB and the Health and Safety Executive then supported the company in getting the concept of an encapsulating guard as the European Standard.

In 1996 William Baird challenged the existing guarding standard for needles on sewing machines, which had remained unchanged since 1918. By targeting their efforts and consulting with the people who use the machines – GMB members – they developed an effective guarding solution. This was an effective example of "participatory ergonomics". It allowed the users of equipment to be directly involved in the new design of a more effective guard on the sewing machines.

In the year prior to the introduction of the guards, the Company paid around €190,000 for needle-in-finger compensation claims. 18 months after the introduction of the first guard, the claims were down to €30,000. The guard is effective, and sewing machine operators throughout the European Union will be better protected. Where the guard was fitted to machines, not one first aid treated injury was recorded.

The GMB supported the company in extending the use of the guard. Within the UK, the British Clothing Industry Association had most of the big clothing manufacturers as members. As the Association also had an agreement with the GMB over pay and conditions for BCIA member companies, a National Joint Health and Safety Committee had been established for many years. In this Committee were health and safety specialists from the companies and the Health and Safety Executive – the UK's main enforcing authority.

Here it was agreed that the principles of an encapsulating guard should be applied across BCIA member companies. As these were competitor companies, other designs were developed. William Baird's Risk Manager also approached the main machinery manufacturers. However, none would be the first to offer an encapsulating guard. It then became clear that they needed to influence the CEN standards organisation.

The GMB and the Health and Safety Executive then supported the company in getting the concept of an encapsulating guard as the European Standard. After some lobbying and pressure from the UK delegates to the CEN Technical Committee dealing with industrial sewing machines, changes were accepted. Instead of variations of a wire guard being accepted, the standard was changed to set out the dimensions of an encapsulating guard. This was adopted in EN ISO 10821 *Industrial sewing machines Safety requirements for sewing machines, units and systems.*

The BCIA were influential in promoting the concept of an encapsulating guard to member companies. While some machines in UK clothing companies may not yet have this type of guard fitted, many companies have already adopted the guard in advance of the European Standard.

Key points

This example raises the following key points :

- Involving the people who operate the machinery gives them an opportunity to improve the safety performance of the equipment that is likely to be bought in, making it more likely to be accepted by the workforce generally.
- The improvements - both in financial terms and the virtual elimination of needle-in-finger injuries - meant that William Baird management were more likely to involve the workforce in "designing out" hazards from equipment and processes.
- Getting the industry federation (BCIA) involved enabled them to put pressure on member companies to adopt this standard. It allowed the BCIA to show that they were genuinely interested in improving standards, not just accepting existing standards.
- Both William Baird and the BCIA supported a campaign by the GMB in the clothing industry to increase the use of the guard on industrial sewing machines in advance of CEN's standard development work.
- The GMB, William Baird, the BCIA and the Health and Safety Executive all using the Machinery Directive principles and specific parts of EN 292 on Safeguarding of Machinery were effective in changing a draft standard which – in their view – offered a lower standard of protection for the operator.

How can Industry Federations assist in participatory ergonomics ?

It has to be accepted straight away that industry federations will vary in their interest and the resources that they devote to health and safety. However, the trade unions can help to put a focus on the practical steps that can be taken jointly. Many are already involved to some extent with the standards process. Many industry federations will have targeted Technical Committees and comment upon drafts. The challenge to the trade unions is to get them to take a step further.

The drafting of standards is highly technical, can take many years to develop, and can take up a great deal of an individual's time to participate in. However, trade unions can work with industry federations to influence new standards for work equipment. How can this be achieved ?

Some industry federations are already closely involved with standards development. The main approach is to either comment upon a proposed draft standard or try to promote an amendment to existing standards. The structure of standards organisations in Member States allows them to participate in the consultation process. While the TUTB - SALTSA report shows examples of end-users being involved in influencing the design of new equipment, this is not common. The authors of the report also indicated that case studies were difficult to find.

The following are suggested as possible ways for trade unions to work with industry federations to develop a more proactive approach to participatory design of work equipment.

Target equipment

Within industry sectors, equipment that is associated with a high number of accidents can often be identified. When the Machinery Directive was being developed, woodworking and agricultural machinery were identified as particular problems from Member States' accident records. Using accident statistics within a sector can help to identify particular equipment that could benefit from improvements in design. However, ill-health must also be considered.

Within CEN/TC 153 on Food Processing equipment, the Federation of Bakers, the Health and Safety Executive and the Bakers' Food and Allied Workers' Union concentrated on the hazards associated with flour dust to develop improvements in dust control in bread mixers. This was to help reduce exposure to flour and other bread ingredients that could cause asthma. There will be many examples where health issues need to be addressed, not just safety.

Standards development

Many industry federations are already involved with standards development. Trade unions could promote participatory design for particular standards when drafts are at an early stage. Instead of just offering comments, industry federations could be asked to help organise a project with member companies to get the end users looking at the draft standard and actively promote their involvement.

In the TUTB - SALTSA report, there was some suggestion of amending the Framework Directive to allow safety representatives to be formally involved in the development of standards. While this is a useful aim, there needs to be a whole supporting mechanism in place to make this meaningful for the representative. The trade unions working with an industry federation may be able focus effort so that safety representatives are clear about how they can be involved. The case study with William Baird was initiated by a single company ; however, the industry federation was able to convince other companies to develop an encapsulating guard.

Lobbying

The European Commission is particularly keen to develop social partnership. At both national and European level, if the trade unions and industry federations have an agreed approach, this can be quite powerful when arguing for change. This is clearly demonstrated through the formal process that the European Commission has with the social partners in developing health and safety directives.

However, when considering standards, if the trade unions and relevant industry federations have an

agreed position, this can be a powerful lever in lobbying for change. Again, with the William Baird example, it was shown that the new guard offered better protection than the types of guard that met the existing standard at the time. By using the basic principles laid down in EN 292 *Safety of machinery – Basic concepts, general principles for design*, it was demonstrated that the encapsulating guard could almost eliminate needle-in-finger injuries.

Reviewing existing standards

At workplace level, machinery can be modified for a variety of reasons. This may result in improved safety designs which are not communicated elsewhere. Industry federations may be able to encourage companies to discuss improvements to particular machines by asking for between-company comparisons of guarding devices on a specific machine. Clearly, some companies may feel they have a competitive edge with some guarding solutions. This is where a co-operative effort with trade unions can help. If the industry federation and the trade unions are making the same approach to individual companies, results are more likely to be positive.

Political influence

In the TUTB - SALTSA report, some participants suggested that various changes should be made to specific directives so that it is easier to get the direct involvement of trade union representatives in the standards development process. While that has been discussed, if industry federations and trade unions lobby the Commission and relevant Commissioners and national Ministers jointly, they are more likely to be successful than by doing so separately.

Possible action

The following is suggested as action to improve the effectiveness of industry federations in participatory design.

- Guidance note

Key points from the workshop should be incorporated into a guide for trade unions on the opportunities that exist in industry federations to improve participatory design initiatives. The key aim would be to assist unions to target their efforts and use examples from the TUTB – SALTSA report to be more proactive.

- Promote success

The ETUC could be asked to seek funding from the European Commission to promote the opportunities that exist within industry federations at Member State and European level. This would provide an opportunity at national level for unions to discuss participatory design with industry federations directly. It would assist in directing the efforts of joint working. Included in such seminars, for example, would be the successful case studies presented in the TUTB – SALTSA report.

- European Health and Safety Agency

The Agency could be approached to develop part of its website to promote the advantages of participatory design. Industry federations could be targeted and asked to provide further examples.

- CEN

The European standards organisation CEN could be asked to host a conference where trade union and industry federation representatives from the Member States could be invited to promote participatory design. While it may be difficult, industry federations could be asked to identify an action plan for taking a proactive stance on participatory design.

- European Parliament

The European Parliament could be asked to host promotional events to make MEPs aware of the participatory design initiative and ask them to help promote the results with industry federations at national and European level.

Conclusion

While these opportunities do exist, it is recognised that there are barriers and these were identified earlier in the paper. However, a number of the examples in the TUTB – SALTSA report show that significant improvements in health and safety and in the efficiency of equipment can be made by getting end-users directly involved with the design process.

Industry federations offer support in promoting joint approaches to improve proactive participatory design. ■

A common scientific background for the participatory approach ?

Ilkka Kuorinka

Introduction

Participation - however we define it – is observable and has been analysed in a scientific framework, but has seldom been designed *a priori* on the basis of a specific model or paradigm. It is as if life itself produced a rich and diverse form of participation, and then scientists come with their questionnaires to dissect it like a butterfly held by a pin.

In this article, participation is examined first in the framework of occupational safety and health.

Arguably, any answer to the title question about a "common scientific background" is fated to be fragmented, and so a weak aid to decision on strategies for participation. Before moving to implementation, the goal of the desired participation must first be decided. A strategy to strengthen the influence of trade unions is totally different from a strategy to increase employee participation in planning and design in a company. The former goal is political, the latter organizational.

From an historical perspective, the baseline for the investigation into participation at work could be set at any point in the time scale. Entirely arbitrarily, I have taken the report of a preparatory committee for a "Direct Workers' Participation in Matters of Work Safety and Health" conference. The conference was to be held in Italy in 1982, organised by the Vienna Centre (later the European centre for social welfare policy and research) and the Institute of Psychology (Italy).

The preparatory committee's report is interesting in that it drew experts from many European countries together in a bid to outline the topical area of participation, exactly as we are doing today.

A first observation on the report is that it (and the following conference) seem to have been inspired by the anti-Taylorist debate of the 1960s and 1970s. However, it is accepted that in the future, "microelectronics" will become important and will change the technical and organisational parameters (at work).

However, the preparatory group states that important questions in the future will be job enrichment, job enlargement and autonomous groups, but will then move on to the "Italian approach" presented by the Italian Metal Workers' Federation (and "intellectuals"). The elements of the Italian approach were mainly the physical work environment and physical and mental workload. The approach also refuses to delegate health issues to other groups or institutions (other than trade unions). The report also notes that trade union participation is limited to "homogenous worker groups", i.e., a department, an assembly line, etc. Individual participation was not approved.

After discussing the Italian approach, the group cited the experience of three other European countries. In **West Germany**, the government was reported as promoting participatory structures in the field of work safety. The trade unions emphasised primary prevention (of accidents). In **Norway**, the framework was institutional : labour market authorities, labour inspection and work research institutions were seen as the main actors. **French** sources reported that responsibilities concerning participation were scattered in France. The French representative found that scientific positivism was a major obstacle. French trade unions dislike organisational structures and emphasise the role of strike action. Also, any worker participation had to be accompanied by the necessary scientific instruments. A few comments on legislation in other European countries and in the Eastern Bloc were presented.

We do not know whether the report reflects European views in general, and certainly some countries' views are missing, e.g., Scandinavia (other than Norway), the U.K. and the Eastern Bloc. Some conclusions may be drawn, however.

First, the report shows that twenty years ago, the idea of participation was not really a big issue among trade unions and work scientists (except perhaps for the sociologists who examined it in a context of democratisation). The fact that today's conference is discussing "user-oriented strategies" shows that attitudes may have moved on.

Second, the interests of the various actors were manifestly very far apart. Where one actor underlined the physical work factors, another focused on bureaucratic controls, and a third *de facto* rejected all forms of participation.

As a final conclusion of the above, it might be said that even if approaches to participation as such have evolved, the cultural divergences in European work life may still be very wide.

The nature of participation

Participation as an everyday, vernacular concept is weak and far too broad and may not be useful in understanding participation as a means of improving work and working conditions.

Participation and collaboration are closely-related concepts. Collaboration is an everyday concept : those working together to the same end are deemed to do so at least to some extent in unison. Participation seems to go beyond that. Participation requires, in addition to collaboration, an active, intellectual, innovative and creative contribution that is needed for change. Collaboration does not presuppose change, but participation does.

In an historical and societal context, we may note ideas such as industrial democracy, participation in the capital of an enterprise, participation in decision-making, etc., notions that were particularly debated after World War II. Although the debate left permanent imprints in the social legislation of many countries, today it seems to have fallen silent.

Who is to participate ?

The concept of participation raises the question of who should participate. Are we mainly talking about "workers" or "employees" or "operators" participating in the design and planning of a company's working environment ? But then who is a "worker" in today's fragmented production systems with individual work contracts, autonomous groups and outsourcing ? What about the participation of supervisors and other levels of management ? The competition between (and within) occupational groups further splits the basis of participation.

It should be noted that participation in a given situation offers advantages to some groups but leaves others indifferent or hostile. Thus, there are situations where participation is a field for social power games.

It seems that in many cases we have to abandon the models of participation that made sense a quarter of a century ago. Perhaps we have to adopt other categories like "user / operator participation" vs. design (of products, tools, workplaces, etc.). In point of fact, anyone who can infuse new knowledge and experience into a design situation is a potential candidate. This would be in line with the language of standardisation as well as ergonomics.

The efficiency of participation

In conjunction with the question of "Who should participate ?", we challenge the usefulness of participation. A participatory process is often demanding and requires resources. Does it deliver the expected return ?

Efficiency of participation is difficult to measure and establish. Participation is too multidimensional for it to be easily squeezed into an epidemiological analysis (on multidimensionality see, for example, the discussion by Haines & Wilson, 1998). Some trials have been reported, however. Cotton *et al.* (1988) did a meta-analysis of 91 studies investigating the effect of participation on (work) performance and satisfaction. The results give food for thought, although such meta-analyses have to be taken with a grain of salt.

Modality	Performance	Satisfaction
Decisions	Positive	+/-
Occasional	No effect	No effect
Informal	Positive	Positive
Stakeholder	Positive	Positive
Representative	No effect	No effect

The results tend to show that both informal participation and participation where actors have a concrete (e.g., pecuniary) interest in participation have a positive effect. By contrast, occasional participation, as well as participation through representatives (e.g., trade union representatives) shows no effect on (work) performance and (employee) satisfaction.

A recent publication (Carpentier-Roy, 1997) on efficiency of participation demonstrates the problems of studying the effects of participation. An intervention study had been done in the warehouse environment in Quebec, Canada. The study was completed in 1990. Three years later, another research group undertook a follow-up study on the effects of the previous study. The conclusions were that both from the operational and economic points of view, the results were positive. However, closer consideration of the methodology of the follow-up study reveals major biases that compromise the conclusions. The follow-up was neither badly done nor otherwise faulty, but merely demonstrated the difficulties of a follow-up study on participation in a dynamic and continually changing situation.

Participation at an individual level

At an individual level, a wide spectrum of positions, attitudes and expectations towards participation can be found. Some of them promote a positive attitude towards participation, while others merely engender criticism and possibly lead to a refusal of participation. The Belgian sociologist Bolle de Bal (1982) presented a somewhat cynical but probably realistic view of the motivation of individuals to participate in his three "paradoxes of participation" :

- People want participation, but are at the same time afraid of it.
- Everybody wants participation, but not for other people.
- Everybody wants no-risk participation (but participation always contains a risk).

Interest in participation seems to depend on individual characteristics and on earlier experience or prejudices derived from peers.

Some individuals are more interested in joining an activity that seems to offer social contacts, self-fulfilment and gratification of various kinds. Others may be more inclined to remain at a distance.

At an individual level, also, questions of sharing one's work skills, formal or acquired, are tacitly or openly considered. An employee's "market value" depends on his/her skills, and sharing them may decrease his/her competitiveness.

Participation is not just rules and procedures. It also has an ethical dimension. It should be noted that participation at an individual level has an important ethical component. This is realised especially in participatory projects at the company level. Well-conducted participatory projects may create a situation where both participants' expectations and the psychological investment are high. If, in such a situation, the project is mismanaged, deceitfully or otherwise, and leads to failure, the results may be dramatic not only for the organisation, but also expressly for the participating individuals.

Ethical questions :
- In some cases, the experience of participation may be psychologically profound : avoid being the wizard's apprentice.
- Honesty of objectives.
- Precision of mandates.
- Clarity of messages.

Participation at a group (company) level

Several issues, results and experiences presented above stem from trials and projects undertaken at the company level.

We know relatively little about those group dynamic features that influence participation, but we may assume that they are no different from any other group activity. Many of the issues related to participatory group dynamics are discussed in the following chapters.

It is worthwhile noting that an organisation's hierarchical levels may have varying attitudes towards participation. Sometimes top management and the trade unions may, each from their own motivational standpoint, be supportive of participation. However, middle management is, more often than not, critical and often flatly dismissive of participatory initiatives. Upper middle management may see their organisational position being eroded by more direct contact between employees and top management. In many cases, the foremen and supervisor level proves the real obstacle to any change that further empowers their subordinates. That fear is well–founded, because employee empowerment transfers varying degrees of planning and other responsibilities to the workers. The number of supervisors is reduced and their role shifts towards consultation and coaching.

Participation versus learning and learning experience

Participation is a learning experience for the participating individuals as well as for the organisation itself. If this were not the case, participation would remain at the level of socialising and entertainment.

The learning experience may be a goal in itself. The organisation may favour and organise participatory activities to enhance interaction between the actors. The benefit is supposed to be reaped through better collaboration and mutual understanding between various groups of personnel. The usefulness of participation *per se*, when there are no defined concrete goals, remains to be shown. Even in non-conflictual situations at work, tensions and eventual conflicts of interest between individuals or organisational groups may ruin well-meaning initiatives to "empower people". However, inter-individual frictions and conflicts between groups tend to be a reality in workplaces. Participation without defined goals in such situations has little chance of working.

If goal-oriented participation is instituted, the result seems more likely. A defined goal reduces the ambiguities and makes participation less abstract. It permits actors to gauge the psychological investment, risks and gains.

Goal-oriented participation is sometimes examined in the context of *behavioural modelling* and has been applied in the work safety and health context (Hale, 1987). Behavioural modelling is a strategy of learning that is not far from Pavlovian reflexology. The significant elements are imitation of others' behaviour and feedback. Group norms are important determinants. Behavioural modelling in various forms has been applied to work-related problems and has been reported to be successful in many cases. The significant criticism that can be made is that when behavioural modelling is applied at work, the line between indoctrination and true participation is drawn in water.

Learning at work has been examined in the context of an activity theory (Garrigou *et al.*, 1995) where learning is understood as a complex interaction leading to transformations at work. These transformations interact and lead to a broader learning through repeated cycles. Earlier similar cyclical modelling was discussed in relation to planning and design. The design model does not explicitly rely on cognitive models, as does the previous model.

Teaching a work task by developing cognitive models via participation and simulation has been

developed both in theory and in practice. Learning through a better understanding of the (internal models) of work may be the central element that influences the success of a participatory process.

Learning has a significant social component that is mediated by supervisors and opinion leaders, but it is also significantly influenced by individuals' beliefs and expectations. Also, social feedback seems to be important. Part of the feedback comes from the credibility and prestige of the participatory process, assuming that the process is positively credible. It seems that part of the success of reported participatory projects lies here : the participants feel that they are paid attention in a credible project and are willing to co-operate. Here, St Exupéry's principle (*Vol de nuit*) applies : "In life, there are no solutions. There are forces in motion. You create the forces, and solutions automatically follow."

Participation as knowledge transfer

We may limit our scope and exclude formal professional training and concentrate on the creation, transformation, diffusion, reception and adoption of work-related knowledge and information both vertically and horizontally in an organisation. Transfer of innovation is also an issue that is tangential to participation.

Depending on the context, "knowledge" and "information" are used alternatively to signify the same concept.

Knowledge transfer at work is a subset of learning and education. This section is inspired by the analysis of Mario Roy *et al.* (1995), examining the issue in relation to the physical work environment, organisational changes and the effect of individual factors. Knowledge is defined here as organised representations of the real.

Knowledge transfer is analysed as a process in which there can be identified :

- Generation of relevant knowledge / information for those who need it. Here, generation means creation, research, invention and innovation. User participation is primordial.
- Transformation of information means the reorganisation of knowledge to facilitate the diffusion and adaptation of the expression to suit the target group.
- The actual diffusion of the information.
- Reception of the information.
- Organisational adoption of the information.
- Utilisation of the information.

Roy emphasises that the reception of information is not a mechanical process but a complex interaction in the actors' network, where individual and social factors are intertwined in a complex system. Information should not be understood as an object that moves from one system to another, but merely a result of the interaction between the members of social systems. A participatory process can succeed only if the issues to be dealt with can be linked with the groups' preoccupations and interests. Further, the perceived value of knowledge and information produced by a participatory group should exceed the cost of participation.

In Roy's model, the social network is emphasised. All information that does not find a response in the network of actors and "receptors" of information is doomed to disappear. He notes further that the real challenge is to eliminate barriers that prevent exchanges between occupational groups and organisational units.

How should knowledge transfer be organised ?

In operational terms, formal classroom lecturing about knowledge transfer is minimised, and emphasis is on on-the-job (self) learning, mainly in participatory groups. The specialists act as guides and facilitators and to a lesser extent as teachers. This approach is close to cognitive training in work-related issues.

As a social interaction, knowledge transfer is a more limited issue than participation. If participation has a concrete goal in a work context, the essence of the procedure is the input of new knowledge to reach the goal. This knowledge is not limited to the technical nuts-and-bolts type of knowledge, important as such, however, but also to understanding the work, work organisation, the learning of social skills and so on.

Knowledge transfer in participation has been examined, for example, when ergonomists transferred practical knowledge to non-specialists (St-Vincent *et al.*, 1997). The prior training and organisational status of group members influenced the assimilation of knowledge. Among many other factors, one can highlight the importance of management support and (positive) attitudes of co-workers. In a similar context, the author studied mental models of engineers and operators. The results open promising avenues for redesigning the knowledge transfer approach (St-Vincent, 1994).

Knowledge transfer can take many forms. In the International Labour Organisation's ergonomics projects, transfer of knowledge uses intensive shop floor level participation as the didactic means. The workers are induced to examine their workplace and work without any prior formal training. The facilitator prompts answers to a question. "What would you like to change in your work ?" The process then converges towards realistic proposals using supporting material and group discussions (Ergonomic Checkpoints, ILO, Geneva 1996).

Participation as part of the change strategy

Participatory approaches are often part of a larger organisational change. Modern theories concerning change in enterprises assume or require at least some degree of employee participation. Use of some form of employee participation in a change project may provide a greater sense of control over the process, can help gain employee support, and may result in better implementation decisions.

The following discussion was inspired by Norrgren (1997). A great number of change strategies can be identified. Usually the actors want to give an image that all has been carefully planned, although the *post hoc* analysis shows that much of the result was pure improvisation. Benchmarking and other external references are important levers of change.

Continuous improvement and learning as change strategies are definitely modern approaches that have demonstrated their viability at least under certain cultural conditions. Participation is by definition a natural part of these strategies. It can be used as means to bring reality into learning. French ergonomists point out that there is a wide gap between what is supposed to be done and what is actually done.

Participation is, in a way, a reality test of ideas.

On the other hand, participatory ergonomics may be an approach that can be adopted independently of the change strategies. However, the problem to be tackled must be important enough, because a participatory approach is often time-consuming and expensive.

In practical terms, countless numbers of ways and methods have been proposed to carry out a change process in an enterprise. Two approaches are cited as examples (Hendrick, 1995). Lewin's three phases are an example of such approaches. Three phases were identified : unfreezing, changing, refreezing. In the first phase, the employees are made aware of the need for change ; in the second, the actual change is implemented ; and finally, the new methods are established. In Dalton's model the need to change must exist before the actual change is attempted. The forces of change must be mobilised and oriented by a prestigious influence agent.

Often, the concept of resistance to change is discussed extensively. However, the lack of success cannot be reduced simply to resistance to change.

Work organisation and work practices together with the technology in modern industrial workplaces seem to be under constant pressure to change. As has been claimed since the early days of Taylorism, organisational changes and cumulative requirements for operators may create stress and may provoke negative consequences in production and generate health problems.

Participation has sometimes been understood as a means of reducing change-related stress. Participation in the planning of a future situation at work is supposed to help master the future work situation and cope with the inevitable unexpected problems. In many critical tasks, simulators are successfully used to prepare the operator for future tasks and problem-solving. It may be assumed that simulation techniques using computers will gain in popularity in the future and be applied in production and work-related areas.

Using participation as a means to help change work may be double-edged. On the one hand, participation may be a means of reducing the stress that is usually related to an organisational change. For example, relocating an intensively collaborating working group may provoke negative reactions and create stress. If the group itself can plan the move and occupation of the future premises, the process can be fluid and unproblematic, as this author's experience has shown.

On the other hand, participation as such may, and in fact often does, create stress, and thus may be more of a burden than a help in a change process. It is up to the leader of the participatory process (facilitator) to observe and note eventual symptoms of friction and stress and to take necessary action to correct the problem.

Participation as part of an innovative process

Innovation is a concept that applies to concrete artefacts, to new ideas, new organisational practices and any other issue that proposes making a deviation from old practices. Participation contains many features that are close to innovation. The participatory process as such is innovative, but also, the eventual result may be something new, and therefore, more or less of an innovation.

Adoption of innovation depends on the addressee's perception of the value of the innovation, namely, how useful they see the innovation being to the situation to be changed. Also, the compatibility of the innovation with the addressee's values, earlier experience and needs, affect adoption. The opinion of peers has a significant effect on adoption. The norms of the group that is meant to adopt an innovation have an important effect. In some cases, norms may run counter to adoption of the innovation; in other cases they may favour the spread of innovation. In short, dissemination of an innovation depends on the social system that communicates the innovation to the members (Rogers, 1995).

Peers and opinion leaders seem to have an important effect on the broadcasting of the innovation. When a sufficient number of avant-garde individuals have adopted an innovation, it tends to spread almost automatically. In popularised terms, those who adopt an innovation first are classified as early adopters. Then come the early majority, late majority and laggards.

Participation may be examined as an innovative process, although the most obvious link between the two appears at the end of a participatory process when the results are presented to colleagues and to the organisation. This phase is often underestimated. The result of a participatory activity may have great value for the participants in the process but not necessarily for the others. Thus, the result must be "sold".

Participation as an element in usability testing

Many branches of industry routinely have their products tested and evaluated by future user populations. These procedures are highly formalised. The product to be tested may be an artefact, but is more often an administrative procedure, questionnaire or a computer interface and program. In a recent doctoral thesis, usability testing was examined also from the point of view of participation (Garmer, 2002). It showed that an interaction between "subjects / users" and designers (engineers) of the product in question is important. It should actually take the form of an intimate collaboration that should also be reflected in the formal procedure.

Usability testing is presented here as one example among many other production-, quality- or design-related procedures like just-in-time, lean production, various quality management programmes, reengineering, concurrent engineering, etc. They require, formally or informally, the participation of employees. To what extent they can be discussed under the heading of participation may depend on individual cases and their organisation. ■

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Future research needs – Designing pilot projects on collecting information on specific equipment from the workplace

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Identifying the need

From the title, the topic appears quite straightforward, and yet it is anything but ! It is easy enough to provide an immediate answer from a particular point of view, but then on reflection, a number of different perspectives begin to emerge. The answer given for the researcher will differ from that for a collaborator or a member of a standards committee. Although there may be others, these are the perspectives that will be considered in turn in this presentation. Other fundamental issues are how the problem with a piece of equipment, and the need for further investigation, have been identified. It is suggested that there are three possible opportunities for research needs to be identified, as shown in Figure 1 and links between these can provide an opportunity for "triangulation". Such an approach can help question whether this is a local concern or whether is it one that is affecting a much wider working population.

Research requirements

Once an area for further investigation has been identified, then the "ideal" design of the project may differ according to the perspective of the person involved. For the researcher, the role that I am most familiar with, the following factors are suggested as being significant for the success of the project :

- The level of resources available for the project.
- The commitment of a "champion" within different arenas who will support the project.
- The quality and ease of access to appropriate collaborators.
- A flexibility on the part of the researcher and their methods to adapt to changes to the project during its life span.

Identifying "champions" is a key stage, as they may influence the level of resources available either directly to the researcher for the programme of work, or indirectly by allowing access to target areas and other collaborators. The champion may be within a trade union organisation, a government body or an insurance group, as the German case studies for the TUTB – SALTSA project have shown. The research programme that is developed to address a problem must consider the resource and access limits that are set at the outset. Also throughout the programme, the researcher must have a reflective approach and develop the programme to respond to the "real world".

Within a project concerned with the collection of information on equipment in the workplace, the collaborators should be the end-users – the workers, their organisations and possibly other research partners. Each of these collaborators will fulfil very different roles, but for each one, certain factors that are important for the success of the project will be the same. These are as follows :

- Clarity of their role, what is expected of them, when and what this entails.
- Sufficient resources particularly in terms of time to be able to fulfil their role.
- Clarity of definitions and terms used within the project, as often there are opportunities for error through poor communication or misunderstanding of terms.
- An appropriate structure for data collection that is easy to use and administer in the varied settings of the project. The structure may be developed for the project or based upon existing tools and frameworks.

Example of a framework – the Participatory Ergonomics Framework (PEF)

For the TUTB-SALTSA project, a number of national authors were commissioned to collect case studies where end-users had been able to participate in the

Figure 1 : Opportunities for identifying research needs

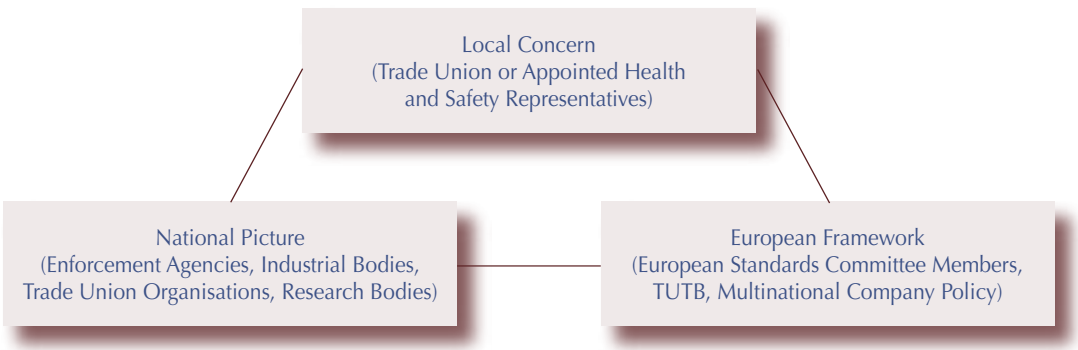

Figure 2 : The Participatory Framework (Haines *et al.*, 2002)

DIMENSION	CATEGORIES								
Permanence	Ongoing (O)					Temporary (T)			
Involvement	Full direct participation (FDP)			Direct representative participation (DRP)			Delegated participation (DP)		
Level of influence	Group of organisations (GO)		Entire organisation (EO)			Department (D)		Work group / team (WG)	
Decision making	Group delegation (GD)			Group consultation (GC)			Individual consultation (IC)		
Mix of participants	Operators (O)	Line management (LM)	Senior management (SM)	Internal specialist / technical staff (IS)		Union (U)	External adviser (EA)	Supplier / purchaser (SP)	Cross industry organisation (CIO)
Requirement to participate	Compulsory (C)					Voluntary (V)			
Topics addressed	Physical design / spec of equip., places, tasks (PD)			Design of job teams or work org. (DJ)			Formulation of policies or strategies (FP)		
Brief	Problems identification (PI)		Solution development (SD)		Implementation of change (IC)		Set –up / structure the process (SP)		Monitor / oversee process (MP)
Role of ergonomics specialist	Initiates and guides process (IP)		Acts as an expert (AE)		Trains participants (TP)		Available for consultation (AC)		Not involved (NI)

redesign of their workplace or work equipment. To facilitate the collection of data from a number of collaborators, a framework was required. The Participatory Ergonomics Framework (PEF) has been developed in recent years to consider the nature of participatory projects. It was first published in 1998 (Haines and Wilson), but has since been further developed (Haines *et al.*, 2002). This framework is shown in Figure 2. Whilst its initial purpose was to consider the nature and extent of participation, and the methods used in existing projects, it may also be applied to the area of developing participatory projects. Consideration of the various dimensions provided in the PEF and the extent to which the participation of end-users is possible within the project may help to guide the process for future participatory research projects as well as its content. It is acknowledged, however, that the PEF is still being developed, and further refinements are anticipated as it is used.

The main focus of the TUTB-SALTSA project has been to consider cases where end users have not only been able to participate in the redesign of work equipment but also where the insight from their involvement has been taken into a wider arena to influence the standards concerned with that work equipment. Although I have limited experience of the world of standards committees, it would seem that their requirements for pilot projects collecting work equipment data would be different again from those outlined above. It is suggested that the requirements of standards committees from such projects would be as follows :

- The projects should be clearly relevant so there is a need to link research programmes with the standards that are to be reviewed.
- The research needs to be carried out at an appropriate time and this requires co-ordination well in advance of the standards review.
- Research that is undertaken needs to be published and made available in the public domain.
- The application of research should consider the standards setting process as well as advancing knowledge in specialist areas, so giving a wider application for the work.

Summary

In considering the title given for this presentation, a number of different perspectives have been identified each with different requirements for the design of research projects that seek to collect information on specific equipment in the workplace. These different perspectives have been discussed in turn and lead to a number of proposals for improvement.

- Standards committee members are asked to actively engage with research institutes to identify areas for further work and the time constraints. It is acknowledged that in some areas this already takes place, but there is a need for this collaboration to be more widely undertaken.
- Standards institutions should raise awareness of the review and development process for standards, so that end user representatives can engage in a timely manner wherever possible, and research institutions can target the appropriate groups with their findings.
- Standards institutions are asked to improve accessibility to and usability of existing standards to raise awareness and understanding of future research areas.
- Researchers need to gain approval from collaborators to allow publication of the findings, so as to inform the wider community of their work.
- The research community are asked to build a network of both experts and tools to build a people and data resource to support the work proposed above. ■

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The need for consumer representation in standardisation

Gottlobe Fabisch
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This paper is based on the presentation given by Dr. Gottlobe Fabisch, Secretary General of ANEC, at the Conference panel discussion.

Standardisation is not a media-attracting topic. It is industry-driven, often technical, patient and very time-consuming work. Why should consumers bother to participate ? Wouldn't industry look after the interests of consumers anyway because they have to sell their products ? This is actually an argument consumer representatives often encounter : "We are consumers ourselves !", industry representatives used to say. Many years of practical involvement in standardisation, however, have shown that this argument falls short, and that there is a need to defend and represent the consumer interest in a systematic manner. This is the mission of ANEC, the European consumer voice in standardisation. ANEC has gained considerable experience in doing so since its establishment in 1995. ANEC co-ordinates a network of more than 200 consumer experts across the fifteen EU Member States as well as Iceland, Norway, Switzerland, the Czech Republic and Slovakia. It is only a question of time before the other new Member States join. ANEC provides technical expertise, and its representatives directly contribute to more than 60 Technical Committee and Working Groups of the European standards bodies. Some ANEC members - such as the BSI Consumer Policy Committee - even look back at more than 50 years of institutionalised consumer participation in national standardisation.

ANEC

ANEC stands for "European association for the co-ordination of consumer representation in standardisation". ANEC is an international non-profit association under Belgian law and was set up in 1995 to protect consumer interests in standardisation, in particular in standardisation work complementing European legislation under the New Approach to Technical Harmonisation.

ANEC co-ordinates a network of more than 200 consumer experts across the EU and EFTA, as well as the Czech Republic and Slovakia. Our experts directly contribute to the work of more than 60 Technical Committees and New Deliverables of the European Standards Bodies. Our areas of priority, in which we hold standing working groups, are : child safety, design for all, domestic appliances, environment, information society, services and traffic safety. Research is key for this kind of work. Scientific evidence helps to back up our arguments in standardisation committees and working groups. This is of particular importance where a consumer representative has to argue his case against a strong industry majority.

The main political decision-making body is the General Assembly, which meets once a year and consists of 20 national members and six European members. All national consumer organisations of a country nominate one person to represent them in the ANEC GA. In between GA meetings, a Steering Committee made up of nine GA members and the President, acts on behalf the GA. The Secretary-General represents the association to the outside world and runs the Brussels-based Secretariat with a team of seven permanent staff members. For more information, please see the ANEC website : www.anec.org.

Why is consumer representation important ?

Standards affect us all every day and everywhere. They can help to make our lives easier and the products we buy safer. It is a standard that defines that a washing machine cannot be opened during operation. It is a standard that ensures that credit cards have the same features and can be used everywhere. Thus, standardisation is a proven means of consumer protection in terms of safe products and services.

In addition, standardisation is at the very heart of the Internal Market. It is the regulatory role of standardisation under the New Approach to Technical Harmonisation that makes it so important to participate in the process. Since the adoption of the New Approach in 1985, European legislation has confined itself to defining essential safety requirements, leaving the technical solutions to standard-makers, namely CEN, CENELEC and ETSI. Because of the specific role that standardisation fulfils in the European context, proper consumer participation in the process is a prerequisite for the credibility of the system.

Another reason for consumer participation is that it is crucial to counterbalance the industry view, or in other words, consumer involvement makes a difference. For instance, for many years, ANEC called for a European Standard on child-resistant lighters. A series of fires had been caused by young children playing with cigarette lighters that were very easy to operate. In light of the risks involved, the European Commission asked CEN to produce a standard for child-resistant lighters. Finally, in 2002, after much dispute with industry, CEN members adopted European Standard EN 13869 *Lighters – Child-resistance for disposable and novelty lighters – Safety requirements and test methods.*

Finally, consumers tend to promote new concepts such as "design for all". ANEC is currently calling upon the European standards bodies to implement ISO/IEC Guide 71 in order to take the needs of elderly and disabled people into account when designing mainstream products and services, so that as many people as possible can use them easily, whatever their age and ability.

Challenges for consumer participation

European standardisation is based on national voting but unfortunately consumer participation in the work of national standards bodies is far from being satisfactory. It is developed to any great extent in only 8 of the 15 EU and 3 EFTA countries. This is the finding of an ANEC study on the national arrangements for consumer representation in standardisation published in 2001 (ANEC2001/GA/014). Consumer representatives in all EU and EFTA countries see the lack of public resources as the main obstacle to consumer participation in standardisation.

Furthermore, ANEC members are keen to improve the functioning of the European standardisation system (ANEC2001/GA/007). For instance, we want measures to protect stakeholders representing the public interest. These measures should include improved quality control and the establishment of an early conflict resolution mechanism within the standards bodies. ANEC members are gratified to learn of CEN's recent acknowledgement of the need for such a mechanism.

In addition, consumer participation in standardisation encounters new challenges :

- First of all, standardisation is no longer just about product safety, conformity and harmonisation. Nowadays, it also addresses new policy areas such as the environment, corporate social responsibility, and services. Consumer organisations need to build up expertise in these areas in order to be in a position to defend the consumer interest as well as to influence developments in a proactive manner.
- Secondly, it seems that the European Commission is looking at New Deliverables of the European standards bodies - other than formal standards, for instance CEN/ISSS Workshop Agreements - to support EU policies in the ICT sector. The reason for this being that technologies and processes, especially in the ICT sector, emerge at a rapid pace. Product and technology life cycles have never been shorter. In many cases, the formal standard-making process is too slow to produce the standards required by the market in a timely manner. ANEC, however, is concerned about the lack of consensus and democracy of New Deliverables, as there is no systematic representation of the public interest. Therefore, ANEC does not support the approach of using non-formal standards, including New Deliverables, to complement European legislation.
- Thirdly, there is a general shift to international standardisation due to globalisation, while consumer representation is weak at international level. Consumer representatives can attend ISO and IEC meetings as members of national delegations, but as such they are constrained to follow the national consensus view. Furthermore, there are very few representatives from consumer associations in national delegations at the international level. Hence, ANEC and Consumers International see a need to provide high-quality representation of the consensus consumer opinion into standards-making at the international level, and have agreed to work together to produce a framework for achieving this.

To meet these challenges, consumer organisations need to invest time and resources in standardisation. However, participation of consumers can only be as effective as the system allows it to be ! ■

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THE EUROPEAN TRADE UNION TECHNICAL BUREAU FOR HEALTH AND SAFETY was established in 1989 by the European Trade Union Confederation (ETUC). It provides support and expertise to the ETUC and the Workers' Group of the Advisory Committee on Safety, Hygiene and Health Protection at Work. The TUTB is an associate member of the European Committee for Standardization (CEN). It coordinates networks of trade union experts in the fields of standardization (safety of machinery) and chemicals (classification of hazardous substances and setting occupational exposure limits). It also represents the ETUC at the European Agency for Health and Safety in Bilbao.

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