

Assessing health and moral stress in IT-based work*

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Abstract

Health and Moral Stress Questionnaire (HMSQ) was constructed with the aim to assess organizational learning processes and individual skills necessary for the handling of problems connected to five areas of activity: work demands, work task control, support, computer tool use, and ethics. The main hypothesis was that the existence of organizational learning processes and individual skills contributes to lower levels of stress by providing the knowledge needed to solve the problems arising during IT-supported work. The results showed that it is possible to construct a questionnaire to assess organizational learning and personal skills as a factor defining stress level at IT-based work. High levels of reliability were obtained. In accordance to our hypothesis five factors could be discerned as well as an underlying factor representing learning processes and personal skills.

Keywords

Health, stress, computer-supported work, assessment, reliability, moral stress, computer ethics, skill, process.

Introduction

Control, moral stress and ethical competence

Today office workers spend most of their working hours at the computer. From 1989 to 1997 the proportion of computer users among office workers in Sweden increased from 65% to 90%. (Marklund, 2000). For women this figure has continued to increase from 91% in 1997 to 94% in 1999 (Ekman et al., 2000). Thirty-five per cent of the women and 30% of the men in the total work force in Sweden use computers at least half of the working day (Arbetsmiljöverket, 2001), and these figures are clearly higher if you look only at office workers. With the increase of computer-supported work, there has been a dramatic increase in health problems related to it (Bergqvist, 1993; Aronsson et al., 1994; Punnett & Bergqvist, 1997). Health problems in IT-supported work are well known and well documented. The main symptoms are visual discomfort, musculoskeletal disorders

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(repetitive strain injuries, RSI) and stress-related symptoms (Aronsson et al., 1994; Punnett & Bergqvist, 1997; Smith 1997; Aarås et al., 2000).

Numerous studies, mostly from the USA, have shown that the staff costs, including education, training, support, etc, is a totally dominating part of the total costs when introducing new computer systems. Such studies also show that bad designed software products can lead to big losses, in efficiency, effectiveness and money (Nielsen, 1993). Despite this fact the hardware usually gets most attention from buyers, investors and decision makers.

Badly designed computer systems lead to inefficient use and to a variety of cognitive problems, such as confusion, lack of overview and memory overload, in the next step leading to high mental workload, frustration and stress. And again, even if the technology is not good enough and the system is actually not possible to comprehend, we tend to blame ourselves and experience stressful self-doubts.

The vulnerability of the technology is a specific stressor on its own. The fear of all kinds of disruptions that might occur creates feelings of uncertainty and stress, especially in users handling important information that can affect other people's situation and wellbeing. To be afraid of harming people depending on you is a quite strong and stressful feeling. The vulnerability often is double; you could be concerned about both the total business (or even the society) and about your own personal situation.

The health problems in IT work are caused by multiple, interrelated risk factors, some of which are directly related to the design of the software tools used. Other factors are related to the work organization and job design. In IT work, the work organization and job design are to a large extent shaped by the software. Technology often comes before work practices and not the other way around (Clegg et al, 1997; Eason, 1997; Boivie et al, 2003).

Technical and financial factors usually determine how to develop, implement and use IT systems. However, today other aspects such as user competence, work environment, work organization, work tasks, and also ethical issues, are more important for system usability. A significant issue is how ethical competence can be achieved and maintained in a highly changing environment dominated by the use of IT tools, and how to play a positive role in reducing stress and promoting health. Ethical competence is an important factor in the efforts towards optimal use of IT systems, e.g. through increasing the user's control of the work situation. Ethical competence can contribute to a more satisfying handling of moral problems (Collste, 2000), and thereby reduce the stress level and promote a better work environment.

Ethical competence is defined as a psychological process based on ethical autonomy (Piaget, 1932; Kohlberg, 1985; Kavathatzopoulos, 2004). An ethically competent person is unconstrained by moral fixations, moral authorities and uncontrolled reactions and is able to start the thought process of considering and analyzing critically and systematically all relevant values in a situation involving a moral problem. An ethically confident person trusts his/her own ability to cope with moral problems and has the emotional strength to implement

controversial decisions. Such ethical skills result in better handling of moral problems, feelings of higher control and less moral stress, and thereby could contribute to better health.

Efficient use of IT systems demands competent users with certain kind and amount of knowledge. Persons lacking necessary knowledge feel that they cannot satisfactorily handle the work demands and control their work situation, and lack of control is a well known stress factor (Karasek & Theorell, 1990). The imbalance we experience when we feel that we don't have enough resources to deal with the work demands is a classic stressful situation, referred to as high job strain, leading to increased risks for health problems. This is described in the widely used stress model called "the demand-control model" or "the Karasek model". The model subsequently became three-dimensional, by adding the factor social support (i.e. support from supervisors and colleagues). Social support has been shown to have an important effect on work related stress and health. (House, 1981; Wahlstedt, 2001). The most favorable, in terms of stress and health, is when the work situation is perceived as characterized by reasonable demands, high control/decision latitude and high social support. Most experiences, from a long period of time, show that when new and expanded IT systems are introduced into a workplace the subjective demands increase, while the subjective control and support decrease (Aronsson et al, 1994; Sandblad et al., 2003). The control factor is of special interest within the scope of this paper. The type of control users report as decreasing when they get more IT-based work is control of their own work situation and their subjective decision latitude, while at the same time the control of employees by management is perceived as increasing (Aronsson et al., 1994; Åborg & Billing, 2003).

New IT-systems often make it easier to monitor and "control" the actions of the users. This also leads to increased risks for situations where the managers and/or the users experience moral problems and need ethical competence. If you at a given moment do not have the needed knowledge and competence, as a person or within your organization, to handle the work tasks or the IT systems, there has to be processes to create the missing competence. Persons as well as organizations clearly need moral knowledge. Individuals need a psychological problem-solving and decision-making skill to cope with moral problems, that is, they need ethical competence. In a corresponding way organizations need adaptive processes and routines to help people to handle moral problems satisfactorily. Individuals can learn through their own personal experience and by organized training. Organizations can reorganize in order to be able to co-ordinate existing knowledge and expertise. What is needed are both personal skills and organizational processes supporting general problem-solving methods applicable to an infinite number of problems of the same kind, e.g. moral problems. This ethical competence is necessary for lower stress and better health.

Focus on skills and processes

In systems development, implementation and use, the main aim is to create, adopt and apply a tool in order to satisfy certain goals. Therefore good function of these IT-tools is necessary in order to satisfy the goals. As a consequence we are searching for working solutions to design problems rather than the achievement of perfection, something that is more appropriate for academic research or theory construction. However, searching for design standards, guidelines, recommendations and the like is not sufficient, and this is especially true regarding ethics. That

depends on changing organizational, societal and technical conditions which do not allow the construction of tools that cover all possible situations and that can provide solutions to all problems. Furthermore, these tools are based on knowledge from other disciplines, such as psychology, but these disciplines cannot provide clear answers to our design problems due to their internal diversity of conflicting theoretical positions.

Then what is possible to be done is to search for methods that can help us produce the knowledge we need, such as scenarios, prototypes, experiments, field studies, observations, heuristics, etc. However, the focus of all these methods is on producing knowledge in the form of clear solutions to concrete problems of the designer, independently if these problems are pure technical or education programs or organizational changes (see for example Preece et al. 2002). Working answers through the use of these methods are indeed obtained, but up to a certain point. A significant amount of questions, particularly ethical issues, are still left without answers, especially after the installation of a system and during its continuous use.

What we need are methods for the acquisition of knowledge to design and use a system, methods that are not focusing exclusively on the needs of designers or on the production of ready answers. Such different methods, which should be complementary to the already established methods, need to focus on individual skills and organizational processes. These are the skills and the processes that continuously create knowledge necessary during all the phases of system construction and use. They cover knowledge needs for the whole spectrum of optimal system function, i.e. demand formulation, construction, implementation, and use. Some examples of knowledge production organizational processes and individual skills are user participation structures, specialized organizational roles, informal dynamics and processes, education policies for purchasers, developers and users, individual skills in problem-solving and decision-making, social skills, cooperation skills, ethical competence, etc (Kavathatzopoulos, 2001a, 2001b).

The existence of organizational learning and individual skills is significant for the usability of a system (Argyris, 1999). Despite that, very little has been done to study this dimension of human-computer interaction. One way to use this approach is to construct methods based on the learning and skills hypothesis. Such assessment methods would be able to describe the conditions affecting organizational learning and personal skills during system purchase, development, implementation and use. A questionnaire could be a suitable method to investigate the existence of skill and learning oriented processes at personal and organizational levels.

Health and Moral Stress Questionnaire

Health and Moral Stress Questionnaire (HMSQ) was constructed with the aim to assess organizational processes and personal skills necessary for the handling of problems originating either from the system, or from the organization, or from ethical issues. The main hypothesis was that the existence of organizational learning processes and individual skills contributes to lower levels of stress by providing the knowledge needed to solve the problems arising during IT-supported work. Therefore an assessment method constructed in accordance to the above

hypothesis investigating the existence of such processes and skills was supposed to show acceptable reliability.

The questionnaire must have the ability to capture and to describe processes, personal as well as organizational, necessary for the copying of all problems connected to the whole spectrum of purchase-development-implementation-use of IT-tools. In that sense it is important to investigate all significant areas of activity. Therefore the HMS Questionnaire was comprised of five different subscales adapted to five different areas of activity. Each subscale was assessing the presence of particular conditions affecting the use of organizational learning processes and personal skills in each area of activity.

One significant area of activity is the use of technology itself; therefore a subscale assessed the features of technology and the preparedness of users to handle the problems connected to the use of their computer tools, and to their possibilities to find solutions (Åborg, 2002). Another subscale focused on ethical issues which are a new and important area of concern in IT-based work (Collste, 2000; Johnson & Nissenbaum 1995); and in this case the focus was on ethical skills and ethical competence to handle ethical issues rather than on values or normative aspects (Kavathatzopoulos et al., 2002, 2003). Three other subscales focus on support, work demand and work task control, all of which are also significant sources of stress (Karasek & Theorell, 1990).

HSMQ was comprised of five subscales (Demand, Control, Support, Technology, and Ethics) containing seven to eight questions each. The questions were of Likert type with four fixed alternatives. The scoring varied from zero to three for each question (HSMQ is published in Kavathatzopoulos et al., 2004).

Method

The questionnaire was applied to employees at the National Registration Office in Sweden as part of the VERKA research project to study the upcoming FOLKE-system (a case-handling system under development).

Participants

The number of participants was 376. Most of them were women (96%). The average age was 46 years ($SD = 1.09$). Almost all of them were clerks or assistant clerks. They were coming from all regional departments of the National Registration Office except one.

Material

The HSMQ was printed in a 14-page pamphlet. On the first page the participants were informed about the aims of the investigation, and they were assured that their answers would be strictly anonymous.

Procedure

One of the researchers met the respondents group-wise locally in nine out of ten geographical regions in Sweden and administered the questionnaire. The questionnaire was handed out after an oral introduction given to the groups in which purpose and feedback matters were presented.

The participants gave their answers individually. Then at the end of the day the questionnaires were gathered again.

Results

The results showed that the mean for the Demand subscale was 2.3 ($SD = 3.26$) in a range from 0 to 3. For the Control subscale the mean was 2.0 ($SD = 3.91$). For the Support subscale the mean was 2.6 ($SD = 3.99$). For the Technology subscale the mean was 2.4 ($SD = 3.06$). For the Ethics subscale the mean was 1.6 ($SD = 3.74$).

A test of item analysis showed that the Cronbach's alpha for the Demand subscale was 0.60. For the Control subscale $\alpha = 0.70$, Support subscale $\alpha = 0.71$, Technology subscale $\alpha = 0.56$, and Ethics subscale $\alpha = 0.74$.

As seen in table 1, a correlation analysis of the whole questionnaire showed that there was a significant correlation among the different subscales.

Table 1. Correlations between the different subscales of the HMS Questionnaire

	Demand	Control	Support	Technology
Control	0.39			
Support	0.37	0.36		
Technology	0.29	0.32	0.35	
Ethics	0.28	0.32	0.40	0.27

$n = 376$. All correlations significant at $p < 0.05$

Discussion

HMSQ was focused on processes for organizational learning and on individual skill learning and performance. Indeed, the reliability of the questionnaire was high showing satisfactory internal coherence for each subscale as well as significant correlations among all subscales. These results suggest the existence of five factors as well as the existence of an underlying factor that is organizational learning processes and personal skills. Our hypothesis that the existence of organizational learning processes and individual skills plays a significant role for the stress level has gained positive evidence from these results obtained through the use of HMSQ. The present study showed that it is possible to construct a questionnaire to assess organizational learning and personal skills as a factor defining stress levels at IT-based work.

There are certain problems, however, particularly with the Technology subscale but also with the Demand subscale. Although they showed acceptable inter item reliability, these two subscales showed lower inter item reliability compared to the other subscales. A possible cause is that the questions in these subscales did not follow consistently the main hypothesis of the study as the questions of the other subscales did. Another cause might be that these two areas of activity by their nature were not so close to individual skills or organizational learning processes such as Support, Control and Ethics subscales were. Indeed the Technology subscale

and in a lesser degree the Demand subscale showed the relatively lowest correlations to the other subscales. The questions in these two subscales referred to a greater degree to external conditions and to facts searching to describe various situations, instead of focusing on individual skills or on organizational learning processes. That multifocus may cause disparity and, anyway, it did not consistently follow the theoretical assumption of skills and organizational processes as the other subscales did.

A further development and adjustment of the questionnaire by removing the present shortcomings in the two subscales would allow its application in order to assess the levels of organizational processes and personal competencies necessary for the optimal use of IT-systems at work and consequently a lower level of stress and better health.

Nevertheless, the application of HMSQ in the present study showed that the National Registration Office in Sweden was a rather good work place; something that is in accordance with previous studies by other methods at the same workplace (Kavathatzopoulos et. al., 2004, 2003). There were high levels of organizational learning processes and individual skills allowing the satisfactory handling of work demands, providing necessary support, giving control of work tasks, and facilitating the use of computer support. Regarding the handling of ethical issues at work the results did not show the same high levels of organizational learning processes and individual skills, pointing to the fact that some measures, such as education and organizational development, have to be taken in order to achieve a higher level of these processes and skills in this area of activity too.

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