

TRIPOD SIGMA. RESULTS OF A PRO-ACTIVE WORK STRESS-SURVEY.

Ruud Nelemans, Noortje Wiezer, Fietje Vaas, Johan Gort,
Jop Groeneweg*
TNO Work & Employment
*University of Leiden, Centre for Safety Research

Work related stress is one of the most important causes of disability and absenteeism. It can cause a decline of motivation and productivity. TNO Work and Employment has developed an instrument, called Tripod Sigma, that identifies risks to work stress and provides tools for remedying these risks. The Tripod Sigma model is developed analogous to the Tripod philosophy which Shell has initiated to identify and pro-actively control safety risks. This model, is used to measure latent failures in the working environment that can cause human error. The main philosophy behind Tripod is that human error can most effectively be controlled by controlling the working environment and the organisation of work. Work stress, like human error, is something that occurs on the level of the individual. Research shows that causes which contribute to work related stress can also be traced back to conditions of the working environment of employees. The project described in this paper has the aim to develop an instrument for analysis of risks for work related stress 'all the way back' to the level of management decisions. An instrument that not only identifies risks, but also provides directions for management to reduce or prevent risks.

Introduction

Work-related stress is one of the most important causes of disability and absenteeism. Moreover work-related stress can influence an employee's performance and company loyalty in a negative way. Research shows that 29 % of the workers in Europe experience stress - and 22% experience fatigue due to work (Houtman ea 2001). More and more work-related stress is considered as a substantial problem throughout companies in Europe.

Although work related stress involves the mental and physical state of an individual, a 'sound organisation' is the best way to prevent it and to guarantee an optimal performance (Vaas, 1995). Shell¹, considers work-related stress a prominent health risk. Shell sought tools that enable line managers to proactively manage the root causes of stress in order to reduce stress at work and to remove factors which prevent an optimal work performance. TNO Work and Employment was asked to develop an instrument which will help Shell line managers to identify and assess the General Failure Types that cause work-related stress and prevent optimal work performance. An instrument that should be developed analogous to the Tripod instrument used to identify and pro-actively control safety risks. Tripod is used within the Shell company and accepted by management as a useful and workable tool. With the new developed instrument (Tripod Sigma) two pilot studies are conducted. In this paper the instrument and the results of these two pilot studies are described.

The Tripod philosophy

Accidents are often attributed to human error. Accident analysis however points out that contributing causes of accidents can be traced back to elements of the working environment and eventually to management decisions.

¹ For the purpose of improved readability, the term 'Shell' will be used instead of 'The Royal Dutch/shell Group of Companies'.

The main philosophy behind Tripod is that human error can most effectively be controlled by controlling the working environment and organisation. In Tripod the environmental conditions that cause human error are called 'latent failures'. These failures are organised into so-called General Failure Types (GFTs). What is measured with the Tripod Delta survey is the level of control an organisation has over each GFT. The survey results show whether there are deficiencies in the business process and where these deficiencies are. By remedying these deficiencies, management can prevent human error and business upsets (Groeneweg, 1998).

The TNO approach to work-related stress and performance is based on scientific theories about the relationship between the division of labour (organisational structure, culture and business process design), work-related stress, and learning). Although work-related stress and performance, like human error, occur on the level of the individual, our approach is based on the notion that the focus should not be on the individual employee but on the work conditions of this employee and the deficiencies in the business process behind these conditions.

A new tool?

The Tripod Sigma instrument has two aims: it should help management to identify and assess the General Failure Types that cause work-related stress and prevent optimal work performance. But it should also identify steps to be taken to decrease the risks on work-related stress and sub-optimal work performance. Where other instruments can be used only to detect risks on work-related stress, this instrument goes back into the causation chain all the way to the management decisions that allowed these risks to occur. By identifying these decisions not only the risks that can cause work-related stress and sub-optimal performance are identified, but also the steps that can be taken to decrease these risks. The instrument on its own should stimulate action. Eventually this instrument will be an instrument to support consultancy projects.

Towards the Tripod Sigma model

Research shows that there are four main categories of problems over which a person can feel that he/she has less control (Veerman et al, 2000):

1. **Job Demands**, caused by high demands, time constraints and disturbances / breakdowns in production.
2. **Work-life balance**: too much interference of work with private life, demands from the sphere of work time and presence that are difficult to combine with private care obligations
3. **Working relations**: such as social support, co-operation, and coaching on the positive side; and conflicts, mobbing and discrimination on the negative side.
4. **Working conditions**: such as contracts, job security, opportunities for learning, management development, and career planning.

Culture can interfere with control opportunities. A corporate culture can be a stimulating or an inhibiting factor. The culture of a group (or organisation) can be defined in terms of values and assumptions (notions about what is right and wrong, about how the world should be, do's and don'ts), and perspectives on situations that are shared by members of the group. Sometimes these values are formalised in rules, incentives and targets, at other times they exist despite the formal rules.

The Tripod Sigma Model

With the aid of the Tripod Sigma model (figure 1), those elements are searched for, within the way in which the employing organization is set up and managed, that increase the risk of occurrence of any of the above stressors. A number of distinct areas, termed General Failure Types (GFTs) are studied.

GFTs are those organization and management aspects which have frequently been found to constitute the underlying causes of incidents and accidents. The six stress-relevant GFTs have been further elaborated and adapted for the purposes of Tripod Sigma. They are:

- procedures,
- materials and resources,

- organization,
- communication,
- training and skills,
- incompatible goals.

If all or part of an organization ‘scores poorly’ in any of these areas, problems may arise in that area or those areas that lead to work overload, work/life imbalance, upset working relationships and/or dissatisfaction with terms of employment.

Tripod Sigma assesses the ‘problems’ in each area (GFTs) and the possible causes of those problems, studying whether resources are adequate and methods are supportive. It is also investigated whether staff have sufficient ‘control options’ to resolve problems by themselves or with other people, and whether the organizational culture supports the use of such control options.

The allocation of resources and the practicalities of the methods ensue from policy choices made on (senior) management level. It is within these policy choices that the underlying causes of problems – but also the first steps towards resolving them – often lie.

Several mechanisms may delay the progression from problems to stress and from stress to burnout. A very important one is ‘support by colleagues and supervisors’.

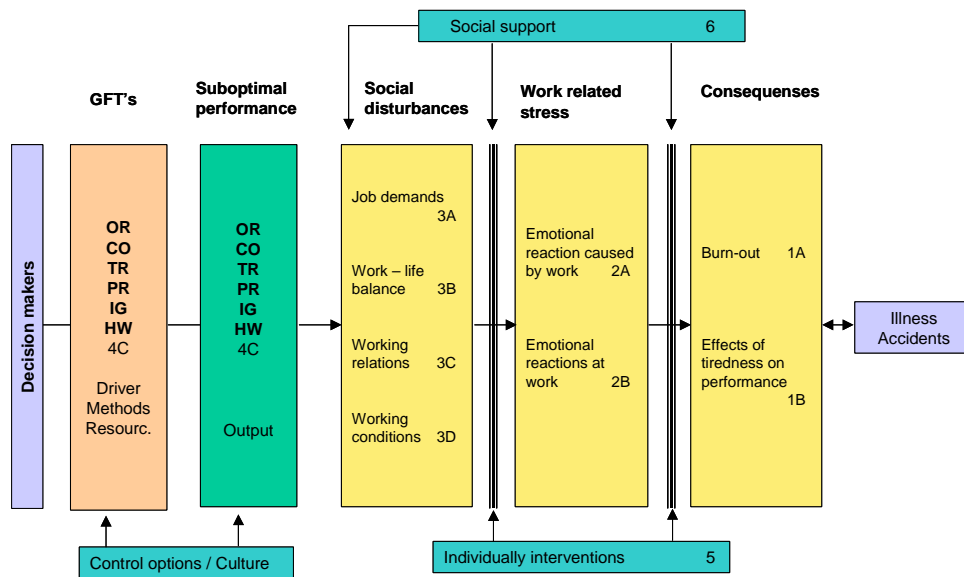


Figure 1: Tripod Sigma Instrument: (OR: Organization, CO: Communication, TR: Training and competence development, PR: Procedures, IG: Incompatible Goals, HW: Hardware)

Methods

Samples

Data were collected in two pilot organizations, both part of the Shell company. The Tripod Sigma questionnaire was filled out by 712 respondents. Of these respondents 165 work in a virtual team. In addition to the questionnaire 18 interviews were held, with managers and HR officers. The purpose of these interviews was to validate the survey instrument by using another instrument (interviews) to measure the same items. The interviews were structured on the basis of the Tripod Sigma questionnaire in such a way that all the relevant topics from which scales can be constructed were discussed. This structure has made it possible to highlight the most important causes of work-related stress and to get the opinions of managers who have a broad overview of the types of work within their respective lines of business. Some of the interviews held after the survey results were analysed. These interviews were used to discuss the results and the steps that ought to be taken by management.

Measurements

The reliability analysis on the used variables pointed out that, except for the scales Working relations and Working conditions, each construct has sufficient reliability ranging from 0.67 to 0.85.

Especially the scales Deranged working relations and Working conditions can be regarded as a priori scales, meaning that they are constructed based on a wider variety of topics with also more extreme questions.

Anchor modules

The assumption that the seven GFTs have a genuine bearing on stress risks and stress complaints must of course be verified. For that purpose, an existing reliable and valid TNO tool was largely incorporated in the test version of the tool applied at the pilot studies. This is NOVA WEBA, a tool for identifying stress risks in groups, with a reference database of 11,311 respondents built up in the course of research. The following modules of this tool were adopted: work demands (pressure of work), autonomy, contacts, organizational tasks, information provision and burnout. Items from the 'control problems' module were also taken over.

Results

Four stressors, i.e. causes of job related stress, have been defined: high job demands, work-life disbalance, deranged working relations and dissatisfaction with working conditions. Analysis show that amongst the GFT's, Incompatible goals and Organisation were two dominant factors in explaining variance of the four stressors.

In order to obtain which GFT's explain differences in the four stressors, regression analyses were conducted. This analysis shows that there is a direct relation between problems with 'Procedures', problems with 'Communication' and high Job Demands. The scale 'Procedures' also has a direct relation with Work-life disbalance. These results support the hypotheses that time consuming or unclear procedures and a lack of the right information to do your job increased the job demands and the time pressure people experience.

The hypothesis that lack of confidence in the skills of co-workers or supervisors can have a negative effect on the working relations within a department is supported by this analysis. The third stressor, working relations is strongly related to 'Training'. There is also a strong direct relation between problems with training and dissatisfaction with working conditions and problems with Hardware and dissatisfaction with Working conditions. This can be explained by the fact that training, but also hardware (especially computer equipment) are sometimes considered as rewards. The scale working conditions also contains items on the opportunity for people to develop skills and competences. Sufficient training opportunity provides for that.

A very strong direct relation has been found between Incompatible goals and Job Demands, Work-life balance and Working conditions and a strong relation between Incompatible goals and Working relations.

Conflicts that occur when different interests are not compatible is not improving the efficiency of the processes in the organisation. This increases the job demands and the time constraints of the individual workers. It can also result in scarcity of staff and budget. Conflicts easily occur in a situation in which there is scarcity in staff and budget and in which people are dependent of each other. The results of the analysis supports these ideas. Part of goals to increase health and well-being of employees can be to supply sufficient opportunity for people to take special leaves (like parental leave) or to work part-time. Opportunities like that increases the possibility for people to balance between work and private life.

Organization is very strongly related to Work-life balance and Working relations. Organization is also related to Job demands. An inefficient organization of work and coordination problems were expected to result in extra work and therefore increase the job demands of people. These problems were expected to result in work that was not anticipated of. Work that has to be done in overtime. The results of the analyses support these ideas. Coordination problems can easily lead to conflicts. The relationship between 'Organization' and 'Deranged work relations' supports this idea.

Very important for an instrument to direct in improving stressful situations at work is the ability of the instrument to explain a significant amount of the variance in job related stress. The amount of job related stress is measured by the Burnout scale. A low score on this scale means a high amount of job related stress.

The results of the pilot show that there is a direct relation between Procedures and Burnout. This result is somewhat unexpected and will be discussed in the next section. Research has shown that there are four main categories of problems that can cause work related stress: high job demands, a disbalance between work and private life, deranged work relations and dissatisfaction with working conditions. The results of the analyses support three of the four expected relations. There is also a strong direct relation between Disturbed working relations, Work life balance and Job demands and Burnout. The hypotheses that dissatisfaction with working conditions can also increase work related stress is not supported.

The full Tripod Sigma model explains 42% of the total variance of Burnout which is very high compared to other models.

Discussion

The allocation of resources and the practicalities of the methods ensue from policy choices made on (senior) management level. It is within these policy choices that the underlying causes of problems – but also the first steps towards resolving them – often lie. In each area, these '*drivers*' are mapped out as far as possible, as the key to resolving problems lies in analysing them.

The management actions needed to reduce or prevent risks were derived from the drivers of each area. The driver subscales contains of policy choices that underlie causes of problems on the six specific areas. For consultancy purposes it is important to incorporate a variety of significant policy choices in the model.

The fact that six very specific areas were distinguished, made it possible to make the actions needed to reduce or prevent risks, concrete and workable. The results of the regression analyses, however show that a substantial part of the variance in the four stressors is explained by two of the six General Failure Types, namely Organisation of Work and Incompatible Goals. High job demands, imbalance between work and private, deranged work-relations and dissatisfaction with working conditions can be explained for a large part by work not being efficiently organized and by the fact that conflicts occur when different interests are not compatible. The results suggest that problems with Organisation of Work and Incompatible Goals were caused by problems with Procedures, Hardware, Communication and Training. So problems with executing

all procedures, delays in their work, a lack of information and undertrained personell, lead to coordination problems and incompatible goals of efficiency and production against safety & health.

For research purposes it might be enough to only use two of the six General Failure Types. For consultancy purposes however it is very useful to analyse all six of the areas.

The results show that there is a direct relation between Procedures and Burnout. This result is somewhat unexpected. For some parts of the pilot Organization following procedures is literally a matter of life and death (or accidents). An unclear or missing procedure, not only increased job demands, but in this situation, may cause strain on its own. Another explanation can be that good procedures also decreases ambiguity for people and provide them with a clear direction of what to do in a variety of circumstances. Ambiguity and uncertainty can cause feelings of stress. Effective procedures may prevent this.

Conclusion

The total instrument proved to be successful in explaining a substantial part of the variance of strain of individuals (measured with a scale called 'Burnout'). The hypothesis that the GFT's caused the problems on the four Job stressors was largely supported. This too applies for the hypothesis that the four stressors cause strain on the level of individuals. The fact that Procedures on itself contributed to de explanation of the variance of Burn out will be subject of further analysis.

Due to the use of Tripod Sigma a complex construct as Job related stress was translated to various concrete organizational problems that management and employees could relate to. This helped the management in optimising the organisation. Because of the translation of Job related stress into day to day problems, the results became a start in discussion between management and employees and has already led to various improvements of the organization.

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