Applying the « Feedback Method » to any kind of working environment

Lessons learnt from the scaffolding sector

Final report, September 2016
Introduction

This report presents the results and possibilities for applying the Feedback method to any working environment and equipment. The Feedback method is a tool that has been developed for accumulating knowledge from the workplace and real activity, formalising it and making it available to standardisers, manufacturers, employers, users, workers and public authorities. While the feedback methodology had been until now successfully applied to the Machinery sector, the ETUC STAND project has worked to assess whether this method is applicable to any working environment and non-machinery equipment, such as scaffolding.

The ETUC STAND project – aimed at sustaining the voice of trade union in European standardisation – covers two main areas of involvement (advanced manufacturing and services) and is fully committed to the promotion of workers’ effective participation in the design of any work system and equipment.

ETUC is convinced that in work system design and equipment a participatory approach is essential in order to avoid sub-optimal solutions, because the experience of workers provides an indispensable knowledge base: the design process should therefore, wherever possible, involve workers in all stages. In addition, the quality and acceptability of a standard depends to a large extent on the full integration of the concerns, limitations, demands and recommendations of the people affected by the standard itself. In this view, the effectiveness of trade union participation in standardisation is increased when linked to methods for feeding back workers’ own experience of their working conditions in standardisation processes. Appropriate methods and techniques for this purpose imply the use of evaluation tools for working conditions. This evaluation should consider the quality of work in order to create a healthy basis within working situations for long-term effective performance of workers. It thus indispensable to have an evaluation tool enabling the identification of information regarding most critical aspects related to equipment, operating and maintenance procedures, training programmes, or inspection strategies that have an impact on health and safety, reliability of tasks or even production efficiency.

These dimensions are integrated and implemented by the Feedback method, a tool developed for accumulating knowledge from the workplace, structuring it and making it available to standard-setters. Feedback collects the contribution of employers and employees for the reconstruction and comprehension of the actual work and real activity at the workplace: this knowledge is then elaborated for the improvement of selected standards.

This report is structured as follows. In the first part, the report presents the Feedback method and its different steps as experienced in the Machinery sector. In a second part, the application of the method to the field of scaffolding is presented and discussed in order to highlight the specific challenges of the application of the feedback method to non-Machinery sectors. The report concludes positively on the possibility to apply the Feedback method to any working equipment and environment, taking into account that relevant committees, actors and/or initiatives are identified to value the knowledge produced by the application of the method.
1. **THE FEEDBACK METHOD**

The “Feedback Method” is a scientific method\(^1\) to explore how real work is performed under different working conditions. By collecting the contribution of users of work equipment and by reconstructing and understanding how real work is performed under different operating conditions, the feedback method identifies most critical aspects related to equipment, operating and maintenance procedures, training programmes, or inspection strategies that have an impact on health and safety, reliability of tasks or even production efficiency. It is a scientific method gathering and formalizing real work experiences in order to increase trade union influence in standardisation and ensure that workers' concerns are included in the knowledge base of standards. This method will support ETUC standardisation action and provides workers representatives with scientific evidence of great value for defining, revising or improving technical standards.

Unfortunately, standardisation process still doesn’t facilitate the direct participation of workers: this poses the risk of losing an important opportunity to improve – among others - the application of ergonomic principles in technical standards.

The “Feedback Method” provides the best available solution to achieve the objectives of raising the quality of work systems by benefitting from workers’ experience. This flowchart summarizes the method as presented by Strambi et al. (2012) and formalized in the CEN technical report 16710-1, “Ergonomics methods - Part 1: Feedback method - A method to understand how end users perform their work with Machines”:

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1. The Method was designed by F. Strambi and developed with M. Bartalini and coll. with the support of the trade union movement. See Strambi F. et al. (2012). End users “Feedback” to improve ergonomic design of machinery, *Work 41*: 1212-1220.
The method has been designed and developed to gather the direct contribution of end users, to give information and suggestions to designers, manufacturers and also to employers for the improvement of standards and health and safety of work.

Significant evidence of the added-value of the application of the Feedback method to the machinery sector exist. As Strambi et al. (2012, p. 1212) note, "The Feedback method has since now been applied successfully - in collaboration with public authorities, market surveillance bodies, social partners’ organization and technical institutes across Europe - to different types of machines: woodworking machinery, forklift trucks, angle grinder and combine harvester. After ten years of experimentation in seven European countries Feedback has proved to be trans-nationally comparable and has attracted the interest of as much as 250 expert users - mostly workers, but also employers and technicians - who have shared their knowledge and experience by taking part in almost 30 working groups."

This is the flowchart describing the different steps of the Feedback Method when applied to work equipment in the field of Machinery:

The Feedback Method has been developed to supply a concrete answer to difficulties of end users in transferring their knowledge and suggestions inside the standardisation system. It provides a reliable and concrete method to all interested subjects (standardisers, designers, manufacturers and employers) for gathering the experience and knowledge of workers/craftsmen that use the machinery every day.
As a matter of fact, information collected thanks to the Feedback method are valuable for a wide range of actors. According to the designers of the method (Strambi et al., 2012: 1216), such information can be used by:

- "CEN and ISO standardisation committees and working groups to become aware of the problems relating to the real use of specific machines in different work contexts, and thus to be able to draw up new or to revise existing standards accordingly;
- Designers and manufacturers to produce better, more comfortable and safer machines and to provide precise instructions for use;
- Employers, users and workers for training purposes and for defining appropriate work procedures;
- Inspection bodies to enhance their knowledge and improve the efficiency of their interventions and advice."

The “Feedback Method” fills in a gap in the technical standards; it provides a method that in many field studies (with the involvement of users of different companies and in different UE member states) has demonstrated to be low expensive and extremely reliable for:

- Comparability of results obtained in different contexts and countries for similar machines;
- Wealth of suggestions even for machinery of simple manufacture and usage (for example angle grinders) and specific answers to particular problems of context (for example, climatic differences, differences of manufacturing processes, etc.);
- Simplicity of the method that, based on a deep technical knowledge of the standards and the literature concerning each specific machinery, needs only a short preliminary training for the operators who are going to apply it;
- Applicability in small and medium enterprises (the method has been experimented mainly with workers/ coming from small and medium enterprises and even with the participation of craftsmen and small businesses employers).

Over the years, the Feedback method has provided valuable results and achieved a substantial improvement of technical standards shaping workplaces and procedures involving Machinery. The outcomes of the application of the Feedback method to the machinery sector resulted in improved machinery safety and higher safety requirements that could be incorporated into European standards. The contribution of the Feedback Method to safer machinery was further acknowledged by the European Committee for Standardisation (CEN) and in December 2015, the ‘Feedback Method’ was adopted as a CEN Technical Report.

While the feedback methodology had been until now successfully applied to the Machinery sector, it is now important, given the value of this evaluation tool, to explore within the ETUC

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3 See “CEN/TR 16710-1, Ergonomics methods - Part 1: Feedback method - A method to understand how end users perform their work with Machines.”
2. ADAPTATION OF THE FEEDBACK METHOD TO SCAFFOLDING

As a participatory approach to equipment and workplace design based on the knowledge that final users possess on the equipment they work with, the Feedback method is prone to being used in various working environment. Based on their experience and practical knowledge of the equipment, users constitute a precious source of information on the adaptability of the technical solutions provided by manufacturers. For instance, exchanges of information between manufacturers and users may help to improve the design of equipment, in particular by revealing certain unusual uses of work equipment by their operators.

To test the adaptation of the Feedback method to non-Machinery sector, the scaffolding sector has been selected for several reasons. First, because “Falls from height are the main causes of fatal accidents in the construction industries of the EU Member States”\(^4\), including falls from scaffolds. Second, the design and stability of the scaffold is of great importance for the safety of the workers using the scaffold. Third, scaffolds are required for a vast number of construction activities including new build, roofing, isolation, demolition, refurbishments and are used in a great variety of locations such as airports, rail sites, underground, industrial sites, historic sites or commercial buildings to name but a few. Fourth, scaffolds are being used for a wide range of maintenance activities and maintenance is a selected field of ETUC involvement in standardisation. Fifth, the ETUC could benefit from the experience, support and interest of the European federation of building and woodworkers (EFBWW) in applying the Feedback method to the scaffolding sector.

In order to test the adaptation of the Feedback method to any working environment, an introductory workshop has been organised in Toscana (Italy) under the leadership of Massimo Bartalini, Alessandro Fattorini and Fabio Strambi (Azienda USL 7 di Siena). The different steps described in the following figure were thus tested and further detailed during this introductory workshop.

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The different steps for applying the Feedback Method to scaffolding

1. Preliminary data collection
   - Collection of available technical documentation and data on scaffolding and their uses (i.e., instruction handbooks, literature, reports) so as to be aware of the main safety features and ergonomic requirements (accident statistics or records of undesired events) → Scaffolding Dossier

2. Companies and Workplace selection
   - Trade unions and employers’ associations help to identify suitable companies willing to take part and to select workplace where Feedback will be applied

3. Visit to workplace
   - Workplace visits are realized with the cooperation of the stakeholders to: observe of the environment and work processes (1 day) and to openly discuss with workers performing the job and activities (0, 5 day) → Workplace Dossier

4. Working group
   - A real work analysis is carried out in working groups (made up of 5 to 9 users meeting for 4h): skilled users, guided by a facilitator, reconstruct their job based on the daily activities carried out on scaffolding.

5. Consolidation of WG Feedback sheet
   - At the end of the process, the facilitator transfers the results of the job ergonomic analysis onto the so called “Feedback sheet” and delivers it to every participant for their validation and/or for any corrections/additions → WG Feedback sheet (see table 1)

6. Project Report
   - The project report describes all the different project phases and outcomes, from the preparation of the scaffolding dossier to the consolidation and validation of the WG report.

The first step of the Feedback method is a **preliminary data collection** intended to gather all relevant documents on the working environment and equipment under consideration. This preliminary data collection is leading to the “Scaffolding dossier”. According to Strambi et al. (2012:1214), such as dossier has to include:

- Relevant standards (CEN, ISO, etc.);
- Safety guidelines elaborated by technical bodies, professional associations or research organisations;
- Accident statistics, data and records of accident associated with scaffolding (together with any specific accident investigations);
- Market surveillance data provided by National authorities;
• Information from manufacturers about the geographical diffusion of scaffolding and its different models and/or configurations;
• Instruction and user handbooks accompanying the scaffolding;
• Other related documentation (publications, journals, testimonies, etc.) and materials (films, photographs, miniature models of the machine, etc.).

Thanks to the preparatory work done by the Feedback team in Italy prior to the introductory workshop, suitable companies were already identified, contacted and selected to conduct the workplace observation. The corresponding observations were realised during the workshop in Italy and lead to the identification and description of the main activities for erecting, using and dismantling of scaffolding:

**ACTIVITY SCAFFOLDING ASSEMBLY – SEQUENCE OF OPERATIONS**

**PRELIMINARY OPERATIONS**
- ANALYSIS OF THE COORDINATION AND SAFETY PLAN (PSC) AND THE ASSEMBLY, USE AND DISMANTLING PLAN (PIMUS)
- WORKPLACE/SITE INSPECTION
- ARRIVAL OF THE MATERIAL
- UNLOADING THE MATERIAL
- ALLOCATION OF WORKERS’ TASKS AND PARTS DISTRIBUTION
- MOVING PARTS CLOSE TO THE ASSEMBLY SITE

**ASSEMBLY OF FIRST LEVEL**
- PLACING BASE PLATES/FEET
- ASSEMBLY OF FIRST FRAME
- POSITIONING OF FRAMES
- FINALIZING THE WORKING PLATFORM WITH STAIRWAY FOR TRAP DOOR
- FINALIZING FRAMES FIRST LEVEL (USE OF DOUBLE-CABLE ANCHOR BELT)

**ASSEMBLY OF HIGHER LEVELS**
- ASSEMBLY OF HIGHER WORKING PLATFORMS
- PLACING ANCHORS

**ASSEMBLY OF ANCILLARY STRUCTURES**
- ASSEMBLY OF TOP WORKING PLATFORM WITH GUARD RAIL
- PLACING ANTI-DUST NET
- ASSEMBLY OF SPECIFIC PARTS: UNIT BEAM/LADDER BEAM, CARRIAGE ENTRANCE
- SCAFFOLDS BOUNDARIES

**SCAFFOLDING MANAGEMENT**
- HANDING OVER THE SCAFFOLDING TO THE COMPANY
- VERIFICATION/MAINTENANCE INTERVENTIONS

**SCAFFOLDS DISMANTLING**
- ON-SITE INSPECTION TO ASSESS STABILITY
- TOP WORKING PLATFORM DISMANTLING
- DISMANTLING OF SPECIFIC PARTS: UNIT BEAM/LADDER BEAM, CARRIAGE ENTRANCE
- DISMANTLING OF LOWER WORKING PLATFORMS

**STORAGE**
- MOVING PARTS
- LOADING ON THE TRUCK
On the basis of the identified sequence of operations, a real work analysis has been carried out with involvement of workers during a working group meeting that took place on one day. During the working group meeting, the sequence of operations was first validated by the workers. With guidance of the Feedback team, the workers reconstructed their real work activities and provided fruitful and very valuable insights on critical aspects of scaffolding.

Based on the constructive discussions that took place, a Feedback sheet could be elaborated, specifying for each operation the competences required, critical aspects and potential solutions and suggestions for improvements. While an excerpt of the Feedback sheet is provided in annex 1, main points identified for improvements during the discussions included:

- Scaffolding work and personal protective equipment against falls.
- Connecting scaffolds with building structures (stowage).
- Skid-proofed surfaces.
- Standard regarding the distance to building walls and insulation work.
- Weight of the equipment: improving safety under “appropriate ergonomic conditions”, i.e. conditions that are not ergonomically arduous (preventing musculoskeletal disorder, also as part of the aging workforce challenge).
- Collective protection by railings that are pushed up from below favoured over individual fall protection.
- Subcontracting, foreign workers and competences.

While this above-mentioned list is not exhaustive, it highlights the value of gathering workers’ knowledge about the equipment they are working with. Moreover, during the discussions some potentially conflicting requirements were highlighted. A case in point is for instance the requirement for having skid-proofed planks and at the same time light scaffolding element calls for using aluminium plank that in the same time often increases skidding risks if not integrate anti-slippery elements.

Taking stock of the exploratory work conduct to assess whether the Feedback Method can be applied to non-machinery sector, it is worth recognizing that the method is suitable for a wide range of working environment and equipment. The challenges in applying the Feedback Method to any working environment are nonetheless twofold: there is a thematic challenge and the challenge of translating workers’ knowledge into technical requirements and specifications.

The thematic challenge is specific to the working equipment to which the Feedback method is applied. In order to value the knowledge produced by the application of the Feedback Method, it is necessary to identify the broad range of relevant actors in the corresponding field, such as manufacturers, competent authorities, providers of vocational training, professional associations providing guidance on training and competence or use of working equipment. The same holds for standardisation arenas: the various and different issues raised by the Feedback method might well be covered by different standards, different technical committees and even different standardisation organisations. Moreover, some relevant standards might be under development, thus enabling to feed the standardisation process with workers’ knowledge, while others might already be published, thus not offering a relevant and timely support to value the results of a Feedback study.
The second challenge relates to the translation of identified solutions and suggestions for improvements in the technical language governing standardisation work. In other words, it relates to translating concerns formulated in general terms into technical specifications: asking for the use of skid-proof plank in scaffolding is one thing, setting the technical criteria defining what can be considered as skid-proof is much more challenging. Solving the translation issue might then imply further research but also trigger further collaboration with technical institute, manufacturers, standardisation bodies and public authorities around the shared objective of improving working conditions on the basis of users knowledge.

3. CONCLUSIONS

The ETUC STAND Project promotes the careful analysis of 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 is a basis not just for devising technical solutions, but also putting them to work. Workers and trade unions must be actively involved in systematically collecting information at the workplace, and in transferring and giving legitimacy to their knowledge in arenas outside the workplace.

What the ETUC STAND Project shows is that the « Feedback » methodology is the best available answer to the 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 Agreement with the ISO, can initiate their own information collection so as to be certain, for instance, that risk assessments stand up in practice.

By collecting the experiences of skilled users, ETUC promotes a broader use of this method that produces added value in reconstructing actual work activities under different operating conditions and with any kind of work equipment. The Feedback Method is an important tool and provides the best available solution to identify all the critical aspects having an impact on health and safety, or associated with human interface principles. As such, it enables the identification of crucial elements for defining the standards for work equipment and for their revision and improvement. These elements need then to be translated into technical specifications or into other available solutions (e.g. training) to deliver the full benefits of the Feedback method. In this regard, the scientific and participatory basis of the Feedback method shall further encourage a wide range of actors of the added value of integrating workers’ knowledge.

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A special thanks goes also to Stefano Boy (ETUI) for his support in establishing contacts between the ETUC and the team of the Azienda USL 7 di Siena.
ANNEX 1 - Work Group sheet, Feedback Method « SCAFFOLDING »

<table>
<thead>
<tr>
<th>Sequence of tasks</th>
<th>Operating Procedure</th>
<th>Competence</th>
<th>Hazards/Risks/Critical aspects;</th>
<th>Suggestions for prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of the procedure for carrying out the tasks listed with information on the equipment used, safety devices and personal protective equipment, PPE, people involved</td>
<td>Information about the competence required for optimum execution of task (technical skill/ knowledge, use of equipment, materials, procedures ... and information about the instruction handbook).</td>
<td>Factors that represent a hazard/risk as regards the machinery itself, equipment, safety devices, surrounding conditions (e.g. microclimate, dust, lighting or layout), fatigue and organisation (frequency, shifts etc.)</td>
<td>Improvement of the standard, design and manufacturing of the machinery, Suggestions on how to eliminate the hazards and to prevent the risks identified; information on training, instruction handbook, safety devices, procedure, PPE; need of further researches.</td>
<td></td>
</tr>
<tr>
<td>(...) Preparing the ground</td>
<td>Check the stability of the ground</td>
<td>Workers must be able to carry out a careful assessment of the soil and ground conditions</td>
<td>Soil fragility or open excavations nearby can represent a source of hazards</td>
<td>Compact the ground or build foundations if necessary. Foreseeable loads and the nature of the ground should be assessed carefully in order to minimize the possibility of instability. The base of the scaffolding should never be allowed to rest on hollow building materials (bricks, concrete blocks) or wooden parts subjected to bending forces if their strength has not been calculated.</td>
</tr>
<tr>
<td>(...) Starting assembly</td>
<td>Assemble the scaffolding frame</td>
<td>Workers need to be able to understand and follow the assembly, use and dismantling plan</td>
<td>Safe work and movement can be at risk if the size, shape and layout of scaffolding flooring is not appropriate for the type of work to be performed</td>
<td>The scaffolding flooring must be assembled in such a way that its components cannot move in the context of normal use. It is important to use proper grades of lumber and to inspect planks before erection to ensure that there are no weak areas, deterioration, or cracks.</td>
</tr>
<tr>
<td></td>
<td>Place the planks</td>
<td>Workers need to know how to lift the planks through the scaffold bars and into place. Hardware should be included to fasten the planks into place</td>
<td>Low-quality wood planks aren’t strong enough for the work surface. Use special scaffold planks to cover the frames from side to side.</td>
<td></td>
</tr>
</tbody>
</table>

5 Column headings and generic description according to Strambi et al. (2012: 1215).